RESTRICTED

TM 11-280

WAR DEPARTMENT

TECHNICAL MANUAL

RADIO SET SCR-299-A
RADIO SET SCR-299-B
RADIO SET SCR-299-C
RADIO SET SCR-299-D

22, June 1943

WAR DEPARTMENT
Washington, 25, D. C., 22, June 1943

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HALLICRAFTERS — 75,100 — SEPTEMBER 29, 1943

[redacted]

TECHNICAL MANUAL

RADIO SET SCR-299-A
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RADIO SET SCR-299-C
RADIO SET SCR-299-D

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON 25, D. C., 8 September 1944.

TM 11-280, 22 June 1943, is changed as follows:

SAFETY NOTICE

This equipment employs extremely HIGH VOLTAGES which are DANGEROUS TO LIFE if contacted. **Although** electrical interlock switches have been provided for your protection, **they should not be relied upon. If the contact points of relay RY_1 stick, high voltages are still present in the transmitter after the interlock switches are operated. For this reason,** be sure that the back cover, and cover doors are closed BEFORE APPLYING PLATE POWER. **A red bull's-eye pilot lamp, labeled PLATE POWER, on the front panel of the transmitter indicates when the high-voltage supply is turned on. Always make certain that the lamp is out before changing coils. Since this lamp may burn out, do not rely upon it to show that no high voltage is present.**

* * * * * * *

SECTION I—DESCRIPTION

* * * * *

Other technical manuals or instructions which are necessary for a complete understanding of Radio Set SCR-299-(*) are as follows:

TM 9-805 for 1½-ton 4 x 4 Truck (Chevrolet).

TM 9-883 for 1-ton, 2-wheel Cargo and Water Trailers.

TM 11-333 for Telephones EE-8-A and EE-8.

* * * * *

1. General Characteristics.

* * * * *

d. Frequency Coverage.—The transmitting components * * * 2 to 8 megacycles. **By using Frequency Conversion Kits MC-509, MC-516, and MC-517 (pars. 33 and 34), the transmitter frequency range may be extended as follows:**

Stock No.	Frequency Conversion Kit	Extends transmitter range	
		From—	To—
2Z5725-509	MC-509	2 mc	1 mc
2Z5725-516	MC-516	8 mc	12 mc
2Z5725-517	MC-517*	8 mc	18 mc

*Frequency Conversion Kit MC-517 cannot be used with Radio Set SCR-299-(*) installed in Truck K-51-(*) since there is insufficient space above the transmitter to install Antenna Tuning Unit BC-939-A.

The receiving components provide reception over a range of 1.5 to 18 megacycles.

e. ***Range of Operation.***—Reliable two-way phone communication may be expected with any other Radio Set SCR–299–(*), **SCR–399–A, or SCR–499–A** operating within 100 miles while either or both vehicles are in motion. Using c-w telegraphy should increase the range. Results, however, depend * * * these higher frequencies. Skip-distance may make a shorter 100- or 200-mile contact impossible. **When operating from a fixed location, a half-wave doublet antenna may be used to extend the transmitting range. Use of a doublet antenna will increase the range of communication several hundred miles. Doublet Antenna Kit, stock No. 2A1652, is designed for use with Radio Transmitter BC–610–(*). Paragraph 32 contains installation and operation instructions for this equipment.**

The distance which * * * of *operating personnel.*

* * * * *

2. Main Components.

* * * * *

*a. **The Radio Station.***

* * * * *

(2) ***Accessory Components.***—

* * * * *

(*u*) (Added.) Fire extinguisher in cab of Truck K–51–(*).

* * * * *

3. Brief Description of Principal Units and Major Components.

*a. **The Radio Station.***

* * * * *

(1) ***Operating Components.***

* * * * *

(*e*) Mast Base MP–47 * * * the top section. **When Radio Set SCR–299–(*) is operated while in motion,** the transmitting antenna is bent backwards to a horizontal position, being held down by an insulated guy to the rear of the truck roof. This provides clearance * * * **Do not touch.**

* * * * *

(2) ***Accessory Components.***

* * * * *

(*e*) **SCR–299–A and SCR–299–B.—The following applies only to sets still equipped with original cords. See note in paragraph 35a regarding replacement cords; (*f*) below applies to these sets with new cords.** Equipment for operation * * * box as follows:

* * * * *

(*f*) **SCR–299–C and SCR–299–D.—** Equipment for operation * * * cords as follows:

* * * * *

4. Alphabetical Tabulation Of Components. The following is a complete list of components included in Radio Set SCR–299–(*). A zero indicates that the item is not used in that model.

SCR–299–A Quantity	SCR–299–B Quantity	SCR–299–C Quantity	SCR–299–D Quantity	Article
*	*	* *	*	* *
12	12	12	12	Battery BA–30; **4 in use, 8 spare.**
*	*	* *	*	* *

6. Preparation For Use.

* * * * * * *

*c. **Storage Batteries.***—Examine the cells * * * of sufficient size.

***Caution: Add acid to water slowly and stir well with a glass or wood rod; do not add water to acid. Use extreme caution when handling acid in order to prevent painful burns and destruction of clothing or other materials. If acid is spilled while handling, the burning effect may be counteracted by neutralizing with a solution of sodium bicarbonate (baking soda) or ammonium hydroxide (household ammonia).* After** pouring this * * * holes in them.

9. Transmitting.

a. Putting Station In Readiness.—

(1) Push the START * * * LINE VOLTAGE meter. In damp climates and after long periods of idleness, moisture enters the transmitter. In order to drive out this moisture, a drying out period of approximately 30 minutes is recommended and may be accomplished by turning on the FILAMENT POWER switch. (See *b*(2) and *b*(3) below.) The drying out process can be accelerated by turning on the heater in the truck.

* * * * *

b. C-W Transmission.

* * * * *

(3) Adjust the FILAMENT * * * to 5.3 volts.
Caution: Always allow a filament warm-up period of at least 30 seconds before applying plate power to prevent damage to tube filaments.

* * * * *

(5) ***Read Safety Notice in front of manual before proceeding further.*** Lift open the * * * paragraph 9*c* or *d*.

* * * * *

(12) Rescinded.

c. M. O. (Master Oscillator) Control.

* * * * *

(2) Set the EXCITER * * *. Radio Transmitter BC–610–D.
Caution: The door over the tuning units in the cover of the transmitter should be open at this time to keep the high voltage from reaching the final amplifier.

* * * * *

(5) **Press either key. The key must be held down while making subsequent tuning adjustments. Release except when actually making tuning adjustments.** Adjust the center knob * * * GRID CURRENT meter.

* * * * *

*d. **Crystal Oscillator Control.***—Follow all the steps outlined in paragraph 9*b* (1) through (11), then proceed as follows:

* * * * *

(6) **Press either key. (The key must be held down while making subsequent tuning adjustments.)** Observe the reading * * * crystal circuit oscillates.*

* * * * *

f. Transmitter Operation.

* * * * *

(12) During transmissions on critical frequencies under certain conditions of unusual weather where altitude is high above sea level, extreme voice peaks may cause flashovers. The overload relay * * * this flashover condition:
(*a*) Switch to a favorable operating frequency.

* * * * *

(*c*) Use the auxiliary transmitting antenna.

* * * * *

k. Reduced Power Operation (Added).

(1) The power output of Radio Transmitter BC–610–(*) may be reduced for both c-w and phone operation by a 50 percent reduction of the voltage applied to the high-voltage transformer primary circuit. However, the regulation of the high-voltage power supply is adversely affected and may result in some reduction in the quality of phone modulation.

(2) Normal tune up and operation of Radio Transmitter BC–610–(*) with the HIGH VOLTAGE PROTECT switch set on NORMAL and the CW-PHONE switch set on CW provides a power output in excess of 400 watts on c-w.

(3) Resetting the HIGH VOLTAGE PROTECT switch to the ON position and adjusting the COUPLING control of Antenna Tuning Unit BC–729–(*) until the plate current in the final reaches a value of 125 milliamperes as indicated on the P. A. PLATE meter, provides a power output of 200 watts on c-w.

(4) Normal tune up and operation of Radio Transmitter BC–610–(*) with the HIGH VOLTAGE PROTECT switch set on NORMAL and the CW-PHONE switch set on PHONE provides a power output in excess of 300 watts on phone.

(5) For reduced power operation of Radio Set SCR–299–(*) on phone, proceed as follows:
(*a*) Reset the HIGH VOLTAGE PROTECT switch to NORMAL.
(*b*) Adjust the COUPLING control of Antenna Tuning Unit BC–729–(*) until the final plate current, as shown on the P. A. PLATE meter, is 125 milliamperes.
(*c*) Reset the MODULATOR BIAS control for a reading of 40 milliamperes, as indicated on the MOD. PLATE meter.
(*d*) Reduce the setting of the GAIN control of Speech Amplifier BC–

614–(*) until the MOD. PLATE meter indicates 90 milliamperes on normal voice modulation peaks. Resultant power output is 175 watts on phone.

11. Radio Transmitter BC–610–(*).

a. ***Mechanical Construction.***—Radio Transmitter BC–610–(*) * * * indicating instruments.

* * * * *

(1) The upper section * * * buffer-doubler stage.) Another switch is provided for selecting grid current **readings** of the intermediate amplifier or power amplifier tube, and there is a tuning control for resonating the power amplifier plate circuit.

* * * * *

b. ***Radio Frequency Section.***—Electrically, the radio * * * associated tuning circuits. (See figures **48** and **49.**)

* * * * *

d. ***Power Supply.***—Power for the entire Radio Transmitter BC–610–(*) is obtained through a–c plug PL_6 from any **adequate** source of 115-volt, single-phase, 50- to 60-cycle power. See figures 50, 51, and 52.)

* * * * *

e. ***Control and Metering.***—

(7) (Superseded.) The operation of relay RY_3 after modifications have been made in accordance with War Department Modification Work Order, MWO SIG 11–280–1, 8 April 1944, is as follows:

(*a*) With the CW-PHONE switch SW_7 in the CW position: Power is connected to transformer T_6 so that its voltage output is maximum. Relay RY_3 contacts connected across transformer T_9 secondary close, thus shorting the winding to prevent surges during keying and a voltage drop through the winding. Relay RY_3 contacts in the modulator bias supply line open, applying a high biasing voltage (through Resistor RS–137) to the grids of V_3 and V_4 which prevents flow of plate current.

(*b*) With the CW-PHONE switch SW_7 in the PHONE position: Power is connected to transformer T_6 so that its voltage output is reduced. Relay RY_3 contacts connected across transformer T_9 secondary open, removing the short from across this winding. Relay RY_3 contacts in the modulator bias supply line close, applying normal Class B bias to the modulator stage.

* * * * *

13. Speech Amplifier BC–614–(*).

* * * * *

b. ***Voice Circuits.***—Refer to figures * * * voice limiter circuits.

* * * * *

(3) Tube V_{103} is * * * a dual triode.

(*a*) One triode section of tube V_{103} operates as a conventional voltage amplifier. Its output voltage appears across plate resistor R_{117}, **and** is fed through capacitor C_{106} to **the** grid of tube V_{104}.

* * * * *

SECTION IV—MAINTENANCE

Note: Failure or unsatisfactory performance of equipment will be reported on W. D., A. G. O. Form No. 468. If this form is not available, see TM 38–250.
Caution: Maintenance and servicing should be attempted only by competent personnel who are thoroughly acquainted with the dangers involved. See Safety Notice. **Always remove the power cord from PL_6 at the rear of the transmitter before performing any servicing operation.**

15. Regular Inspection And Service.

* * * * *

c. ***Outline of Inspection Checks.***—(Major Components.) The * * * is in operation.

* * * * *

(2) Check and tighten the wing **nuts** holding conduit fittings where power cable enters floor of truck **and the wing nuts on the bumper bracket.**

* * * * *

(21) Check for proper operation and condition of—

(*a*) All plugs.

* * * * *

e. ***To Recharge the Spare 12-volt Battery.***—To recharge the spare 12-volt battery proceed as follows:

* * * * *

(2) Connect truck spare battery cord with plug on battery box and make sure the other end of this cord is connected to socket SO_{202} in Table MC–269–(*).

* * * * *

15.1. Lubrication (Added).—The following information supp ements instructions in the Technical Manuals issued with this equipment, in order to provide complete information for the lubrication of Radio

Set SCR-299-(*). The following do not require lubrication·

Speech Amplifier BC-614-(*).
Tuning Units TU-47 to TU-62 inclusive.
Electric heater.

a. General.—Use dry-cleaning solvent only to clean parts. The use of leaded gasoline for this purpose is prohibited. (See AR 850-20.) Before lubrication, clean exposed surfaces with slightly dampened lintless cloth. Do not allow cleaning fluid to come in contact with other parts of the equipment.

b. Radio Transmitter BC-610-(*).—For temperatures above 0° F., use SAE 10 OE—Oil, engine; below 0° F, use PS—Oil, lubricating, preservative, special. The following points require lubrication every 256 hours of operation:

(1) Capacitor shaft bearings: one or two drops of oil on each of three bearings.
(2) Tuning control shaft bearings: one or two drops of oil on each of two bearings.
(3) Tuning control gears: lubricate teeth sparingly with oil.

c. Antenna Tuning Unit BC-729-(*).—For temperatures above 0° F., use SAE 10 OE—oil, engine; below 0° F., use PS—Oil, lubricating, preservative, special. GL—Grease, lubricating, special is used where indicated and for all temperatures.

(1) Points requiring lubricating every 256 hours:
  (*a*) Load coil shaft bearings: one or two drops of oil on each of three bearings.
  (*b*) Primary coil control shaft: one or two drops of oil.
  (*c*) Primary coil shaft bearings: one or two drops of oil.
  (*d*) Capacitor switch shaft rear bearing: one or two drops of oil.
  (*e*) Capacitor switch front bearing and primary coil dial control shaft: lubricate with oilcan.
(2) Points requiring lubrication every 512 hours:
  (*a*) Load coil control bevel pinions: clean and coat teeth sparingly with GL.
  (*b*) Ball spring plunger and disk: clean and coat sparingly with GL.
  (*c*) Primary coil control gear and pinion: clean and coat teeth sparingly with GL.

d. Axle RL-27-A.—For temperatures above 32° F., use SAE 30 OE—oil, engine; for temperatures 0° F., to 32° F., use SAE 10; below 0° F., use PS—oil, lubricating preservative, special. Every 32 hours of operation wash axle using solvent, dry-cleaning, or oil, fuel, Diesel. Remove handle and lock; clean lock and flush out bearings. Lubricate and replace handle. Lubricate bearings of fixed handle by applying oil liberally at opening between axle shaft and inner end of handle.

e. Ventilating Fan.—For temperatures above 32° F., use SAE 30 OE—oil, engine; between 0° F., and 32° F., use SAE 10 OE—oil, engine; below 0° F., use PS—oil, lubricating, preservative, special. Every 1,024 hours of operation, remove filter element covering fan motor and the fan assembly by turning one-quarter turn counterclockwise. Apply four to six drops of oil to the motor bearings. Every 256 hours of operation lubricate ventilating fan air control plate screw sparingly using an oil can.

f. Mast Bases MP-22 (Receiving antenna).—Lubricate every 1,024 hours of operation. On models equipped with lubricator fitting, apply two strokes of pressure gun, using General Purpose Grease No. 1 for temperatures above 0° F.; below 0° F., use CG No. 0. On models having oil cups, apply three to five drops of oil, using SAE 10 OE—oil, engine for temperatures above 0° F.; below 0° F., use PS—oil, lubricating, preservative, special.

15.2. Modification Work Orders (Added).—The following War Department Modification Work Orders apply to Radio Sets SCR-299-(*):

a. MWO SIG 11-280-1, 8 April 1944. Modification of Phone-CW relay (RY_1) circuit.

b. MWO SIG 11-280-2, 23 May 1944. Modification of Radio Sets SCR-299-A, SCR-299-B, SCR-299-C, and SCR-299-D in mounting of rectifier Tubes VT-46-A to prevent flashover.

c. MWO SIG 11-280-4, 21 June 1944. Replacement of rectifier filament transformer (T_1) in Radio Sets SCR-299-A, -B, -C, and -D. (Supersedes MWO SIG 11-280-3, 23 May 1944.)

16. Removal of equipment.

Whenever it becomes * * * proceed as follows:

a. **Whenever possible, disconnect the trailer from the truck and move the truck a short distance away. As an alternative,** move the truck in such a position as to jack knife the trailer so that the rear of the truck will become more readily accessible.

* * * * *

d. Remove Table MC-269-(*). (Requires four men.)

* * * * *

21. Access To Components.

* * * * *

c. For access to the wiring on Table MC-269-(*).

* * * * *

SECTION V—SUPPLEMENTARY DATA (ADDED)

32. Doublet Antenna Kit.

a. Description.—

(1) Doublet Antenna Kit consists of a half-wave doublet antenna (cut to operating frequency by the operators of the radio set) which is fed by means of a coaxial cable. One end of the coaxial cable is connected to the center of the antenna and the other end is coupled to Radio Transmitter BC-610-(*) by means of a variable link which is part of the transmitter tank coil. The antenna is supported by three masts made up of Mast Sections MS-44-A, or by any other available means.

(2) Following is a list of components contained in Doublet Antenna Kit. The items are tabulated in two columns. The second column indicates items required for an installation where masts must be used, and the third column indicates items required for the antenna and coupling system when other means of supporting the antenna are available.

Article	Quantity	
	Complete doublet kit	Antenna system only
Roll BG-176	3	--------
Bag BG-102-A	2	1
Mast Section MS-44-A	21	--------
Mast Base MP-19	3	--------
Guy Plate MP-20	9	--------
Guy GY-22-A	6	--------
Guy GY-41	12	--------
Guy GY-24-A	3	3
Insulator IN-86-A	12	12
Stake GP-2	18	--------
Reel RL-29	2	2
Steel tape (100-foot)	1	1
Wire W-28	250 ft	250 ft
Cord CD-1290 (..ft ..in.)	*1	*1
Coil Unit C-387-D	1	1
Coil Unit C-388-C	1	1
Coil Unit C-389-C	1	1
Coil Unit C-390-C	1	1
Coil Unit C-447-B	1	1
Coil Unit C-448-B	1	1
Coil Unit C-449-B	1	1
Instruction sheets	2	2

*This cord is so designed that if additional distance between the doublet antenna and the radio set is required, several sections may be joined together until the desired length is obtained.

(3) The coil units are contained in a package prepared for oversea shipment. Mast Sections MS-44-A are packed in three canvas Rolls BG-176, seven mast sections to each roll. All of the guys, guy plates, mast bases, and stakes are packed in one Bag BG-102-A. The remaining items, which are required for the antenna system only (column 3), are packed in the other Bag BG-102-A.

(4) As soon as circumstances pe mit, Radio Sets SCR-399-A and SCR-499-A will be delivered with the variable-link tank coils listed above instead of with the old fixed-link tank coils. When Doublet Antenna Kit is issued for use with such sets, the coils may be omitted; if issued, they should be returned to stock. On the other hand, the new coils will always be needed when the Doublet Antenna Kit is to be used with Radio Set SCR-299-(*) because all procurements of this set have been equipped with fixed-link coils.

b. Installation and Operation.—

(1) The choice of location for the erection of the antenna is largely dependent upon tactical considerations. If possible, select a location away from power lines, tall trees, or other obstructions for best operating results. Consideration of cover will not always permit selection of the best location. In any case, use the best compromise between cover and a clear antenna.

(2) The doublet antenna radiates strongest in a direction at a right angle (90°) to the plane of its wire. Remember this, as well as the location of the stations with which communication is desired, when selecting the position of the masts.

(3) Three masts are used to support the antenna; the center mast is used to support the weight of the coaxial cable feeder line.

(4) Erect the masts and install the antenna in accordance with the following procedure:

(*a*) The antenna wire should be cut for the lowest operating frequency to be used. This may be obtained from the formula:

$$\text{antenna length in feet} = \frac{468}{F\ (\text{mc})}$$

(F(mc) is the lowest operating frequency in megacycles.) The frequency versus length curve (fig. 92) can be used to obtain the approximate antenna length. To obtain the distance separating the outer masts, add 6 to 8 feet to the length determined above. The third antenna mast is erected at the midpoint, in line with the two outer masts. (See figure 88 for the general layout to be followed.)

(*b*) Select the following parts from the kit for one mast:
- 7 Mast Sections MS-44-A.
- 6 Stakes GP-2.
- 3 Guy Plates MP-20.
- 1 Mast Base MP-19.
- 2 Guys GY-22-A.
- 1 Guy GY-24-A (antenna halyard).
- 4 Guys GY-41.

(*c*) At the point selected for one of the outer masts, stake Mast Base MP-19 to the ground with two Stakes GP-2. Use the hammer supplied with the radio set.

(*d*) Using a radius of 20 feet from Mast Base MP-19, drive in the remaining four Stakes GP-2, 90° apart from one another and at an angle of 45° to the antenna wire. (See fig. 89.)
Note: When measuring distances on the ground to determine the position of the stakes, a mast section may be used conveniently since its over-all length is 5½ feet or 5 feet NOT INCLUDING the 6-inch ferrule (smaller diameter portion) at one end.

(*e*) Assemble the seven Mast Sections MS-44-A with one Guy Plate MP-20 at the top of the mast, another at the junction of the fourth and fifth sections, and the remaining guy plate at the junction of the first and second sections.

(*f*) Slip the bottom mast section over the mast base.

(*g*) Attach two Guys GY-22-A and the block of one Guy GY-24-A to Guy Plate MP-20 at the top end of the mast, by means of the snap hooks on each guy. Fasten the snap hooks of one Guy GY-22-A and one Guy GY-24-A through one hole of Guy Plate MP-20, and the snap hook of the remaining Guy GY-22-A through the opposite hole. Attach four Guys GY-41 to Guy Plate MP-20 at the junction of the fourth and fifth mast sections with two snap hooks in each of the two holes. Tie both ends of Guy GY-24-A and the bottom ends of Guys GY-41 to a point near the bottom of the mast. Guy GY-24-A is used as a halyard to raise and lower the antenna wire. Guys GY-41 are not used to raise the mast and therefore, their loose ends may also be secured to a point near the bottom of the mast. Make sure that Guy GY-24-A will be on the antenna side of the mast after erection so that the various guys will not become tangled with each other.

(*h*) If the guy assembly of one Guy GY-22-A is grasped by the center ring to which the two lower pulleys are attached, the mast can be raised by walking towards the base of the mast. (See fig. 90.) A second man should assist in the erection procedure by lifting the mast from the ground in a manner similar to that used in raising a ladder. A third man on the remaining Guy GY-22-A should stand by to make the necessary adjustment on the length of the guy when the mast is erect. When the mast has been brought into a vertical position, attach Guys GY-41 to the stakes, securing both Guys GY-22-A and GY-41 to the stakes by making a couple of turns with each guy around the stake in the manner shown in figure 89.

(*i*) Erect the other two masts in the same manner.

(*j*) Select the following parts from the kit: Wire W-28, coaxial-cable feeder Cord CD-1290, and Insulators IN-86-A.

(*k*) Determine the length of the antenna in accordance with the formula given in b (4) (*a*) above, and cut the required length of Wire W-28. If operation on more than one frequency is contemplated, cut the antenna for the lowest frequency.

(*l*) Attach one Insulator IN-86-A to each end of the antenna.

(*m*) Cut the antenna wire at the exact center and join together with the coaxial-cable terminating block at one end of Cord CD-1290. (See fig. 89.) One end of the halyard (Guy GY-24-A) must be made fast to the coaxial-cable terminating block as shown in the same figure, to support the weight of both the antenna and the coaxial cable.

(*n*) Fasten the Guy GY-24-A halyards on the two end masts to their respective antenna insulators, and raise the antenna into position.

(5) Make the following changes in the wiring of Radio Transmitter BC-610-(*):

(*a*) Disconnect the coaxial-cable link between Radio Transmitter BC-610-(*) and Antenna Tuning Unit BC-729-(*) or BC-939-A from the outside terminals of the feed-through insulators on the left side of the transmitter cabinet.

(*b*) Connect the other end of coaxial-cable Cord CD-1290 from the doublet antenna to the feed-through insulators by means of the connector provided on the end of the cord for that purpose.

(6) To place the radio set in operation, proceed as follows:

Caution: Never make the following adjustments while plate power is on. Turn off plate power, make necessary adjustments, then turn power back on. Follow this procedure until the adjustments are completed. Do not rely upon the interlock switches for protection.

(*a*) Select the new coil unit whose frequency range includes the frequency for which the doublet antenna was cut. Plug the coil into the jack bar in the transmitter.

Note: The new coil units are supplied in a package prepared for oversea shipment. Unpack and place them in Chest CH-88 in the location formerly occupied by the fixed-link transmitter tank coils originally supplied with the equipment. Store the old (fixed-link) coils elsewhere or return them to depot stock when authorized.

(*b*) Rotate the link coil so that the purple mark on the link coil will be next to the similar mark on the primary (fixed) winding. Then rotate the link coil in a clockwise direction until its axis is at an angle of 90° to the axis of the primary winding. This is a position of very low coupling. (See fig. 91.)

(*c*) Tune up the transmitter in the usual manner with the HIGH VOLTAGE PROTECT switch in the HIGH VOLTAGE PROTECT position. Resonate the final amplifier plate tank circuit by turning the PLATE TUNING wheel for a minimum reading of plate current, as indicated by the P. A. PLATE meter.

(*d*) Turn off the plate power to the transmitter and open the left-hand cover to gain access to the final tank coil. Increase the coupling of the link coil by rotating it in a counterclockwise direction until its axis is at an angle of about 45° to the axis of the tank coil. Close the transmitter cover, turn the plate power on, and retune the PLATE TUNING wheel for minimum plate current. The value of plate current indicated by the P. A. PLATE meter should show an increase over the value shown when the transmitter was tuned with the coupling coil in the low coupling position. The position of the link coil must be adjusted so that the value of plate current indicated at resonance (minimum plate current) is 100 milliamperes with the HIGH VOLTAGE PROTECT switch in the HIGH VOLTAGE PROTECT position.

Note: Always remember to retune the final plate tank circuit to resonance (minimum plate current) after making each readjustment of the link coupling.

(*e*) Place the HIGH VOLTAGE PROTECT switch in the NORMAL position and turn the transmitter on. The reading on the P.A. PLATE meter should be from 290 to 300 milliamperes. If the value of plate current differs materially from these figures, turn the transmitter off and readjust the coupling of the link coil. A value of plate current greater than 300 milliamperes requires a reduction in coupling; a value of plate current less than 290 milliamperes requires an increase in coupling.

(7) To change the frequency of operation, proceed as follows:

(*a*) Plug in the new coil unit whose frequency range includes the desired operating frequency.

(*b*) If the antenna has been cut for lowest operating frequency as outlined in b (4) (*a*) above, it will be necessary to shorten the antenna for the new frequency. Lower the antenna, determine the proper length for the new frequency, and cut the antenna at points of equal distance from the center of the antenna for the new length. Insert an Insulator IN–86–A at both points where the antenna was cut. Hoist the antenna back into position and tune the transmitter for operation on the new frequency in accordance with the instructions given in b (6) above. For example, if the original length of the antenna was 234 feet (2 mc) and it is desired to operate on 4 mc, it will be necessary to reduce the length of the antenna to 117 feet, or 58.5 feet each side of center. When it is desired to go back to the lower frequency, place a wire jumper across the insulators inserted for operation at the higher frequency. The antenna may be divided into a number of sections to permit operation on different frequencies. Use jumpers across the insulators between the sections if required.

Note: The doublet antenna works best at the frequency for which it is cut. It can be operated without serious loss of efficiency however, over a band extending to approximately 100 kc each side of the frequency for which it was designed.

c. ***Maintenance.***—

(1) To insure proper operation of the doublet antenna system, make routine checks of the electrical connections from time to time.

(*a*) Check the connections from the coaxial cable feeder line to the center of the antenna.

(*b*) Check the connections from the coaxial cable feeder line to the feed-through insulators on the side of Radio Transmitter BC–610–(*).

(*c*) Check the condition and connections of Cord CD–1290 and the coil units.

(*d*) Check the condition of the coaxial terminating block at the antenna. It is imperative that no moisture get into this connector since moisture will seriously impair its operation.

(2) Check the tension on Guys GY–22–A and GY–41 daily. Guy ropes usually shrink during the night and stretch during the day. Sufficient slack must be allowed to permit normal shrinking during damp periods in order to prevent undue strain on the guys. Examine the guy stakes daily to make sure that they are seated firmly in the ground.

d. ***Addenda.***—

(1) The following tabulation illustrates the difference between the new coil units that are a part of this kit and those previously supplied with the transmitter:

Frequency range (mc)	New coil unit		Replaces coil unit
	Coil unit	No. of turns on link coil	
2.0–3.5	C–387–D	6. 5	C–387–B
3.5–4.5	C–388–C	4. 5	C–388–A
4.5–5.7	C–389–C	4. 5	C–389–A
5.7–8.0	C–390–C	4. 5	C–390–A
8.0–11.0	C–447–B	4. 5	C–447
11.0–14.0	C–448–B	2. 5	C–448
14.0–18.0	C–449–B	1. 5	C–449

(2) The new coil units also operate equally well into Antenna Tuning Unit BC–729–(*) or BC–929–A connected to a 15-foot whip antenna. Note that the tuning charts may be slightly in error with respect to the listed dial setting of the plate tuning control. The error may vary somewhat depending on operating frequency and ground conditions. The tuning charts serve, however, to locate the proper dial settings approximately. The final plate tank circuit must be tuned to resonance at all times, as indicated by a dip to a minimum reading of the P. A. PLATE meter.

(3) When the new coil units are used with Antenna Tuning Units BC–729–(*) and BC–939–A, the link coil should be set for maximum coupling. This condition is indicated when the plane of the link coil winding is parallel to the plane of the primary winding, and when the purple mark on the link coil is next to the identical mark on the primary winding.

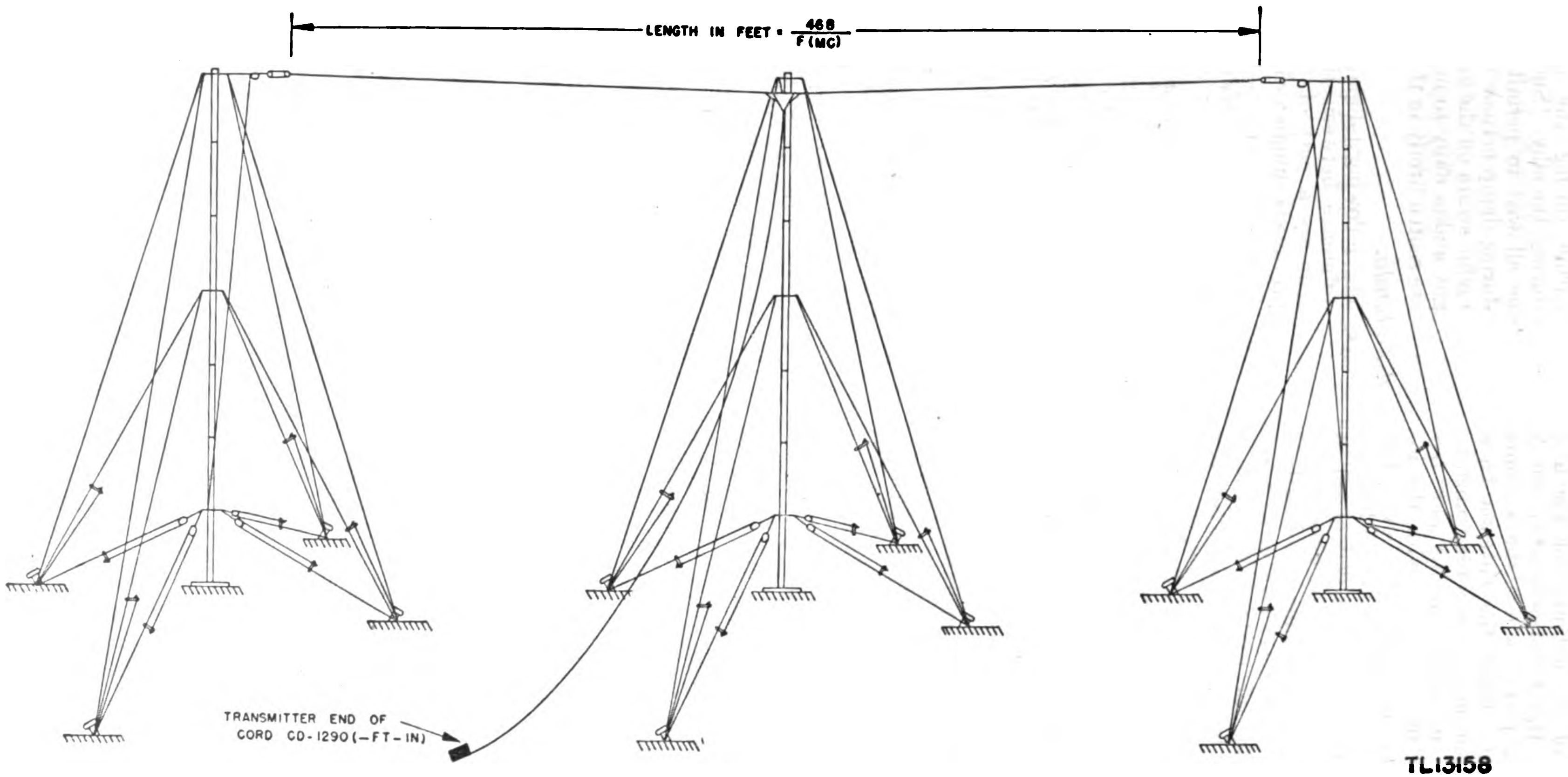


Figure 88. Doublet Antenna Kit, Installation Details.

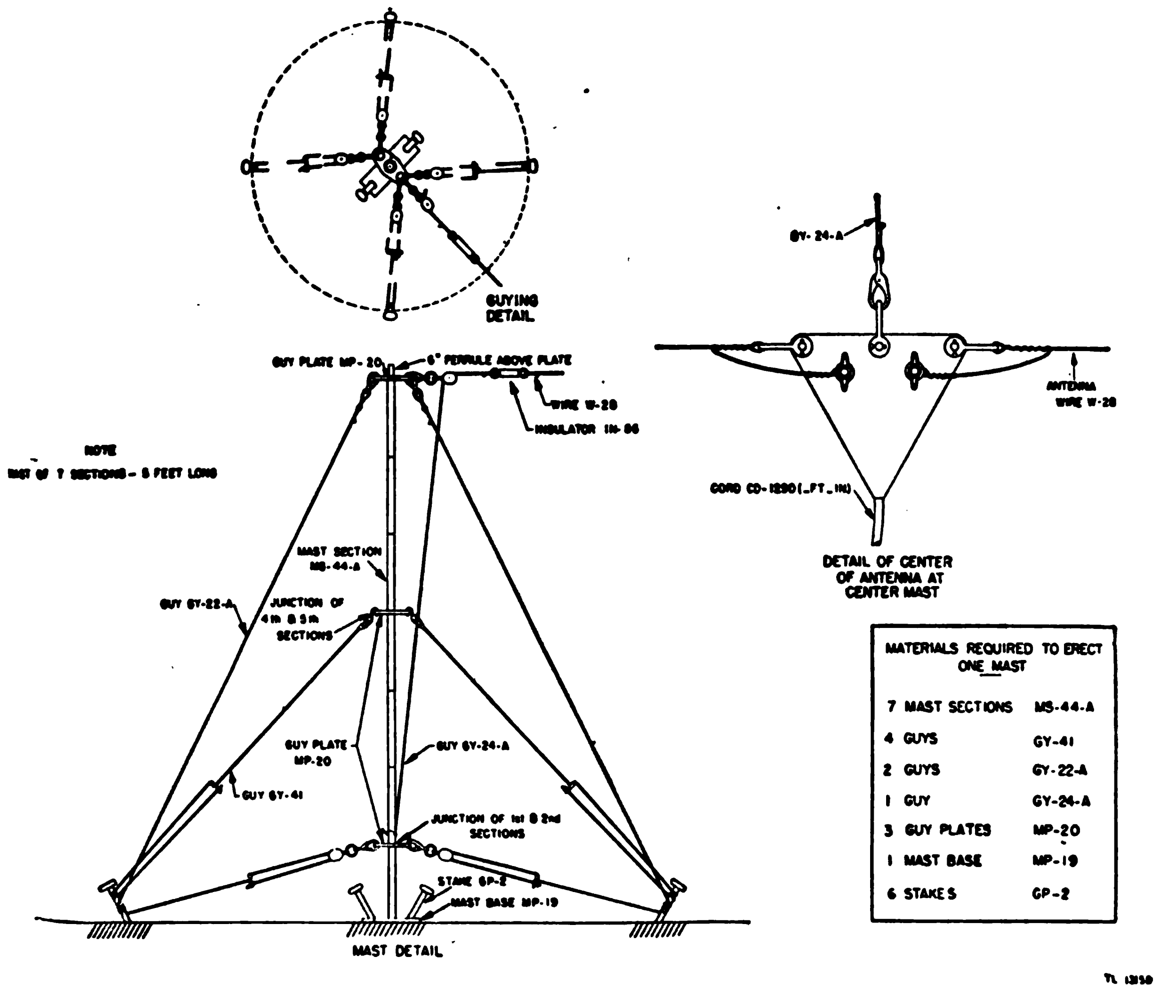


FIGURE 89. DOUBLET ANTENNA KIT, DETAILS OF ONE MAST AND COAXIAL CABLE CONNECTOR BLOCK.

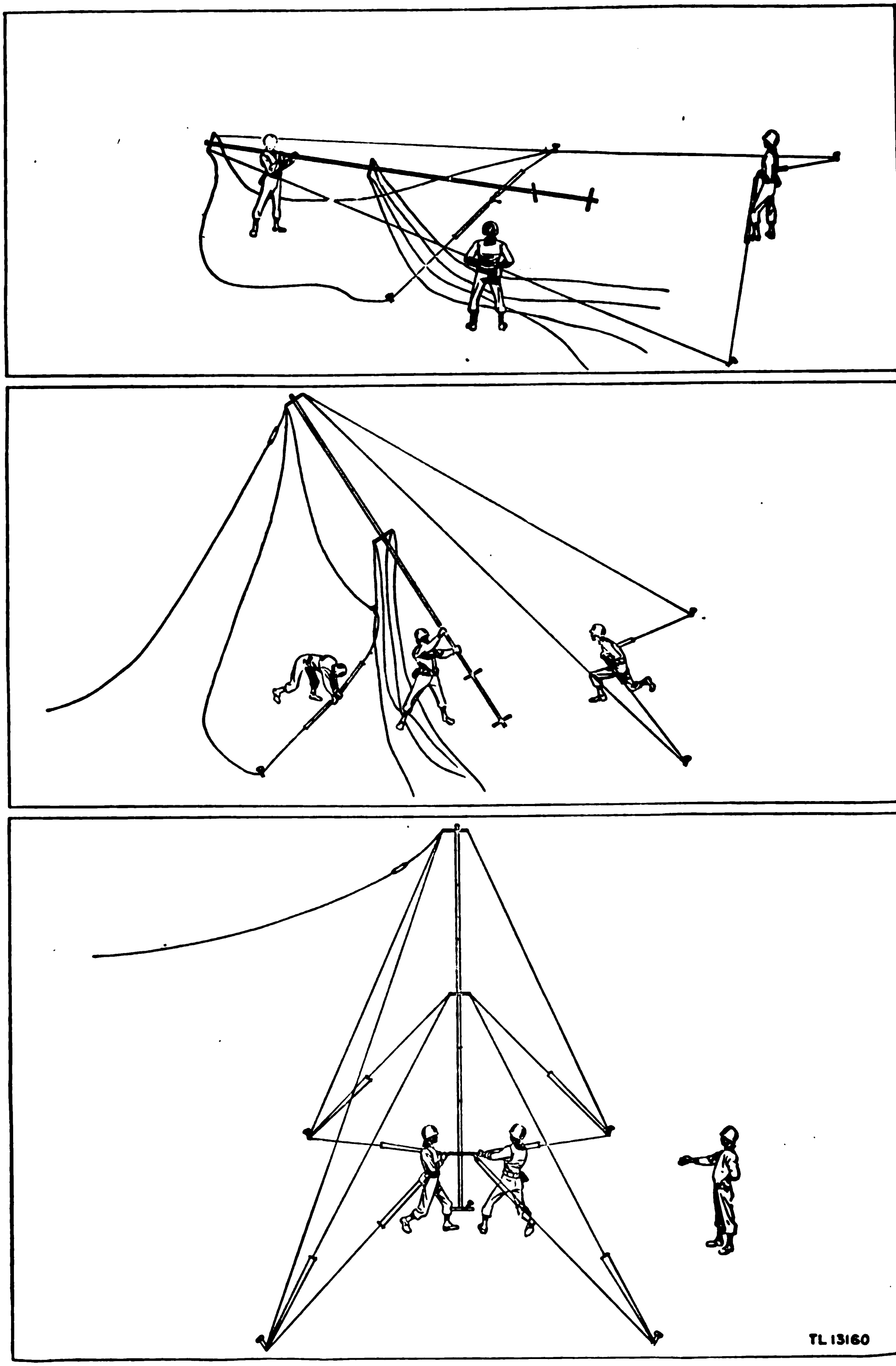


FIGURE 90. DOUBLET ANTENNA KIT, ERECTION OF MASTS.

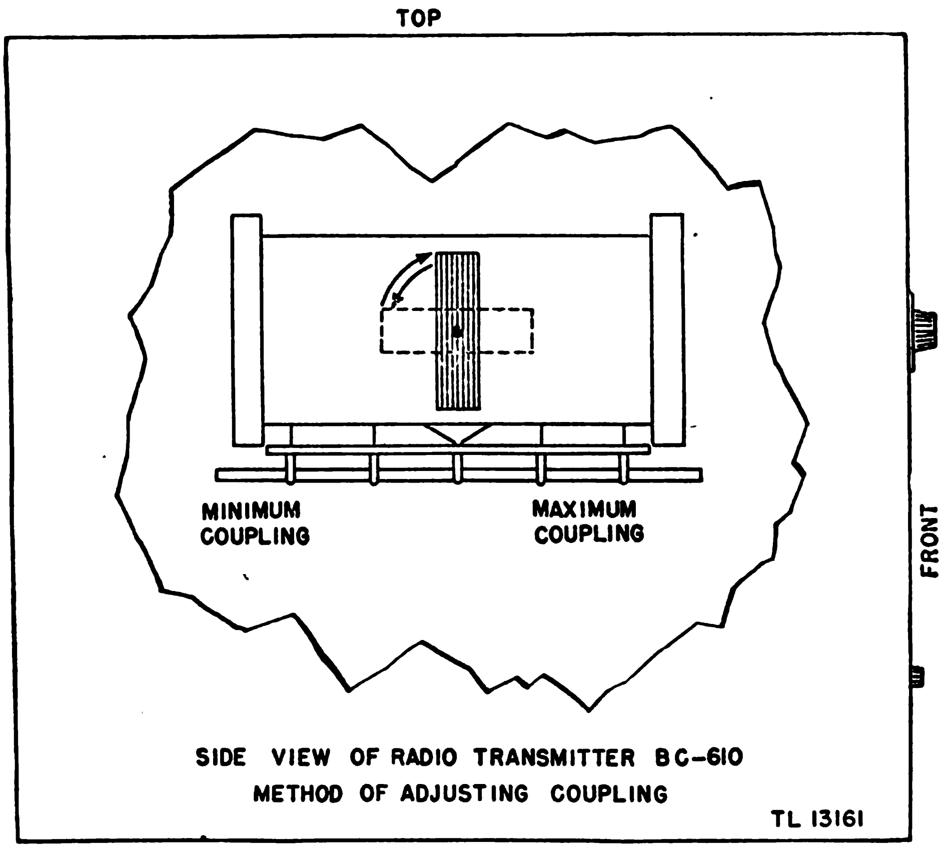


FIGURE 91. DOUBLET ANTENNA KIT, CUT-AWAY VIEW OF TANK AND VARIABLE LINK COILS INSTALLED IN TRANSMITTER.

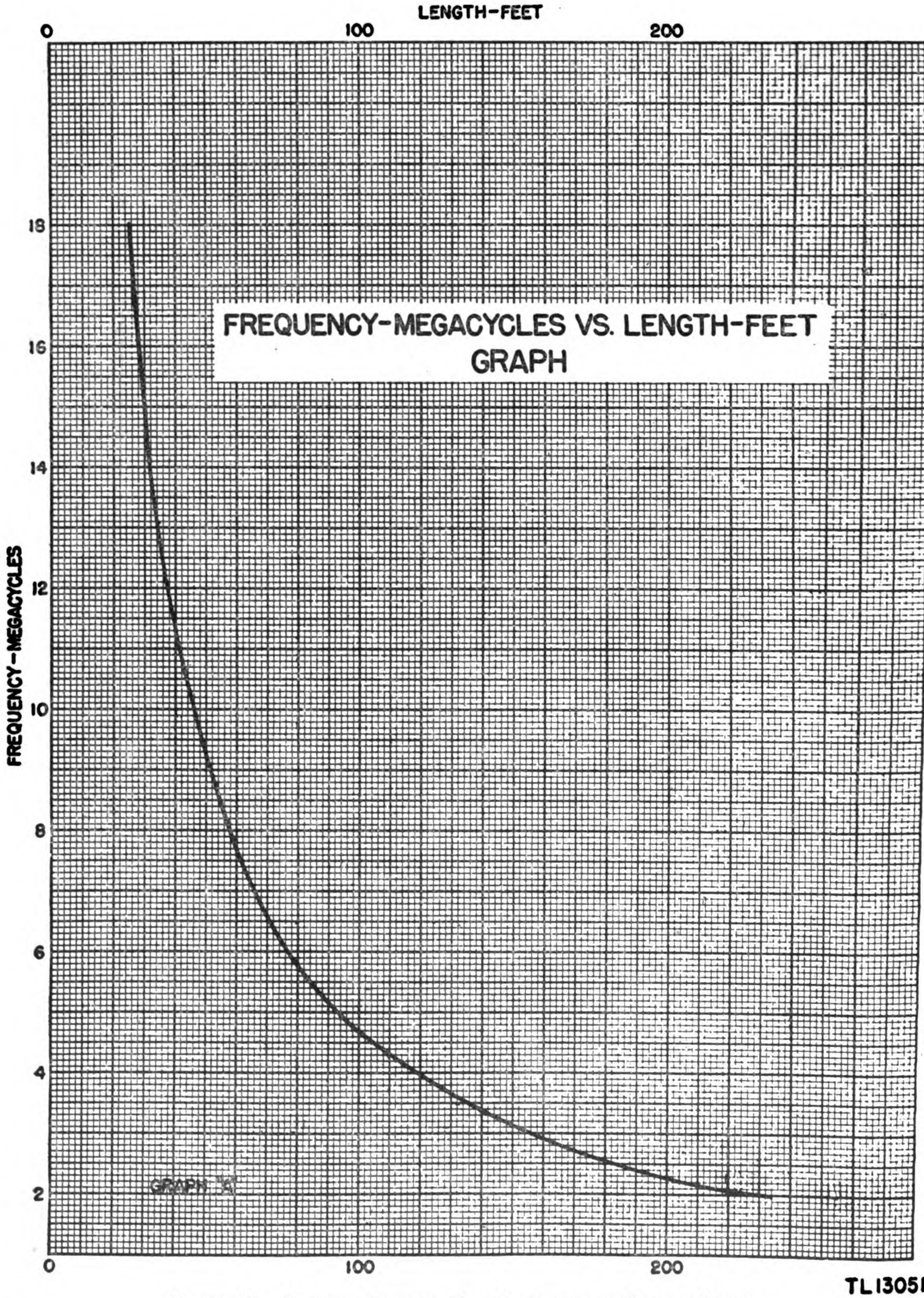


FIGURE 92. DOUBLET ANTENNA KIT, FREQUENCY VS LENGTH CURVE.

33. Frequency Conversion Kit MC–509.

a. List of Component Parts.—The component parts of Frequency Conversion Kit MC–509 are:

- 1 Chest CH–251.
- 3 Tuning Units TU–61 (range 1.5 to 2.0 mc).
- 3 Tuning Units TU–62 (range 1.0 to 1.5 mc).
- 2 Coil Units C–454 (range 1.5 to 2.0 mc).
- 2 Coil Units C–455 (range 1.0 to 1.5 mc).
- 2 Vacuum capacitors, 100-mmf.
- 2 Vacuum capacitors, 50-mmf.
- 1 Antenna AN–168, long wire.
- 7 Mast Sections MS–44.
- 1 Mast Base MP–19.
- 2 Mast Plates MP–20.
- 6 Stakes GP–2.
- 1 Halyard GY–24–A.
- 4 Guys GY–22–A.
- 1 Roll BG–176, antenna.
- 1 Bag BG–102–A, antenna accessories.
- 1 Wire W–128, 17-inch.
- 1 Lug, solder (with ¼-inch hole).
- 1 Lug, solder (with 8/32-machine screw hole).
- 1 Screw, machine, 8/32 x 1¼ inches long.
- 1 Lockwasher, 8–32.
- 1 Nut, hexagonal, 8–32.
- 2 Supplements to TM 11–280B, TM 11–280, TM 11–281, 17 April 1943, and TM 11–281, 4 September 1943.

b. Installation.—

(1) ***Modification of Antenna Tuning Unit BC–729–(*).***—Antenna Tuning Unit BC–729–(*) may be modified by Frequency Conversion Kit MC–509 to allow operation of Radio Set SCR–299–(*) on frequencies from 1 to 2 megacycles. To install, see figure 93 then proceed as follows:

(*a*) Open the coaxial line between the transmitter and Antenna Tuning Unit BC–729–(*) by removing the center wire at the terminal on the antenna tuning unit (the terminal for coaxial cable nearest front panel).

(*b*) To the center wire connect one end of a jumper. Remove plug-in vacuum capacitor VC–50 from Antenna Tuning Unit BC–729–(*). Attach the other end of the jumper to point *X* (the VC–50 rear mounting clip, fig. 93) which connects with the slider of coil L_8 in Antenna Tuning Unit BC–729–(*).

(*c*) Place the SERIES COND switch of Antenna Tuning Unit BC–729–(*) in the 6–8 MC position.

(2) ***Modification of Antenna Tuning Unit BC–939*–A.**—Antenna Tuning Unit BC–939–A may be modified by the use of Frequency Conversion Kit MC–509 to allow operation of Radio Set SCR–299–(*) on frequencies from 1 to 2 megacycles. To install, see figure 93 and proceed as follows:

(*a*) Open the coaxial line *inside* Antenna Tuning Unit BC–939–A by removing the center conductor of the coaxial line from point *Y*. Bend this wire away from the insulator, and tape. Attach one end of the 17-inch length o. Wire W–128 to point *Y*.

(*b*) Remove the lead running from coupling coil L_5 to the ANTENNA CURRENT meter (M_4) at terminal 1.

(*c*) Attach the free end of the 17-inch length of Wire W–128 to the ANTENNA CURRENT meter (M_4) at terminal 1.

(*d*) Remove the lead from high-frequency inductor coil L_{44} to the ANTENNA CURRENT meter (M_4) at terminal 2. Do not remove the other lead on this same post which runs to a contact of switch $SW_{9,1}$ which is marked 2–10 MC LONG WIRE 10–18 MC.

(*e*) Place the antenna range switch on Antenna Tuning Unit BC–939-A in the 2–10 MC position.

(3) ***Modification of Radio Transmitter BC–610–(*).***—When operating on frequencies from 1 to 2 megacycles, the single lead to one side of resistor R_9 in Radio Transmitter BC–610–(*) must be removed. Resistor R_9 is located under the p-a tank capacitor mounting panel adjacent to the p-a r-f choke CH_{10}. After removing the lead, the resistor should be so positioned that it will hang clear of the chassis and all surrounding parts.

Caution: Failure to make the above change may result in damage to the 700-ohm resistor, R_9, and r-f choke CH_{10}. When operation on frequencies above 2 megacycles is again desired, make certain that the lead to resistor R_9 is re-p aced by reso dering into the circuit.

(4) ***Erection of Antenna.***—A 75-foot or 125-foot antenna must be used. Erect a long wire antenna as shown in figure 94. All necessary items are provided in Frequency Conversion Kit MC–509. If the ¼-inch screw original:y supplied in Mast Base MP–47–(*) is no longer available, use Mast Section MS–53.

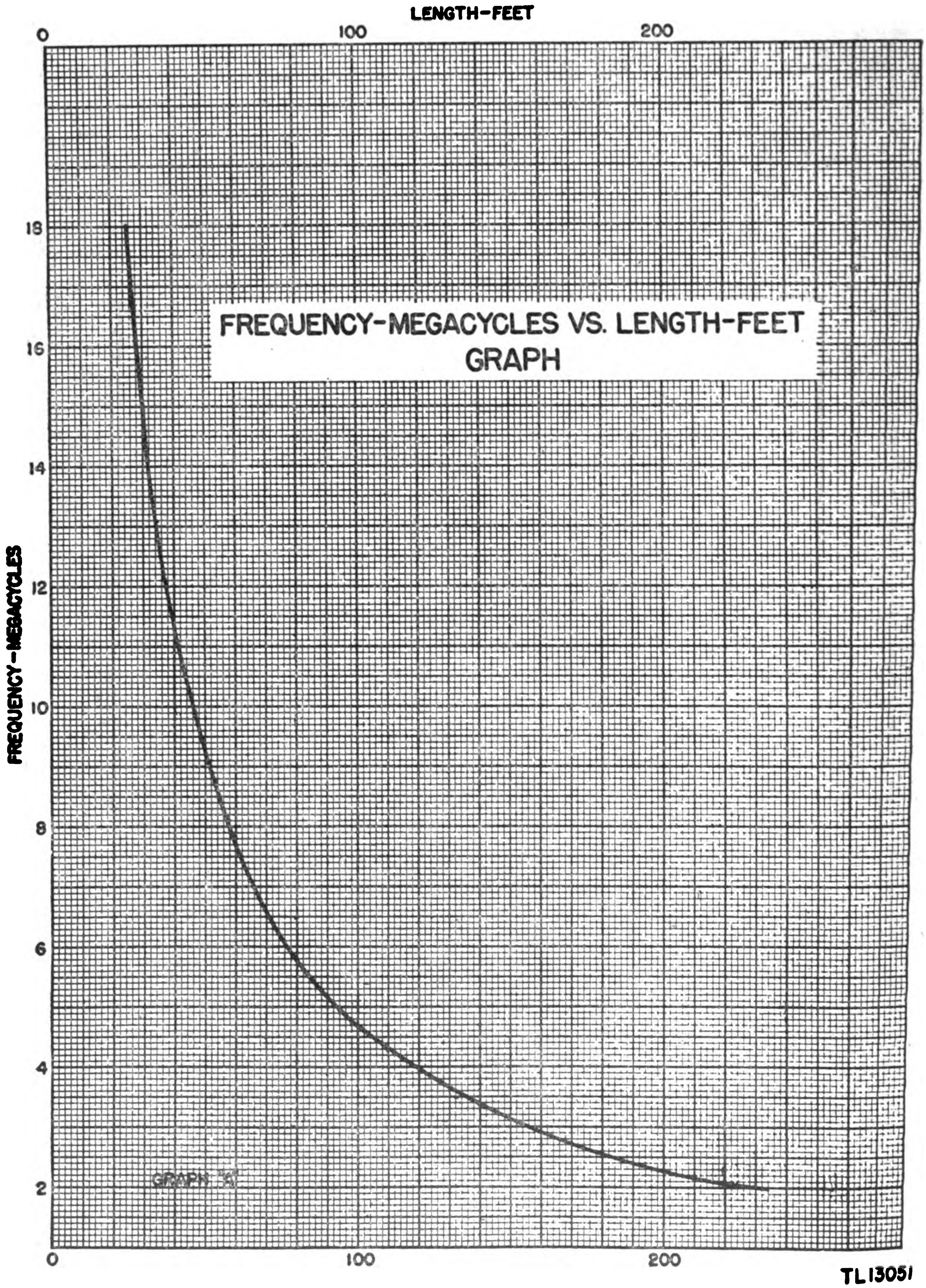


FIGURE 92. DOUBLET ANTENNA KIT, FREQUENCY VS LENGTH CURVE.

33. Frequency Conversion Kit MC-509.

a. List of Component Parts.—The component parts of Frequency Conversion Kit MC-509 are:

- 1 Chest CH-251.
- 3 Tuning Units TU-61 (range 1.5 to 2.0 mc).
- 3 Tuning Units TU-62 (range 1.0 to 1.5 mc).
- 2 Coil Units C-454 (range 1.5 to 2.0 mc).
- 2 Coil Units C-455 (range 1.0 to 1.5 mc).
- 2 Vacuum capacitors, 100-mmf.
- 2 Vacuum capacitors, 50-mmf.
- 1 Antenna AN-168, long wire.
- 7 Mast Sections MS-44.
- 1 Mast Base MP-19.
- 2 Mast Plates MP-20.
- 6 Stakes GP-2.
- 1 Halyard GY-24-A.
- 4 Guys GY-22-A.
- 1 Roll BG-176, antenna.
- 1 Bag BG-102-A, antenna accessories.
- 1 Wire W-128, 17-inch.
- 1 Lug, solder (with ¼-inch hole).
- 1 Lug, solder (with 8/32-machine screw hole).
- 1 Screw, machine, 8/32 x 1¼ inches long.
- 1 Lockwasher, 8-32.
- 1 Nut, hexagonal, 8-32.
- 2 Supplements to TM 11-280B, TM 11-280, TM 11-281, 17 April 1943, and TM 11-281, 4 September 1943.

b. Installation.—

(1) ***Modification of Antenna Tuning Unit BC-729-(*).***—Antenna Tuning Unit BC-729-(*) may be modified by Frequency Conversion Kit MC-509 to allow operation of Radio Set SCR-299-(*) on frequencies from 1 to 2 megacycles. To install, see figure 93 then proceed as follows:

(*a*) Open the coaxial line between the transmitter and Antenna Tuning Unit BC-729-(*) by removing the center wire at the terminal on the antenna tuning unit (the terminal for coaxial cable nearest front panel).

(*b*) To the center wire connect one end of a jumper. Remove plug-in vacuum capacitor VC-50 from Antenna Tuning Unit BC-729-(*). Attach the other end of the jumper to point *X* (the VC-50 rear mounting clip, fig. 93) which connects with the slider of coil L_6 in Antenna Tuning Unit BC-729-(*).

(*c*) Place the SERIES COND switch of Antenna Tuning Unit BC-729-(*) in the 6-8 MC position.

(2) ***Modification of Antenna Tuning Unit BC-939-A.***—Antenna Tuning Unit BC-939-A may be modified by the use of Frequency Conversion Kit MC-509 to allow operation of Radio Set SCR-299-(*) on frequencies from 1 to 2 megacycles. To install, see figure 93 and proceed as follows:

(*a*) Open the coaxial line *inside* Antenna Tuning Unit BC-939-A by removing the center conductor of the coaxial line from point *Y*. Bend this wire away from the insulator, and tape. Attach one end of the 17-inch length o. Wire W-128 to point *Y*.

(*b*) Remove the lead running from coupling coil L_5 to the ANTENNA CURRENT meter (M_4) at terminal 1.

(*c*) Attach the free end of the 17-inch length of Wire W-128 to the ANTENNA CURRENT meter (M_4) at terminal 1.

(*d*) Remove the lead from high-frequency inductor coil L_{44} to the ANTENNA CURRENT meter (M_4) at terminal 2. Do not remove the other lead on this same post which runs to a contact of switch $SW_{9,1}$ which is marked 2-10 MC LONG WIRE 10-18 MC.

(*e*) Place the antenna range switch on Antenna Tuning Unit BC-939-A in the 2-10 MC position.

(3) ***Modification of Radio Transmitter BC-610-(*).***—When operating on frequencies from 1 to 2 megacycles, the single lead to one side of resistor R_9 in Radio Transmitter BC-610-(*) must be removed. Resistor R_9 is located under the p-a tank capacitor mounting panel adjacent to the p-a r-f choke CH_{10}. After removing the lead, the resistor should be so positioned that it will hang clear of the chassis and all surrounding parts.

Caution: Failure to make the above change may result in damage to the 700-ohm resistor, R_9, and r-f choke CH_{10}. When operation on frequencies above 2 megacycles is again desired, make certain that the lead to resistor R_9 is rep aced by reso dering into the circuit.

(4) ***Erection of Antenna.***—A 75-foot or 125-foot antenna must be used. Erect a long wire antenna as shown in figure 94. All necessary items are provided in Frequency Conversion Kit MC-509. If the ¼-inch screw original y supplied in Mast Base MP-47-(*) is no longer available, use Mast Section MS-53.

APPROXIMATE DIAL SETTINGS

Frequency (mc)	Tuning Unit				Coil unit	Plate tuning	P. A. fixed capacitor (mmf)	BC-729-(*) antenna tuning crank	BC-939-A antenna tuning crank 2-10 MO	Antenna length (ft)
	No.	M. O.	Doub.	Int. Amp.						
1.0	TU-62	5	4.0	1.0	C-455	54	100	1.4	13	125
1.1	TU-62	32	3.8	3.8	C-455	8	50	11.9	20	125
1.2	TU-62	52	5.5	5.5	C-455	40	50	20.9	28.8	125
1.3	TU-62	68	7.0	7.0	C-455	68	50	27.9	33.6	125
1.4	TU-62	81	8.0	8.0	C-455	90	50	33.5	38.3	125
1.5	TU-62	92	9.0	8.8	C-455	28	0	38.4	44.2	125
1.5	TU-61	13	3.0	5.0	C-454	56	50	22.8	26	75
1.6	TU-61	35	4.0	6.0	C-454	76	50	27.9	29.7	75
1.7	TU-61	53	5.5	7.5	C-454	91	50	32.2	33.2	75
1.8	TU-61	67	6.5	8.5	C-454	27	0	33.6	36.3	75
1.9	TU-61	80	7.0	9.0	C-454	38	0	36.8	39.6	75
2.0	TU-61	91	8.0	9.5	C-454	50	0	39.5	42.1	75

c. ***Operation.***—To operate Radio Set SCR-299-(*) in the 1- to 2-megacycle frequency range, proceed as follows:

(1) From the table above determine the correct antenna length for the selected frequency. If a 125-foot antenna is required, connect a short jumper wire around the insulator separating the 75-foot and the 50-foot lengths of antenna wire. (See fig. 94.) If a 75-foot antenna is required, omit this jumper wire.

(2) From the table determine the correct tuning unit, coil unit, and P. A. fixed capacitor to be used for the desired frequency. Install these units in the radio transmitter.

(3) The exciter stages are tuned by the M. O., DOUB., and INT. AMP. controls on the tuning units. (See par. 9 a, b, c, and d.)

(4) To tune the final amplifier stage and adjust the antenna circuit with the p-a amplifier, proceed as follows:

(*a*) See the table for approximate setting of PLATE TUNING dial and antenna tuning crank.

(*b*) Throw the HIGH VOLTAGE PROTECT switch to HIGH VOLTAGE PROTECT.
Caution: Be sure that plate power is turned off when making coupling adjustments.

(*c*) Set the movable coupling link located in the tank coil (either Coil Unit C-454 or C-455) at minimum coupling. Minimum coupling is obtained when the movable coil is at right angles to the tank coil.

(*d*) Set the transmitter control switch on the speech amplifier to TRANS. ON.

(*e*) Place the SERIES COND switch of Antenna Tuning Unit BC-729-(*) in the 6-8 MC position. (When using Antenna Tuning Unit BC-939-A, the antenna range switch should be placed in the 2-10 MC position.)

(*f*) Depress the sending key and adjust the PLATE TUNING dial until the P. A. PLATE current meter dips to minimum.

(*g*) Turn the antenna tuning crank abou the approx mate position indicated in the table for the desired frequency. As this sett:ng is approached, observe the P. A. PLATE current meter for a rising plate current indication. Adjust the crank for maximum current as indicated by the P. A. PLATE current meter.

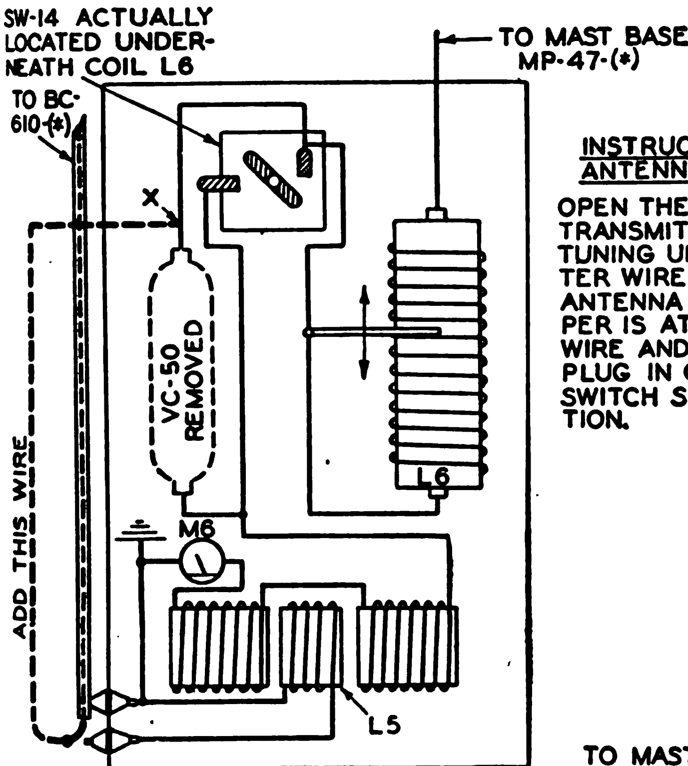
(*h*) If the current indicated on the P. A. PLATE meter exceeds 110 milliamperes, decrease the coupling. After the coupling has been reset, readjust the PLATE TUNING dial for minimum reading of the PLATE CURRENT meter.

(*i*) Repeat the steps in (*f*), (*g*), and (*h*) above until max mum antenna current is obtained with PLATE TUNING at dip.
Note: Keep in mind the 110-milliampere maximum allowable P. A. PLATE meter reading.

(*j*) Throw the HIGH VOLTAGE PROTECT switch down to NORMAL. The P. A. PLATE meter should read approximately 290 milliamperes.

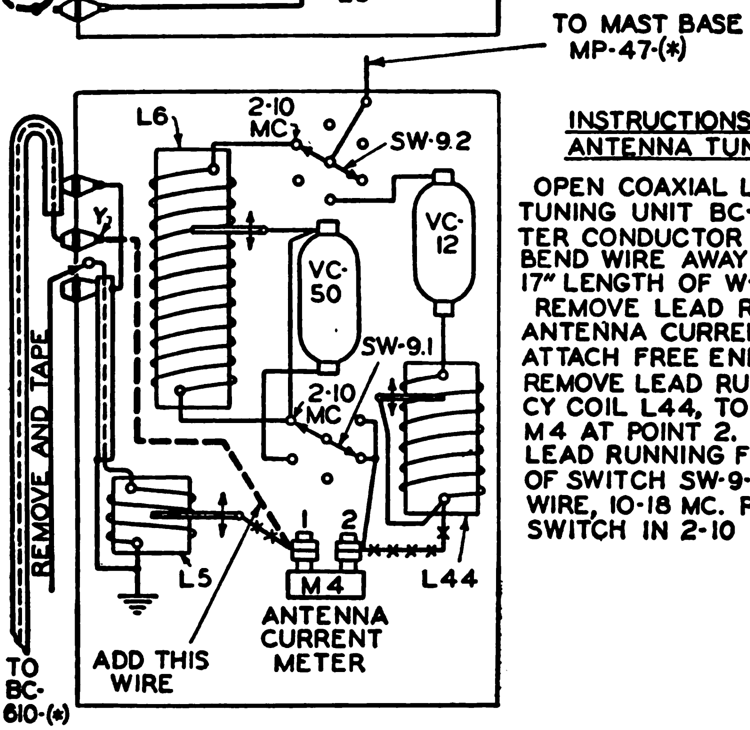
(*k*) Carefully repeat the steps in (*f*), (*g*), and (*h*) above with the HIGH VOLTAGE PROTECT switch in the NORMAL position; adjust for a reading of 290 milliamperes on the P. A. PLATE current meter. The transmitter is now ready for c-w operation.

(*l*) For phone operation proceed as above and then refer to paragraph 9*e*.



INSTRUCTIONS FOR MODIFICATION OF ANTENNA TUNING UNIT BC-729-(*)

OPEN THE COAXIAL LINE BETWEEN RADIO TRANSMITTER BC-610-(*) AND ANTENNA TUNING UNIT BC-729-(*) BY REMOVING CENTER WIRE OF THE COAXIAL CABLE FROM ANTENNA TUNING UNIT BC-729-(*). A JUMPER IS ATTACHED BETWEEN THIS CENTER WIRE AND POINT X. REMOVE THE VACUUM PLUG IN CAPACITOR VC-50 AND THROW SWITCH SW-14 TO 6-8 MEGACYCLES POSITION.



INSTRUCTIONS FOR MODIFICATION OF ANTENNA TUNING UNIT BC-939-A.

OPEN COAXIAL LINE INSIDE OF ANTENNA TUNING UNIT BC-939-A, BY REMOVING CENTER CONDUCTOR OF LINE FROM POINT Y. BEND WIRE AWAY AND TAPE. ATTACH END OF 17" LENGTH OF W-128 WIRE TO POINT Y.

REMOVE LEAD RUNNING FROM COIL L5 TO ANTENNA CURRENT METER M4 AT POINT 1. ATTACH FREE END OF WIRE W-128 TO POINT 1. REMOVE LEAD RUNNING FROM HIGH-FREQUENCY COIL L44, TO ANTENNA CURRENT METER M4 AT POINT 2. DO NOT REMOVE OTHER LEAD RUNNING FROM POINT 2 TO CONTACT OF SWITCH SW-9-1 MARKED 2-10 MC, LONG WIRE, 10-18 MC. PLACE ANTENNA RANGE SWITCH IN 2-10 MC POSITION.

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FIGURE 93. FREQUENCY CONVERSION KIT MC-509, MODIFICATION OF ANTENNA TUNING UNITS.

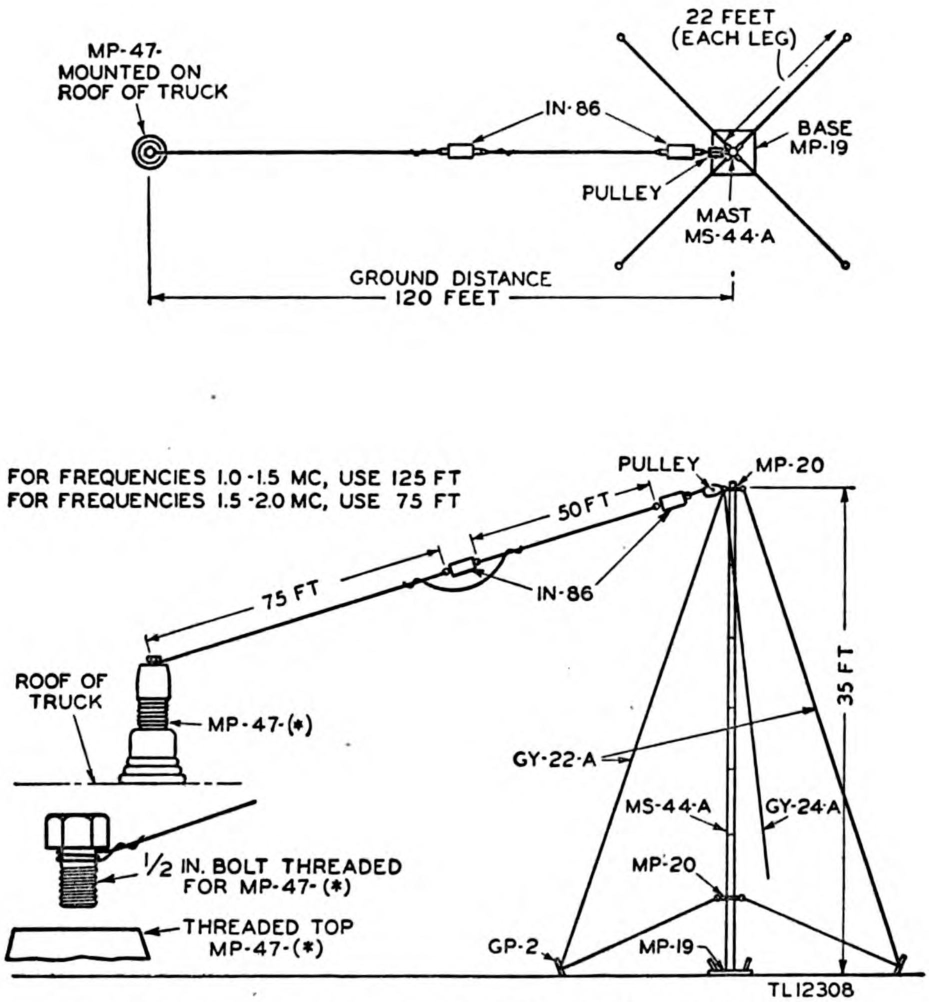

FIGURE 94. FREQUENCY CONVERSION KIT MC–509, ANTENNA INSTALLATION.

14. Frequency Conversion Kits MC-516 and MC-517.

a. Description.—Frequency Conversion Kits MC-516 and MC-517 are furnished for the purpose of extending the transmitter frequency range of Radio Set SCR-299-(*).

(1) Frequency Conversion Kit MC-516 extends the frequency range from 8 to 12 megacycles.

(2) Frequency Conversion Kit MC-517 extends the frequency range from 8 to 18 megacyc es.

LIST OF COMPONENTS

Quantity: Frequency conversion kit MC-516	Quantity: Frequency conversion kit MC-517	Components
1	--------	Chest CH-252.
--------	1	Chest CH-253.
3	3	Tuning Unit TU-53 (range: 8 to 12 mc).
--------	3	Tuning Unit TU-54 (range: 12 to 18 mc).
2	2	Coil Unit C-447-A (range: 8 to 11 mc).
2	2	Coil Unit C-448-A (range: 11 to 14 mc).
--------	2	Coil Unit C-449 (range: 14 to 18 mc).
2	1	Vacuum Capacitor VC-12 (12 mmf).*
1	1	Counterpoise CP-15-( ).
--------	1	Coaxial feeder.
--------	1	Antenna Tuning Unit BC-939-A.
2	2	Supplement to TM 11-280.

*Frequency Conversion Kit MC-516 is supplied with two Vacuum Capacitors VC-12, one for use in Antenna Tuning Unit BC-729-(*) and a spare. Frequency Conversion Kit MC-517 is supplied with one Vacuum Capacitor VC-12 already installed in Antenna Tuning Unit BC-939-A and a spare. This capacitor is used only for operation on frequencies above 8 megacycles.

b. Installation and Operation.—

(1) ***Frequency Conversion Kit MC-516.***—MC-516 uses Antenna Tuning Unit BC-729-(*) which is originally supplied with the transmitter. For operation above 8 megacycles, remove Vacuum Capacitor CA-423, insert Vacuum Capacitor VC-12 in its place, and throw the SERIES COND switch to the 6-8 MC position. Be sure to replace Vacuum Capacitor CA-423 when again operating below 8 megacycles. For operation on 8-12 megacycles see table I.

(2) ***Frequency Conversion Kit MC-517.***—MC-517 is supplied with Antenna Tuning Unit BC-939-A. (See fig. 95.) Remove Antenna Tuning Unit BC-729-(*) and the connecting leads from the transmitter. Permanently fasten Antenna Tuning Unit BC-939-A to the top of the transmitter and connect with the coaxial feeder. Antenna Tuning Unit BC-939-A is used for operation from 2 to 8 megacycles as well as from 8 to 18 megacycles.

Note: Antenna Tuning Unit BC-939-A cannot be used with Radio Sets SCR-299-(*) installed on Truck K-51-(*) because of insufficient space above the transmitter to install Antenna Tuning Unit BC-939-A.

(*a*) Set the antenna range switch at the 2-10 MC position if the operation is below 10 megacycles, or at the 10-18 MC position if the operation is above 10 megacycles.

(*b*) When the antenna range switch is in the 10-18 MC position, turn the 2-10 MC antenna inductance tuning crank until the number 30.0 appears. For operation above 10 megacycles, make no further adjustment of this control.

(*c*) For 8- to 18-megacycle operation consult table II. For 2- to 8-megacycle operation consult table III and the tuning charts. Set the COUPLING control to about 2 to start the tuning procedure. Final adjustment of this control for proper P. A. PLATE current is made in the usual manner. See paragraph 9b, c, and d on transmitter tuning.

(*d*) The following chart shows frequency ranges which can be covered by various lengths of antennas. Make adjustments of the tuning units and plate tuning in the same way as when using the whip antenna. The setting of the controls of Antenna Tuning Unit BC-939-A wi l be different. If proper loading cannot be obtained, set the switch on the front of the antenna tuning unit in the LONG WIRE position.

Antenna lengths:	*Useful frequency range*
25 feet------	2 to 10 mc; 15 to 18 mc.
35 feet------	2 to 6 mc; 11 to 18 mc.
45 feet------	2 to 4 mc; 10 to 18 mc.
65 feet------	2 to 3 mc; 9 to 18 mc.

Note: It may be found that the lengths of the antenna given above vary in different installations. In such case proper antenna length must be determined by experiment.

(3) ***Conversion Kits MC-516 and MC-517.***—

(*a*) **Crystals.**—For crystal control of the transmitter frequency at 8 to 12 megacycles, obtain crystals which operate at one-half of the des red output frequency. For crystal control of the transmitter frequency at 12 to 18 megacycles, obtain crystals which operate at one-quarter of the desired output frequency.

(*b*) **Tuning Units and Coil Units.**—For use of tuning units and coil units on frequencies above 8 megacycles, consult tables I and II. Installation and tuning with these units is the same as with lower frequency tuning units and coil units.

(*c*) **Counterpoise.**—Counterpoise CP-15-( ) is used for operation from 2 to 18 megacycles when the components of Radio Set SCR-299-(*) are removed from Truck K-51 and the set is operated as a fixed station. This counterpoise is used to obtain proper loading of the transmitter. Connect the counterpoise to one of the bolts holding the rear cover in place and fan out the individual conductors of the counterpoise radial.

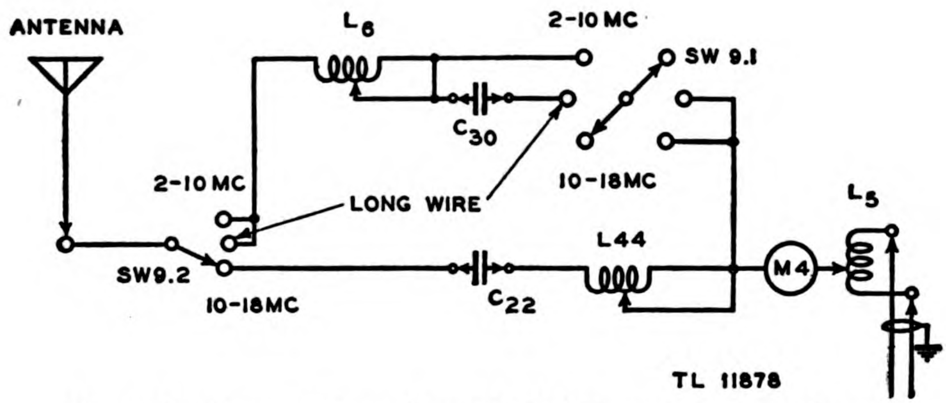

Figure 95. Antenna Tuning Unit BC-939-A, Schematic Wiring Diagram.

Table I. Approximate Dial Settings, 8 to 12 MC

(Using Antenna Tuning Unit BC-729-(*), 15-foot whip antenna)

Frequency (mc)	Tuning unit				Coil unit	Plate tuning	Antenna tuning crank*
	No.	M. O.	Doub.	Int. amp.			
8.0	TU-53	6	1.5	1.5	C-447-A	25	48.1
8.5	TU-53	23	2.8	2.8	C-447-A	38	49.6
9.0	TU-53	38	4.0	4.0	C-447-A	50	50.9
9.5	TU-53	51	4.9	4.9	C-447-A	62	52.0
10.0	TU-53	61	5.7	5.7	C-447-A	69	53.0
10.5	TU-53	70	6.4	6.4	C-447-A	75	54.0
11.0	TU-53	78	7.1	7.1	C-447-A	81	55.1
11.0	TU-53	78	7.1	7.1	C-448-A	43	55.1
11.5	TU-53	84	7.6	7.6	C-448-A	52	56.2
12.0	TU-53	90	8.1	8.1	C-448-A	57	56.7

*Set SERIES COND switch to 6-8 MC.

TABLE II. APPROXIMATE DIAL SETTINGS, 8 TO 18 MC
(Using Antenna Tuning Unit BC-939-A, 15-foot whip antenna)

Frequency (mc)	Tuning unit				Coil unit	Plate tuning	Range switch	Antenna tuning crank	
	No.	M. O.	Doub.	Int. amp.				2 MC-10 MC	10 MC-18 MC
8.0	TU-53	6	1.5	1.5	C-447-A	22	2-10	55.7	----------
8.5	TU-53	23	2.8	2.8	C-447-A	34	2-10	56.4	----------
9.0	TU-53	38	4.0	4.0	C-447-A	45	2-10	57.2	----------
9.5	TU-53	51	4.9	4.9	C-447-A	55	2-10	57.8	----------
10.0	TU-53	61	5.7	5.7	C-447-A	63	2-10	58.5	----------
10.5	TU-53	70	6.4	6.4	C-447-A	70	10-18	30	4.0
11.0	TU-53	78	7.1	7.1	C-447-A	76	10-18	30	5.6
11.0	TU-53	78	7.1	7.1	C-448-A	40	10-18	30	5.6
11.5	TU-53	84	7.6	7.6	C-448-A	47	10-18	30	7.0
12.0	TU-53	90	8.1	8.1	C-448-A	54	10-18	30	8.3
12.5	TU-54	19	1.2	2.3	C-448-A	61	10-18	30	9.4
13.0	TU-54	29	1.9	3.2	C-448-A	66	10-18	30	10.4
13.5	TU-54	38	2.6	4.0	C-448-A	71	10-18	30	11.2
14.0	TU-54	46	3.2	4.6	C-448-A	75	10-18	30	11.8
14.5	TU-54	53	3.7	5.2	C-449	39	10-18	30	12.5
15.0	TU-54	61	4.1	5.7	C-449	45	10-18	30	13.4
15.5	TU-54	66	4.6	6.2	C-449	51	10-18	30	14.1
16.0	TU-54	72	5.0	6.6	C-449	56	10-18	30	14.9
16.5	TU-54	77	5.4	6.8	C-449	61	10-18	30	15.8
17.0	TU-54	82	5.7	7.2	C-449	66	10-18	30	16.6
17.5	TU-54	86	6.0	7.6	C-449	70	10-18	30	17.5
18.0	TU-54	91	6.3	8.1	C-449	74	10-18	30	18.7

TABLE III. APPROXIMATE DIAL SETTINGS, 2 TO 8 MC
(Using Antenna Tuning Unit BC-939-A, 15-foot whip antenna, BAND SWITCH position 2-10 MC)

Frequency (mc)	Antenna tuning crank, 2-10 MC	Frequency (mc)	Antenna tuning crank, 2-10 MC
2.0	9.2.	5.0	49.1 (TU-50 or TU-51).
2.5	28.5 (TU-47).	5.5	50.9.
2.5	25.7 (TU-48).	6.0	52.1.
3.0	34.8.	6.5	53.2.
3.5	40.3.	7.0	54.2.
4.0	44.2 (TU-49 or TU-50).	7.5	55.1.
4.5	47.0.	8.0	55.8 (TU-52).

35. Maintenance Parts List.

a. Components and Miscellaneous.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2A1359-1	ANTENNA GUY ASSEM: (receiver antenna).					(*)	(*)	(*)
	2A1359-2	ANTENNA GUY ASSEM: (transmitter antenna).					(*)	(*)	(*)
	2C527-729( )	ANTENNA TUNING UNIT BC-729-( ).					(*)		(*)
	6H227	AXLE RL-27: wire laying; (for carrying Reel DR-4).							(*)
	6H227A/15	BEARING: needle; (supports shaft).	4						(*)
	6H227A/8.1	BUSHING: bearing; nonlocking.	1						(*)
	6H227A/9.1	BUSHING: bearing; locking.	1						(*)
	6H227A/18	PIN: (holds bushing).	2						(*)
	6H915	CRANK GC-15: (Axle RL-27-B only).	1						(*)
	2Z1174-5	BOX: extension; cable terminal.					(*)		(*)
	2Z1246	BRACKET: bumper clamp.					(*)		(*)

*Indicates stock available.

a. Components and Miscellaneous—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z2588	CHEST CH-88: (wall).					(*)		(*)
	2Z2589	CHEST CH-89: (seat bench).					(*)		(*)
	2C671	CONTROL BOX BC-731-( ).					(*)		(*)
	1F4H1-4.25	CABLE coaxial; (transmitter to antenna tuning unit).					(*)	(*)	(*)
	3E2313	CORD CO-313: 100′ long; 2-conductor; (rubber-covered; a-c power cord extension).					(*)	(*)	(*)
		NOTE: Cords CD-556, CD-557, CD-558, CD-559, CD-560 are not listed since they can no longer be requisitioned. When replacement of *any* of the above cords becomes necessary, the following complete set of cords should be requisitioned: Cord CO-313, Cord CO-314, Cord CO-315, Cord CD-652, and mounting bracket for Cord CO-315.							
	3E2314	CORD CO-314: 3′ long; 2-conductor; (rubber-covered; adapter for commercial power).					(*)	(*)	(*)
	2E2315	CORD CO-315: 45″ long; 6-conductor; (shielded; rubber-covered; Junction Box JB-69 or JB-49 to Cord CO-316).					(*)	(*)	(*)
	3E2316	CORD CO-316: 8′4″ long; 6-conductor (shielded; rubber-covered; Power Unit PE-95 to Cord CO-315).					(*)	(*)	(*)
	3E4142-12	CORD: 10′ long; 2-conductor; (shielded; rubber-covered; Radio Transmitter BC-610 to Table MC-269).					(*)	(*)	(*)
	3E4142-10	CORD: 6-conductor; (shielded; rubber-covered; control cord for Radio Transmitter BC-610 to Speech Amplifier BC-614).					(*)	(*)	(*)
	3E1318	CORD CD-318: 7′ long; (connection for Microphone T-30).					(*)	(*)	(*)
	3E1563	CORD CD-563: 6′ long; 3-conductor; (shielded; rubber-covered; Radio Receiver BC-312 to battery, power cord).					(*)	(*)	(*)
	3E1564	CORD CD-564: 3′ long; 2-conductor; (shielded; rubber-covered; Radio Receiver BC-342 to Table MC-269, power cord).					(*)	(*)	(*)
	3E1565	CORD CD-565: 4′ long; 4-conductor; (shielded; rubber-covered; Radio Receiver BC-312 to Table MC-269, power and control).					(*)	(*)	(*)
	3E1566	CORD CD-566: 4′ long; 3-conductor; (shielded; rubber-covered; Radio Receiver BC-342 to Table MC-269, control cord).					(*)	(*)	(*)
	3E1587	CORD CD-587: 16′ long; 2-conductor; (shielded; rubber-covered; spare battery).					(*)	(*)	(*)
	3E1605-6.5	CORD CD-605: 6.5′ long; (Headset HS-30 connection).					(*)	(*)	(*)
	3E1652	CORD CD-652: 100′ long; 6-conductor; (shielded; rubber-covered; Cord CO-315 to Cord CO-316, power extension).					(*)	(*)	(*)
	3E1765	CORD CD-765: 30″ long; 7-conductor (shielded; rubber-covered; operating control cord).					(*)	(*)	(*)
	2A715 ( )	COUNTERPOISE CP-15-( ).					(*)	(*)	(*)

*Indicates stock available.

a. Components and Miscellaneous—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z3400-146 ( )	COVER BG-146-( ): (for Radio Transmitter BC-610 and Antenna Tuning Unit BC-729).					(*)		(*)
	2Z3400-145 ( )	COVER BG-145-( ): (for Chest CH-120-( )).					(*)		(*)
	2Z3400-144 ( )	COVER BG-144-( ): (for Chest CH-88-( )).					(*)		(*)
	2Z3400-143 ( )	COVER BG-143-( ): (for Chest CH-121-( )).					(*)		(*)
	2Z3400-142 ( )	COVER BG-142-( ): (for Chest CH-119-( )).					(*)		(*)
	2Z3400-141 ( )	COVER BG-141-( ): (for Chest CH-89-( )).					(*)		(*)
	2Z1134B	BOX BX-34-B: (carries 72 operating crystals).					(*)		(*)
	2Z7598-5	CUT-OUT ASSEM: heater.					(*)	(*)	(*)
	2Z5020.2	ELEMENT: heating.					(*)	(*)	(*)
	2C1411 ( )	FREQUENCY METER SET SCR-211-( ).							(*)
	2B830	HEADSET HS-30-( ):					(*)	(*)	(*)
	2B1300	INSERT M-300.	2				(*)	(*)	(*)
	3Z10161	TERMINAL TM-161.	4				(*)	(*)	(*)
	3Z10163	TERMINAL TM-163.	2				(*)	(*)	(*)
	2Z5020	HEATER: electric.					(*)		(*)
	2Z5652-49A	JUNCTION BOX JB-49-A.					(*)		(*)
	2Z5652-60A	JUNCTION BOX JB-60-A: (in early models, called remote terminal box).					(*)		(*)
	2Z5652-69A	JUNCTION BOX JB-69-A.					(*)		(*)
	3Z3437	KEY J-37.					(*)	(*)	(*)
	3Z3444	KEY J-44.					(*)	(*)	(*)
	3Z3445	KEY-J-45.					(*)	(*)	(*)
	6Z3863 6Z3863.1	LIGHT FIXTURES: (for Table MC-269).					(*)	(*)	(*)
	2Z6303.1	LOUDSPEAKER LS-3.					(*)	(*)	(*)
	2A2082	MAST BASE MP-22.					(*)	(*)	(*)
	2A2088-47A	MAST BASE MP-47-A.					(*)	(*)	(*)
	2A2349	MAST SECTION MS-49.					(*)	(*)	(*)
	2A2350	MAST SECTION MS-50.					(*)	(*)	(*)
	2A2351	MAST SECTION MS-51.					(*)	(*)	(*)
	2A2352	MAST SECTION MS-52.					(*)	(*)	(*)
	2A2353	MAST SECTION MS-53.					(*)	(*)	(*)
	2A2354	MAST SECTION MS-54.					(*)	(*)	(*)
	2B1650	MICROPHONE T-50: dynamic.					(*)	(*)	(*)
	2B1630	MICROPHONE T-30: throat.					(*)	(*)	(*)
	2B1899	NECKBAND M-199.							(*)
	2C6500	RADIO TRANSMITTER BC-610-( ).					(*)		(*)
	3H4691-63( )	RECTIFIER RA-63: (battery charger).					(*)		(*)
	6H2504	REEL DR-4: includes approx. 2,600′ of Wire W-110-B.					(*)		(*)
	6Z7926	ROPE RP-5: 50′ long.					(*)	(*)	(*)
	2C214-( )	SPEECH AMPLIFIER BC-614-( ).					(*)		(*)
	2A3308	STAKE GP-8.					(*)	(*)	(*)
	2Z9019	STRAP ST-19.					(*)	(*)	(*)
	3Z9849.46	SWITCH: toggle; 3-pole; 3-position.					(*)	(*)	(*)
SW_{201}	3Z9824-273	SWITCH: push-button; (DPST; Power Unit PE-95; start-stop).					(*)	(*)	(*)
	2Z9059	TABLE MC-269.					(*)		(*)
	4B5008	TELEPHONE EE-8.					(*)	(*)	(*)
	2Z9488-6	THERMOSTAT.					(*)	(*)	(*)
	6R38048	TOOL EQUIPMENT TE-48.							(*)
	2C8047	TUNING UNIT TU-47.					(*)	(*)	(*)
	2C8048	TUNING UNIT TU-48.					(*)	(*)	(*)
	2C8049	TUNING UNIT TU-49.					(*)	(*)	(*)
	2C8050	TUNING UNIT TU-50.					(*)	(*)	(*)
	2C8051	TUNING UNIT TU-51.					(*)	(*)	(*)
	2C8052	TUNING UNIT TU-52.					(*)	(*)	(*)

*Indicates stock available.

a. Components and Miscellaneous—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	6M1800	TYPEWRITER: portable; (telegraphers' keyboard; with carrying case).							(*)
	1A812.4	WIRE: antenna; No. 12 AWG; 250' per roll.					(*)	(*)	(*)
		TABLE OF NUTS, BOLTS, SCREWS, AND WASHERS							
	6L504-1.5	BOLT: wing; brass; ¼-20 x 1" x ½"; (nickel-plated).							(*)
	6L3324-20.1	WING NUT: brass; ¼-20 x 1"; (nickel-plated).							(*)
	6L3310-32.1	WING NUT: brass; 10-32 x 27/32"; (nickel-plated).							(*)
	6L3328-13.1	WING NUT: brass; ½-13 x 1 15/16"; (nickel-plated).							(*)
	6L3506-32.1	NUT: hex; brass; ⅜-32 x ½" x 5/32"; (nickel-plated).							(*)
	6L3508-13	NUT: hex; steel; ½-13; (transmitter hold-down nut).							(*)
	6L3504-28.1	NUT: hex; brass; ¼-28 x 7/16" x 3/16"; (nickel-plated).							(*)
	6L3504-20.1	NUT: hex; brass; ¼-20 x 7/16" x 3/16"; (nickel-plated).							(*)
	6L3108-32.1	NUT: hex; brass; 8-32 x 11/32" x ⅛"; (nickel-plated).							(*)
	6L3106-32.1	NUT: hex; brass; 6-32 x 5/16" x 7/64"; (nickel-plated).							(*)
	6L3106-32.4	NUT: hex; brass; 6-32 x ¼" x 3/32"; (nickel-plated).							(*)
	6L3110-32.1	NUT: hex; brass; 10-32 x ⅜" x ⅛"; (nickel-plated).							(*)
	6L3104-36.1	NUT: hex; brass; 4-36 x ¼" x 3/32"; (nickel-plated).							(*)
	6L4908-20.20N	SCREW: cap; hex; steel; ½-20 x 1¼"; (nickel-plated).							(*)
	6L4904-4.28N	SCREW: cap; hex; steel; ¼-28 x ¼"; (nickel-plated).							(*)
	6K7920-4-24.5	SCREW: cap; hex; brass; ¼-20 x 1½"; (nickel-plated).							(*)
	6L4904-20BN	SCREW: cap; hex; brass; ¼-20 x 1¼"; (nickel-plated).							(*)
	6L4904-12N	SCREW: cap; hex; brass; ¼-20 x ¾"; (nickel-plated).							(*)
	6L6832-10.7	SCREW: machine; brass; fillister-head; 8-32 x ⅝"; (nickel-plated).							(*)
	6L7032-6.9	SCREW: machine; brass; oval head; 10-32 x ⅛"; (nickel-plated).							(*)
	6L7032-8.5	SCREW: machine; brass; round head; 10-32 x ½"; (nickel-plated).							(*)
	6L7032-6.5	SCREW: machine; brass; round head; 10-32 x ⅜"; (nickel-plated).							(*)
	6L7032-8.9	SCREW: machine; brass; round head; 10-32 x ½"; (nickel-plated).							(*)
	6L6832-20.5	SCREW: machine; brass; round head; 8-32 x 1¼"; (nickel-plated).							(*)
	6L6832-8.5	SCREW: machine; brass; round head; 8-32 x ½"; (nickel-plated).							(*)
	6L6832-6.5	SCREW: machine; brass; round head; 8-32 x ⅜"; (nickel-plated).							(*)
	6L6632-20.5	SCREW: machine; brass; round head; 6-32 x 1¼"; (nickel-plated).							(*)
	6L6632-12.5	SCREW: machine; brass; round head; 6-32 x ¾"; (nickel-plated).							(*)
	6L6632-6.5	SCREW: machine; brass; round head; 6-32 x ⅜"; (nickel-plated).							(*)

*Indicates stock available.

a. Components and Miscellaneous—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	6L6632-10.9	SCREW: machine; brass; round head; 6–32 x 3/8"; (nickel-plated).							(*)
	6L6436-4.5	SCREW: machine; brass; round head; 4–36 x 1/4"; (nickel-plated).							(*)
	6L75009-5	WASHER: steel; 5/16" ID x 1 1/4" OD x 3/32" thick.							(*)
	6L50008-2	WASHER: steel; 0.141" ID x 3/8" OD x 0.025" thick.							(*)
	6L50011-3	WASHER: steel; 0.171" ID x 13/32" OD x 0.032 thick.							(*)
	6L50010-NP	WASHER: steel; 0.203" ID x 7/16" OD x 0.032" thick.							(*)
	6L50012-IN	WASHER: steel; 0.265" ID x 1/2" OD x 0.040" thick.							(*)
	6L50012-N3	WASHER: brass; 0.380" ID x 5/8" OD x 0.020" thick.							(*)
	6L50502-1	WASHER: Black fibre; 0.141" ID x 3/8" OD x 0.025" thick.							(*)
	6L50503	WASHER: black fibre; 0.171" ID x 13/32" OD x 0.032" thick.							(*)
	6L72904	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; No. 4).							(*)
	6L72906	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; No. 6).							(*)
	6L72908	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; No. 8).							(*)
	6L72910	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; No. 10).							(*)
	6L72914-1	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; 1/4").							(*)
	6L72920	WASHER: phosphor-bronze; (nickel-plated; Shakeproof; internal teeth; 3/8").							(*)
	6Z8202	SNAPS: open-eye.							(*)
	5B19014-3	TURNBUCKLE: (eye both ends).							(*)
	2T46A	TUBE VT-46A.					(*)	(*)	(*)
	2T80	TUBE VT-80.					(*)	(*)	(*)
	2T94	TUBE VT-94.					(*)	(*)	(*)
	2T95	TUBE VT-95.					(*)	(*)	(*)
	2T100	TUBE VT-100.					(*)	(*)	(*)
	2T103	TUBE VT-103.					(*)	(*)	(*)
	2T107	TUBE VT-107.					(*)	(*)	(*)
	2T115	TUBE VT-115.					(*)	(*)	(*)
	2T139	TUBE VT-139.					(*)	(*)	(*)
	2T145	TUBE VT-145.					(*)	(*)	(*)
	2T218	TUBE VT-218.					(*)	(*)	(*)
	2T220	TUBE VT-220.					(*)	(*)	(*)
	2T231	TUBE VT-231.					(*)	(*)	(*)
	2T233	TUBE VT-233.					(*)	(*)	(*)

b. Antenna Tuning Unit BC-729-(*).

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
M_6	3F1015-18	AMMETER: r-f; 0–15-amp. Note: Substitute war standard meter No. MR35WO15RFAA.					(*)	(*)	(*)
	3G115-24.1	BUSHING: male and female; feed-thru.					(*)	(*)	(*)
C_{30}	3D423	CAPACITOR: vacuum; 50-mmf; 32,000 v ac (working).					(*)	(*)	(*)
	3Z1030	FUSE CLIP: 60-amp; brass; (nickel-plated).					(*)	(*)	(*)

*Indicates stock available.

b. Antenna Tuning Unit BC-729-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
L_6	3C302B-2	COIL: r-f; variable inductance.					(*)	(*)	(*)
L_5	3C302B-1	COIL: r-f; plit; 6-mh.					(*)	(*)	(*)
L_6	3C302B	COIL: r-f; coupling; variable; 7-turn link.					(*)	(*)	(*)
	2Z3263-1	CYCLOMETER.					(*)	(*)	(*)
	2Z3407-7	CRANK ARM.					(*)	(*)	(*)
	3G1405-36	DISK: coil; (coupler insulator).					(*)	(*)	(*)
	3G1405-22	DISK: switch; (coupler insulator).					(*)	(*)	(*)
	2Z4700	FRICTION SHOE: (vary inductance on coil L6).					(*)	(*)	(*)
	2Z3407.5	HANDLE: crank; (for rotor coil).					(*)	(*)	(*)
	3G1250-32.10	INSULATOR: stand-off; ceramic; ¾" diam x 2" long; cylindrical.					(*)	(*)	(*)
	3G1250-32.11	INSULATOR: ceramic; cylindrical pillar.					(*)	(*)	(*)
	2Z5822-27	KNOB AND POINTER ASSEM: 1⅝" diam.					(*)	(*)	(*)
	2C527-729A/L1	LEG: rotor coil; (end-support mounting).					(*)	(*)	(*)
	2C527-729A/P	PLATE: rotor coil; (end support).					(*)	(*)	(*)
	3G1816-74A021	ROD: glass; 10⅝" long x ⅝" diam.					(*)	(*)	(*)
	2C527-729A/S1	SLEEVE: with spring; (guide for friction shoe).					(*)	(*)	(*)
	3G1Z50-6.5	SPACER: coil support.					(*)	(*)	(*)
	3G1100-88.1	SUPPORT MOUNTING: coupling coil.					(*)	(*)	(*)
SW_{14}	3Z9817-9	SWITCH: rotary; (DPST; antenna range switch assembly); B & W 60B114.					(*)	(*)	(*)
SW_{14}	3Z9825-29	SWITCH: rotary; (DPST; antenna range switch assembly); Hallicrafters 1X124.					(*)	(*)	(*)

c. Antenna Tuning Unit BC-939-A.

M_4	3F1015-18	AMMETER: r-f; 0-15-amp; GE DO-53. **Note:** substitute war standard meter MR35WO15RFAA.					(*)	(*)	(*)
	3Z737-16	BINDING POST: brass; Eby; B & W M409.					(*)	(*)	(*)
	2Z5630	BONDING JUMPER: brass; Aircraft Marine; B & W M403.					(*)	(*)	(*)
	3C115-24	BUSHING: ceramic; Cook 1173; B & W E32.					(*)	(*)	(*)
	3C112-24.2	BUSHING: ceramic; Alsimag 35; B & W E3.					(*)	(*)	(*)
	3Z1409-5	BUSHING: coil shaft; B & W M100.					(*)	(*)	(*)
	3Z1409-6	BUSHING: switch shaft; B & W M127.					(*)	(*)	(*)
	3G115-24	BUTTON: female; feed-thru; Alsimag 1173.					(*)	(*)	(*)
	3G115-24	BUTTON: male; feed-thru; Alsimag 1173.					(*)	(*)	(*)
C_{30}	3D423	CAPACITOR: fixed; vacuum; 50 mmf; 3,200-v ac; E. McCullough VC-50.					(*)	(*)	(*)
C_{22}	3D9012-32	CAPACITOR: fixed; vacuum; 12-mmf −1%+½%; 20,000-v dc; E. McCullough VC-50.					(*)	(*)	(*)
	3Z1030	FUSE CLIP: brass; nickel-plated; 60-amp; (holds vacuum capacitor); Efengee Elec Co 67.					(*)	(*)	(*)
L_6	3C302B-2	COIL: r-f; variable inductance.					(*)	(*)	(*)
	2Z2935	COLLAR: crank shaft; B & W M28.					(*)	(*)	(*)
	2Z2935-1	COLLAR: rear, coil shaft; B & W M8.					(*)	(*)	(*)

*Indicates stock available.

c. Antenna Tuning Unit BC-939-A—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z3263-2	COUNTER: Veeder Root 114134 or B & W M36-1.					(*)	(*)	(*)
	2Z32-633	COUNTER: Veeder Root 114144 or B & W M36.					(*)	(*)	(*)
	2Z3300-2	COUPLER: ceramic; small; Cardwell FNF Special.					(*)	(*)	(*)
	3G1350-56	COUPLER: ceramic; small; short; Cardwell FNF.					(*)	(*)	(*)
	3G1350-53	COUPLER: ceramic; large; Cardwell C.					(*)	(*)	(*)
	2Z4926.8	CRANK: long handle; B & W X110.					(*)	(*)	(*)
	2Z4926.9	CRANK: short handle; B & W X111.					(*)	(*)	(*)
	2Z4926.10	HANDLE: crank; bakelite; B & W M30.					(*)	(*)	(*)
L_{46}	3C302B-4	INDUCTOR: replacement; high-frequency; B & W per Hallicrafters 1C308.					(*)	(*)	(*)
L_6	3C302B-3	INDUCTOR ASSEM: replacement coupling; B & W per Hallicrafters 1C307.					(*)	(*)	(*)
	2Z5822-27	KNOB: with pointer; Kurz-Kasch S-309-64BB40263-517.					(*)	(*)	(*)
	2Z5822-54	KNOB: less pointer; Kurz-Kasch S-309-64BB; (coupling coil adjustment).					(*)	(*)	(*)
	3G1150-78	PLATES: set; end; B & W E102; (high-frequency loading coil).					(*)	(*)	(*)
	3G1150-78	PLATES: set; end; ceramic; B & W E102; (coupling coil).					(*)	(*)	(*)
	3G1150-132	PLATES: set; end; ceramic; B & W E-103; (low-frequency loading coil).					(*)	(*)	(*)
	2Z7249.6	PLUG: Johnson 75C; B & W L-3.					(*)	(*)	(*)
	3G1250-32.12	POST: round; ceramic; grade G; 2" high; Alsimag 1041.					(*)	(*)	(*)
	3G1450-16.2	POST: square; ceramic; grade G; 1" high; Alsimag 1086.					(*)	(*)	(*)
	3G1250-24.9	POST: 2"; cylindrical; Alsimag 1040.					(*)	(*)	(*)
	3G1450-16.2	POST: ceramic; 1' high; square; Alsimag 1086.					(*)	(*)	(*)
	2Z7857-3	RINGS: bakelite; Synthane 101H; B & W L1.					(*)	(*)	(*)
	2Z7857-2	RINGS: bakelite; Synthane 100H; B & W L2.					(*)	(*)	(*)
	3G1816-74A021	ROD: glass (Pyrex); Corning Glass D23900.					(*)	(*)	(*)
	2Z8203-6	SHAFT: contact wheel; B & W M104.					(*)	(*)	(*)
SW_9	2C527939A/S4	SWITCH ASSEM: B & W per Hallicrafters dwg Nos.: ID305-SW9.1 (front section), ID306-SW9.2 (rear section).					(*)	(*)	(*)
	3Z7650-2	SWITCH ROD: Micalex; B & W M303.					(*)	(*)	(*)
	2ZA/350-3	WHEEL: contact; B & W M-115.					(*)	(*)	(*)

d. Control Box BC-731-(*).

	3Z2831-4	FUSE BLOCK: dual; glazed ceramic.					(*)	(*)	(*)
	3G1837-18	BUSHING: insulated; 1" end.					(*)	(*)	(*)
	6Z317G-9	COUPLING AND LOCKNUT: 1".					(*)	(*)	(*)
FS_{201} FS_{202} FS_{203} FS_{204}	3Z2030	FUSE: 30-amp, 125-v.					(*)	(*)	(*)
	6Z5012-1	HANDLE: door; steel.					(*)	(*)	(*)
	3Z2879	FUSE HOLDER: spare.					(*)	(*)	(*)
	3G1795-2	NIPPLE: rubber; 7-mm.					(*)	(*)	(*)

*Indicates stock available.

d. Control Box BC-731-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
SW_{201}	3Z9824-273	SWITCH: push-button; (DPST).					(*)	(*)	(*)
TS_{202}	2Z9405.2	TERMINAL STRIP: 5-terminal; bakelite.					(*)	(*)	(*)
	3F8150-40	VOLTMETER: (a-c line indicator) GE type AO-22. **Note:** Substitute war standard meter No. MR35W150 ACVV. This meter is not essential to operation of the equipment and need not be replaced. Operator should use the meter on Power Unit PE-95 in place of this meter.							(*)

e. Junction Box JB-49-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C_{201}	3DB1.7483	CAPACITOR: fixed; bathtub; 1-mf ±10%; 200 v dc (working).					(*)	(*)	(*)
	2Z2200	CHANNEL: rubber, ⅜" x 7" long.					(*)	(*)	(*)
	3G1837-18	BUSHING: insulating.					(*)	(*)	(*)
	6Z5012-1	HANDLE: door.					(*)	(*)	(*)
	2Z9010-2	JUMPER: copper.					(*)	(*)	(*)
	3G1838-24.7	STRIP: binding post.					(*)	(*)	(*)
TS_{201}	2Z9410.10	STRIP: terminal; bakelite; 14-hole.					(*)	(*)	(*)
	331838-188	STRIP: terminal guide.					(*)	(*)	(*)
	6L31215-1N	STUD: stand-off.					(*)	(*)	(*)

f. Junction Box JB-69-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	3Z2831-4	FUSE BLOCK: dual.					(*)	(*)	(*)
	2Z1247.7	BRACKET: (fuse block mounting).					(*)	(*)	(*)
	3C1837.18	BUSHING: insulating.					(*)	(*)	(*)
C_{201}	3DB1.7483	CAPACITOR: fixed; paper; 1-mf ±10%; 200 v dc (working).					(*)	(*)	(*)
	6Z1747-12	CATCH: door top-cover.					(*)	(*)	(*)
	2Z2200	CHANNEL: rubber; ⅜" x 7" long.					(*)	(*)	(*)
	3Z2879	FUSE HOLDER: spare.					(*)	(*)	(*)
	2Z9010-2	JUMPER: copper.					(*)	(*)	(*)
	3Z737-4	BINDING POST: No. 14.					(*)	(*)	(*)
	3G1838-140.1	SPACER: terminal strip.					(*)	(*)	(*)
	3G1848-24.7	STRIP: binding post.					(*)	(*)	(*)
	3G1838-140	STRIP: power terminal; TS201.					(*)	(*)	(*)
	6L31215-1N	STUD: stand-off.					(*)	(*)	(*)

g. Radio Transmitter BC-610-(*).

Note. Letter(s) following a reference symbol indicates item applies only to that model(s).

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z1231-1	BRACKET: resistor; Ohmite No. 9.					(*)	(*)	(*)
	2Z1247.1	BRACKET: resistor; Ohmite No. 18.					(*)	(*)	(*)
C_{28}	3D423	CAPACITOR CA-423: fixed; vacuum; 50-mmf; 32,000-v ac; Eitel McCullough VC-50.					(*)	(*)	(*)
C_{13}ABC	3D9100-80	CAPACITOR: fixed; mica; 100-mmf ±5%; 500-v dc; Aerovox 1460.					(*)	(*)	(*)
C_{13}D	3D9150-19	CAPACITOR: fixed; mica; 150-mmf ±20%; 500-v dc; Aerovox 1460.					(*)	(*)	(*)
C_{14}	3D9200-35	CAPACITOR: fixed; mica; 200-mmf ±10%; 500-v dc; Aerovox 1460.					(*)	(*)	(*)

*Indicates stock available.

g. Radio Transmitter BC-610-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C_7, C_{10}	3DA10-127	CAPACITOR: fixed; mica; 0.01-mf ±10%; 300-v dc; Aerovox 1450.					(*)	(*)	(*)
C_{29}	3K4510211	CAPACITOR: fixed; mica; 1,000-mmf ±10%; 2,500-v dc (working); Aerovox 1447.					(*)	(*)	(*)
C_6C_7	3DA2-84	CAPACITOR: fixed; mica; 2,000-mmf ±10%; 500-v dc; Aerovox 1406.					(*)	(*)	(*)
C_{11}	3DA2-85	CAPACITOR: fixed; mica: 2,000-mmf ±5%; 6,000-v dc.					(*)	(*)	(*)
C_{15}	3DA2-86	CAPACITOR: fixed; mica; 2,000-mmf ±10%; 600-v dc; Aerovox 1450.					(*)	(*)	(*)
$C_1C_2C_3$ $C_4C_5C_8$ C_{25}	3DA6-10	CAPACITOR: fixed; mica; 6,000-mmf ±10%; 300-v dc; CD type 1W.					(*)	(*)	(*)
C_{24}	3DA6-37	CAPACITOR: fixed; mica; 6 000-mmf ±10%; 500-v dc; Aerovox 1450.					(*)	(*)	(*)
C_{19} C_{22}	3DB3.8	CAPACITOR: fixed; oil-filled; 3-mmf −10% +40%; 4,000-v dc; Industrial Condenser 7459.					(*)	(*)	(*)
C_{23}	3DB40-7	CAPACITOR: fixed; electrolytic; 40-mf −10%; +40%; 450-v dc; Industrial Condenser 010458B.					(*)	(*)	(*)
C_{13}	3D9150V-4	CAPACITOR: variable; air; 150-mmf max; 2,500-v dc (working); Johnson 150DD70.					(*)	(*)	(*)
C_{18}	3D9005VE5	CAPACITOR: variable; air; 5.5-mmf max; 3,000-v dc (working); Johnson 6G70.					(*)	(*)	(*)
C_{26}	3DA6-38	CAPACITOR: fixed; mica; 6,000-mmf ±10%; 500-v dc; Aerovox 1460.					(*)	(*)	(*)
C_{16} C_{17}	3DB8-33	CAPACITOR: fixed; oil-filled; dual 8-mf −10% +40%; 1,000-v dc; Aerovox 7462.					(*)	(*)	(*)
C_{20} C_{21}	3DB8-34	CAPACITOR: fixed; electrolytic; 8-mf −10% +40%; 600-v dc; Industrial Condenser 60B5.					(*)	(*)	(*)
C_{27}	3DB40-5	CAPACITOR: fixed; electrolytic; 40-mf —10%; 100-v dc; Industrial Condenser 10B281.					(*)	(*)	(*)
CH_4	3C375-1	COIL: choke; r-f; 2.2-mh ±5%; 25-ohm dc; Guthman, Hallicrafters 53A033.					(*)	(*)	(*)
CH_1 CH_3 CH_5 CH_8	3C363	CHOKE: r-f; 1.0-mh ±10%; 20-ohm dc; Guthman 4885.					(*)	(*)	(*)
CH_{10}	3C308-3	CHOKE: r-f; 2.5-mh ±10%; 8.5-ohm dc; 500-ma; SW Inductor CH 500.					(*)	(*)	(*)
CH_9	3C550	CHOKE: r-f; 10-mh ±10%; 42-ohm dc; Guthman 4979.					(*)	(*)	(*)
	2Z2712	CLIP: grid; National 12.					(*)	(*)	(*)
	2Z2724	CLIP: grid; Nationa 24.					(*)	(*)	(*)
L_7	3C280-387	COIL C-387: r-f; fina amplifier plate; 2.0–3.4-mc; Barker & Williamson 51A438.					(*)	(*)	(*)
L_7	3C280-388	COIL C-388: r-f; final amplifier plate; 3.4–4.4-mc; Barker & Williamson 51A439.					(*)	(*)	(*)
L_7	3C280-389	COIL C-389: r-f; final amplifier plate; 4.4–5.7-mc; Barker & Williamson 51A440.					(*)	(*)	(*)
L_7	3G280-390	COIL C-390: r-f; final amplifier plate; 5.7–8.0-mc; Barker & Williamson 51A441.					(*)	(*)	(*)
	2Z3291-1	COUPLING: ceramic; flexible; Johnson 251.					(*)	(*)	(*)
	2Z3270-8	COUPLING: flexible; ¼" x ¼".					(*)	(*)	(*)
	2Z3402-7	COVER: overload relay.					(*)	(*)	(*)

*Indicates stock available.

g. Radio Transmitter BC-610-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z6195.7	DIAL LOCK ASSEMBLY: Crowe P60875.					(*)	(*)	(*)
	2Z3708-5	DIAL: locking; Crowe P59917.					(*)	(*)	(*)
	2Z3719-7	DIAL DRIVE MECHANISM: Oak Mfg. Co. 6301-2.					(*)	(*)	(*)
	2Z3108-4	DIAL: Scale 0-100; Crowe P59482.					(*)	(*)	(*)
FS_1 FS_2	3Z2025	FUSE: plug; 25-amp; 125-v; Effengee 4325.					(*)	(*)	(*)
FS_3	3Z2020	FUSE: plug; 20-amp; 125-v; Effengee 4320.					(*)	(*)	(*)
FS_4	3Z1935	FUSE: 4AG; 5-amp; 125-v; Littelfuse 1094.					(*)	(*)	(*)
FS_5	3Z1950	FUSE: 3AG; 3-amp; 250-v; Littelfuse 1043.					(*)	(*)	(*)
	6C46C/G1	GROMMET: ⅜"; rubber; black; ¼" thick; Atlantic India Rubber 763, Hallicrafters 16A002.					(*)	(*)	(*)
	6Z4856-9	GROMMET: ½"; rubber; black; ¼" thick; Atlantic India Rubber 1724, Hallicrafters 16A008.					(*)	(*)	(*)
	3G1250-16	INSULATOR POST: 1"; cylindrical; ceramic; Centralab, Hallicrafters 8A003.					(*)	(*)	(*)
	3G1837-32.8	INSULATOR: cylindrical; bakelite.					(*)	(*)	(*)
	3G1000-8.4	INSULATOR: cone; ceramic; Johnson 501.					(*)	(*)	(*)
	3G1250-6.4	INSULATOR: feed-thru; button; ceramic; American Lava No. 1440.					(*)	(*)	(*)
	3G1050-36	INSULATOR ASSEM: feed-thru; No. 1165.					(*)	(*)	(*)
	3G1250-6.5	INSULATED SPACER: ceramic; (part of tank coil).					(*)	(*)	(*)
PL_7 PL_8 PL_9	2Z5594.11	JACK BAR ASSEM: Barker & Williamson A54, Hallicrafters No.8B006.					(*)	(*)	(*)
LM_1 LM_2	2Z5927	LAMP LM-27: 6-8-v; 0.25-amp; bayonet base; type 44.					(*)	(*)	(*)
LM_3 LM_4	2Z5903	LAMP: 120-v; 6-watt; candelabra; type S6; clear.					(*)	(*)	(*)
	2Z5988	LAMP: pilot; red; Dial Light Co. of America.					(*)	(*)	(*)
	2Z5988-6	LAMP: pilot; green; Dial Light Co. of America.					(*)	(*)	(*)
M_1	3F910-13	MILLIAMETER: 0-100-ma dc; bakelite case; (substitute war standard meter No. MR25W100DCMA); GE DO-53.					(*)	(*)	(*)
M_5	3F950-20	MILLIAMETER: 0-500-ma dc; bakelite case; (substitute war standard meter No. MR25W500DCMA); GE DO-53.					(*)	(*)	(*)
M_2 M_4	3F930-10	MILLIAMETER: 0-300-ma dc; bakelite case; (substitute war standard meter No. MR25W300DCMA); GE DO-53.					(*)	(*)	(*)
$PL_{1\text{-}1}$ $PL_{2\text{-}1}$ $PL_{3\text{-}1}$ABC $PL_{4\text{-}1}$	2Z7228-14.1	PLUG: 6-contact; male; Jones P-406-Lab.					(*)	(*)	(*)
$PL_{3\text{-}1}$D	2Z7228-1	PLUG: 8-contact; male; square; Jones P408-Lab, Hallicrafters No. 10A060.					(*)	(*)	(*)
	3G1100-68-1	POST: ceramic; for 150DD70 variable air capacitor; Johnson type D, Hallicrafters No. 8A037.					(*)	(*)	(*)
R_{12}	2Z7261	POTENTIOMETER: 500-ohm ±5%; 50-w; (bias voltage control); IRC PR50 or PR050.					(*)	(*)	(*)

*Indicates stock available.

g. ***Radio Transmitter BC-610-(*)—Continued.***

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
L_1 L_2 L_3	3C560	REACTOR: 6-h; 250-ma; 125-ohm dc; (exciter power supply filter); Standard Transformer 10C13.					(*)	(*)	(*)
L_4	3C560-1	REACTOR: 11-h; 500-ma; 50-ohm dc; 5,000 v dc (test); (final amplifier supply filter); Standard Trans. Corp 10C16.					(*)	(*)	(*)
RY_2	2Z7717.5	RELAY: DPDT; 117-v ac; (overload protector locking); Guardian 32423.					(*)	(*)	(*)
RY_5	2Z7717.4	RELAY: DPDT; 600-ma dc; (overload protector locking); Guardian 32422.					(*)	(*)	(*)
RY_4	2Z7717.3	RELAY: DPDT; 117-v ac; (antenna short-out); Leach 1702MX.					(*)	(*)	(*)
RY_3	2Z7717.2	RELAY: DPDT; 117-v ac; (phone c-w switching); Advance 400.					(*)	(*)	(*)
RY_1	2Z7717	RELAY: DPDT; 117-v ac; (plate power ON-OFF); Leach 1154 (replaces GML 251 (2Z7717)).					(*)	(*)	(*)
R_{19}	3Z6001F6-2	RESISTOR: 16-ohm; 600-w; heater element; (T_6 primary voltage dropping); Eagle Electric EAE415A.					(*)	(*)	(*)
R_{21} R_{22}	3Z6005-13	RESISTOR: 50-ohm ±5%; ½-w; IRC BW½.					(*)	(*)	(*)
R_{24}	3Z6050-52	RESISTOR: 500-ohm ±5%; 10-w; Ohmite BD.					(*)	(*)	(*)
R_9	3Z6070-5	RESISTOR: 700-ohm ±5%; 20-w; Utah EE.					(*)	(*)	(*)
R	3Z4607	RESISTOR RS-207: 750-ohm ±10%; 1-w; IRC BT1, RC31BE751J.					(*)	(*)	(*)
R_{20}	3Z6075-16	RESISTOR: 750-ohm ±5%; 10-w; Ohmite BD.					(*)	(*)	(*)
R_{11}	3Z6250-27	RESISTOR: adjustable tap; 2,500-ohm ±5%; 100-w; Ohmite DIVEU.					(*)	(*)	(*)
R_8	3Z6615-38	RESISTOR: 15,000-ohm ±5%; 20-w; Utah 20VWQ.					(*)	(*)	(*)
R_6 R_7 R_{16} R_{17}	3Z6620-12	RESISTOR: 20,000-ohm ±10%; 2-w; IRC BT2, RC41BE203J.					(*)	(*)	(*)
R_1	3Z4540	RESISTOR: 30,000-ohm ±10%; ½-w; IRC BT½, RC21BE303J.					(*)	(*)	(*)
R_{10}	3Z6640-16	RESISTOR: 40,000-ohm ±5%; 20-w; Utah EE.					(*)	(*)	(*)
R_{25}	3Z6650-7	RESISTOR: 50,000-ohm ±10%; 2-w; IRC BT2, RC41BE513J.					(*)	(*)	(*)
R_{13}	3Z6675-15	RESISTOR: 75,000-ohm; 200-w; Ohmite 0924.					(*)	(*)	(*)
R_2CD	3Z6506-8	RESISTOR: 5,600-ohm ±5%; 20-w; Utah 20VWQ.					(*)	(*)	(*)
R_{14} R_{15}	3Z4550	RESISTOR RS-150: 100,000-ohm ±10%; ½-w.					(*)	(*)	(*)
R_2AB	3Z6575-20	RESISTOR: 7,500-ohm ±5%; 20-w; Utah 20VWQ.					(*)	(*)	(*)
R_{26} R_{27}	3Z6010-27	RESISTOR: 100-ohm ±5%; 1-w; IRC BW1.					(*)	(*)	(*)
R_3	3Z6100-6	RESISTOR: 1,000-ohm ±5%; 10-w; Ohmite BD.					(*)	(*)	(*)
R_5	3Z6610-68	RESISTOR: 10,000-ohm ±5%; 20-w; Utah 20VWQ.					(*)	(*)	(*)
R_{28}	3Z6620-52	RESISTOR: 20,000-ohm ±5%; 20-w; Ohmite BROHI or Utah 20VWQ.					(*)	(*)	(*)
R_{29}	3Z6630-18	RESISTOR: 30,000-ohm −0% +10%; 2-w; IRC BT2, RC41BE333J.					(*)	(*)	(*)
R_{30}	3Z7015-3	RHEOSTAT: 15-ohm ±10%; approx 50-w; IRC 15-ohm, PR 50 per Spec. Pr-709 Sub 2, or Ohmite G, Hallicrafter No. 25A501.					(*)	(*)	(*)

*Indicates stock available.

g. *Radio Transmitter BC-610-(*)—Continued.*

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
PL_3	2Z8659-6	SOCKET: octal; bakelite; (speech amplifier input); Amphenol M1P-8.					(*)	(*)	(*)
PL_3D	2Z8768.43	SOCKET: 8-contact; female; modified Jones S-408-AB, per Hallicrafters dwg. No. 10A077.					(*)	(*)	(*)
	2Z8678.87	SOCKET: Amphenol connector; Amphenol P08F1, Hallicrafters No. 10B040.					(*)	(*)	(*)
	2Z5883-21	SOCKET: pilot; light; with leads; Drake 204CE.					(*)	(*)	(*)
PL_6	6Z7588	SOCKET: male; twist-lock 20-amp; 250-v; Hubbell 8808.					(*)	(*)	(*)
PL_1 PL_2 PL_2ABC PL_4	2Z8639.1	SOCKET: 6-contact; female; Jones S-406-LAB.					(*)	(*)	(*)
PL_7 PL_8 PL_9	2Z8639-5	SOCKET TERMINAL STRIP 10-terminal; bakelite.					(*)	(*)	(*)
SW_{11}	2C6500A/S1	SWITCH ASSEM: 4-section; isolantite wafers; CRL 14BHC411D.					(*)	(*)	(*)
SW_7	3Z9845-14	SWITCH: toggle; 4-pole DT; bakelite; (phone c-w switching); Cutler-Hammer 8885K1.					(*)	(*)	(*)
SW_1 SW_3 SW_4 SW_6	3Z9851	SWITCH: toggle; SPST; bakelite; (filament ON-OFF; exciter plate ON-OFF; series resistor ON-OFF; plate power ON-OFF); Effengee P & S-1311.					(*)	(*)	(*)
SW_{12}	3Z9824-274	SWITCH: push-button; SPST; momentary; (over-load relay reset); Utah PS-3.					(*)	(*)	(*)
SW_5 SW_{10} $SW_{11}ABC$ SW_{13} $SW_{16}D$	3Z9812-2	SWITCH: interlock; SPST; bakelite; HH 3592D.					(*)	(*)	(*)
SW_8 SW_9	3Z9849.16	SWITCH: toggle; DPDT; bakelite; CH 8363KS.					(*)	(*)	(*)
	3Z9812-3	SWITCH: interlock; SPST; HH 1796.					(*)	(*)	(*)
TS_3	2Z9408.1	TERMINAL BLOCK: 8-terminal; (power supply chassis cable connection); Jones S-10-142.					(*)	(*)	(*)
TS_1 TS_2	2Z9412	TERMINAL STRIP: 12-terminal; Jones S-12-6.					(*)	(*)	(*)
TS_4	2Z9402	TERMINAL STRIP: standard; 2-terminal; Cinch Mfg. Co. 1720.					(*)	(*)	(*)
TS_5	2Z9402.1	TIP JACK STRIP: standard; 2-jack; Cinch Mfg. Co. 1490.					(*)	(*)	(*)
T_1	2Z9613.3	TRANSFORMER: primary 117-v; secondary 1,000-v ct at 220 ma; 2.5-v ct at 5 amps; 5-v ct at 3 amps; (bias supply plate power); Standard Transformer No. 10P33.					(*)	(*)	(*)
T_2	2Z9611.144	TRANSFORMER: primary 115-100-v ac; sec 2.5-v ct at 10 amps; (filament power); Standard Transformer Co. 10P50.					(*)	(*)	(*)
T_3	2Z9614.1	TRANSFORMER: primary 115-100-v; secondary 5-v ct at 10.5 amps; (filament power); Standard Transformer Co. 10P35.					(*)	(*)	(*)
T_4	2Z9614.2	TRANSFORMER: primary 100-115-v; secondary 5-v ct at 10.5 amps; 6.3-v ct at 3.5 amps; 5-v ct at 3 amps; (filament power); Standard Transformer Co. 10P36.					(*)	(*)	(*)

*Indicates stock available.

g. Radio Transmitter BC-610-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
T_5	2Z9612	TRANSFORMER: primary 125-115-v; secondary 870-v ct at 250 ma; (exciter plate power); Standard Transformer Co. 10P37.					(*)	(*)	(*)
T_6	2Z9612.1	TRANSFORMER: primary 115-v tapped to provide 5,000-v or 4,000-v ct at 500 ma; (plate power); Standard Transformer Co. 10P43.					(*)	(*)	(*)
T_7	2Z9636	TRANSFORMER: primary 500-ohm; secondary 20,000-ohm ct; (interstage); Standard Transformer Co. 10A021.					(*)	(*)	(*)
T_8	2Z9632.2	TRANSFORMER: primary 5,000-ohm; ratio 1/1.35, 1/2 primary to 1/2 secondary; (driver): Standard Transformer Co. 10A022.					(*)	(*)	(*)
T_9	2Z9634.3	TRANSFORMER: primary 16,000-ohm ct; secondary 8,330-ohm ct at 250 ma; (modulation); Standard Transformer Co. 10A38.					(*)	(*)	(*)
M_3	3F8010-8	VOLTMETER: 0-10-v ac; bakelite case; General Electric DO-53; (substitute war standard meter No. MR25W010ACVV).					(*)	(*)	(*)

h. Speech Amplifier BC-614-(*).

Note. Letter(s) following a reference symbol indicates item applies only to that model(s).

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C_{101} C_{102} C_{103}	3DA10-128	CAPACITOR: fixed; mica, 10,000-mmf ±10%; 600-v dc; Micamold MP4134.	10				(*)	(*)	(*)
C_{104}	3DB10-21	CAPACITOR: fixed; electrolytic; 10-mf −10% +40%; 25-v dc; 1 section of 4-section unit; Industrial Condenser 1B99.	1				(*)	(*)	(*)
C_{105} C_{106}		CAPACITOR: same as C_{101}							
C_{107}		CAPACITOR: same as C_{104}.							
C_{108} C_{109}	3DB8-35	CAPACITOR: fixed; electrolytic; dual; 8-8-mf −10% +40%; 475-v dc; 1 section of dual unit; Industrial Condenser 40B233.	3				(*)	(*)	(*)
C_{110}		CAPACITOR: fixed; electrolytic; 30-mf −10% +40%; 25-v dc; one section of four-section unit; (see C_{104}).							
C_{111} C_{112} C_{113}		CAPACITOR: same as C_{108}.							
C_{114}		CAPACITOR: same as C_{101}.							
C_{115}		CAPACITOR: same as C_{108}.							
C_{116}	3DA350-5	CAPACITOR: fixed; 0.035-mf ±10%; 400-v dc; bathtub; Industrial Condenser 7476.	2				(*)	(*)	(*)
C_{117} C_{118}	3DA2-71	CAPACITOR: fixed; mica; [illegible],000-mmf ±10%; 500-v dc; Aerovox 1467.	4				(*)	(*)	(*)
C_{119}		CAPACITOR: same as C_{101}.							
C_{120}		CAPACITOR: same as C_{110}.							
C_{121}		CAPACITOR: same as C_{101}.							

*Indicates stock available.

h. Speech Amplifier BC-614-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C_{122}		CAPACITOR: same as C_{117}.							
C_{123}									
C_{124}		CAPACITOR: same as C_{116}.							
$C_{125}D$		CAPACITOR: same as C_{101}.							
$C_{126}D$									
CH_{101}	3C548	REACTOR: iron core; 29-h; GTC 1C103.	1				(*)	(*)	(*)
J_{101}	2Z5524	JACK JK-24: single-circuit; standard headphone type.	1				(*)	(*)	(*)
J_{102}	2Z5522	JACK JK-22: 3-circuit; telephone-type.	1				(*)	(*)	(*)
LM_{101}	2Z5927	LAMP LM-27: 6-8-v; 0.25-amp; miniature bayonet base; type 44.	1				(*)	(*)	(*)
M_{101}	3F3306	LEVEL METER: −10 to +6db. **Note:** This meter is not essential to operation of the set and need not be replaced. Operator should use the MOD. PLATE meter on Radio Transmitter BC-610-(*) as speech level indicator.	1				(*)	(*)	(*)
R_{101}	3Z6801-16	RESISTOR: fixed; 1-meg ±20%; ½-w; IRC BT½, RC21BE1105M.	2				(*)	(*)	(*)
R_{102}									
R_{103}	3Z6270-6	RESISTOR: fixed; 200,000-ohm ±10%; ½-w; IRC BT½, RC21BE204J.	2				(*)	(*)	(*)
R_{104}	3Z6010-31	RESISTOR: fixed; 100-ohm ±10%; ½-w; IRC BT½, RC21BE101K.	1				(*)	(*)	(*)
R_{105}	3Z4528	RESISTOR: fixed; 5,000-ohm ±10%; ½-w; IRC BT½, RC21BE502J.	4				(*)	(*)	(*)
R_{106}	3Z4525	RESISTOR: fixed; 1,000-ohm ±10%; ½-w; IRC BT½, RC21BE102K.	4				(*)	(*)	(*)
R_{107}	3Z4550	RESISTOR: fixed; 100,000-ohm ±10%; ½-w; IRC BT½, RC21BE104K.	4				(*)	(*)	(*)
R_{108}		RESISTOR: same as R_{103}.							
R_{109}	3Z4533	RESISTOR: fixed; 500,000-ohm ±10%; ½-w; IRC BT½, RC21BE514J.	2				(*)	(*)	(*)
R_{110}	3Z4562	RESISTOR: fixed; 250,000-ohm ±10%; ½-w; IRC BT½ RC21BE244J.	7				(*)	(*)	(*)
R_{111}	2Z7298-3	POTENTIOMETER: 1-meg; 1-w; CRL 1-01-1602.	2				(*)	(*)	(*)
R_{112}		RESISTOR: same as R_{106}.							
R_{113}		RESISTOR: same as R_{107}.							
R_{114}		RESISTOR: same as R_{110}.							
R_{115}	3Z6050-53	RESISTOR: fixed; 500-ohm ±10% 1-w; IRC BW1, RC31BE511J.	3				(*)	(*)	(*)
R_{116}		RESISTOR: same as R_{107}.							
R_{117}									
R_{118}		RESISTOR: same as R_{110}.							
R_{119}									
R_{120}									
R_{121}		RESISTOR: same as R_{115}.							
R_{122}	2Z7298-5	POTENTIOMETER: 15,000-ohm; Utah 6757.	1				(*)	(*)	(*)
$R_{123}AB$		RESISTOR: (See note below.)							
$R_{123}CD$	3Z4540	RESISTOR: 30,000-ohm ±10%; ½-w; IRC BT½, RC21BE303J.	1				(*)	(*)	(*)
$R_{124}AB$		RESISTOR: (See note below.)							
$R_{124}CD$	3Z4529	RESISTOR: 10,000-ohm ±10%; ½-w; IRC BT½, RC21BE103K.	1				(*)	(*)	(*)
R_{125}	3Z6675-10	RESISTOR: fixed; 75,000-ohm ±10%; 2-w; IRC BT2, RC41BE753J.	1				(*)	(*)	(*)
R_{126}	3Z6620-12	RESISTOR: fixed; 20,000-ohm ±10%; 2-w; IRC BT2, RC41BE203J.	2				(*)	(*)	(*)

*Indicates stock available.

Note: When necessary to replace R_{123}, R_{124}, or R_{137} in Radio Set SCR-299-A or SCR-299-B, replace *all three* with values indicated for Radio Sets SCR-299-C and SCR-299-D.

h. *Speech Amplifier BC-614-(*)—Continued.*

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R_{127}	3Z6650-7	RESISTOR: fixed; 50,000-ohm ±10%; 2-w; IRC BT2, RC41BE513J.	1				(*)	(*)	(*)
R_{128}	3Z66508	RESISTOR: fixed; 50,000-ohm ±10%; 1-w; IRC BT1, RC31BE513J	1				(*)	(*)	(*)
R_{129}		RESISTOR: same as R_{128}.							
R_{130}	3Z4531	RESISTOR: fixed; 50,000-ohm ±10%; ½-w; IRC BT½, RC21BE513J.	2				(*)	(*)	(*)
R_{131}		RESISTOR: same as R_{106}.							
R_{132}		RESISTOR: same as R_{109}.							
R_{133}	3Z4593	RESISTOR: fixed; 3-meg ±10%; ½-w; IRC BT½, RC21BE305J.	1				(*)	(*)	(*)
R_{134}	2Z7298-4	POTENTIOMETER: 500,000-ohm; CRL 1-010-1603.	1				(*)	(*)	(*)
R_{135}		RESISTOR: same as R_{110}.							
R_{136}	3Z4524	RESISTOR: fixed; 500-ohm ±10%; ½-w; IRC BT½, RC21BE511J.	1				(*)	(*)	(*)
R_{137}AB	2Z7231-31	RESISTOR: (See note below.)							
R_{137}CD	3Z4614	RESISTOR: 15,000-ohm ±10%; ½-w; IRC BT½, RC21BE153K.	1				(*)	(*)	(*)
R_{138}		RESISTOR: same as R_{110}.							
R_{139}	3Z4528	RESISTOR: same as R_{106}.							
R_{140}		RESISTOR: same as R_{105}.							
R_{141}	3Z6030-11	RESISTOR: fixed; 300-ohm ±10%; 1-w; IRC BW1, RC31BE301J	1				(*)	(*)	(*)
R_{142}		RESISTOR: same as R_{111}.							
R_{143}D	3Z6005-44	RESISTOR: fixed; 50-ohm ±10%; ½-w; IRC BT½. RC21BE510J.	1				(*)	(*)	(*)
R_{144}		RESISTOR: same as R_{115}.							
RY_{101}	2Z7585-31	RELAY: 12.5-v; 1.5-h; Clare A11731.	1				(*)	(*)	(*)
SO_{101}	2Z8658	SOCKET: female; 3-contact; (chassis connector); Amphenol PC3F.	1				(*)	(*)	(*)
SO_{102}	2Z8659-7	SOCKET: 6-prong; bakelite; rivet mounting; Amphenol MIP-6.	1				(*)	(*)	(*)
SO_{103} SO_{104}	2Z8659-6	SOCKET: octal; bakelite; Amphenol MIP-8.	2				(*)	(*)	(*)
SW_{101}	3Z9825-34	SWITCH: rotary; 2-pole 3-position; CRL 60B083.	1				(*)	(*)	(*)
SW_{102} SW_{103}	3Z9849-16	SWITCH: toggle; DPDT; bakelite; CH 8363K5.	3				(*)	(*)	(*)
SW_{104}	3Z9818-1	SWITCH: key; 2-way locking; CPC A1697.	1				(*)	(*)	(*)
SW_{105}		SWITCH: same as SW_{102}.							
T_{101}	2Z9631.3	TRANSFORMER: a-f; microphone; (2 windings; 125-ohm primary; 125-ohm secondary); GTC 2D-131.	1				(*)	(*)	(*)
T_{102}	2Z9632.4	TRANSFORMER: a-f; audio output; (2 windings; 18,000-ohm primary; 500-ohm secondary); GTC 2D-99.	1				(*)	(*)	(*)
T_{103}	2Z9613.2	TRANSFORMER: filament and plate; (primary 117-v ac; secondary (1) 500-v ac ct 25-ma; (2) 6.3-v ac ct 2-amp; (3) 5-v ac 2-amp); GTC 5C160.	1				(*)	(*)	(*)
T_{104}	2Z9634.2	TRANSFORMER: a-f; modulator limiter; (2 windings; 10,000-ohm primary; 80,000-ohm secondary); GTC 2A109.	1				(*)	(*)	(*)
	2Z1247.2	BRACKET: resistor mounting; Ohmite 12, Hallicrafters 67A068.					(*)	(*)	(*)
	2Z2626.11	CLAMP: tube base and capacitor; Industrial Condenser 11-86, Hallicrafters 76A029.					(*)	(*)	(*)
	6Z4856-13	GROMMET: rubber; ¼".					(*)	(*)	(*)

*Indicates stock available.

Note: When necessary to replace R_{133}, R_{134}, or R_{137} in Radio Set SCR-299-A or SCR-299-B, replace *all three* with values indicated for Radio Sets SCR-299-C and SCR-299-D.

h. Speed Amplifier BC-614-(*)—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	6Z4856-14	GROMMET: rubber; ¾".					(*)	(*)	(*)
	2Z5849.11	KNOB: with skirt.					(*)	(*)	(*)
	2Z5882-6	LIGHT: pilot; red; assem.					(*)	(*)	(*)
	2Z7118.20	RECEPTACLE: octal; male; Amphenol PO8M-1.					(*)	(*)	(*)
	2Z8678.13	SOCKET: octal; Amphenol PO8-F 10B040.					(*)	(*)	(*)

i. Table MC-269.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z8674.34	SOCKET: 4-contact receptacle; female; 10-amp; 250 v.					(*)	(*)	(*)
	2Z7118.20	RECEPTACLE: 8-prong; male.					(*)	(*)	(*)
	6Z7809-9	RECEPTACLE: duplex; 3-contact; female.					(*)	(*)	(*)
	6Z7808	SOCKET: 2-contact; female.					(*)	(*)	(*)
	6Z7809-8	SOCKET: duplex; 2-contact; female.					(*)	(*)	(*)
	6Z7809-5	SOCKET: duplex; 2-contact; female.					(*)	(*)	(*)
	2Z7155	PLUG PL-55.					(*)	(*)	(*)
	2Z7168	PLUG PL-68.					(*)	(*)	(*)
	2Z7116.11	PLUG: male; 6-prong; (with cable clamp).					(*)	(*)	(*)

j. Tuning Units TU-47 through TU-62.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2C8047	TUNING UNIT TU-47.					(*)	(*)	(*)
C_{36}	3D9140-1	CAPACITOR: fixed; ceramic; 140-mmf ±5%; tc zero; 500-v dc; Hallicrafters dwg No. 47A021.					(*)	(*)	(*)
C_{47}	3DK9075-13	CAPACITOR: fixed; mica; 75-mmf ±10%; 500-v dc; C-D type 5W.					(*)	(*)	(*)
L_{8}	3C1090	COIL: r-f; 96-mh; tapped; 2.0-2.5-mc; (master oscillator coil); Hallicrafters 51A468, Guthman 4846.					(*)	(*)	(*)
L_{14}	3C1090-6	COIL: r-f; 28.8-mh; single winding; 2.0-2.5-mc; (crystal coil); Hallicrafters 51A450, Guthman 4881.					(*)	(*)	(*)
L_{20}	3C1090-12	COIL: r-f; 36.3-mh; single winding; 2.0-2.5-mc;(doubler buffer coil); Hallicrafters 51A456, Guthman 4872.					(*)	(*)	(*)
L_{26}	2C8048	TUNING UNIT TU-48.					(*)	(*)	(*)
C_{37}	3D9155-1	CAPACITOR: fixed; ceramic; 500-v dc; tc-0.00015 mmf/mmf/degree C; Muter.					(*)	(*)	(*)
L_{9}	3C1090-1	COIL: r-f; 55.5-mh; tapped; 2.5-3.2-mc; (master oscillator coil); Hallicrafters dwg 51A467, Guthman 4847.					(*)	(*)	(*)
L_{21} L_{27}	3C1090-13	COIL: r-f; 30.8-mh; single winding; 2.5-3.2-mc; (doubler buffer coil); Hallicrafters 51A457, Guthman 4873.					(*)	(*)	(*)
L_{15}	3C1090-7	COIL: r-f; 12-mh; single winding; 2.5-3.2-mc; (crystal coil); Hallicrafters 51A451, Guthman 4882.					(*)	(*)	(*)
	2C8049	TUNING UNIT TU-49.					(*)	(*)	(*)
C_{36}	3D9135-2	CAPACITOR: fixed; ceramic; 135-mmf±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg 47A010.					(*)	(*)	(*)
L_{10}	3C1090-2	COIL: r-f; 41.0-mh; tapped 3.2-4.0-mc; (master oscillator coil); Hallicrafters 51A469, Guthman 4848.					(*)	(*)	(*)

*Indicates stock available.

j. Tuning Units TU-47 through TU-62—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		TUNING UNIT TU-49—Con.							
L_{22} L_{28}	3C1090-14	COIL: r-f; 20.6-mh; single winding; 3.2-4.0-mc; (doubler buffer coil); Hallicrafters 51A458 Guthman 4874.					(*)	(*)	(*)
L_{16}	3C1090-8	COIL: r-f; 9.2-mh; single winding; 3.2-4.0-mc; (crystal coil); Hallicrafters dwg 51A452, Guthman 4883.					(*)	(*)	(*)
	2C8050	TUNING UNIT TU-50.					(*)	(*)	(*)
C_{46}	3D9100-64	CAPACITOR: fixed; mica; 100-mmf ±10%; 500-v dc; C-D type 5W.					(*)	(*)	(*)
C_{39}	3D9170-1	CAPACITOR: ceramic; 170-mmf ±5%; 500-v dc; tc-0.00015 mmf/-mmf/degree C; Hallicrafters dwg No. 47A012.					(*)	(*)	(*)
L_{17}	3C1090-9	COIL: r-f; 66.0-mh; single winding; 4.0-5.0-mc; (crystal coil); Hallicrafters dwg No. 51A453. Guthman 4884.					(*)	(*)	(*)
L_{11}	3C1090-3	COIL: r-f; 21.4-mh; tapped; 4.0-5.0-mc; (master oscillator coil); Hallicrafters dwg No. 51A470, Guthman 4849.					(*)	(*)	(*)
L_{23} L_{29}	3C1090-15	COIL: r-f; 12.6-mh; single winding; 4.0-5.0-mc; (double buffer coil); Hallicrafters dwg No. 51A459, Guthman 4875.					(*)	(*)	(*)
	2C8051	TUNING UNIT TU-51.					(*)	(*)	(*)
C_{40}	3D9160	CAPACITOR: fixed; ceramic; 160-mmf ±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg No. 47A020.					(*)	(*)	(*)
L_{12}	3C1090-4	COIL: r-f; 14.1-mh; tapped; 5.0-6.35-mc; (master oscillator coil); Hallicrafters dwg No. 51A471, Guthman 4850.					(*)	(*)	(*)
L_{18}	3C1090-10	COIL: r-f; 22.8-mh; single winding; 5.0-6.35-mc; (crystal coil); Hallicrafters dwg No. 51A454, Guthman 4900.					(*)	(*)	(*)
L_{24} L_{30}	3C1090-16	COIL: r-f; 5.0-6.35-mc; (buffer coil); Hallicrafters No. 51A460, Guthman 4876.					(*)	(*)	(*)
	2C8052	TUNING UNIT TU-52.					(*)	(*)	(*)
C_{41}	3D9185-1	CAPACITOR: fixed; ceramic; 185-mmf ±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C.					(*)	(*)	(*)
L_{19}	3C1090-11	COIL: r-f; 18.0-mh; single winding; 6.35-8.0-mc; (crystal coil); Hallicrafters 51A455, Guthman 4901.					(*)	(*)	(*)
L_{25} L_{31}	3C1090-17	COIL: r-f; 5.66-mh; single winding; 6.35-8.0-mc; (double buffer coil); Hallicrafters 51A461, Guthman 4877.					(*)	(*)	(*)
L_{13}	3C1090-5	COIL: r-f; 8-1-mh; tapped; 6.35-8.0-mc; (master oscillator coil); Hallicrafters 51A482, Guthman 4851.					(*)	(*)	(*)
	2C8053	TUNING UNIT TU-53.					(*)	(*)	(*)
C_{42}	3D9060-5	CAPACITOR: fixed; ceramic; 60-mmf ±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg No. 47A022.					(*)	(*)	(*)
L_{32}	2C8053/C1	COIL: r-f; 8.0-12.0-mc; (master oscillator coil); Hallicrafters dwg No. 51A490, Guthman special.					(*)	(*)	(*)
L_{33} L_{34}	3C1084P-5	COIL: r-f; single winding; 8.0-12.0-mc; (doubler buffer coil); Hallicrafters dwg No. 51A491.					(*)	(*)	(*)

***Indicates stock available.**

j. Tuning Units TU-47 through TU-62—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		TUNING UNIT TU-53—Con.							
L_{41}	2C8053/C2	COIL: r-f; 8.0-12.0-mc; (crystal coil); Hallicrafters 51A502, Guthman special.					(*)	(*)	(*)
	2C8054	TUNING UNIT TU-54.					(*)	(*)	(*)
C_{49}	3D9065-3	CAPACITOR: fixed; ceramic; 65-mmf ±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg No. 47A051.					(*)	(*)	(*)
C_{50}	3D9075-7	CAPACITOR: fixed; ceramic; 75-mmf ±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg No. 47A023.					(*)	(*)	(*)
L_{36}	3C1084P	COIL: r-f; 4.84-mh; tapped; 12.0-18.0-mc; (doubler buffer coil); Hallicrafters 51A493, Guthman special.					(*)	(*)	(*)
L_{35}	2C8054/C2	COIL: r-f: 12.7-mh; tapped; 12.0-18.0-mc; (master oscillator coil).					(*)	(*)	(*)
L_{42}	2C8054/C3	COIL: r-f; 14.2-mh; single winding; 12.0-18.0-mc; (crystal coil).					(*)	(*)	(*)
	2C8061	TUNING UNIT TU-61.	3				(*)	(*)	(*)
C_{61}	3D9133V	CAPACITOR: variable; air; 133-mmf ±3% max.	1						
C_{62}	3D9075-12	CAPACITOR: fixed; ceramic; 75-mmf ±2%; 1,000-v dc (test): tc-0.00015 mmf/mmf/degree C; Muter H-15.	1				(*)	(*)	(*)
L_{55}	3C1084P-19	COIL: r-f; 1.5-2.0-mc; (mo).	1				(*)	(*)	(*)
L_{56}	3C1084P-18	COIL: rf- 1.5-2.0-mc; (buffer).	1				(*)	(*)	(*)
L_{57}	3C1084P-17	COIL: rf-; 1.5-2.0-mc; (ipa).	1				(*)	(*)	(*)
L_{58}	3C1084P-16	COIL: rf-; 1.5-2.0-mc; (crystal).	1				(*)	(*)	(*)
	2C8062	TUNING UNIT TU-62.	3				(*)	(*)	(*)
C_{48}	3D9060-5	CAPACITOR: fixed; ceramic; 60-mmf±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C.					(*)	(*)	(*)
L_{51}	3C1084P-14	COIL: r-f; 1.0-1.5-mc; (mo).	1				(*)	(*)	(*)
L_{52}	3C1084P-13	COIL: r-f; 1.0-1.5-mc; (buffer).	1				(*)	(*)	(*)
L_{53}	3C1084P-15	COIL: r-f; 1.0-1.5-mc; (ipa).	1				(*)	(*)	(*)
L_{54}	3C1084P-12	COIL: r-f; 1.0-1.5-mc; (crystal).	1				(*)	(*)	(*)
		ADDITIONAL MAINTENANCE PARTS FOR ALL TUNING UNITS.							
C_{31}, C_{32}	3D9140V-7	CAPACITOR: variable; air; 140-mmf max; Johnson 140K8.					(*)	(*)	(*)
C_{34}	3D9150V-14	CAPACITOR: variable; air; 150-mmf max; Bud MC 1857.					(*)	(*)	(*)
C_{42}	3D9040-10	CAPACITOR: fixed; ceramic; 40-mmf±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg No. 47A019.					(*)	(*)	(*)
C_{44}	3K2024112	CAPACITOR: fixed; mica; 240-mmf±5%; 500-v dc; AWS CM20A241J.					(*)	(*)	(*)
C_{45}	3D9400-16	CAPACITOR: mica; 400-mmf± 10%; 500-v dc; C-D type 5W.					(*)	(*)	(*)
C_{35}	3D9100V-9	CAPACITOR: variable; air; 100-mmf max; Bud MC 1855.					(*)	(*)	(*)
C_{33}	3D9100V-8	CAPACITOR: variable; air; 100-mmf max; Johnson 100K8.					(*)	(*)	(*)
C_{43}	3D9050-61	CAPACITOR: fixed; ceramic; 50-mmf±5%; 500-v dc; tc-0.00015 mmf/mmf/degree C; Hallicrafters dwg. No. 47A049.					(*)	(*)	(*)
	2Z3717. 5	DIAL ASSEM: tuning box; scale 0-100; (includes knob).					(*)	(*)	(*)
	2Z6195.8	LOCK: dial; National 401.	1				(*)	(*)	(*)
	2Z5849.8	KNOB: dial; bakelite.	2				(*)	(*)	(*)
PL_{10}	2Z7122.11	PLUG: male; 12-prong.	1				(*)	(*)	(*)

*Indicates stock available.

j. Tuning Units TU-47 through TU-62—Continued.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R_{29} R_{30} R_{31} R_{32}	3Z4540	RESISTOR: 30,000-ohm ±10%; ½-w; IRC BT½, RC21BE303J.					(*)	(*)	(*)
	2Z8672.25	SOCKET: (crystal holder).					(*)	(*)	(*)
SW_{15}	3Z9858-3	SWITCH: toggle; DPDT; bakelite; H & H 81012.					(*)	(*)	(*)

k. Doublet Antenna Kit.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z502	BAG BG-102-A.	2	0		(*)	(*)	(*)	(*)
	2Z2010.17	CABLE CONNECTOR: coaxial; (antenna end).	1	0		(*)	(*)	(*)	(*)
	2Z3010.18	CABLE CONNECTOR: coaxial; (transmitter end).	1	0					
L_7	3C280-387D	COIL C-387-D: r-f; p-a plate; 2.0-3.5-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C280-388C	COIL C-388-C: r-f; p-a plate; 3.5-4.5-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C280-389C	COIL C-389-C: r-f; p-a plate; 4.5-5.7-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C300-390C	COIL C-390-C: r-f; p-a plate; 5.7-8.0-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C300-447B	COIL C-447-B: r-f; p-a plate; 8.0-11.0-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C300-448B	COIL C-448-B: r-f; p-a plate; 11.0-14.0-mc.	1	1		(*)	(*)	(*)	(*)
L_7	3C300-449B	COIL C-449-B: r-f; p-a plate; 14.0-18.0-mc.	1	1		(*)	(*)	(*)	(*)
	2A1322A	GUY GY-22-A.	3	0		(*)	(*)	(*)	(*)
	2A1324A	GUY GY-24-A: halyard.	3	0		(*)	(*)	(*)	(*)
	3A1341	GUY GY-41: 30-ft.	12	0	(*)	(*)	(*)	(*)	(*)
	3G586A	INSULATOR IN-86-A.	12	0	(*)	(*)	(*)		(*)
	2A2344-A	MAST SECTION MS-44-A.	21	0		(*)	(*)	(*)	(*)
	1F425-34	RADIO FREQUENCY CABLE RG-34/U: coaxial; 70-ohm. (Specify length when ordering.)	1	0		(*)	(*)	(*)	(*)
	2A3129	REEL RL-29.	2	0		(*)	(*)	(*)	(*)
	2A3194-176	ROLL BG-176.	3	0			(*)	(*)	(*)
	2A3302	STAKE GP-2.	18	0		(*)	(*)	(*)	(*)
	1A28	WIRE W-28: 250-ft.	1	0	(*)	(*)			

l. Frequency Conversion Kit MC-509.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2A275-168	ANTENNA AN-168: long wire.	1	0			(*)	(*)	(*)
	2Z502	BAG BG-102-A: (antenna accessories).	1	0			(*)	(*)	(*)
C_{28}	3D423	CAPACITOR CA-423: fixed; vacuum; 55-mmf + 0 − 4 mmf; 20,000-v rms test.	2	0			(*)	(*)	(*)
C_{28}	3D9100-133	CAPACITOR: fixed; vacuum; 100-mmf ± 5 mmf; 20,000-v rms test.	2	0			(*)	(*)	(*)
L_7	3C280-454	COIL UNIT C-454: 1.5-2.0-mc.	2	0			(*)	(*)	(*)
L_7	3C280-455	COIL UNIT C-455: 1.0-1.5-mc.	2	0			(*)	(*)	(*)
	2A1322A	GUY GY-22-A.	4	0			(*)	(*)	(*)
	2A1324A	GUY GY-24-A: halyard.	1	0			(*)	(*)	(*)
	2A2344A	MAST SECTION MS-44-A.	7	0			(*)	(*)	(*)
	2A3194-176	ROLL BG-176: (for Mast Section MS-44).	1	0			(*)	(*)	(*)
	2A3302	STAKE GP-2.	6	0			(*)	(*)	(*)
	2C8061	TUNING UNIT TU-61. (See par. 35j for maintenance parts.)	3	0			(*)	(*)	(*)
	2C8062	TUNING UNIT TU-62. (See par. 35j for maintenance parts.)	3	0			(*)	(*)	(*)
	1B128	WIRE W-128: 17″ length.	1	0			(*)	(*)	(*)

* Indicates stock available.

m. Frequency Conversion Kits MC-516 and MC-517.

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2C527-939-A	ANTENNA TUNING UNIT BC-939-A. (See par. 35c for maintenance parts.)	1	0			(*)	(*)	(*)
	1F4H1-5.29	CABLE: coaxial; rigid; shielded.	1	0			(*)	(*)	(*)
	3D9012-11	CAPACITOR: 12-mmf −1%+½%; 20,000 v dc (working).	1	1			(*)	(*)	(*)
	3C280-447A	COIL UNIT C-447-A: 8-11-mc.	2	0			(*)	(*)	(*)
	3C280-448A	COIL UNIT C-448-A: 11-14-mc.	2	0			(*)	(*)	(*)
	3C2510-6	COIL UNIT C-449: 14-18-mc.	2	0			(*)	(*)	(*)
	2A715F	COUNTERPOISE CP-15-F.	1	0			(*)	(*)	(*)
	2C8053	TUNING UNIT TU-53: 8-12-mc.	3	0			(*)	(*)	(*)
	2C8054	TUNING UNIT TU-54: 12-18-mc. **Note:** (See par. 35j for tuning unit maintenance parts.)	3	0			(*)	(*)	(*)

*Indicates stock available.

[A. G. 300.7 (23 Aug 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
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For explanation of symbols, see FM 21-6.

U. S. GOVERNMENT PRINTING OFFICE: 1944

TECHNICAL MANUAL
No. 11-280

WAR DEPARTMENT
Washington, 25, D. C., 22, June 1943

RADIO SET SCR-299-A, RADIO SET SCR-299-B, RADIO SET SCR-299-C, and RADIO SET SCR-299-D

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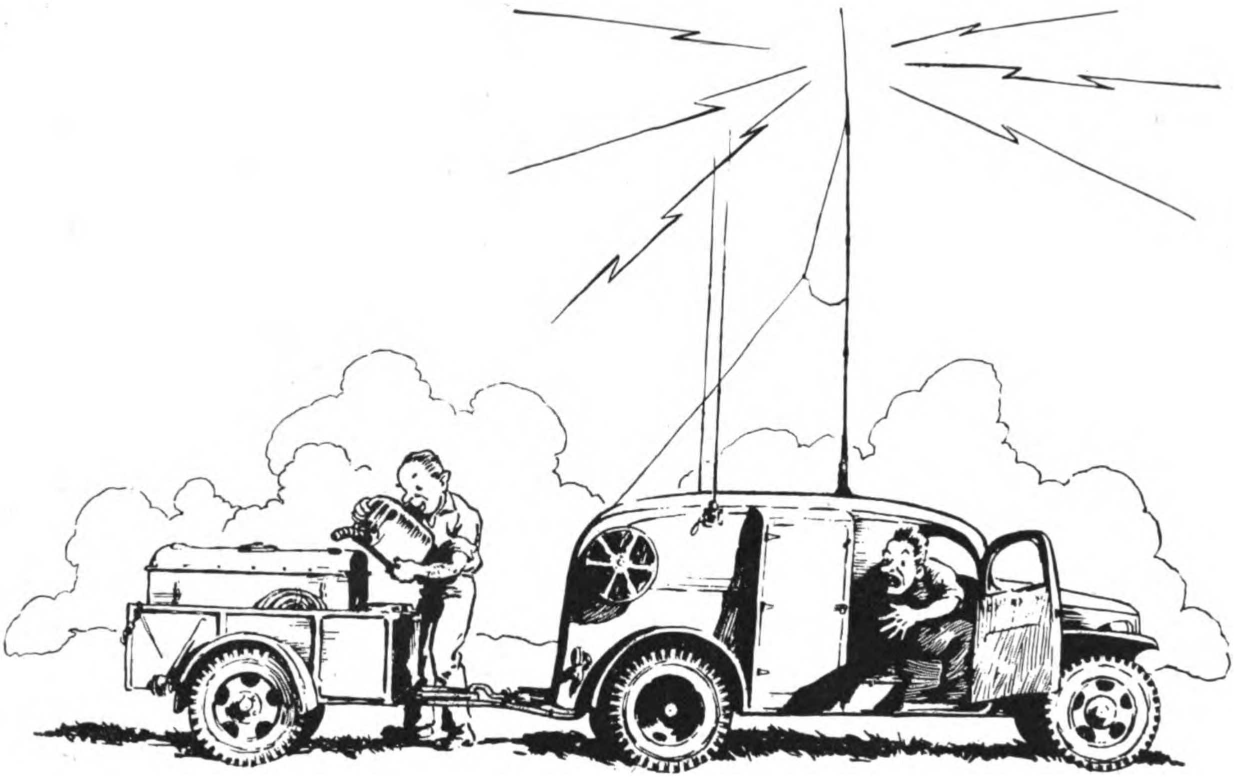


1

2

NEED WE SAY MORE ?

DESTRUCTION NOTICE

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

WHEN — When ordered by your commander, or when you are in immediate danger of capture.

HOW — 1. Smash — Use sledges, axes, hand-axes, pick-axes, hammers, crowbars, heavy tools, etc.

2. Cut — Use axes, hand-axes, machete, 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.
6. USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT — 1. Smash all tubes, ceramic coil forms, variable capacitors, switches on control panels, meters, dials, castings, microphones and keys.

2. Cut wires, cables, phone cords, microphone cords, test leads, etc.
3. Bend or break shelves, metal supports and mountings, conduit, panels, cable connectors, sockets, plugs, and jacks.
4. Burn technical manuals and instruction books, messages, codes, papers, orders, documents, and books.

SAFETY NOTICE

This equipment employs extremely HIGH VOLTAGES which are DANGEROUS TO LIFE if contacted. Electrical interlock switches have been provided for your protection. They remove the high d-c voltage to the output circuits in the transmitter when the hinged doors of the cover or the back screen are opened. Be sure that back, cover and cover doors are closed BEFORE APPLYING PLATE POWER.

When the transmitter is in operation EXTREMELY HIGH RADIO FREQUENCY VOLTAGES are present in and around the antenna tuning unit, all its connecting leads, the antenna and the antenna insulator. DANGEROUS BURNS can result from arcs caused by touching the ANTENNA CIRCUIT. DON'T BE CARELESS. Do not attempt to make any adjustments unless thoroughly familiar with this equipment. Exercise extreme caution.

DO NOT FILL GASOLINE TANKS OF TRUCK OR POWER UNIT WHILE TRANSMITTER IS TURNED ON. Difference in r-f potential between truck or trailer and ground may cause a spark resulting in explosion of gasoline, fatal to personnel operating the equipment.

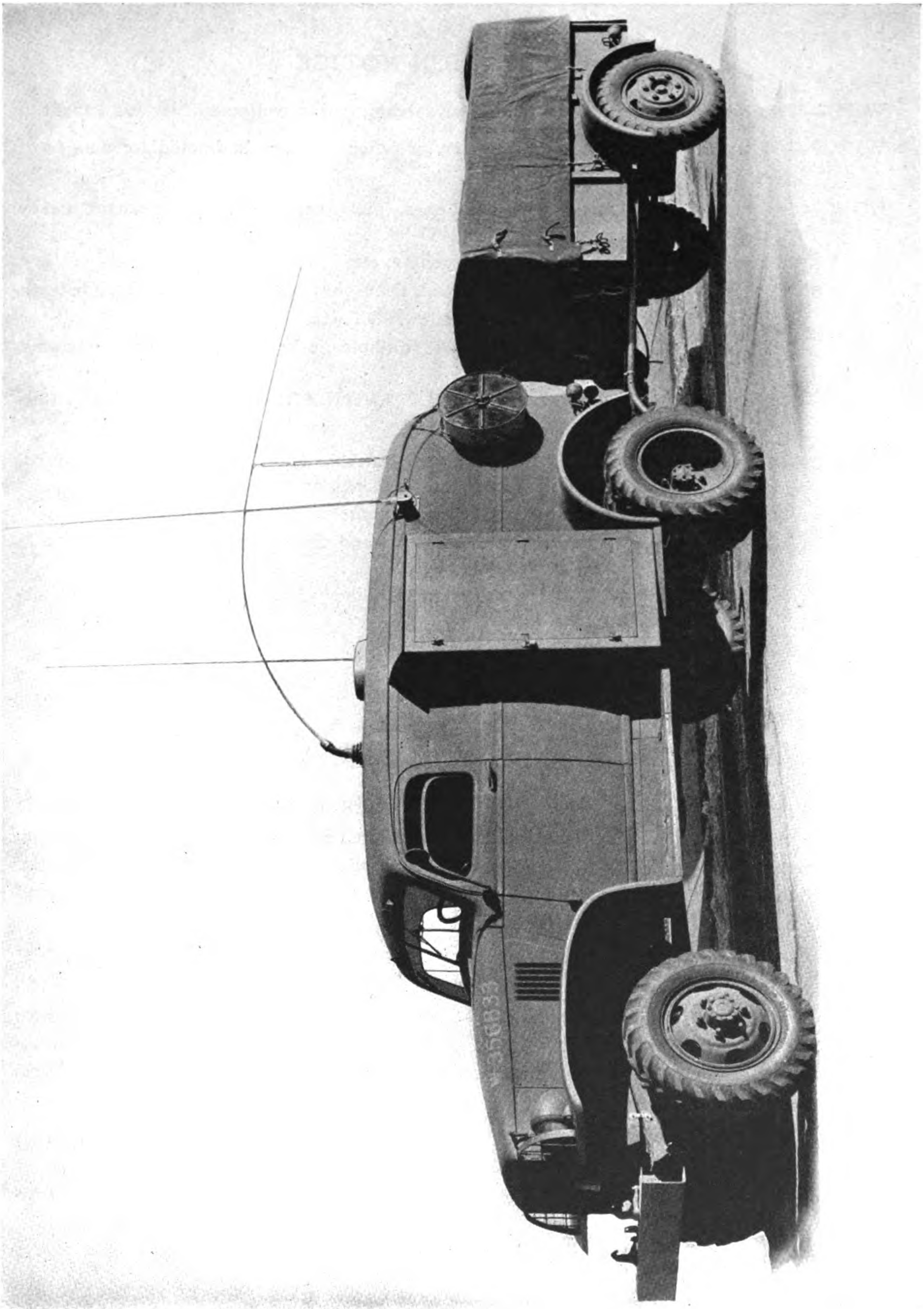


FIGURE 1. RADIO SET SCR-299-(*), EXTERIOR.

SECTION I — DESCRIPTION

Note: This manual describes Radio Sets SCR-299-A. SCR-299-B, SCR-299-C and SCR-299-D. For the sake of simplicity, Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D will be referred to as SCR-299-(*) in this manual where remarks are applicable to all these sets. Similarly, basic components such as Speech Amplifiers BC-614-A, BC-614-B, BC-614-C, BC-614-D, and Radio Transmitters BC-610-A, BC-610-B, BC-610-C and BC-610-D are referred to as BC-614-(*) and BC-610-(*). Where there are specific differences, as in operation, wiring or layout, each unit is described separately.

Radio Sets SCR-299-A and SCR-299-B differ from each other only in the type and quantity of accessories (see paragraph 4).

Radio Set SCR-299-C differs from SCR-299-B in accessories and cording arrangements between Truck K-51-(*) and Trailer K-52-(*) (paragraph 4). The wiring of Radio Transmitter BC-610-C differs slightly from that of BC-610-A and BC-610-B (see figures 50 and 51).

Radio Set SCR-299-D differs from SCR-299-C as follows:

(1) Radio Transmitter BC-610-D
- **(*a*)** Keying circuit changes (see figures 51 and 52)
- **(*b*)** Relocation of fuses (see figures 6 and 7)

(2) In Speech Amplifier BC-614-D Relay RY_{101} has been redesigned to key the transmitter as well as operate the automatic disabling circuits to provide rapid "break in" on c-w transmission.

(3) Table MC-269-A
- **(*a*)** Relocation of main components (see figures 12 and 13)
- **(*b*)** Switch SW-199-A replaces the remote starting function performed by Control Box BC-731-C.
- **(*c*)** Fuses located in Control Box BC-731-C are installed in Junction Box JB-69-A (see figures 17 and 20)
- **(*d*)** Radio Receivers BC-312-(*) and BC-342-(*) are mounted in Mounting FT-389-A.

Other technical manuals or instructions which are necessary for a complete understanding of Radio Set SCR-299-(*) are as follows:

TM 11-333 for Telephones EE-8-A and EE-8.
TM 11-850 for Radio Receivers BC-312-(*) and BC-342-(*).
TM 11-300 for Frequency Meter SCR-211-(*).
TM 11-904 for Power Unit PE-95-(*).

CAUTION: Power Units PE-95-A, PE-95-B and PE-95-C are Ford powered.

Power Units PE-95-E, PE-95-F and PE-95-G are Willys powered. Be sure you have the proper technical manual for your power unit.

1. General Characteristics.

a. Capabilities. — Radio Set SCR-299-(*) is a high power, vehicular radio station capable of providing voice (amplitude modulation) or c-w communication over a range of approximately 100 miles depending upon conditions of atmosphere and terrain, either from a stationary position or while moving at high speeds over rough roads. This radio set consists of a completely equipped radio station installed in a 1½-ton Truck K-51-(*), combined with a power plant carried in a 1-ton cargo Trailer K-52-(*). It is designed primarily to provide reliable headquarters communication for corps, division and other higher echelons.

b. Over-all Description. — Radio Set SCR-299-(*) will accommodate a team of four. Two seats, one for the driver, are located in the forward part of Truck K-51-(*). Behind them is the radio equipment where two operators may sit at the operating positions provided at Table MC-269-(*). From here it is possible, by remote control, to start or stop Power Unit PE-95-(*) located in Trailer K-52-(*). All receiving and transmitting controls, as well as tuning units, coils and crystals, are within reach of the operating positions. Moderate temperatures can be maintained within the truck through use of the electric heater in cold weather and the roof ventilator and heater fan in warm weather. Both are fan driven units providing air circulation regardless of whether the truck is stationary or in motion. Sleeping space for one person is provided by Chest CH-89 (seat bench) which has 4-inch cushions mounted on each lid covering its spare parts compartments. By removing the wooden frame and the tarpaulin from the trailer additional shelter may be made.

c. Adaptability. — Following is a list of features and equipment included in Radio Set SCR-299-(*) to insure continuity of operation under varied circumstances as required by field or combat conditions.

(1) Microphones T-30-(*) (throat) permit voice modulation when gas masks are used.

(2) One fire extinguisher is within reach of the operators and a second truck extinguisher is

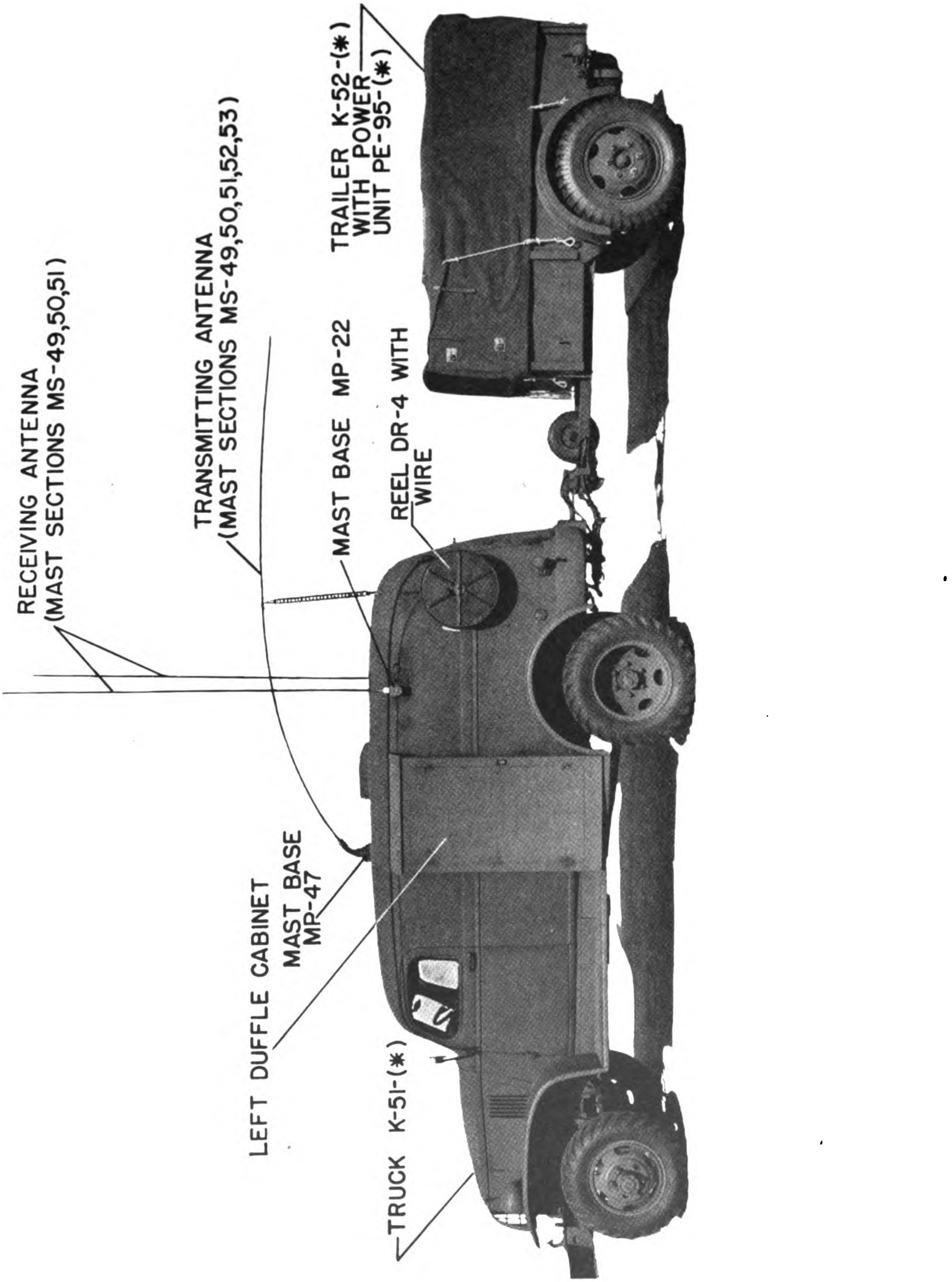


FIGURE 2. RADIO SET SCR-299-(*), EXTERNAL COMPONENTS.

located where it can be reached easily by the driver. (SCR-299-A and SCR-299-B are provided with two operator's extinguishers.)

(3) Radio Transmitter BC-610-(*) may be controled, keyed, and voice modulated from either of the two operating positions within Truck K-51-(*) at all times. Radio Set SCR-299-D is provided with break-in c-w operation facilities.

(4) Remote operation is made possible by removing one Telephone EE-8-(*) as far as one mile from the truck. From this point the remote operator can modulate or key the transmitter, listen in on either Radio Receiver BC-312-(*) or BC-342-(*), and maintain contact with the truck personnel through the field telephone remaining in the truck.

(5) Two Telephones EE-8-(*), together with one or both Reels DR-4 (with Wire W-110-B), can be removed from the truck and set up as a field telephone system.

(6) Power Unit PE-95-(*) may be:

(*a*) Operated 100 feet away from the truck through the use of the extension cables provided.

(*b*) Operated 200 feet away from the truck through the use of two extension cables, provided the operator walks to the trailer to start or stop the power unit.

(*c*) Used as a source of power for lighting, and other purposes, at a distance up to 200 feet from the trailer.

(7) If Power Unit PE-95-(*) is disabled or destroyed it is possible to:

(*a*) Operate Radio Receiver BC-312-(*) from the spare storage battery.

(*b*) Operate the entire radio station from a commercial power source. Use is made of extension cables provided for this purpose.

(8) When necessary, the complete radio station can be quickly removed from the truck and set up elsewhere. Chest CH-88 (wall), Chest CH-89 (seat bench), Table MC-269-(*) (operating), and Radio Transmitter BC-610-(*) can be removed easily without tools because wing nuts, wing head bolts, clasps, and turnbuckles have been used extensively to simplify this operation. The table itself is a complete radio unit containing all the basic electrical wiring and all major operating components except the transmitter. All this equipment can be set up in the field in any shelter, or, if necessary, can be installed in any other vehicle of ample size and put in mobile operation again by being connected to Power Unit PE-95-(*).

(9) When the truck is in motion a radio operator can strap himself in by means of Strap ST-19-A hooked up to one or both eyebolts located in the ribs of the roof near the rear doors. Then, with either or both rear doors open he can observe, sight, or fire. At the same time he can listen to either receiver, or can voice-modulate the transmitter.

d. ***Frequency Coverage.*** — The transmitting components of Radio Set SCR-299-(*) provide radio communication either by voice (amplitude modulation) or by c-w telegraphy in the frequency range from 2 to 8 megacycles. The receiving components provide reception over a range of 1.5 to 18 megacycles.

e. ***Range of Operation.*** — Reliable two-way phone communication may be expected with any other Radio Set SCR-299-(*) operating within 100 miles while either or both vehicles are in motion. Using c-w telegraphy should increase this range to 250 miles or more. Such results, however, depend largely on the frequency selected and the time of day or night it is used. Experience has shown that distances up to 200 miles may be covered during daylight hours by using frequencies around 4000 kilocycles. For nighttime use, frequencies closer to 2000 kilocycles have worked well for this range. For extreme distance, the higher frequencies from 6000 to 8000 kilocycles will prove effective, particularly at night. But be careful when using these higher frequencies. Skip-distance may make a shorter 100- or 200-mile contact impossible.

The distance which can be worked depends somewhat upon the vehicle's location. Dips, valleys, underpasses and overhead steel bridges are very poor radio locations, as they prevent good reception and absorb transmitted radio energy. Avoid them wherever possible. High tension lines create radio interference. Give them a wide berth when sending or receiving. ***Be sure that your antennas are close-hauled when driving under them. Contact with high tension wires may set your vehicle on fire and cause the instant death of operating personnel.***

f. ***Source Of Power.*** — Radio Set SCR-299-(*) is equipped with its own power source. Power Unit PE-95-(*), in its Trailer K-52-(*), forms a complete self contained mobile generating unit. It supplies 12 volts of direct current from its battery for Radio Receiver BC-312-(*) and delivers from its

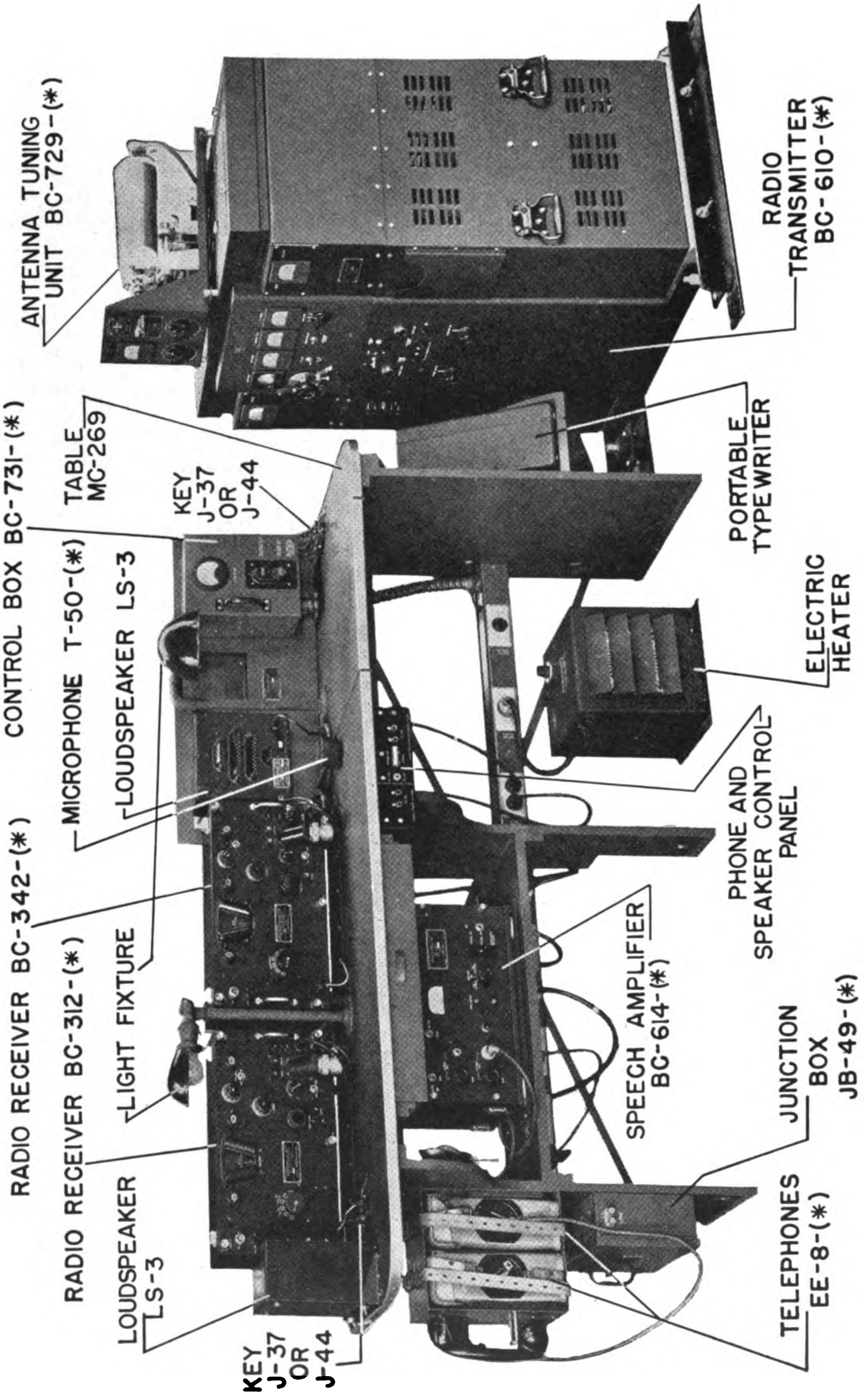


FIGURE 3. RADIO SETS SCR-299-A, SCR-299-B AND SCR-299-C, OPERATING COMPONENTS.

RADIO SETS SCR-299-A, SCR-299-B, SCR-299-C, and SCR-299-D

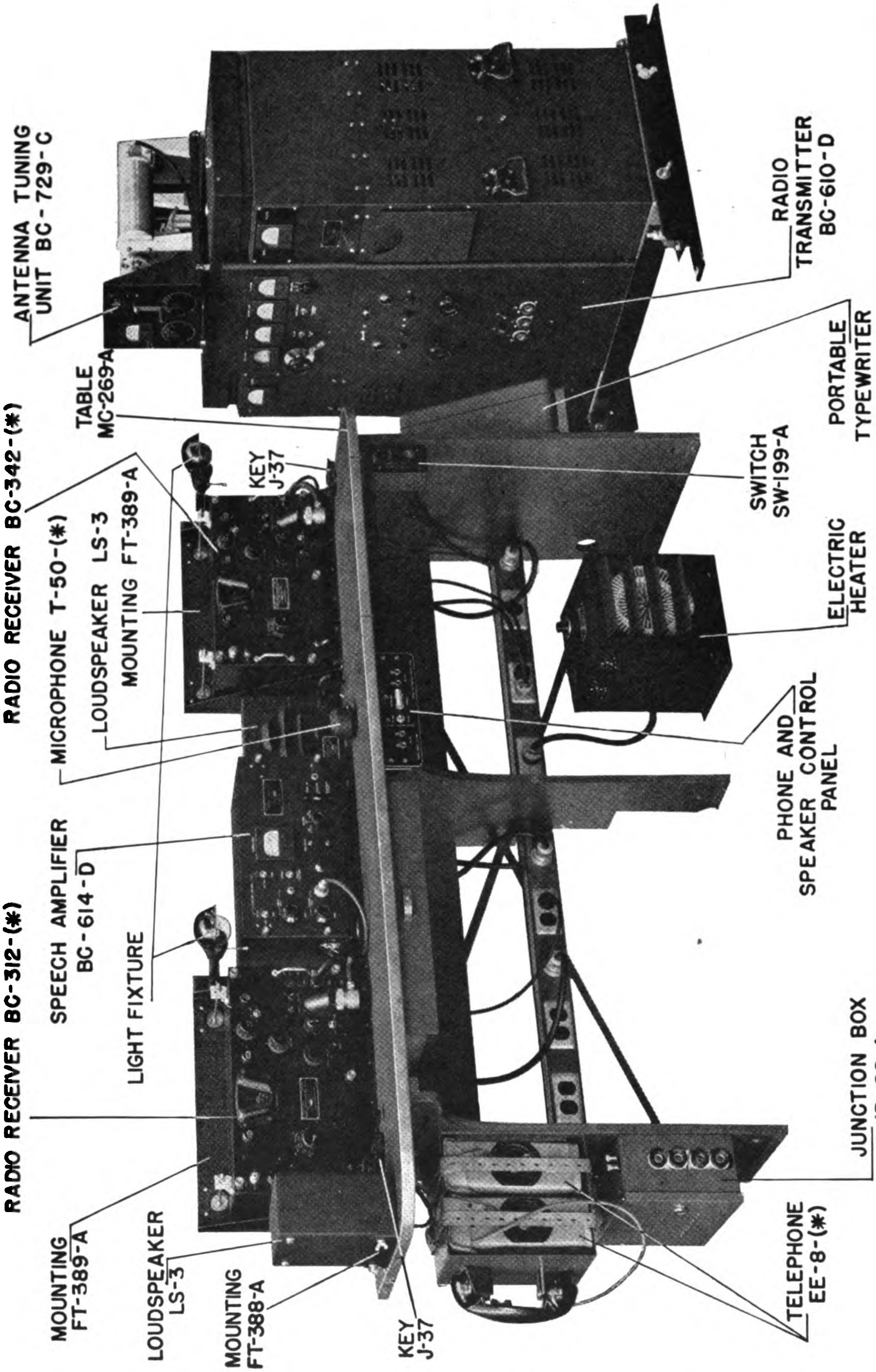


FIGURE 4. Radio Set SCR-299-D, operating components.

generator approximately 5 kilowatts of single-phase, 60-cycle alternating current at 115 volts to meet the chief power requirements in the radio station. In the absence of Power Unit PE-95-(*) any commercial or other source of power having the same alternating current and voltage characteristics may be used to operate the radio station, as a d-c source is obtainable at the spare 12-volt battery in Truck K-51-(*).

2. Main Components.

The main components of Radio Set SCR-299-(*) are divided between two vehicular units. The first consists of the Truck K-51-(*) and other components installed on or within it, comprising the radio station. The second is the power plant and consists of Trailer K-52-(*) carrying the remaining components, chief of which is Power Unit PE-95-(*), always connected to the truck to supply power to the radio station. The main components which form the radio station in the truck, also consist of two groups. The first and more important of these (referred to as the operating components) is made up of the transmitting and receiving components which are at all times interconnected to function as a complete electrical system that ties in directly with the power unit. The second group, (referred to as the accessory components) consists of spare parts, tools, chests and a few components occasionally used with the operating group. Thus, the major components of Radio Set SCR-299-(*), listed by vehicular units and by functional groups are as follows:

a. ***The Radio Station.*** — Truck K-51-(*), 1½-ton, 4x4, panel body, in which are installed the following:

(1) ***Operating Components.*** —

(*a*) Antenna Tuning Unit BC-729-(*)
(*b*) Radio Transmitter BC-610-(*)
(*c*) Mast Base MP-47 (used for transmitting)
(*d*) Mast Sections MS-49, 50, 51, 52, 53, 54.
(*e*) Mast Bases MP-22 (used for receiving)
(*f*) Two Headsets HS-30-(*) with Cord CD-605. If not available, replace with Headsets P-23 or P-20.
(*g*) Table MC-269-(*) (operating) on which are mounted and interconnected:
(*1*) Speech Amplifier BC-614-(*)
(*2*) Microphone T-50-(*)
(*3*) Two Keys J-37 or J-44
(*4*) Radio Receiver BC-312-(*)
(*5*) Radio Receiver BC-342-(*)
(*6*) Two Loudspeakers LS-3
(*7*) Control Box BC-731-(*) or Switch SW-199-A
(*8*) Junction Box JB-49-(*) or Junction Box JB-69-A
(*h*) Associated cords and cables
(*i*) The tuning units and coil units contained in Chest CH-88
(*j*) Crystals in Box BX-34-(*) (Not included in SCR-299-A)

(2) ***Accessory Components.*** —

(*a*) Frequency Meter Set SCR-211-(*)
(*b*) Equipment for remote control of Radio Set SCR-299-(*) consisting of:
(*1*) Two Telephones EE-8-(*)
(*2*) Junction Box JB-60
(*3*) Key J-45
(*4*) Two Reels DR-4
(*5*) Approximately 1 mile of Wire W-110-B
(*6*) Axle RL-27-(*)
(*c*) Extension cords (and extension cable terminal box for SCR-299-A and SCR-299-B)
(*d*) Auxiliary transmitting antenna (SCR-299-C and SCR-299-D only)
(*e*) Chest CH-89 (seat bench)
(*f*) Chest CH-88 (wall)
(*g*) Spare 12-volt battery
(*h*) Cordage for battery
(*i*) Microphone T-17-(*) (SCR-299-C and SCR-299-D only)
(*j*) Microphone T-30-(*) (throat), stowed in Chest CH-88
Note: Two furnished with SCR-299-A and SCR-299-B.
(*k*) Portable typewriter, with telegraphic keyboard
Note: Two furnished with SCR-299-A and SCR-299-B.
(*l*) Two Straps ST-19-A, stowed in Chest CH-89.
(*m*) Auxiliary transmitting antenna for fixed location (SCR-299-C and SCR-299-D only)
(*n*) Spare parts contained in Chests CH-88 and CH-89
(*o*) Tools and repair equipment contained in Chest CH-89
(*p*) Tool Equipment TE-48
(*q*) Electric heater (117 volts A-C) mounted on floor.

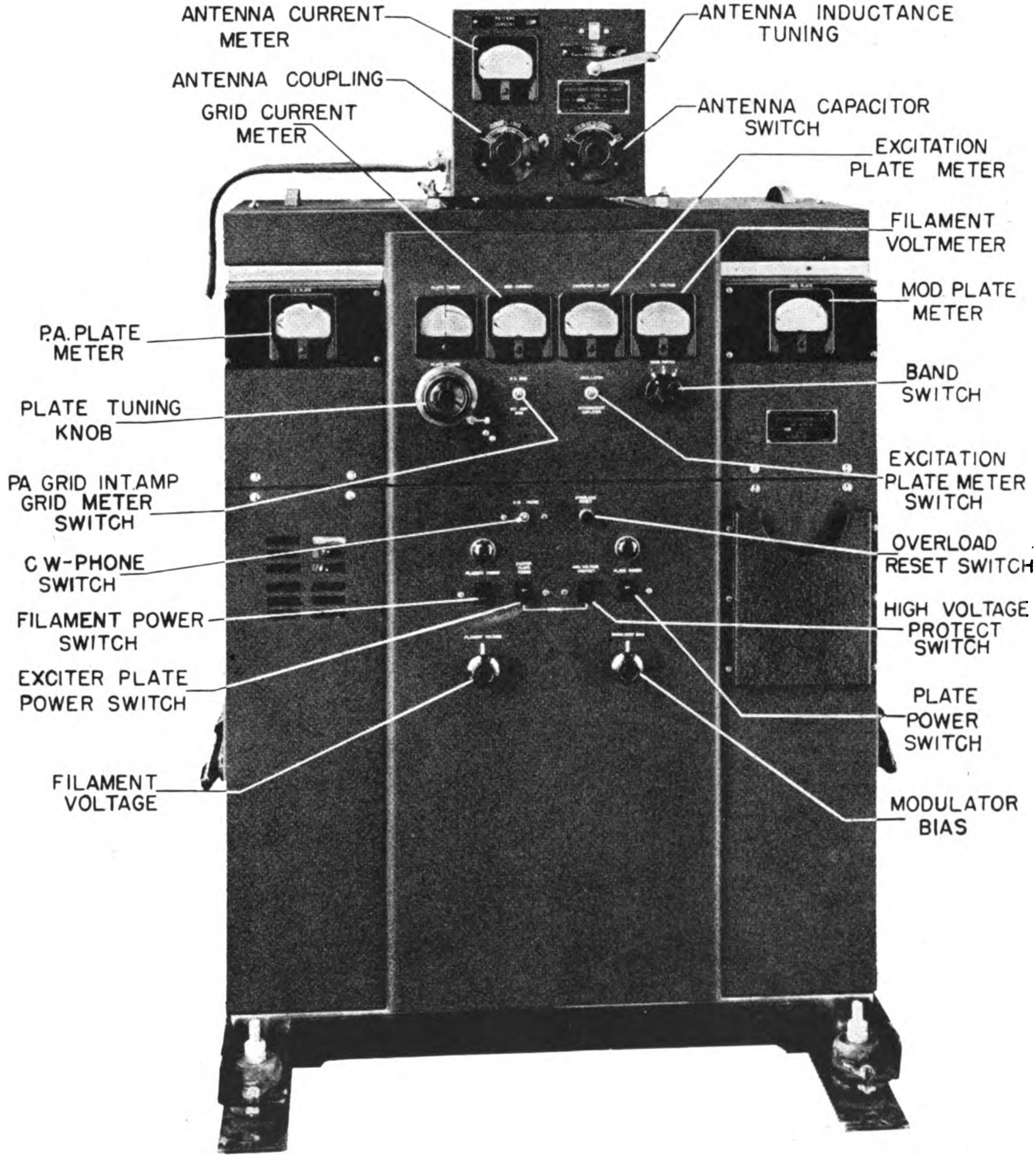


FIGURE 5. RADIO TRANSMITTERS BC-610-A, BC-610-B, BC-610-C WITH ANTENNA TUNING UNIT BC-729-(*), FRONT VIEW.

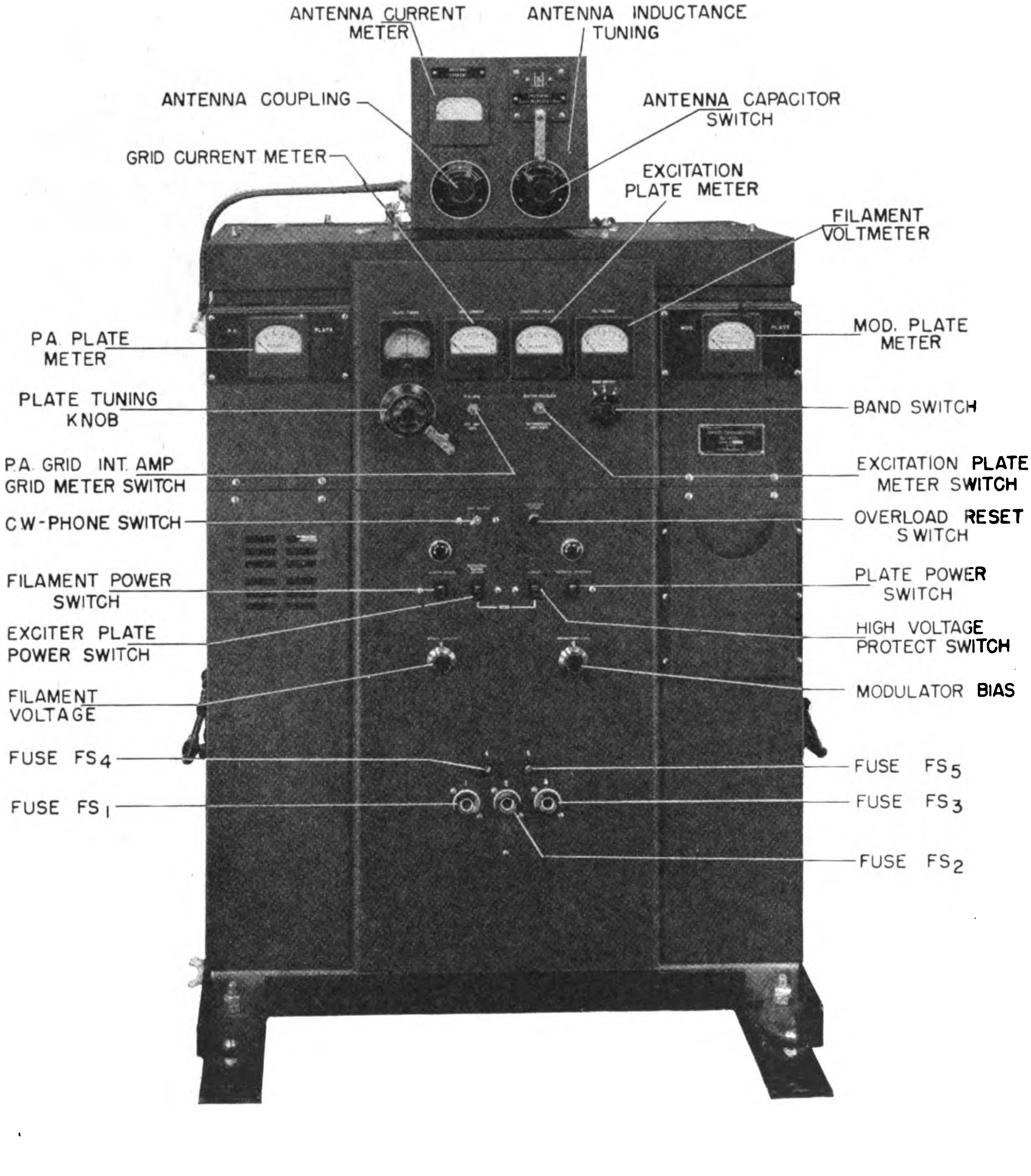


FIGURE 6. RADIO TRANSMITTER BC-610-D WITH ANTENNA TUNING UNIT BC-729-C, FRONT VIEW.

(*r*) Roof ventilator, (6 volts D-C) mounted on roof.

(*s*) Fire Extinguisher, Randolph Laboratories, Model FF-4, capacity 4 pounds CO_2, total weight 23½ pounds charged.

Note: SCR-299-A and SCR-299-B are equipped with two fire extinguishers, Alfite, Type 4S, capacity 4 pounds CO_2, total weight 23½ pounds charged.

(*t*) Tools and spare parts for Truck K-51-(*)

b. ***The Power Plant.*** — Trailer K-52-(*), 1-ton, 2-wheel, in which are installed:

(1) Power Unit PE-95-(*) and the cording normally terminating at the power plug or junction box of Truck K-51-(*)

(2) Cord, a-c power, emergency, 100 feet. (200 feet in SCR-299-A and SCR-299-B)

(3) Six galvanized steel, 5 gallon gasoline drums (QM Stock No. 42-D-1280).

(4) Spare wheel and tire for either truck or trailer.

3. Brief Description Of Principal Units And Major Components.

a. ***The Radio Station.*** — Truck K-51-(*), has various special features which adapt it for most effective use as a vehicular radio station. Electrical bonds (connections) and filters are installed at necessary points in the ignition system and body to minimize ignition interference. A transmitting antenna Mast Base MP-47 and a fan-driven ventilator are installed on the roof. Two receiving antenna Mast Bases MP-22, two mountings for Reels DR-4, and two duffle cabinets are installed on the sides. Suitable bolts, mountings, etc. are fastened inside the truck to provide anchorage for the other components of the radio station.

(1) ***Operating Components.*** — Among these, the principal transmitting components are: Radio Transmitter BC-610-(*) with Antenna Tuning Unit BC-729-(*) and Speech Amplifier BC-614-(*). Each of these units is described in detail in Section III.

(*a*) Antenna Tuning Unit BC-729-(*) is mounted on top of and connected to Radio Transmitter BC-610-(*) to match its output to the 15-foot antenna.

***Caution*: When power is on, do not touch any leads to, or any part of this unit except its front panel controls.**

(*b*) Radio Transmitter BC-610-(*) is shock-mounted on the floor behind the driver's seat in the truck, with its front panel controls facing the rear. This transmitter includes a shock mounting base, plug-in tuning components and two sets of tuning charts.

(*1*) The cradle frame shock mounting base is fastened to the transmitter with wing bolts. The base is anchored to the floor with wrench nuts. The weight is 51 pounds.

(*2*) The plug-in tuning components consist of three sets of tuning units, six per set; two sets of coil units, four per set; and vacuum Capacitor CA-423. (See Table of Tuning Components, Section V.)

(*3*) The frequency range is 2 to 8 megacycles. It is covered by six tuning units and four coil units. Each tuning unit and associated coil unit, or coil unit with capacitor, covers a portion of the range. (See Table of Tuning Components, Section V.)

(*4*) Frequency control is by master oscillator or by crystal and the type of control desired is selected by the M.O.-XTAL switch on the tuning unit.

(*5*) Input power requirements are 1700 to 2000 watts, 115 volts, 50-60 cycles, A-C.

(*6*) The type of emission provided is continuous wave (c-w) telegraphy or amplitude modulated voice.

(*7*) The power output of the transmitter exceeds 400 watts c-w and 300 watts voice.

(*8*) The over-all weight less the shock-mount base is 401½ pounds.

(*c*) Speech Amplifier BC-614-A, BC-614-B, or BC-614-C is securely mounted on the shelf under the top of Table MC-269, whereas Speech Amplifier BC-614-D is fastened to the top of Table MC-269-A. In either case the speech amplifier is held to its shock-mounting base by four snap fasteners. This speech amplifier is a companion unit to, and should be regarded as a part of Radio Transmitter BC-610-(*). As its name implies, its chief function is to amplify the output of the microphone to a level suitable for input to the transmitter audio circuit when voice modulation is desired. The front panel controls of the speech amplifier also provide for:

FIGURE 7. RADIO TRANSMITTERS BC-610-A, BC-610-B, BC-610-C, REAR VIEW.

FIGURE 8. RADIO TRANSMITTER BC-610-D, REAR VIEW.

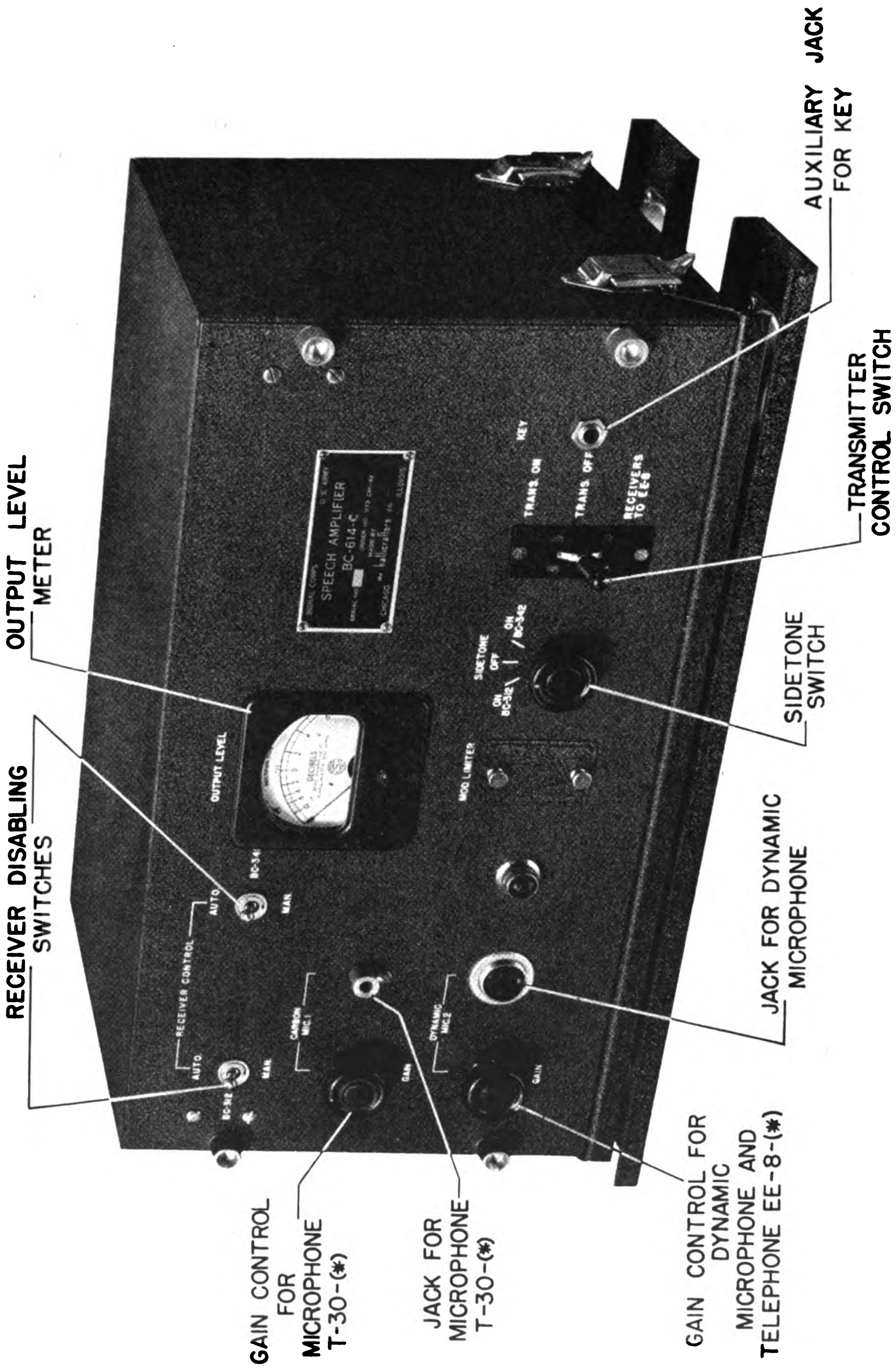


FIGURE 9. SPEECH AMPLIFIERS BC-614-A, BC-614-B, BC-614-C, FRONT VIEW.

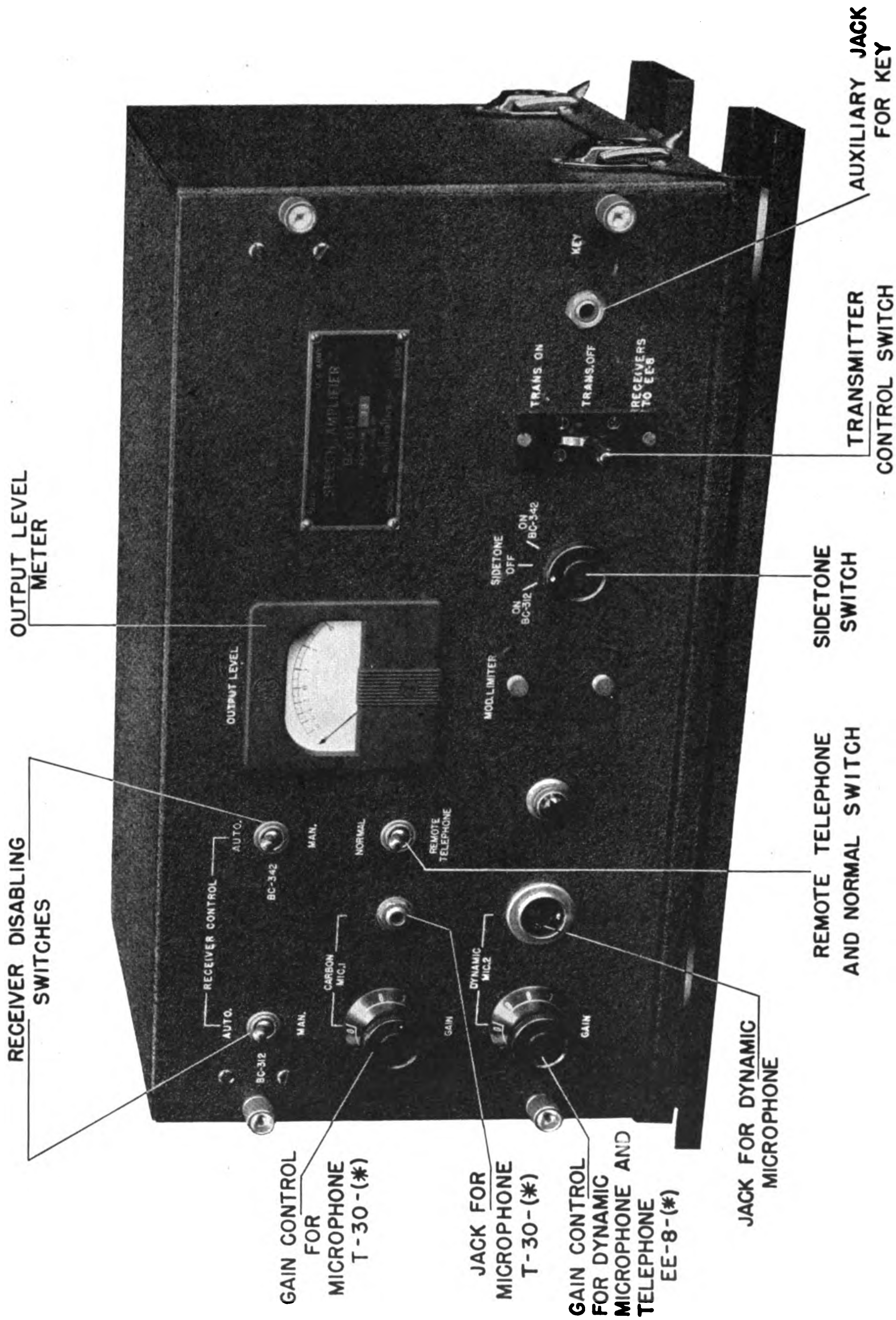


FIGURE 10. SPEECH AMPLIFIER BC-614-D, FRONT VIEW.

(*1*) Sidetone for receiver monitoring of c-w transmissions,

(*2*) Manual or automatic receiver disabling for protection of the receivers when receiving on or near the transmitted frequency or its harmonics,

(*3*) Control of the transmitter final amplifier plate voltage,

(*4*) Control of the receiver output to EE-8 line,

(*5*) Control of remote telephone operation (found on Speech Amplifier BC-614-D only),

(*6*) Audio gain adjustments for Microphones T-30-(*) and T-50-(*).

Speech Amplifier BC-614-(*) contains its own plate supply unit which operates on 115 volts, 50-60 cycle A-C, drawing approximately 40 watts. Its weight is 31 pounds, less the shockmount which weighs approximately 4 pounds.

(*d*) Microphone T-50-(*) normally used is available on Table MC-269-(*) where it should be slipped over a metal tongue mounting when not in use. It is a dynamic type with low level output and is equipped with a press-to-talk switch that operates the transmitter. A cable and connector links it to Speech Amplifier BC-614-(*).

(*e*) Mast Base MP-47 and five Mast Sections MS-49 to MS-53 inclusive form the transmitting antenna. The base is mounted through the roof of the truck. A lead connects it to the antenna tuning unit. Mast Section MS-53 is screwed into the base forming the lowest section and MS-49 is the top section. In its normal operating position this transmitting antenna is bent backwards to a horizontal position, being held down by an insulated guy to the rear of the truck roof. This provides clearance and keeps the antenna from whipping about unduly while in motion. The snap-catches on the guy may be released, causing the antenna to spring to a vertical position. This position is suitable

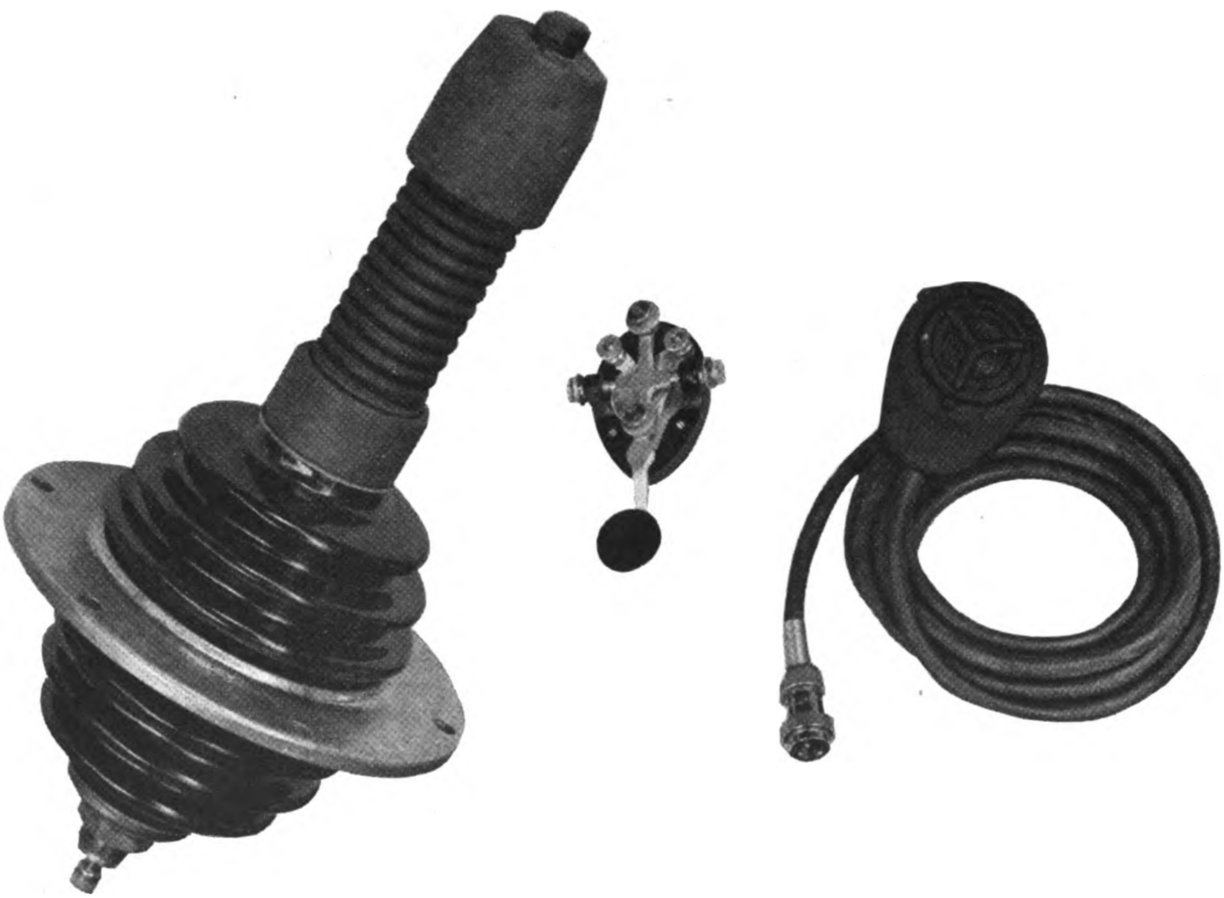


FIGURE 11. MAST BASE MP-47, KEY J-37 AND MICROPHONE T-50-(*).

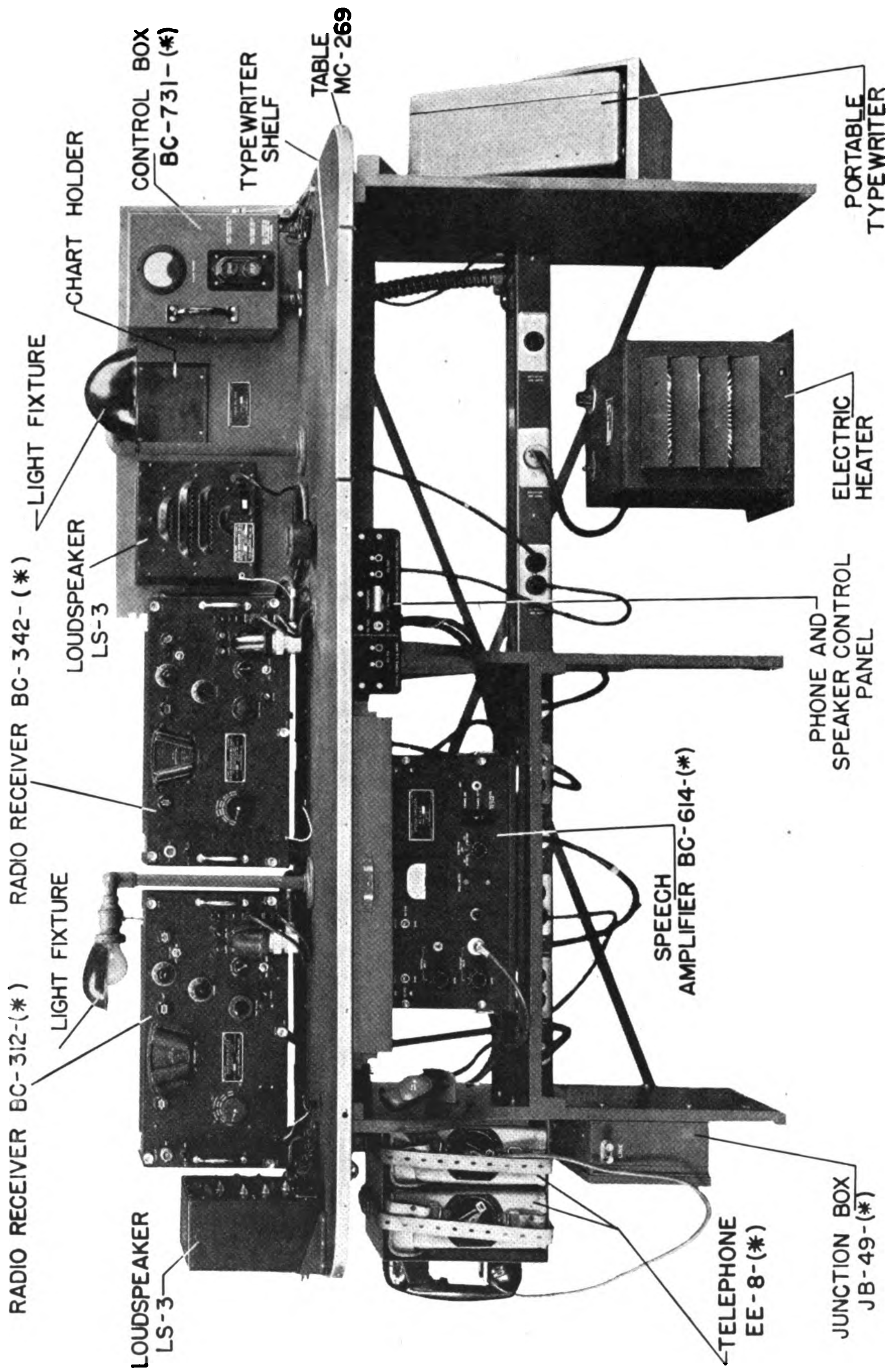


FIGURE 12. TABLE MC-269 WITH ASSOCIATED COMPONENTS.

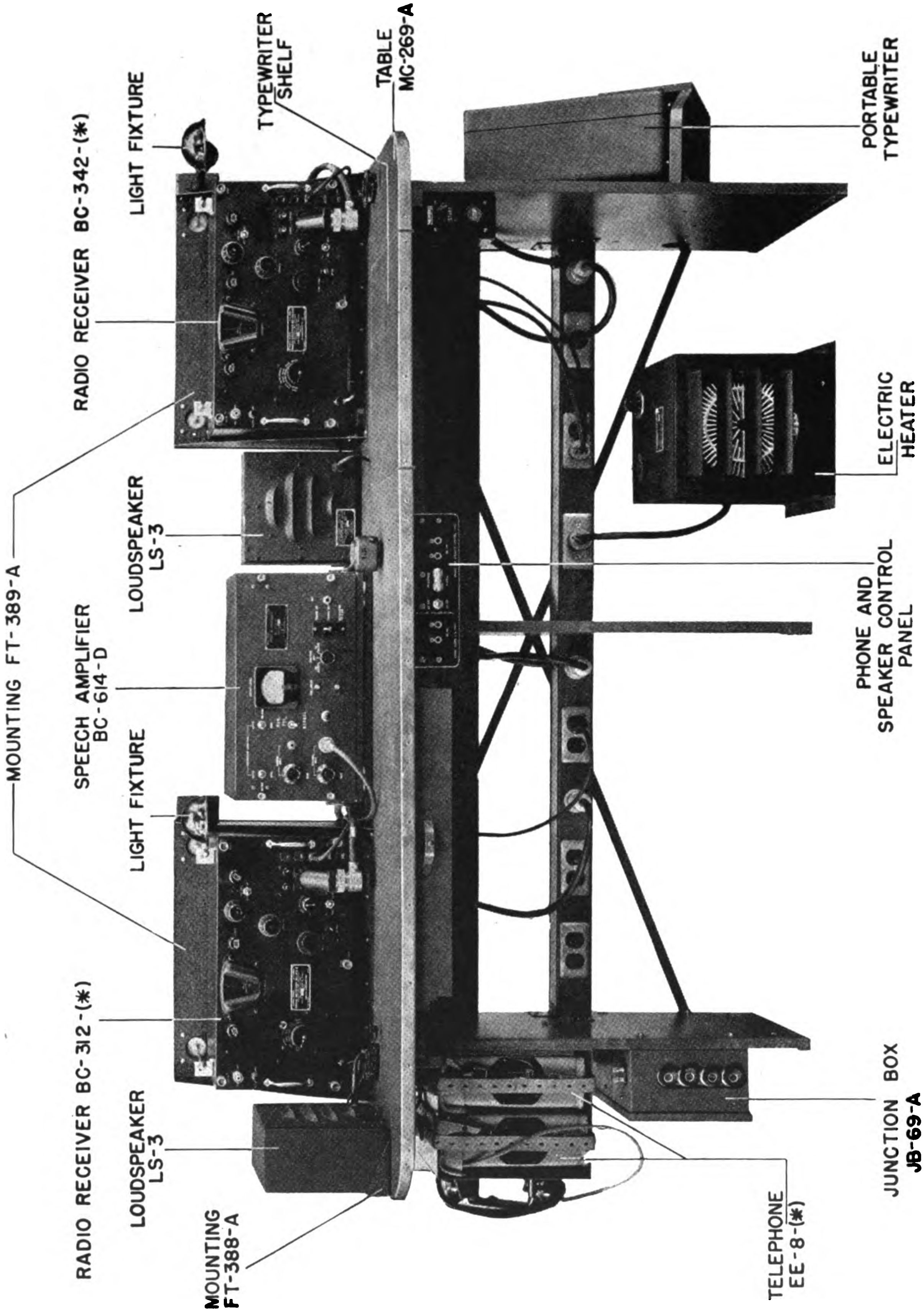


FIGURE 13. TABLE MC-269-A WITH ASSOCIATED COMPONENTS.

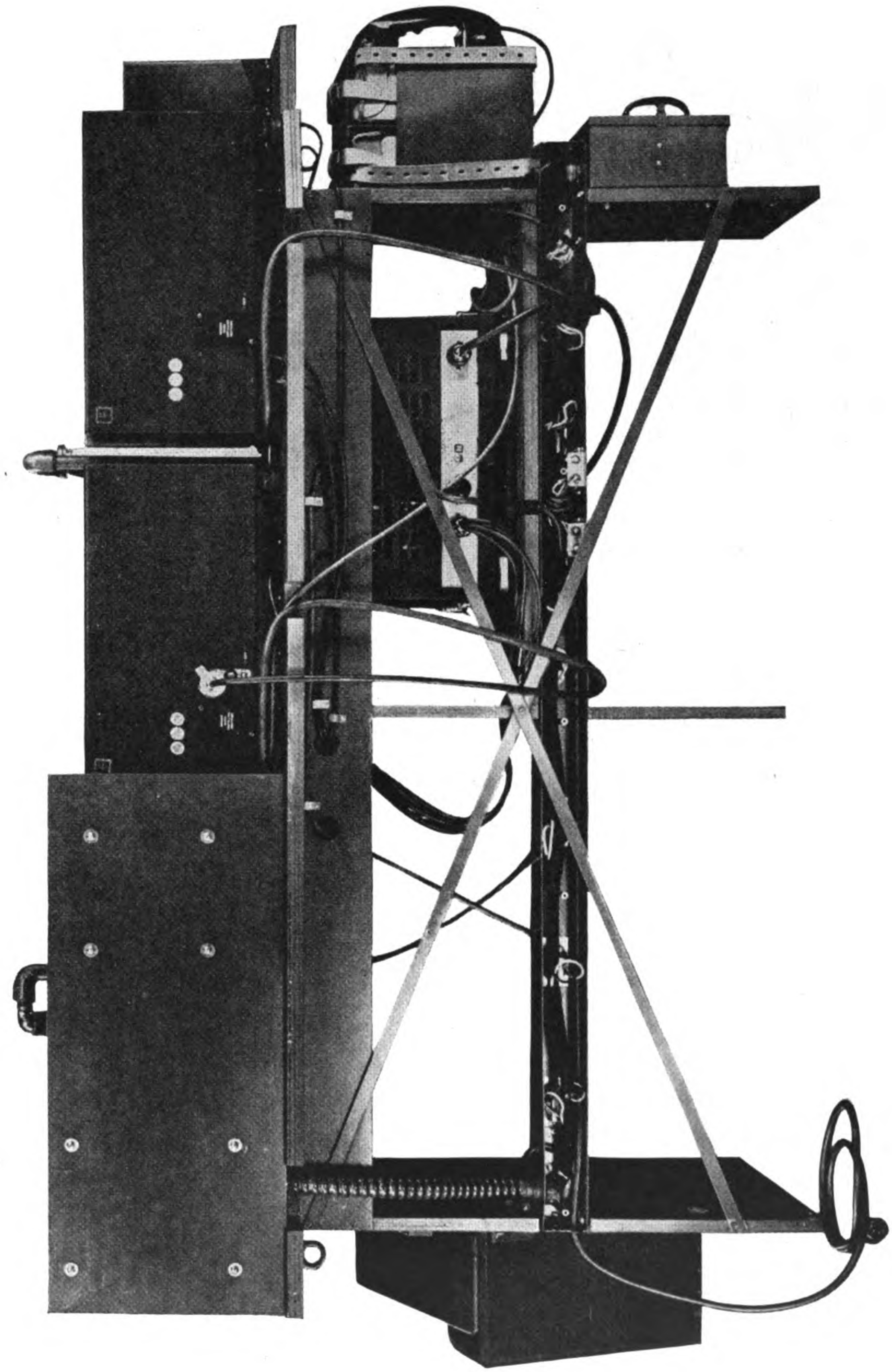


FIGURE 14. TABLE MC-269, REAR VIEW WITH COVER OF WIRING CHANNEL REMOVED.

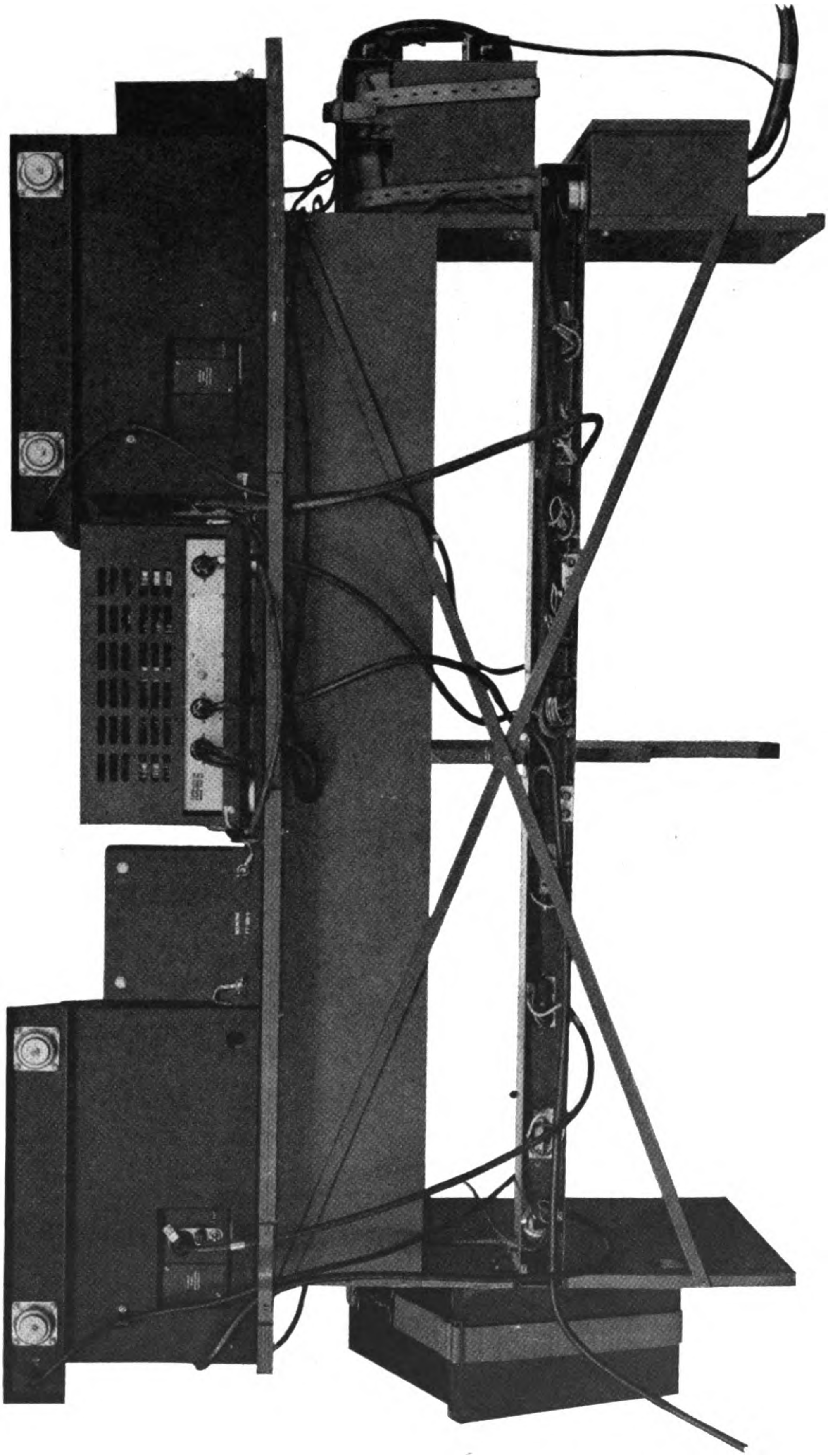


FIGURE 15. TABLE MC-269-A, REAR VIEW WITH COVER OF WIRING CHANNEL REMOVED.

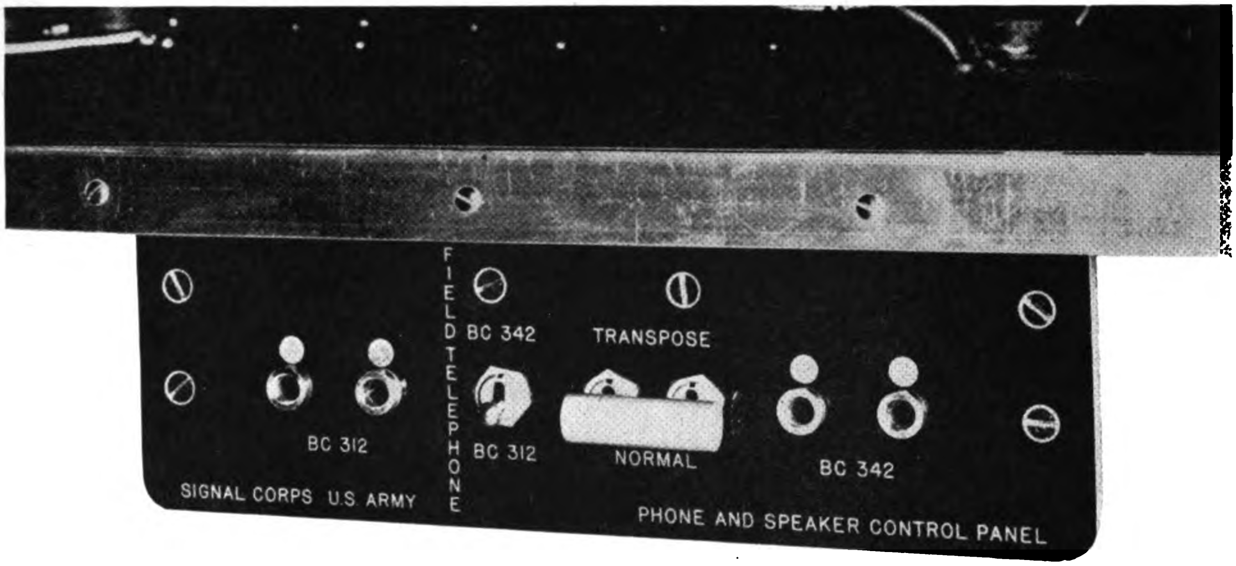


FIGURE 16. PHONE AND SPEAKER CONTROL PANEL.

FIGURE 17. CONTROL BOX BC-731-(*), INTERIOR.

for transmitting if the truck is stationary and greater radiation is required. Then, if necessary, one or two additional Mast Sections MS-54 may be added at the base. ***Caution*: Extremely high and dangerous voltages are present on the antenna and its insulator during transmission. Do not touch.**

(*f*) Radio Receiver BC-312-(*) is mounted at the left-end (rear) operating position on Mounting FT-162 and is further secured with two Mountings FT-178 attached to the body of the truck when installed on Table MC-269. When mounted on Table MC-269-A it is located at the left end (rear) operating position on Mounting FT-389-A, which includes for shock absorption Mounting FT-162 and Mountings FT-178. The receiver is powered by 12 volts d-c normally supplied by the power unit. It may serve as an emergency receiver in the absence of the power unit by using the spare 12-volt battery in the truck. This receiver provides reception of c-w, voice- or tone-modulated signals over the frequency range of 1.5 to 18 megacycles. For further description see Technical Manual TM11-850 for Radio Receiver BC-312-(*).

(*g*) Radio Receiver BC-342-(*) is mounted at the right-end (forward) operating position on Mounting FT-162 and is fur-

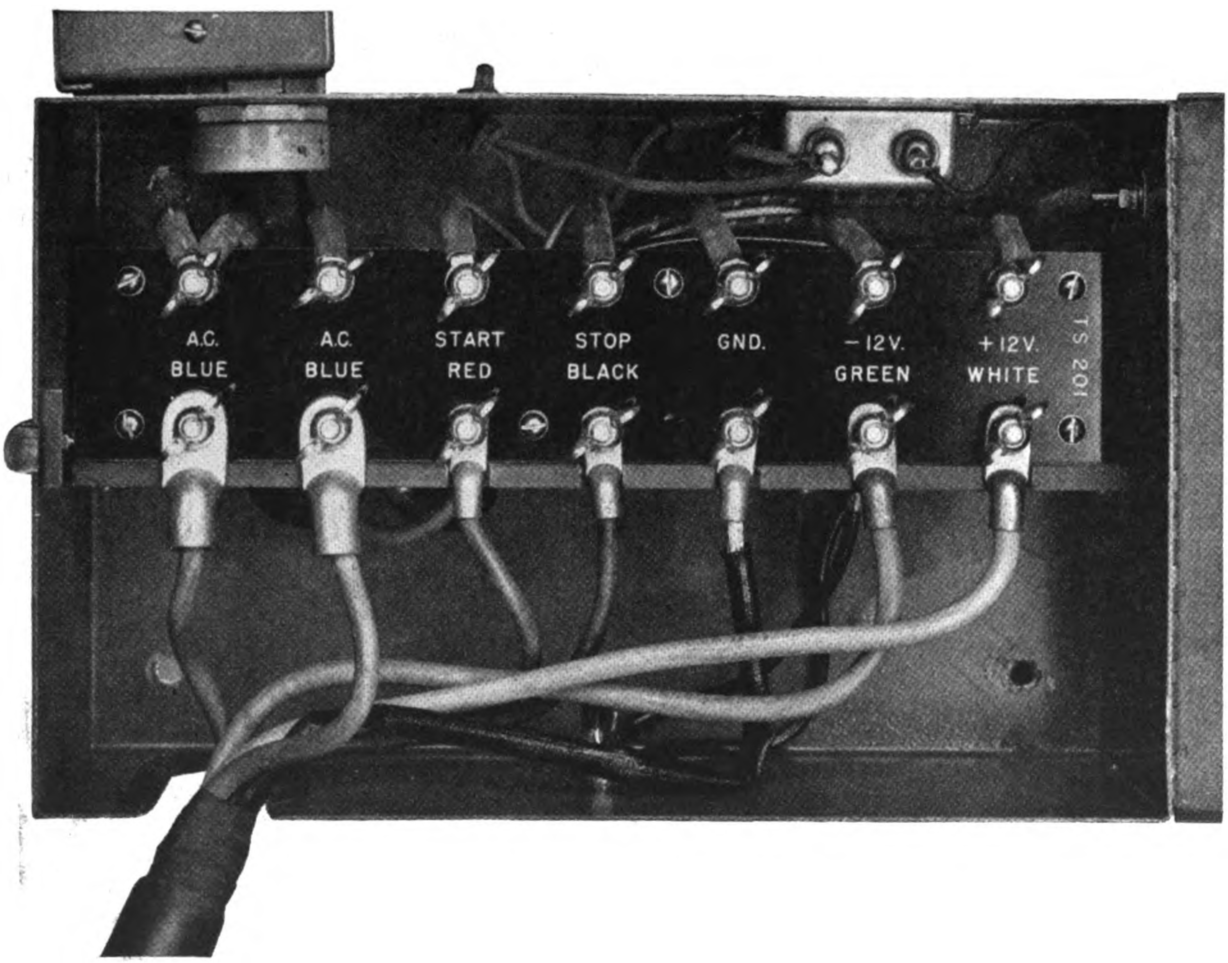


FIGURE 18. JUNCTION BOX JB-49-(*), WIRING IN PLACE.

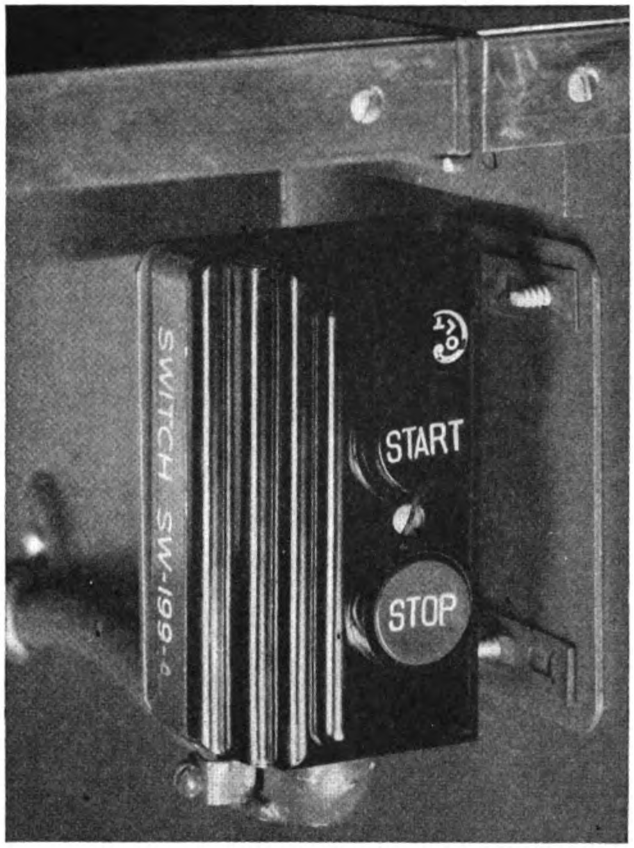


FIGURE 19. SWITCH SW-199-A, EXTERIOR.

ther secured with two Mountings FT-178 attached to the body of the truck when installed on Table MC-269. When mounted on Table MC-269-A it is located at the right-end (forward) operating position in Mounting FT-389-A, which includes for shock absorption, Mounting FT-162 and Mountings FT-178. Radio Receiver BC-342-(*) has the same characteristics as Radio Receiver BC-312-(*) except that it operates from 115 volts 50-60 cycle a-c power. For further description consult Technical Manual TM 11-850, the Instruction Book for Radio Receiver BC-342-(*).

(*h*) Mast Bases MP-22 are mounted on each side of the truck. Mast Sections MS-49, 50, and 51 are assembled and screwed to each base, forming the receiving antennas. Connections to the receivers are provided within the truck.

(*i*) Table MC-269-(*) (operating) is mounted on the floor and against the left side of the truck. Wing nuts secure it to the floor mountings and turnbuckles hold it to the truck side. All necessary radio components except the radio transmitter are mounted on this table. Space for two operators is provided at the table. The layout and identification of the components, mounted in position and connected are shown in figures 12 and 13. The lights, power wiring, marked power outlets, most of the intercomponent connections, as well as the PHONE AND SPEAKER CONTROL PANEL are an integral part of the operating table. The power wiring and power outlets are protected by the wiring channel which runs the length of the table and is bolted to the rear of all three table legs. See figures 14 and 15 for the rear view of this component with its cover removed. Loudspeakers LS-3 are connected to Radio Receivers BC-312-(*) and BC-342-(*) through the switch mechanism on the control panel. Headsets HS-30-(*), P-23, or P-20 are connected to the receivers through jacks on the PHONE AND SPEAKER CONTROL PANEL. Both loudspeakers and headsets can be instantly switched from one receiver to the other by throwing the TRANSPOSE-NORMAL switch. A drawer is provided for message blanks, instruction books, station log, etc. More details on Table MC-269-(*) will be found in Section III.

(j) Control Box BC-731-(*), a part of Table MC-269, is a metal box with a hinged cover. It is mounted rigidly to the back panel at the right hand (forward) end of Table MC-269. Mounted in its front cover facing the operator is a meter to indicate the a-c voltage generated in the power unit. Below this meter is a dual push-button control switch for starting

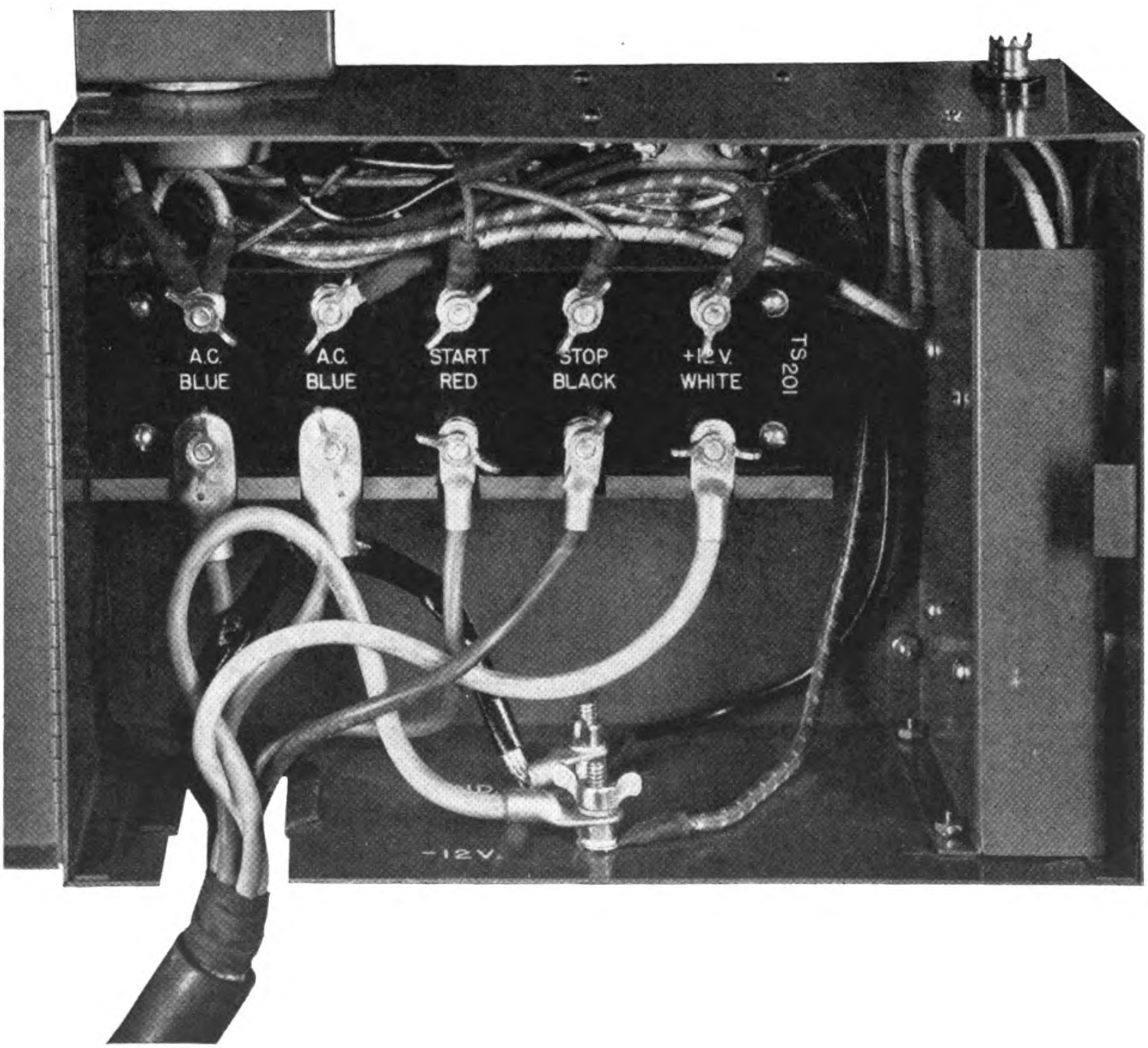


Figure 20. Junction Box JB-69-A, wiring in place.

and stopping the power unit. Inside the control box are four fuses connected in the principal power circuits as indicated, and along side of each is a spare fuse. A more detailed description of the control box is given in Section III.

(*k*) Junction Box JB-49-(*) also a part of Table MC-269, is a metal box rigidly mounted to the left hand (rear) leg near the floor. The hinged front cover of the box swings open for access to the marked terminal strip within. At the terminal strip are fastened, by means of wing nuts, the terminals of the cording, through which all power is supplied to the radio station from the power unit or substitute sources.

(*l*) Switch SW-199-A is part of Table MC-269-A. It is a dual push-button control switch for starting and stopping the power unit. It is enclosed in a metal box and is bolted below the table top to the right hand (front) table leg.

(*m*) Junction Box JB-69-A is another part of Table MC-269-A. It is a metal box with a hinged cover, and is mounted rigidly to the left hand (rear) table leg near the floor. A terminal strip inside the box connects the terminals of Cord CO-315, through which all power connections to the radio station from the power unit or substitute sources are secured. Four fuses inside the control box protect the principal power branches. This unit also provides termination for the local and remote telephones.

(*n*) Cordage used to operate the radio station is as follows:

(*1*) Cord CD-566 (control) is a 4-foot control cord connecting Radio Receiver BC-342-(*) with its outlet receptacle in the wiring channel on Table MC-269-(*).

(*2*) Cord CD-564 (power) is a 3-foot power cord connecting Radio Receiver BC-342-(*) with the a-c receptacle in the wiring channel.

(*3*) Cord CD-565 (control, power) is a 4-foot power and control cord connecting Radio Receiver BC-312-(*) with its receptacle in the wiring channel.

(*4*) The transmitter power cord is 10 feet long and connects Radio Transmitter BC-610-(*) with its a-c power receptacle in the wiring channel.

(*5*) The transmitter control cord is 10 feet long, conducts speech and control circuits to Radio Transmitter BC-610-(*) and furnishes Speech Amplifier BC-614-(*) with a-c power. One end plugs into the rear of the transmitter; the other end plugs into the back of the speech amplifier chassis.

(*6*) The operating control cord is 30 inches long and conducts circuits from controls on Table MC-269-(*) to Speech Amplifier BC-614-(*). Plug receptacles are supplied for this cord in the wiring channel and in the rear of the speech amplifier.

(*7*) Cord CO-315 (power and control, SCR-299-C and SCR-299-D) is 45 inches long. It carries the power and control circuits between Junction Box JB-49-C or JB-69-A and the rear of the truck. One end has a heavy duty cable plug, clamped below the rear of the truck. The other end has lug terminals for making connection to the terminal posts inside of the junction box.

(*8*) SCR-299-A and SCR-299-B have three power and control cords from Power Unit PE-95-(*) — (CD-556, CD-558, CD-560) which are connected directly into Junction Box JB-49-(*).

(*o*) Radio Sets SCR-299-(*) (except SCR-299-A) include two sets of Crystal Holders FT-171-(*). The crystals in them have the operating frequencies indicated in the following table. For convenience, a column is included in the table to show the additional operating frequencies which may be obtained by the use of different tuning units. (Initial deliveries of Radio Set SCR-299-(*) may not include a full complement of crystals.)

Order No. 1257 and 2659-CHI-42

Crystal Frequency	Operating Frequency	Use Tuning Unit (Box)	Additional Possibilities in Operating Freq.	Use Tuning Unit (Box)
2030	2030	TU-47 (A)	4060	TU-50 (D)
2220	2220	TU-47 (A)	4440	TU-50 (D)
2258	2258	TU-47 (A)	4516	TU-50 (D)
2300	2300	TU-47 (A)	4600	TU-50 (D)
2360	2360	TU-47 (A)	4720	TU-50 (D)
2390	2390	TU-47 (A)	4780	TU-50 (D)
3510	3510	TU-49 (C)	7020	TU-52 (F)
3520	3520	TU-49 (C)	7040	TU-52 (F)
3550	3550	TU-49 (C)	7100	TU-52 (F)
3570	3570	TU-49 (C)	7140	TU-52 (F)
3580	3580	TU-49 (C)	7160	TU-52 (F)
3945	3945	TU-49 (C)	7890	TU-52 (F)
3955	3955	TU-49 (C)	7910	TU-52 (F)
3995	3995	TU-49 (C)	7990	TU-52 (F)
2045	4090	TU-50 (D)	2045	TU-47 (A)
2065	4130	TU-50 (D)	2065	TU-47 (A)
2105	4210	TU-50 (D)	2105	TU-47 (A)
2125	4250	TU-50 (D)	2125	TU-47 (A)
2145	4290	TU-50 (D)	2145	TU-47 (A)
2155	4310	TU-50 (D)	2155	TU-47 (A)
2260	4520	TU-50 (D)	2260	TU-47 (A)
2282.5	4565	TU-50 (D)	2282.5	TU-47 (A)
2290	4580	TU-50 (D)	2290	TU-47 (A)
2305	4610	TU-50 (D)	2305	TU-47 (A)
2320	4640	TU-50 (D)	2320	TU-47 (A)
2415	4830	TU-50 (D)	2415	TU-47 (A)
2435	4870	TU-50 (D)	2435	TU-47 (A)
2442.5	4885	TU-50 (D)	2442.5	TU-47 (A)
2532.5	5065	TU-51 (E)	2532.5	TU-48 (B)
2545	5090	TU-51 (E)	2545	TU-48 (B)
2557.5	5115	TU-51 (E)	2557.5	TU-48 (B)
3202.5	6405	TU-52 (F)	3202.5	TU-49 (C)
3215	6430	TU-52 (F)	3215	TU-49 (C)
3237.5	6475	TU-52 (F)	3237.5	TU-49 (C)
3250	6500	TU-52 (F)	3250	TU-49 (C)
3322.5	6645	TU-52 (F)	3322.5	TU-49 (C)

Order No. 2660-CHI-42

2030	2030	TU-47 (A)	4060	TU-50 (D)
2220	2220	TU-47 (A)	4440	TU-50 (D)
2260	2260	TU-47 (A)	4520	TU-50 (D)
2315	2315	TU-47 (A)	4630	TU-50 (D)
2360	2360	TU-47 (A)	4720	TU-50 (D)
2380	2380	TU-47 (A)	4760	TU-50 (D)

Crystal Frequency	Operating Frequency	Use Tuning Unit (Box)	Additional Possibilities in Operating Freq.	Use Tuning Unit (Box)
2520	2520	TU-48 (B)	5040	TU-51 (E)
2575	2575	TU-48 (B)	5150	TU-51 (E)
2660	2660	TU-48 (B)	5320	TU-51 (E)
2745	2745	TU-48 (B)	5490	TU-51 (E)
2805	2805	TU-48 (B)	5610	TU-51 (E)
2905	2905	TU-48 (B)	5810	TU-51 (E)
2940	2940	TU-48 (B)	5880	TU-51 (E)
2990	2990	TU-48 (B)	5980	TU-51 (E)
2040	4080	TU-50 (D)	2040	TU-47 (A)
2070	4140	TU-50 (D)	2070	TU-47 (A)
2105	4210	TU-50 (D)	2105	TU-47 (A)
2130	4260	TU-50 (D)	2130	TU-47 (A)
2150	4300	TU-50 (D)	2150	TU-47 (A)
2157.5	4315	TU-50 (D)	2157.5	TU-47 (A)
2247.5	4495	TU-50 (D)	2247.5	TU-47 (A)
2282.5	4565	TU-50 (D)	2282.5	TU-47 (A)
2290	4580	TU-50 (D)	2290	TU-47 (A)
2305	4610	TU-50 (D)	2305	TU-47 (A)
2320	4640	TU-50 (D)	2320	TU-47 (A)
2415	4830	TU-50 (D)	2415	TU-47 (A)
2435	4870	TU-50 (D)	2435	TU-47 (A)
2442.5	4885	TU-50 (D)	2442.5	TU-47 (A)
2560	5120	TU-51 (E)	2560	TU-48 (B)
2580	5160	TU-51 (E)	2580	TU-48 (B)
2590	5180	TU-51 (E)	2590	TU-48 (B)
3180	6360	TU-52 (F)	3180	TU-48 (B)
3232.75	6465.5	TU-52 (F)	3232.75	TU-49 (C)
3315	6630	TU-52 (F)	3315	TU-49 (C)
3330	6660	TU-52 (F)	3330	TU-49 (C)

Order No. 4668-CHI-42

3024	3024	TU-48 (B)	6048	TU-51 (E)
3473	3473	TU-49 (C)	6946	TU-52 (F)
2780	5560	TU-51 (E)	2780	TU-48 (B)
2835	5670	TU-51 (E)	2835	TU-48 (B)
2885	5770	TU-51 (E)	2885	TU-48 (B)
2945	5890	TU-51 (E)	2945	TU-48 (B)
2983.5	5967	TU-51 (E)	2983.5	TU-48 (B)
3010.5	6021	TU-51 (E)	3010.5	TU-48 (B)
3195	6390	TU-52 (F)	3195	TU-48 (B)

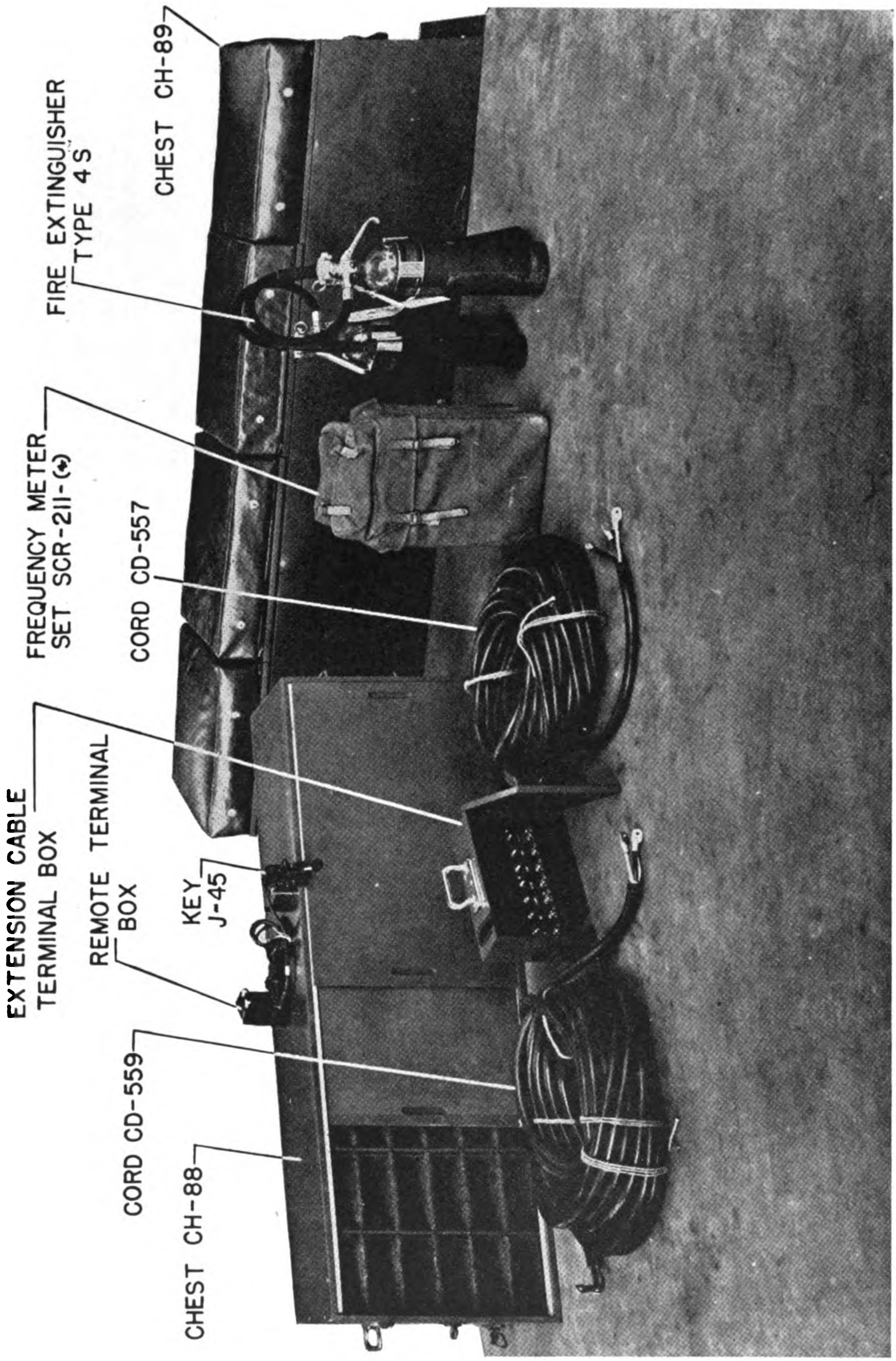


FIGURE 21. RADIO SETS SCR-299-A AND SCR-299-B, ACCESSORY COMPONENTS.

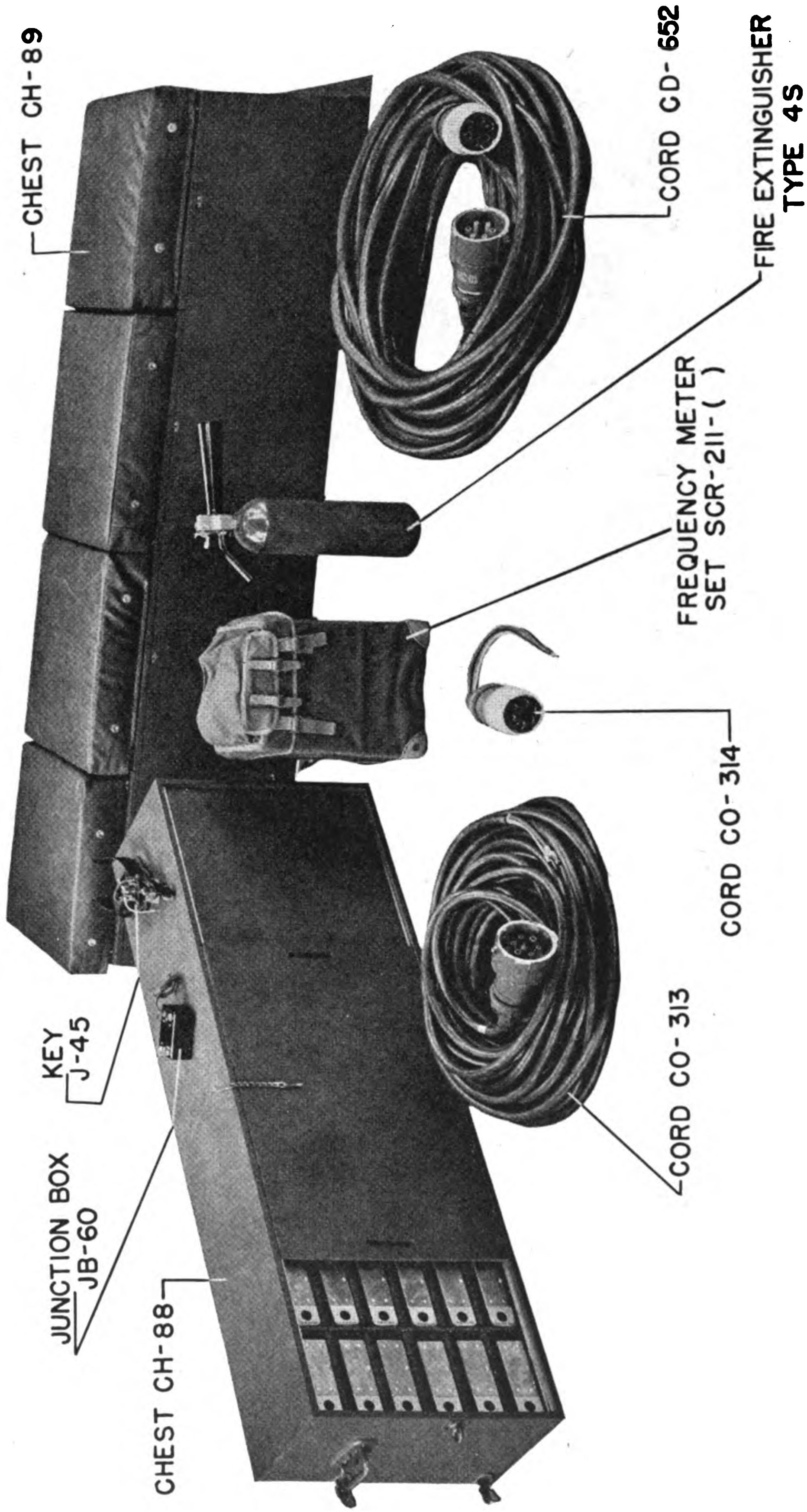


FIGURE 22. RADIO SETS SCR-299-C AND SCR-299-D, ACCESSORY COMPONENTS.

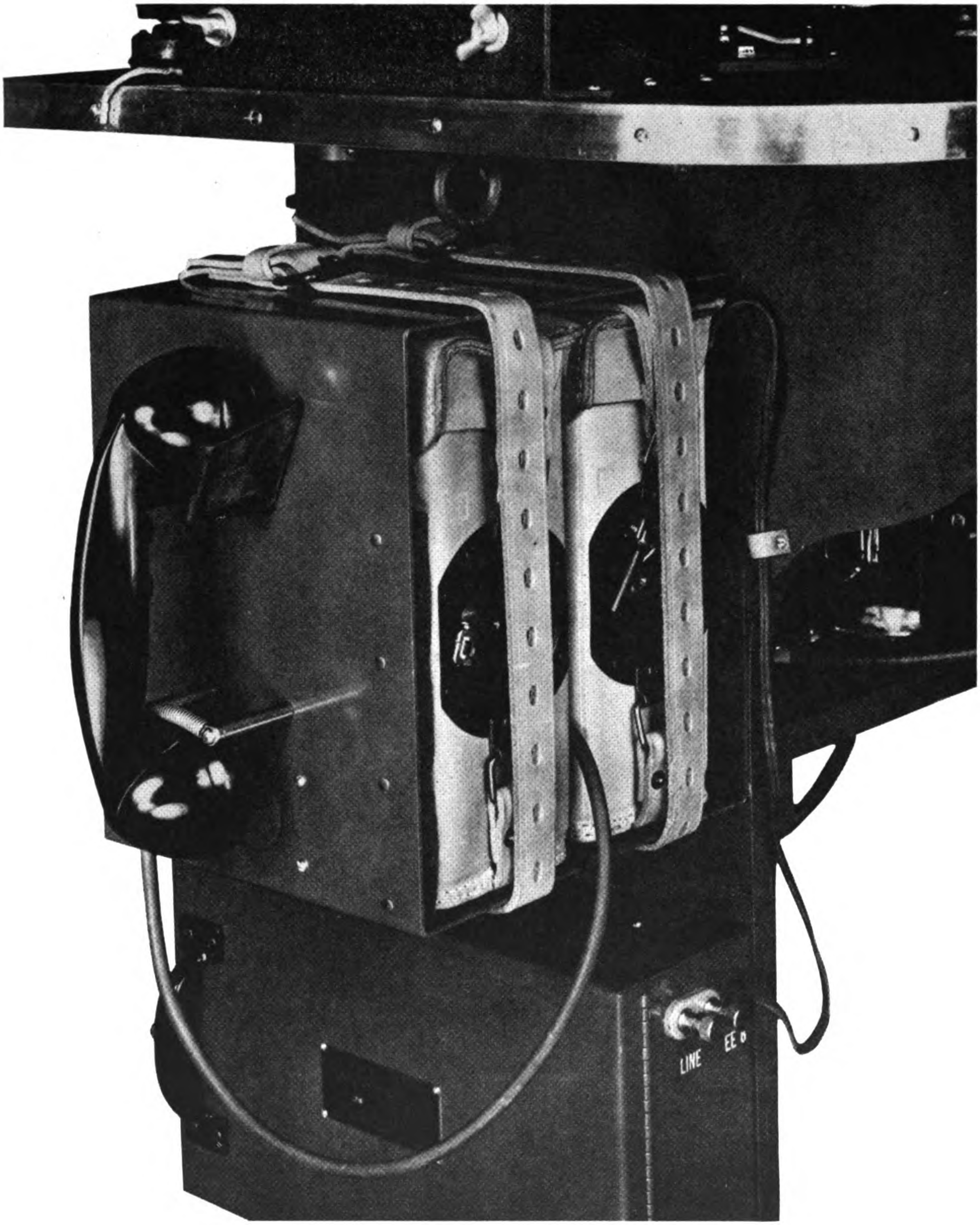


FIGURE 23. TELEPHONES EE-8-(*), SHOWN MOUNTED IN POSITION ON TABLE MC-269-(*).

FIGURE 24. JUNCTION BOX JB-60.

(2) ***Accessory Components.*** —

(*a*) Frequency Meter Set SCR-211-(*) is located on the floor of the truck at the right rear where it is held against the side of the truck with a strap. It can be used for pre-setting the transmitter to any exact frequency for net operation, etc. The instruction book found within the set describes its operation in detail.

(*b*) Equipment for remote control of SCR-299-(*) consists of:

(*1*) Telephone EE-8-(*) (two) strapped to their compartment of Table MC-269-(*).

(*2*) Junction Box JB-60, stowed in Chest CH-89.

(*3*) Key J-45, stowed in Chest CH-89.

(*4*) Reels DR-4 (two) mounted on the sides (rear) of the truck.

(*5*) Wire W-110-B, approximately ½ mile on each reel.

(*6*) Axle RL-27-(*) stowed in Chest CH-89.

(*c*) This remote control equipment when connected as directed in Section II, provides for:

(*1*) Remotely keying or voice modulating the transmitter.

(*2*) Remotely listening to Radio Receivers BC-312-(*) and BC-342-(*).

(*3*) Communicating with the operator in the radio station.

(*d*) The remote position may be located as much as one mile away. It should be noted that when both remotely receiving and remotely transmitting it is necessary to have an operator at the radio station to switch the remotely located telephone from transmitter to receiver or to turn off the carrier when so directed from the remote position. Remote keying of c-w transmissions may be made without the assistance of the station operator, but reception at the remote point must then be obtained from Radio Receiver BC-312-(*). This requires the removal of the receiver and the spare 12-volt battery from the truck.

(*e*) **SCR-299-A and SCR-299-B.** — Equipment for operation of Power Unit PE-95-(*) at a distance up to 100 feet from Truck K-51-(*) consists of three cords and the extension cable terminal box as follows:

(*1*) Cord CD-559 (power), for extending the d-c power connection. Its length is 100 feet. It connects Junction Box JB-49-(*) with the extension cable terminal box.

(*2*) Cord CD-557 (power), for extending the a-c power connection. Length: 100 feet. Connects Junction Box JB-49-(*) with the extension cable terminal box.

(*3*) Cord CD-561 (control, extension), for extending the control circuits to stop and start Power Unit PE-95-(*). Length: 100 feet. Connects Junction Box JB-49-(*) with the extension cable terminal box.

(*4*) The extension cable terminal box. This is a metal box with hinged front cover. Its terminal strip mounted inside permits connections of any or all of the above extension cords with Cords CD-558, 556 and 560 respectively, which are connected to Power Unit PE-95-(*).

FIGURE 25. CHEST CH-89, SHOWN CLOSED AND OPENED.

(*f*) Equipment for operation of the power unit at a distance up to 200 feet from the truck and for individual operation of truck and trailer consists of three cords as follows:

(*1*) Cord CD-652 (power and control), for extending all connections between truck and trailer. It is 100 feet long and is equipped with plugs on both ends for connecting to the power plug on the rear of the truck and the power plug at the tongue of the trailer.

(*2*) Cord CO-313 (a-c power) for extending the a-c power connection from the trailer. Its length is 100 feet. One end has a plug which fits the power plug at the tongue of the trailer and the other end has two terminals from which power may be taken for any desired purpose.

(*3*) Cord CO-314 (a-c power) connects the auxiliary sources of a-c power and the truck to operate the radio station. Its length is 3 feet. One end has a plug to fit the power plug at the rear of the truck and the opposite end has bare leads to be connected to any source of commercial power.

(*g*) The auxiliary transmitting antenna (provided with SCR-299-C and SCR-299-D) will considerably increase the range on the lower frequencies if mobile operation is not necessary. The antenna consists of a 45-foot length of antenna wire with a fitting to attach it to the top of Mast Base MP-47 in place of the regular mast sections. Its other end has an insulator and a length of rope to anchor it to nearby trees or similar supports.

(*h*) Chest CH-89 (seat bench) is mounted with wing bolts to the floor of the truck parallel with, and in front of, Table MC-269-(*). It is 6 feet 8 inches long, 14½ inches high (not including cushions) and 18 inches wide. Fully packed, Chest CH-89 weighs approximately 275 pounds. Its top is divided into four lids equipped with individual cushions to serve, when closed, as a seat for the operators. Below each lid is a large subdivided compartment for stowage of spare parts, repair equipment, etc., as indicated on the chart attached to the chest.

(*i*) Chest CH-88 (wall) is mounted inside and along the right hand wall approximately 3 feet above the floor of the truck. It is fastened at each end to the side of the truck by four trunk clasps and two turnbuckles. Its outside dimensions are 55 inches long, 18 inches high and 12⅛ inches deep. Its weight fully packed is approximately 175 pounds. Two sliding doors on its front side permit access to numerous compartments containing the tuning units (boxes), coil units, etc. A chart showing the quantity and location of these items is supplied to assist the operator.

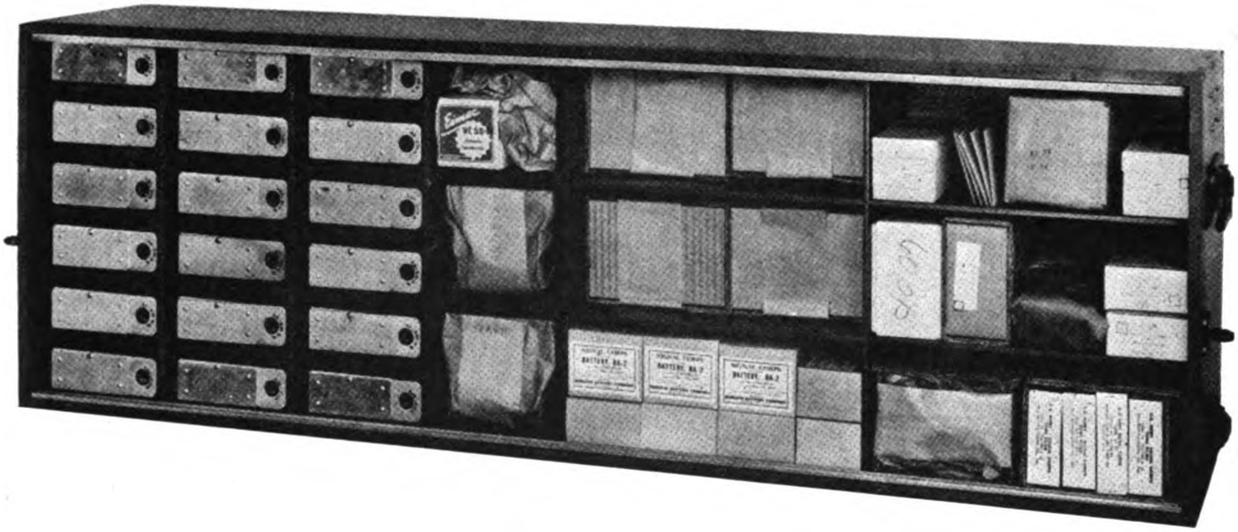
(*j*) The spare 12-volt battery is located on the floor of the truck directly behind the forward operating position. It consists of two 6-volt storage batteries connected in series. They are interchangeable with the two batteries in the power unit. The batteries are wired to a polarized plug mounted on the outside of the spare battery box, to which connection may be made to furnish an emergency source of power or to provide charging current from the power unit when necessary.

(*k*) Cord CD-587 (the truck spare battery cord) is a 16-foot cable equipped with plugs to connect the spare battery box to Table MC-269-(*) at the wiring channel.

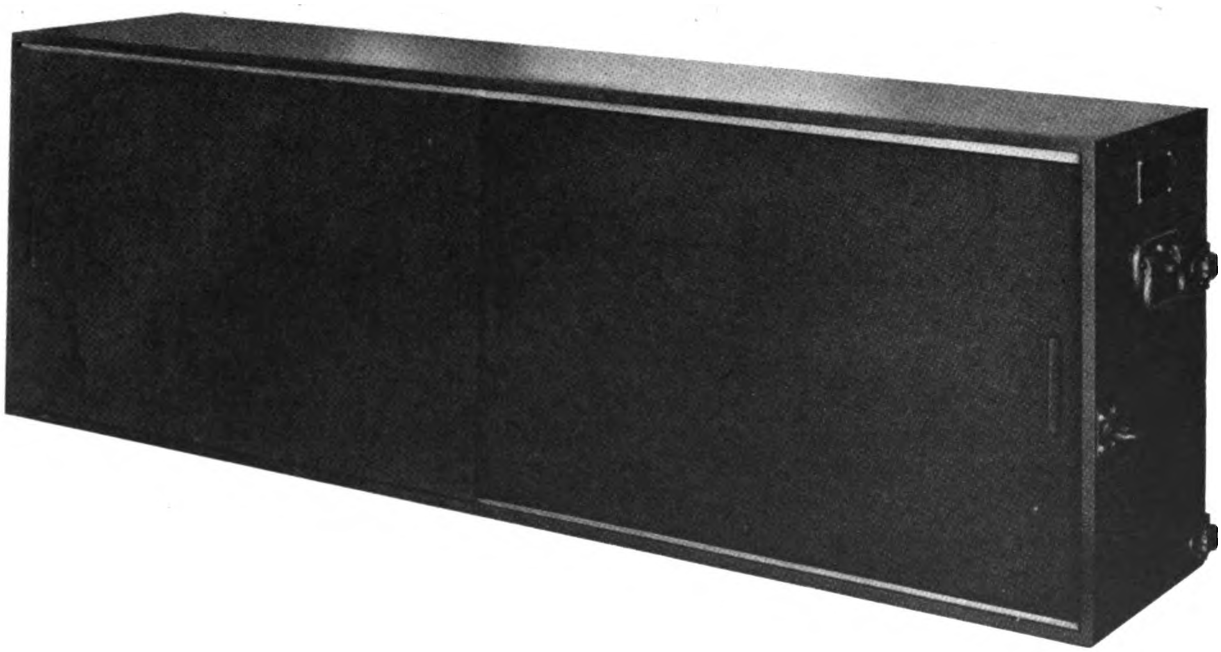
(*l*) Cord CD-563 (power) is a 6-foot cable used to connect Radio Receiver BC-312-(*) to the spare storage battery when both of these units are removed from the radio station.

b. ***The Power Plant.*** — Trailer K-52-(*) is a one-ton, two-wheel vehicle to which has been added Frame FM-62-(*). (This frame, used to hold the spare tire and wheel, is located beneath the rear end and is accessible from that end.) The trailer also includes six galvanized steel drums for gasoline and water as well as Power Unit PE-95-(*) and its associated cords. Radio Set SCR-299-D is equipped with Chest CH-112-(*) mounted in the front section of the trailer to store Cord CO-313, spare tools, etc. The operating components in the trailer are described as follows:

(1) Power Unit PE-95-(*) is a gasoline-driven generating unit capable of delivering 5 kilowatts of single phase, 50-60 cycles A-C at 115 volts. Tools and spare parts accompany the power unit. Its use has already been described. Consult its instruction book for further details and operating data.



Doors Removed



Doors in Place

Figure 26. Chest CH-88, front views.

(2) Cording associated with PE-95-(*) differs with various models of SCR-299-(*) as follows:

(a) For SCR-299-A and SCR-299-B:

(1) Cord CD-558 (power) is connected to Power Unit PE-95-(*). It is 15 feet long and extends from the Trailer K-52-(*) to Truck K-51-(*) where it ends in Junction Box JB-49-(*). It conducts d-c power from the 12-volt starting battery and its charging generator for operating Radio Receiver BC-312-(*) or charging the spare 12-volt battery in the truck.

(2) Cord CD-556 (power) is a 15-foot a-c power cord connecting Power Unit PE-95-(*) with Junction Box JB-49-(*).

(3) Cord CD-560 (control), 15 feet, connects Power Unit PE-95-(*) with Junction Box JB-49-(*). It connects the circuits used to stop and start the power unit.

(4) The emergency a-c power cord (length 200 feet) is carried in Trailer K-52-(*) for extending a-c power from Power Unit PE-95-(*) for emergency or other use when the power unit is not required at Truck K-51-(*).

(b) For SCR-299-C and SCR-299-D:

(1) Cord CO-316 (power and control) is a six-conductor cord, 8⅓ feet long. One end of this cord is connected to the terminal board of the power unit and the other end is equipped with a plug to be inserted into the power plug receptacle under the rear of the truck.

4. Alphabetical Tabulation Of Components.

The following is a complete list of components included in Radio Set SCR-299-(*). A zero indicates that the item is not used in that model.

SCR-299-A Quantity	SCR-299-B Quantity	SCR-299-C Quantity	SCR-299-D Quantity	Article
1	1	1	1	Antenna Tuning Unit BC-729-(*)
0	0	1	1	Antenna, auxiliary, length 45 feet
1	1	1	1	Axle RL-27-(*)
12	12	12	12	Battery BA-30, spare
2	2	2	2	Battery, storage, 6-volt, spare
2	2	2	2	Book, Instruction, or Technical Manual for Radio Receivers BC-312-(*) and BC-342-(*)
2	2	2	2	Book, Instruction, or Technical Manual for Power Unit PE-95-(*)
2	2	2	2	Book, Instruction, or Technical Manual for Frequency Meter SCR-211-(*)
0	1	1	1	Box, BX-34-(*) with crystals
1	1	0	0	Box, extension cable terminal
2	2	2	2	Brush, HV, for dynamotor of BC-312-(*), spare
2	2	2	2	Brush, LV, for dynamotor of BC-312-(*), spare
1	1	1	1	Chest CH-88 (wall)
1	1	1	1	Chest CH-89 (seat bench)
0	0	0	1	Chest CH-112-A
1	1	1	0	Control Box BC-731-(*)
2	2	1	1	Cord CD-318 for Microphone T-30-(*)
0	0	2	2	Cord CO-315 (powar and control), length 45 inches, 1 in use, 1 spare
2	2	0	0	Cord CD-556 (a-c power), length 15 feet, 1 in use, 1 spare
2	2	0	0	Cord CD-558 (a-c power), length 15 feet, 1 in use, 1 spare
2	2	0	0	Cord CD-560 (control), length 15 feet, 1 in use, 1 spare
0	0	1	1	Cord CD-652 (power and control extension), length 100 feet.

SCR-299-A Quantity	SCR-299-B Quantity	SCR-299-C Quantity	SCR-299-D Quantity	Article
1	1	0	0	Cord CD-557 (a-c power, extension), length 100 feet
1	1	0	0	Cord CD-559 (d-c power, extension), length 100 feet
1	1	0	0	Cord CD-561 (control, extension), length 100 feet
0	0	2	2	Cord CO-316 (power and control), length 8 feet 4 inches, 1 in use, 1 spare.
0	0	1	1	Cord CO-313 (a-c extension), length 100 feet
0	0	1	1	Cord CO-314 (a-c connection), length 3 feet
1	1	0	0	Cord (a-c power, emergency), length 200 feet
1	1	1	1	Cord CD-563 (power), spare battery, receiver, length 6 feet
2	2	2	2	Cord CD-564 (power), length 3 feet, 1 in use, 1 spare
2	2	2	2	Cord CD-565 (power and control), length 4 feet, 1 in use, 1 spare
2	2	2	2	Cord CD-566 (control), length 4 feet, 1 in use, 1 spare
2	2	2	2	Cord, transmitter power, length 10 feet, 1 in use, 1 spare
2	2	2	2	Cord, transmitter control, length 10 feet, 1 in use, 1 spare
2	2	2	2	Cord, operating control, length 30 inches, 1 in use, 1 spare
1	1	1	1	Cord CD-587 (spare battery), length 16 feet
0	2	2	2 (sets)	Crystals in Crystal Holders FT-171-B (Quantity varies with Order No.)
6	6	6	6	Drums, gasoline, galvanized steel, with handle, capacity 5 gallons
2	2	2	2	Duffle cabinets
1	1	1	1	Frequency Meter Set SCR-211-(*) with spare tubes and batteries.
0	0	1	1	Fire extinguisher, Randolph Laboratories, Model FF-4
2	2	0	0	Fire Extinguisher, Alfite, Type 4S
1	1	1	1	Frame FM-62-A, for spare tire
6	6	6	6	Fuse FU-21-A, for Radio Receivers BC-312-(*) and BC-342-(*), spare
4	4	4	4	Fuse FU-27, for Radio Receiver BC-342-(*), spare
7	7	7	7 (sets)	Fuses for Radio Transmitter BC-610-(*) and Speech Amplifier BC-614-(*), 1 in use, 6 spare, consisting of: 2 — 25 ampere fuses 1 — 20 ampere fuse 1 — 5 ampere fuse 1 — 3 ampere fuse
28	28	28	0	Fuse, 30 ampere, plug, for Control Box BC-731-C, 4 in use, 24 spare
0	0	0	28	Fuse, 30 ampere, plug, for Junction Box JB-69-A, 4 in use, 24 spare
1	1	0	0	Heater, electric, Arvin Model 201
0	0	1	1	Heater, electric, Electromode Model AA-15
4	4	0	0	Headset P-20,* 2 in use, 2 spare
0	0	4	4	Headset P-23,* 2 in use, 2 spare ***Note:** Headset HS-30-(*) with Cord CD-605 (when available) should replace Headset P-20 or P-23
0	0	1	1	Holder for fire extinguisher
1	1	1	0	Junction Box JB-49-(*)
0	0	0	1	Junction Box JB-69-A
1	1	1	1	Junction Box JB-60
0	0	3	3	Key J-37, 2 in use, 1 spare

SCR-299-A Quantity	SCR-299-B Quantity	SCR-299-C Quantity	SCR-299-D Quantity	Article
3	3	0	0	Key J-44, 2 in use, 1 spare
1	1	1	1	Key J-45
1	1	1	1	Kit, first aid, standard Medical Corps
6	6	8	8	Lamp, 50-watt, 115-volt, 4 in use, 4 spare
0	0	2	2	Lamp, 50-watt, 12-volt, 1 in use, 1 spare
3	3	3	0	Lamp, 10-watt, 115-volt, 1 in use, 2 spare
2	2	2	2	Lamp, trouble, emergency, 115-volt, with 25-foot extension cord and 50-watt lamps
0	0	1	1	Lamp, trouble, emergency, 12-volt, with 25-foot extension cord and 50-watt lamp
4	4	4	4	Lamp LM-27 for radio receivers, spare
2	2	2	2 (sets)	Lamps, headlight, tail light for Truck K-51-(*) and Trailer K-52-(*), spare
2	2	2	0	Light fixture
2	2	2	2	Loudspeaker LS-3
3	3	3	3	Mast Base MP-22, 2 in use, 1 spare
2	2	2	2	Mast Base MP-47, 1 in use, 1 spare
9	9	9	9	Mast Section MS-49, 3 in use, 6 spare
9	9	9	9	Mast Section MS-50, 3 in use, 6 spare
6	6	6	6	Mast Section MS-51, 3 in use, 3 spare
2	2	2	2	Mast Section MS-52, 1 in use, 1 spare
2	2	2	2	Mast Section MS-53, 1 in use, 1 spare
7	7	7	7	Mast Section MS-54
2	2	2	2	Microphone T-50-(*), dynamic, 1 in use, 1 spare
0	0	1	1	Microphone T-17
2	2	1	1	Microphone T-30-(*) (throat)
0	0	0	2	Mountings FT-388-A, for loudspeakers
0	0	0	2	Mountings FT-389-A, for receivers, including light fixtures
3	3	3	3	Nozzles for gasoline drums
1	1	1	1 (set)	Parts, spare, for Radio Transmitter BC-610-(*) and Speech Amplifier BC-614-(*) consisting of: 1 complete set of fixed and variable resistors 1 complete set of fixed capacitors 1 each type of variable capacitors 1 complete set of r-f chokes **Note:** (For itemization of resistors, capacitors, and chokes supplied as spares, see List of Replaceable and Spare Parts, Section V.)
1	1	1	1 (set)	Parts, spare, for Truck K-51-(*) consisting of: 1 complete set of spark plugs 1 fan belt 1 set of radiator hoses and clamps 1 set of breaker points 1 generator, complete (SCR-299-A and SCR-299-B only) 1 carburetor (SCR-299-A and SCR-299-B only) 1 spark coil (SCR-299-A and SCR-299-B only) **Note:** Some or all of these parts are not included in Radio Set SCR-299-(*) as shipped
1	1	1	1	Power Unit PE-95-(*), includes tools and spare parts
1	1	2	2	Preliminary Instructions for SCR-299-(*)

SCR-299-A Quantity	SCR-299-B Quantity	SCR-299-C Quantity	SCR-299-D Quantity	Article
1	1	1	1	Radio Receiver BC-312-(*), includes Mounting FT-162 and 2 Mountings FT-178
1	1	1	1	Radio Receiver BC-342-(*), includes Mounting FT-162 and 2 Mountings FT-178
1	1	1	1	Radio Transmitter BC-610-(*), includes 18 tuning units, 8 coil units, 2 Capacitors CA-423, and 2 sets of tuning charts.
2	2.	2	2	Reels DR-4
0	0	0	1	Switch SW-199-A (start-stop)
1	1	1	1	Speech Amplifier BC-614-(*)
2	2	2	2	Strap ST-19-A
1	1	1	0	Table MC-269
0	0	0	1	Table MC-269-A
2	2	2	2	Telephone EE-8-(*)
1	1	1	1	Tire and wheel, spare for Truck K-51-(*) or Trailer K-52-(*)
1	1	1	1	Tool Equipment TE-48
1	1	1	1 (set)	Tools and repair equipment consisting of: 1 analyzer, Triumph Model 333 2 adaptors, twistlock to standard a-c plug (SCR-299-A and SCR-299-B only) 1 can carbon tetrachloride (SCR-299-C and SCR-299-D only) 1 drill, electric, 110-volt A-C, ½-inch Black & Decker (SCR-299-C and SCR-299-D only) 1 drill, electric, 110-volt A-C, ⅜-inch Stanley (SCR-299-A and SCR-299-B only) 1 drill, twist, carbon steel, ⅜-inch 1 drill, twist, carbon steel, ½-inch (SCR-299-C and SCR-299-D only) 1 hammer, claw, 16 oz. 1 set hardware, assorted. 1 hydrometer for storage batteries (SCR-299-C and SCR-299-D only) 5 pounds of solder, rosin core 1 can machine oil (SCR-299-C and SCR-299-D only) 1 Soldering Iron TL-120 (2 in SCR-299-A and SCR-299-B) 3 rolls tape, friction, ½-inch 1 roll tape, rubber, ½-inch 1 Torch TL-130
8	8	8	8	Tube VT-65-A for Radio Receivers BC-312-(*) and BC-342-(*), 4 installed, 4 spare
4	4	4	4	Tube VT-66-A for Radio Receivers BC-312-(*) and BC-342-(*), 2 installed, 2 spare
16	16	16	16	Tube VT-86-A, for Radio Receivers BC-312-(*) and BC-342-(*), 8 installed, 8 spare
4	4	4	4	Tube VT-87-A for Radio Receivers BC-312-(*) and BC-342-(*), 2 installed, 2 spare
4	4	4	4	Tube VT-88-A for Radio Receivers BC-312-(*) and BC-342-(*), 2 installed, 2 spare

SCR-299-A Quantity	SCR-299-B Quantity	SCR-299-C Quantity	SCR-299-D Quantity	Article
2	2	2	2	Tube VT-97 for Radio Receiver BC-342-(*), 1 installed, 1 spare
3	3	2	2 (sets)	Tubes, vacuum, for Radio Transmitter BC-610-(*), 1 set installed, 1 set spare; consisting of: 2 Tubes VT-46A 2 Tubes VT-95 2 Tubes VT-100 1 Tube VT-107 1 Tube VT-115 3 Tubes VT-139 2 Tubes VT-145 2 Tubes VT-218 1 Tube VT-220
3	3	2	2 (sets)	Tubes, vacuum for Speech Amplifier BC-614-(*), 1 set installed, 1 set spare; consisting of: 1 Tube VT-80 1 Tube VT-94 1 Tube VT-103 3 Tubes VT-231 1 Tube VT-233
2	2	1	1	Typewriter, portable, with telegrapher's keyboard, including case.
1	1	1	1	Truck K-51-(*), including tools
1	1	1	1	Trailer K-52-(*)
1	1	1	1	Ventilator, Electric Service Supplies Co., Keystone #52771 with 6-volt motor
0	0	1	1	Wire, antenna, length 100 feet
1	1	1	1	Wire W-110-B (on Reels DR-4), length 4800 feet

SECTION II — INSTALLATION AND OPERATION

5. Initial Procedure.

Radio Set SCR-299-(*) as furnished is a completely installed unit except for a few components such as batteries, coils, headsets and Frequency Meter Set SCR-211-(*); which require unpacking. If this radio set has been reshipped, certain packing, braces, tapes, etc., will have been added to suit the method of transportation. Look for instructions for removal of such packing in the envelope containing the packing slip. Photographs in this manual will serve as a further guide on the general appearance of components.

6. Preparation For Use.

Consult charts on the two Chests CH-88 (wall) and CH-89 (seat bench) for location of the miscellaneous accessory components.

a. ***Telephone EE-8-(*).***—

(1) Unpack two Headsets HS-30-(*), P-23 or P-20 and four Batteries BA-30

(2) Install two batteries in each telephone as instructed in Technical Manual TM 11-333.

b. ***Frequency Meter Set SCR-211-(*).***—

(1) Remove components for Frequency Meter Set SCR-211-(*) from the packing case.

(2) Install batteries as directed in the instruction book for Frequency Meter SCR-211-(*).

(3) Stow spare batteries and spare tubes in Chest CH-88.

(4) Place the frequency meter in its bag, and its headset in the top pocket.

(5) Stow the set on the floor in the right rear of the truck and strap it to the truck wall, using the straps installed for this purpose.

c. ***Storage Batteries.***—Examine the cells of the storage battery in the power unit and the spare 12-volt storage battery in the truck. If the batteries do not contain electrolyte, it is evident they have been shipped semi-dry and it will be necessary to add electrolyte and charge. The electrolyte should have a specific gravity of 1.265 at 70° F. The quantity of electrolyte required per 12-volt battery is one gallon (128 fluid ounces). To prepare sufficient electrolyte for two 12-volt batteries, one in the truck and one in the power unit, proceed as follows: Carefully add 64 fluid ounces of sulphuric acid (electrolytic grade, specific gravity 1.835 at 60° F.) to 192 fluid ounces of distilled water in a glass or rubber lined container of sufficient size. ***Caution: Add acid to water slowly and stir well with a glass or wood rod; do not add water to the acid.*** After pouring this electrolyte into each battery cell (so that the plates are covered to a height of about ⅜ inch) replace the airtight caps with the vent caps which have breather holes in them.

7. Installation.

a. Since the operating components of Radio Set SCR-299-(*) are completely installed, mounted, and interconnected by cables, there should be no further installation work required other than assembly of antennas and a general inspection to make sure that:

(1) Power Unit PE-95-(*) is properly connected, both mechanically and electrically to Truck K-51-(*).

(2) Receiver, speech amplifier, and transmitter cords are properly plugged into their respective sockets.

(3) All wing nuts, wing headbolts, turnbuckles, etc., are tight. Read thoroughly the Outline of Inspection Checks Paragraph 15*b* and *c* and perform every operation.

b. Now install the transmitting and receiving antennas as follows:

(1) From Chest CH-89 select the following items:

(*a*) Three Mast Sections MS-49.

(*b*) Three Mast Sections MS-50.

(*c*) One Mast Section MS-51, to which a metal S hook has been attached for guying down the transmitting antenna.

(*d*) Two Mast Sections MS-51.

(*e*) One Mast Section MS-52.

(*f*) One Mast Section MS-53.

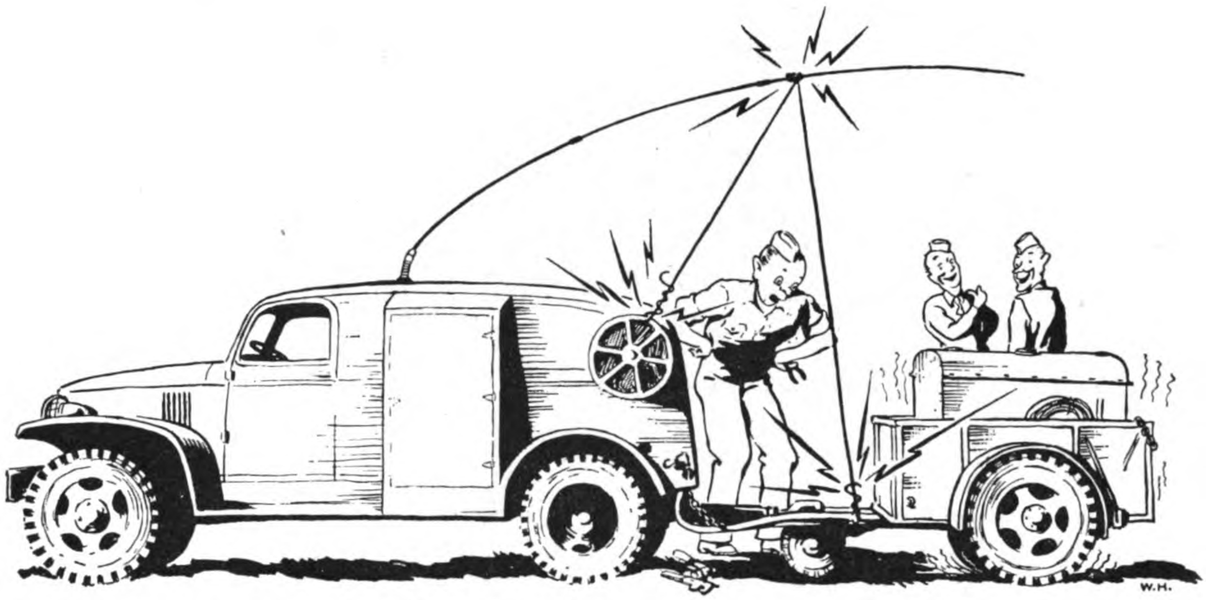
(*g*) The insulated guy rope for the transmitting antenna.

(2) Assemble the transmitting antenna as follows:

(*a*) Screw Mast Section MS-49 into Mast Section MS-50, using two pairs of gas pliers to tighten the joint.

Note: Two Mast Sections MS-49 are provided with brass balls. One of these should always be used on the transmitting antenna to reduce corona discharge.

(*b*) Repeat this procedure with Mast Sections MS-51, 52, and 53.



DON'T TIE DOWN YOUR ANTENNA WITH WIRE !

(*c*) Tape the mast section joints securely to prevent loss due to vibration.

(*d*) Climb up on the roof of the truck with the guy rope and the assembled antenna sections, and screw Mast Section MS-53 into Mast Base MP-47.

(*e*) Attach the open eye snap at the rope ends of the guy rope to the eye bolts on the roof of the truck near the rear.

(*f*) Stand on the center of the truck roof, grasp the antenna with outstretched hand at shoulder height and bend the antenna backwards to a horizontal position.

(*g*) Hold the antenna down in this position and walk to the rear of the truck roof. With your free hand pick up the insulator end of the antenna guy assembly and attach it to the S hook on Mast Section MS-51.

(3) Assemble the left receiving antenna as follows:

(*a*) Screw Mast Section MS-49 into Mast Section MS-50, using two pair of gas pliers to make the connection tight.

(*b*) In a similar manner attach Mast Section MS-51.

(*c*) Tape the mast section joints securely to prevent loss due to vibration.

(*d*) Screw the free end of Mast Section MS-51 into Mast Base MP-22 on the rear left hand wall of the truck near the roof.

(4) Assemble the right hand receiving antenna by repeating steps (3) (*a*), (*b*) and (*c*); then fasten the assembled sections to Mast Base MP-22 on the opposite side of the truck.

8. Precautions Before Operation.

a. ***Caution Note:*** — Before attempting to operate the equipment, read paragraphs 8 and 9 carefully. When thoroughly familiar with this material, proceed with the operations. Always observe the following precautions.

(1) Re-read the Safety Notice in the front of the book.

(2) Read the paragraphs on tuning procedure very carefully. Follow this procedure exactly. Failure to do so may cause damage or shorten tube life.

(3) Never throw the CW-PHONE switch with the plate power on.

(4) Be sure to follow paragraph 9*f*(3).

(5) ***Never fill the gasoline tanks of either the truck or the trailer while the transmitter is in operation.***

(6) When operating the radio set on frequencies below 3 megacycles, with the trailer unhitched from the truck and with an extension cable in use, the readings of ANTENNA CURRENT meter and P.A. PLATE meter are lower than the readings noted when the trailer is hitched to the truck. The decrease does not indicate insufficient power output but simply

that the current distribution in the radiating system has changed from that obtained when the trailer was hitched to the truck.

(7) At temperatures of about — 4° F. the mercury vapor rectifiers V_6 and V_7 (Type VT-46A) refuse to operate properly, hence, it is necessary to maintain an ambient temperature of 0° F. or higher within the truck when operating the transmitter.

b. Before attempting to operate the equipment within the truck, proceed as follows:

(1) Set the large ON-OFF switch marked CIRCUIT BREAKER on the control panel of the power unit to OFF, and check the operation and condition of this power unit in accordance with its instruction book.

(2) When completed push STOP button of the START-STOP switch on the control panel of the power unit and hold it in until the engine stops running. Some power units are issued with momentary push-to-stop switches which do not require that they be held down to stop the power unit. In general, on Ford powered units, the STOP button must be held in until the power unit stops. Willys powered units are issued with momentary push-to-stop switches.

(3) Set ON-OFF (CIRCUIT BREAKER) switch of the power unit to ON.

(4) On Speech Amplifier BC-614-(*):

(*a*) Set the transmitter control switch to TRANS. OFF.

(*b*) Set SIDETONE switch knob to OFF.

(*c*) Set the GAIN control knobs of both CARBON MIC. 1 and DYNAMIC MIC. 2 as far to the left as possible (minimum gain).

(*d*) Set both RECEIVER CONTROL switches to AUTO.

(*e*) On Speech Amplifier BC-614-D, set the REMOTE TELEPHONE - NORMAL switch at NORMAL.

(5) On Table MC-269-(*):

(*a*) Set the bar switch marked TRANSPOSE - NORMAL, on the PHONE AND SPEAKER CONTROL PANEL to NORMAL.

(*b*) Check the following connections to the receivers.

(*1*) When operating Radio Sets SCR-299-A, SCR-299-B and SCR-299-C see that Plugs PL-55 connect to receiver jacks marked PHONES 1ST AUDIO and Plugs PL-68 are in the receiver jacks marked SPEAKER 2ND AUDIO.

(*2*) When operating Radio Set SCR-299-D, see that Plugs PL-68 are in receiver jacks marked SPEAKER 2ND AUDIO.

(6) Set the electric heater switch to OFF.

(7) See that the FILAMENT POWER and PLATE POWER switches of Radio Transmitter BC-610-(*) are turned off, and that the EXCITER PLATE POWER and HIGH VOLTAGE PROTECT switches are at NORMAL.

9. Transmitting.

a. Putting Station In Readiness.—

(1) Push the START button on Control Box BC-731-(*) or Switch SW-199-A until the power unit starts and normal line voltage (110 to 125 volts) is indicated on the A. C. LINE VOLTAGE meter.

(2) Turn on all the electric lights of Table MC-269-(*).

(3) Remove two Headsets HS-30-(*), P-23 or P-20 from Chest CH-88 (wall). Connect one headset to a jack marked BC-312 and the other to a jack marked BC-342 on the PHONE AND SPEAKER CONTROL PANEL of Table MC-269-(*).

(4) Check the operation and condition of Radio Receivers BC-312-(*) and BC-342-(*) as outlined in their instruction books.

(5) Set SEND-REC. switches on the receivers to SEND.

CAUTION: These switches should be at SEND at all times. [See paragraph 9 *f* (3) and (4).]

(6) Turn on the electric heater or roof ventilator if either is desired.

b. C-W Transmission.—Always adjust the transmitter for c-w operation first. This is accomplished as follows:

(1) See that the PLATE POWER switch of the transmitter is at OFF, and left there. [See paragraph 9 *f* (2).] Also make sure the transmitter control switch on Speech Amplifier BC-614-(*) is at TRANS. OFF.

(2) Set FILAMENT POWER switch of the transmitter at ON. The green pilot lamp and the plate tuning dial should now light up, and the FIL. VOLTAGE meter should register.

(3) Adjust the FILAMENT VOLTAGE control

on the transmitter panel until the FIL. VOLTAGE meter indicates 5 to 5.3 volts.

(4) Select one tuning unit covering the desired frequency range from Chest CH-88 (wall).

(5) Lift open the right-hand door in the cover of the transmitter and firmly insert the tuning unit in one of the three available channels, marked 1, 2, 3. (Insert the tuning unit so that the switch marked M.O.-XTAL faces the front panel of the transmitter. See figure 27.) Leave this door open for further adjustments indicated in paragraph 9*c* or *d*.

(6) Set the BAND SWITCH on the front panel of the transmitter so its position number corresponds with the channel number where the tuning unit was placed.

(7) Select from Chest CH-88 (wall) one coil unit covering the desired frequency.

(8) Remove Capacitor CA-423 from Chest CH-88 (wall) if operation in the 2.0 to 2.5 megacycle frequency range is desired.

(9) Lift open the left hand door in the cover of the transmitter and insert coil unit (and Capacitor CA-423 if required). Close this door firmly to insure operation of the interlock switches.

(10) Set COUPLING control of Antenna Tuning Unit BC-729-(*) to the extreme left to decrease coupling to a minimum.

(11) Set the CW-PHONE switch of the transmitter at CW.

(12) Press either key. *The key must be held down while making subsequent tuning adjustments.*

c. ***M. O. (Master Oscillator) Control.*** — Proceed as follows:

(1) Set M.O.-XTAL switch of the tuning unit to M.O.

(2) Set the EXCITER PLATE POWER switch on the transmitter panel at ON. (Also throw the transmitter control switch of the speech amplifier to TRANS. ON when operating Radio Transmitter BC-610-D.)

(3) Set the P. A. GRID-INT. AMP. GRID meter switch on the front panel of the transmitter at P. A. GRID.

(4) Loosen the thumbscrew lock on the M.O. dial and set this dial of the tuning unit to the desired frequency as indicated by the TUNING CHART of Radio Transmitter BC-610-(*) pertaining to the tuning unit in use. [For greater accuracy use Frequency Meter Set SCR-211-(*).] Tighten the dial lock.

(5) Adjust the center knob marked DOUB. on the tuning unit for maximum reading as indicated on the GRID CURRENT meter.

(6) Adjust the INT. AMP. knob of the tuning unit for the maximum deflection on the GRID CURRENT meter.

(7) Repeat steps (5) and (6), (The GRID CURRENT meter will indicate between 60 and 100 milliamperes).

(8) Throw the EXCITER PLATE POWER switch on the front panel of the transmitter OFF and set the transmitter control switch of Speech Amplifier BC-614-D at TRANS. OFF. See paragraph 9 *c* (2).

(9) Close both cover doors. *Make certain that both left and right hand doors on the top cover of the transmitter are firmly closed upon the interlock switches, otherwise plate power cannot be applied.*

(10) Throw the HIGH VOLTAGE PROTECT switch up. ***Always do this before adjusting the P. A. PLATE wheel and the Antenna Tuning Unit BC-729-(*).***

(11) Set the transmitter control switch of the speech amplifier at TRANS. ON.

(*a*) The red pilot lamp should now light.

(*b*) The P. A. PLATE meter should indicate some value of current depending upon the setting of the PLATE TUNING wheel.

(12) Unlock the PLATE TUNING wheel by pushing down on the small knurled knob, and adjust this wheel until the P. A. PLATE meter dips to a minimum reading. *Do not change this adjustment from this point.*

(13) Lock the PLATE TUNING wheel by pushing the lock lever to the right.

(14) On Antenna Tuning Unit BC-729-(*):

(*a*) Set the SERIES COND. switch knob at 2-6 MC if operating below 6 megacycles, or to 6-8 MC if operating above 6 megacycles.

(*b*) Set the COUPLING knob to about the center of its scale.

(15) Ascertain from the tuning chart the approximate setting of the antenna loading inductor for the frequency you have selected.

(16) Turn the antenna loading inductor crank to approach this setting and watch for an indication of rising final plate current at the P. A. PLATE meter.

(17) Adjust the crank for maximum current at the P. A. PLATE meter.

(a) If the value as indicated on this meter exceeds 100 milliamperes decrease the coupling by turning the COUPLING knob on the antenna tuner to the left.

(b) If the value as indicated on this meter falls below 100 milliamperes increase the coupling by turning the COUPLING knob to the right or in the INCREASE direction.

(c) The ANTENNA CURRENT meter of the antenna tuner will now give some indication of antenna current.

(18) Next throw the HIGH VOLTAGE PROTECT switch on the transmitter panel down to NORMAL. Both the P. A. PLATE current meter of the transmitter and the ANTENNA CURRENT meter of the antenna tuning unit will now indicate substantially higher readings.

(19) Adjust the COUPLING knob on the antenna tuner until the P. A. PLATE current meter reads 290 milliamperes.

(20) Now carefully reset the inductor crank for maximum reading on the ANTENNA CURRENT meter.

(21) Readjust the COUPLING control and the inductor crank by repeating (19) and (20) until maximum antenna current occurs when the P. A. PLATE meter reads 290 milliamperes. ***CAUTION: Never exceed a value of 300 milliamperes as indicated by the P. A. PLATE meter; it is permissible to reduce coupling so the plate current is as low as 200 milliamperes if satisfactory c-w communication is still maintained. Do not readjust the PLATE TUNING wheel after it is once adjusted.*** See paragraph 9 c (12). ***A check will show that it remains adjusted if instructions have been followed.***

(22) Now release the key. With the opening of this key switch, the GRID CURRENT, P. A. PLATE, and ANTENNA CURRENT meters should all return to zero indication.

(23) Press the key and check the FIL. VOLTAGE meter. If necessary reset the FILAMENT VOLTAGE knob until the filament voltage is 5.0 to 5.3 volts; then release the key. The transmitter is now tuned and ready for c-w operation. As a further check, data on meter readings will be found in the Chart of Performance Characteristics, Section V.

(24) If a c-w telegraph transmission is not contemplated at the moment, throw the transmitter control switch on the panel of the speech amplifier to TRANS. OFF, thus shutting off the plate power.

Note: To turn off the transmitter completely, set the FILAMENT POWER switch on the transmitter panel at OFF.

d. ***Crystal Oscillator Control.***—Follow all the steps outlined in paragraph 9 b (1) through (12), then proceed as follows:

(1) Set the M.O.-XTAL switch on the tuning unit at XTAL.

(2) Insert a crystal of proper frequency into the XTAL jacks of the tuning unit.

(3) Set the BUFFER-DOUBLER-INTERMEDIATE AMPLIFIER switch on the front panel of the transmitter to BUFFER-DOUBLER. On some earlier models this position of the switch was mistakenly marked OSCILLATOR. However, the current measured is that of the buffer-doubler stage.

(4) Set the EXCITER PLATE POWER switch of the transmitter at ON. (Also throw the transmitter control switch of the speech amplifier to TRANS. ON when operating Radio Transmitter BC-610-D.)

CAUTION: The door over the tuning units in the cover of the transmitter should be open at this time to keep the high voltage from reaching the final amplifier.

(5) Set the P. A. GRID-INT. AMP. GRID meter switch on the front panel of the transmitter at P. A. GRID.

(6) Observe the reading on the EXCITATION PLATE meter to make sure the crystal is oscillating. This meter will indicate approximately 40 to 50 milliamperes when the crystal circuit oscillates.

(7) From here on, tune the transmitter by following steps (5) through (24) as outlined in paragraph 9 c. At this time it may be helpful to remember that within the 2 to 4 megacycle range the crystal frequency is the same as the transmitter output frequency, and the circuit controlled by the DOUB. knob on the tuning unit then operates as a buffer stage. At all other times this stage acts as a doubler; hence the crystal frequency is one-half the output frequency when transmitting from 4 to 8 megacycles. Thus a crystal whose frequency is 2200 kilocycles may be used with Tuning Unit TU-47 to produce the same frequency in the transmitter output; or it may be used with Tuning Unit TU-50 to operate the transmitter at 4400 kilocycles.

e. Voice Transmission. — Follow all the operations exactly as outlined in paragraph 9 *b* (1) through (12) and in either paragraph 9 *c* (1) through (24) for M.O. operation or in paragraph 9*d* (1) through (7) for XTAL operation. Then proceed as follows:

(1) Make sure that the transmitter control switch of Speech Amplifier BC-614-(*) is at TRANS. OFF. (When operating with Speech Amplifier BC-614-D also make sure that the REMOTE TELEPHONE-NORMAL switch is at NORMAL for the following operations.)

(2) Set the MODULATOR BIAS control on the front panel of the transmitter to the extreme left. (This setting increases the bias so that the MOD. PLATE meter will not indicate until further adjustments are made.)

(3) Set the CW-PHONE switch on the transmitter panel at PHONE.

(4) Remove Microphone T-50-(*) from its mount on the table. Pull it toward you to release the catch.

(5) Press the press-to-talk switch button on the microphone. ***Note: This puts the transmitter carrier on the air.*** The P. A. PLATE meter should now read approximately 250 milliamperes, which is the normal plate current for voice operation.

(6) Release the press-to-talk switch on the microphone. ***Caution: Never exceed a value of 260 milliamperes as indicated by the P. A. PLATE meter during voice operation.*** If the transmitter has been adjusted for a plate current of 290 milliamperes on C-W, the plate current will drop to 250 milliamperes when switched to voice operation since the CW-PHONE switch automatically reduces the final amplifier plate voltage. If the P. A. PLATE meter reads more than 260 milliamperes, adjust the COUPLING control on the antenna tuning unit until the proper plate current is obtained.

(7) Hold the microphone in the left hand, press the press-to-talk switch and with the right hand adjust the MODULATOR BIAS control on the front panel of the transmitter until the MOD. PLATE meter indicates 40 milliamperes. Release the press-to-talk switch.

(8) Hold the microphone in a normal speaking position (This position varies with voice characteristics; it is usually from 2 to 6 inches away from the mouth). Press the press-to-talk switch and speak (don't whisper or mumble) into it at your normal voice level. Continue talking and make the following adjustments.

(*a*) Adjust the DYNAMIC MIC. GAIN control knob on the speech amplifier until the OUTPUT LEVEL meter indicates approximately O db on voice peaks.

(*b*) Observe the MOD. PLATE meter. If its indicator swings higher than 200 milliamperes on the extreme voice peaks, reduce the gain by resetting the DYNAMIC MIC. GAIN control knob. (Turn to the left.) The 200 milliampere value represents approximately 100% modulation with the transmitter properly loaded.

(9) Releasing the press-to-talk switch button will now take the carrier off the air. The transmitter is ready for voice communication and should be controlled by the press-to-talk switch button on the microphone.

Note: If the REMOTE TELEPHONE-NORMAL switch on Speech Amplifier BC-614-D is set at REMOTE TELEPHONE, voice transmission without press-to-talk control of the transmitter may be made by setting the transmitter control switch on the speech amplifier panel to TRANS. ON during transmissions and to TRANS. OFF to terminate the transmission. This procedure is not recommended as general practice.

(10) To turn off the transmitter completely, set the FILAMENT POWER switch to OFF.

f. Transmitter Operation. — When operating Radio Transmitter BC-610-(*) in Radio Set SCR-299-(*) remember the following:

(1) The principal switch used to control the transmitter is the transmitter control switch located on the speech amplifier. It is operated between its upper (TRANS. ON) and neutral (TRANS. OFF) positions.

(2) The PLATE POWER switch on the transmitter must always be left at OFF; otherwise, automatic disabling of the receivers is not possible. This switch should be used only in an emergency or during servicing if the transmitter is away from the truck.

(3) *Always leave the RECEIVER CONTROL switches at AUTO. to avoid burning out the receiver input circuits.* The only exception to this is when it is necessary to monitor a frequency other than the transmitter frequency or its harmonic during transmissions. In this case, the RECEIVER CONTROL switch corresponding to the receiver to be used is set at MAN. This procedure is permissible only

when the frequency to be monitored is considerably different from the transmitter frequency, and is not at a harmonic of the transmitter frequency; otherwise damage to the receiver will result. The disabling short circuits the receiver input connections to protect the antenna coils and also short circuits the loudspeakers to prevent acoustic feedback to the dynamic microphone.

(4) The disabling circuits are ready to function when the receiver SEND-REC. switches are at SEND, and the speech amplifier RECEIVER CONTROL switches are at AUTO.

(5) Disabling of receivers occurs automatically as follows:

(*a*) In c-w operation, with the transmitter control switch on the speech amplifier set to TRANS. ON. (When operating Radio Set SCR-299-D the disabling will not be completed until Key J-37 is pressed.)

(*b*) In voice operation:

(*1*) When the transmitter control switch is set to TRANS. ON.

(*2*) When it is set to TRANS. OFF and the press-to-talk switch is pressed on either Microphone T-50-(*), carbon Microphone T-30-(*) (Throat), or carbon Microphone T-17.

Note: The REMOTE TELEPHONE - NORMAL switch on Speech Amplifier BC-614-D must be set at REMOTE TELEPHONE.

CAUTION: Automatic disabling cannot occur unless the PLATE POWER switch on the front panel of the transmitter is set at OFF.

(6) ***Changing the Type of Emission.*** — After the transmitter has been tuned for voice operation as outlined in paragraph 9*e* it can be switched to c-w operation without further tuning adjustments by setting the CW-PHONE switch at CW and the transmitter control switch on the speech amplifier at TRANS. ON.

CAUTION: Never throw the CW-PHONE switch while the final amplifier plate power is on.

The transmitter may be returned to voice operation again by setting the transmitter control switch at TRANS. OFF and switching the CW-PHONE switch to PHONE.

(7) Besides the use of Microphone T-50-(*) there are three additional means of modulating the transmitter. They are:

(*a*) Microphone T-30-(*) (Throat), to be used if gas masks must be worn. The plug on the end of its cord can be inserted into the CARBON MIC. 1 jack on the speech amplifier panel. The adjacent GAIN knob will control the gain for this microphone and the press-to-talk switch on the microphone cord will control the transmitter in the same way that the press-to-talk switch does on Microphone T-50-(*).

(*b*) Microphone T-17. It is plugged into the same jack and used in exactly the same way as Microphone T-30-(*).

(*c*) Handset TS-9 of Telephone EE-8-(*) which is connected to the wiring in Table MC-269-(*). This handset is clamped on the outside of the telephone mounting box. When the transmitter control switch on the panel of the speech amplifier is set to TRANS. ON and the press-to-talk switch on the handset of Telephone EE-8-(*) is pressed, it is possible to modulate the transmitter. (The REMOTE TELEPHONE-NORMAL switch of Speech Amplifier BC-614-D must be at REMOTE TELEPHONE.) The press-to-talk switch in this case does not control the transmitter but merely connects battery current to the microphone. Throwing the transmitter control switch down to RECEIVERS TO EE-8 connects the output of one receiver to the earpiece of the handset. The choice of receivers is selected from position BC-312 or position BC-342 of the FIELD TELEPHONE switch on the PHONE AND SPEAKER CONTROL PANEL of Table MC-269-(*).

(8) ***Changing Frequency, Case 1.*** — The transmitter will accommodate three tuning units, each of which may be instantly selected by the BAND SWITCH. Each tuning unit may be tuned to a separate frequency, ready for use when needed. Since there are three complete sets of tuning units available, it is possible to install three tuning units of the same range, which can be covered by one coil unit. With each tuning unit pretuned to a different frequency within the range of the coil unit, change of the transmitting frequency would then be accomplished as follows:

(*a*) Set the transmitter control switch at TRANS. OFF (if operating C-W) or release the press-to-talk switch (if operating voice).

(*b*) Reset the BAND SWITCH to the desired frequency.

(*c*) Throw the HIGH VOLTAGE PROTECT switch up.

(*d*) Set the transmitter control switch to TRANS. ON and close the key (for C-W) or press the press-to-talk switch (for voice).

(*e*) Slightly retune the PLATE TUNING wheel for a minimum current reading on the P. A. PLATE meter.

(*f*) Adjust the antenna tuning unit inductor crank for a maximum current reading on the P. A. PLATE meter.

(*g*) Throw HIGH VOLTAGE PROTECT switch to NORMAL.

(*h*) Adjust the COUPLING control on the antenna tuning unit for a P. A. PLATE meter reading of 290 milliamperes (C-W) or 250 milliamperes (voice).

(*i*) Reset the inductor crank for a maximum reading on the ANTENNA CURRENT meter.

Note: When the change in frequency is small only steps (*a*), (*b*), and (*d*) may be necessary, but do not disregard the remaining steps.

(9) ***Changing Frequency, Case 2.***—When the three tuning units plugged into the transmitter cover two or more frequency ranges, it is necessary when switching from one frequency to another to observe these precautions:

(*a*) Before changing the BAND SWITCH setting to another channel, open the cover door over the coil unit compartment and determine whether or not the frequency range of the coil unit is correct. If not, remove it and place it in Chest CH-88.

(*b*) Install the proper coil unit for the frequency selected.

(*c*) Close the cover door over the coil unit compartment.

(*d*) Set the BAND SWITCH to the desired channel.

(*e*) Assuming that the tuning unit has already been tuned up, and that the cover door over this compartment is closed, tune the final amplifier and antenna circuits as outlined in the step by step procedure in paragraph 9 *b* (10) through (12) and in paragraph 9 *c* (10) through (24) for c-w operation; or throw the CW-PHONE switch to PHONE at the completion of retuning if voice operation is required.

(10) The tuning units are tuned up in the transmitter by following the steps outlined in paragraph 9 *c* (1) through (7) for M. O. control operation, or paragraph 9 *d* (1) through (6) and paragraph 9 *c* (5) through (7) for crystal control operation.

(11) When the radio station is in motion, it is advisable to speak very close to the microphone with the lips almost touching it so as to exclude unwanted noises. This may require readjustment of the GAIN control on the panel of the speech amplifier to avoid over modulation.

(12) During transmissions on critical frequencies (2 to 2.5 and 6 to 8 megacycles) under certain conditions of unusual weather or altitudes high above sea level, extreme voice peaks may cause flashovers. The overload relay will trip out and momentarily interrupt communication until it is reset by the OVERLOAD RESET switch button on the front panel of the transmitter. To overcome this flashover condition:

(*a*) Switch to a favorable operating frequency,

(*b*) Stop the truck and transmit from a fixed position, but first unguy the antenna and insert one or two Mast Sections MS-54 to provide added height and readjust the antenna tuning unit.

(*c*) Use the auxiliary transmitting antenna, or

(*d*) Decrease the setting of the COUPLING control on the antenna tuning unit until the plate current (P. A. PLATE meter) runs about 200 to 210 milliamperes. ***CAUTION: Do not reduce the plate current below 200 ma.*** With reduced plate current less modulation is required, hence the GAIN control on the speech amplifier should be adjusted so that the voice peaks do not swing the modulator plate current readings (MOD. PLATE meter) above 150 milliamperes.

(13) OVERLOAD RESET Switch.—If the high voltage circuits are overloaded (as by excessive plate current plus heavy modulation), the overload relay will trip and shut off the plate power. When this occurs press the OVERLOAD RESET switch and continue with the transmission. If the overload persists, check

the tuning adjustments and meter readings. See Section V.

(14) *Keying.* — The transmitter is normally keyed by means of Keys J-37 or J-44. However, an emergency keying Jack J_{101} is provided on BC-614-(*). In the event of failure of 12-volt supply or of relay RY_{101}, it is possible to key from this jack after setting the transmitter control switch on BC-614-(*) at TRANS. ON.

CAUTION: Since receiver disabling circuits will not operate in this case, the receivers must be detuned from the operating frequency or its harmonics to prevent damage to them.

g. ***Remote Control Of The Transmitter.*** — A complete description of the equipment and facilities provided for remote control will be found in paragraph 3 *a* (2) (*b*) and (*c*). Its functioning is further described in paragraph 13 *f*. For remote control operation connect the equipment as follows:

(1) Unstrap the unconnected Telephone EE-8-(*) from its mounting compartment on Table MC-269-(*). Before leaving the truck make sure its batteries are in good condition, and the screw switch is set to L.B.

(2) Remove Junction Box JB-60 and Key J-45 from Chest CH-89.

(3) Remove Axle RL-27-(*) from Chest CH-89 for use with either or both Reels DR-4, which should be dismounted, as required, from the truck.

(4) Carry Telephone EE-8-(*), Junction Box JB-60, and Key J-45 to the point where remote control is to be established.

(5) Connect the cord of Junction Box JB-60 to the Telephone EE-8-(*) at terminals L_1 and L_2.

(6) Insert the plug on the cord from Key J-45 into the jack on Junction Box JB-60.

(7) Using Wire W-110-B from Reel DR-4 run a line between the remote station and the radio station in the truck.

(8) Connect the two leads at the truck end of the line to terminals marked LINE on the outside of Junction Box JB-49-C or JB-69-A, depending on which radio set you are operating.

(9) Connect the two leads at the remote end of the line to the two line terminals on Junction Box JB-60.

(10) The telephone at the remote station is now connected to the telephone in the truck. Communication between these points may be established at this time by operating Telephones EE-8-(*) according to instructions in Technical Manual TM 11-333.

(11) The remote station may now instruct the radio operator in the truck to turn on the radio transmitter for voice operation and to adjust the speech amplifier gain (DYNAMIC MIC. 2) so the remote station can properly modulate the transmitter. This is accomplished by exactly the same procedure as outlined in paragraph 9 *f* (7) (*c*). Note that both telephones are on the same circuit; thus both share the same facilities. The radio operator at the truck must switch in the output of either receiver so that it may be heard at the remote station.

(12) Since press-to-talk operation of the transmitter is impossible from either telephone, the remote station must, at the end of transmission, signal the operator at the truck to throw the transmitter control switch to RECEIVERS TO EE-8. This provides receiver reception at the remote station. (The REMOTE TELEPHONE-NORMAL switch on Speech Amplifier BC-614-D must be set at REMOTE TELEPHONE.)

(13) If remote keying for c-w transmission is desired, the radio station operator should be instructed to place the transmitter in c-w operation. When this is done, Key J-45 is used to key the transmitter from the remote point. Again the local operator must switch the transmitter control switch to RECEIVERS TO EE-8 to provide reception at the remote point. (During remote c-w operation, the REMOTE TELEPHONE-NORMAL switch on Speech Amplifier BC-614-D must be left at NORMAL.)

(14) Remote keying of the transmitter in two way communication or net operation may be done without the assistance of a station operator at the truck, if an independent means of reception is available at the remote point. The latter is accomplished by removing Radio Receiver BC-312-(*) and its accessories from the truck. (See paragraph 10 *b*.)

h. ***Use Of Extension Cables.*** — (SCR-299-A and SCR-299-B.)

(1) To operate the trailer up to 100 feet from the truck, proceed as follows:

(*a*) Restore all operating controls in the station to OFF, and NORMAL and stop Power Unit PE-95-(*).

(*b*) Set CIRCUIT BREAKER (ON-OFF) switch located on instrument panel of Power Unit PE-95-(*) to OFF.

(*c*) Remove D. C. OUTPUT FUSE from the fuse receptacle located on instrument panel of Power Unit PE-95-(*).

(*d*) Disconnect the wires from START and STOP terminals on terminal strip of Junction Box JB-49-(*), and tape the ends well.

(*e*) Disconnect all of the remaining wires from terminal strip of Junction Box JB-49-(*).

(*f*) Unscrew the large wing nut retaining the housing of the power cables to floor of truck near the junction box and drop the cable housing from the truck.

(*g*) Pull out pin releasing the small wheel at end of trailer.

(*h*) Remove cotter pin from pintle of truck and open pintle so that lunette of trailer is released.

(*i*) Remove trailer electric light plug from socket at rear end of truck.

(*j*) Disconnect chains of trailer from truck and, with the aid of additional personnel, remove trailer from pintle of truck and set trailer down.

(*k*) Drive truck any desired distance from trailer up to 100 feet away.

(*l*) Remove Cords CD-557 and CD-559 contained in left and right duffle cabinets and Cord CD-561 and the extension cable terminal box from Chest CH-89.

(*m*) Connect leads at one end of each of the Cords CD-557, CD-559 and CD-561 to terminal strip of Junction Box JB-49-(*), and connect the other ends to the terminal strip of the extension cable terminal box placed at the trailer.

(*n*) Reconnect power cables of trailer to terminal strip of extension cable terminal box.

(*o*) Reinsert the D. C. OUTPUT FUSE into the fuse receptacle and throw the CIRCUIT BREAKER (ON-OFF) switch ON.

(*p*) Operation of Radio Set SCR-299-(*) may now proceed as a fixed (stationary) radio station.

(2) To operate the radio set from an external power source up to 100 feet away, proceed as follows:

(*a*) Select a power source which can supply 5 kilowatts of 115-volt, 50 or 60 cycle, single phase alternating current.

(*b*) Perform the operations outlined in paragraph 9 *h* (1) (*a*) through (*e*) above.

(*c*) Remove Cord CD-559 from the left duffle cabinet and connect one end to the A. C. terminals in Junction Box JB-49-(*).

(*d*) Connect the other end of Cord CD-559 to the source of power.

(3) Power for auxiliary purposes may be supplied from Power Unit PE-95-(*) to any point up to 200 feet away as follows:

(*a*) Perform the operations outlined in paragraph 9 *h* (1) (*a*) and (*b*) above.

(*b*) Remove the 200-foot extension cord located on the right side of the trailer.

(*c*) Connect one end of this cord to the A. C. OUTPUT terminals located on the terminal strip beneath the instrument panel of Power Unit PE-95-(*).

(*d*) Prepare the leads on the other end of this cord for desired connection.

(*e*) Throw the CIRCUIT BREAKER (ON-OFF) switch ON. CAUTION: Available power is approximately 1 kilowatt while radio station and heater are in operation, 2½ kilowatt if heater is left off, 5 kilowatt is available if radio set and heater are turned off.

i. ***Use Of Extension Cables.*** — (SCR-299-C and SCR-299-D.)

(1) To operate the trailer up to 100 feet from the truck, proceed as follows:

(*a*) Remove the plugs of the trailer power cord and stop light cord from their sockets underneath the rear of the truck.

(*b*) Unhitch the trailer from the truck.

(*c*) Drive the truck to any point within 100 feet of the trailer.

(*d*) Remove Cord CD-652 from the duffle cabinet.

(*e*) Insert the plug end of this extension cord into the power socket underneath the rear of the truck.

(*f*) Insert the plug of the power cord on the trailer into the socket end of the extension cord. The truck and trailer are now interconnected and their operation will proceed in the normal manner.

(2) To operate the trailer 200 feet from the truck, proceed as follows:

(*a*) Perform the steps indicated in (1), (*a*) and (*b*) above and drive the truck to any point within 200 feet of the trailer.

(*b*) Remove Cord CD-652 from the duffle cabinet, Cord CO-314 from the seat bench, and Cord CO-313 from the trailer.

(*c*) Insert the plug end of Cord CD-652 into the power socket underneath the rear of the truck.

(*d*) Insert the plug of Cord CO-314 into the socket end of Cord CD-652.

(*e*) Twist the leads of Cord CO-314 around the terminals of Cord CO-313, and tape these connections.

(*f*) Insert the plug on the power cord of the trailer into the socket end of Cord CO-313.

Since this is an emergency measure not ordinarily used, it will be necessary to start or stop the power unit with the switch at the trailer instead of remotely with the switch at the truck. The 12-volt supply for the radio station ordinarily obtained from the trailer will now have to be supplied by the spare battery in the truck.

(3) To operate the radio set from an external power source up to 100 feet away proceed as follows:

(*a*) Select a power source which can supply 5 kilowatts of 115-volt, 50 or 60-cycle, single phase alternating current.

(*b*) Remove the plug of the trailer power cord from the power socket underneath the rear of the truck.

(*c*) Insert the plug end of Cord CD-652 into the power socket under the rear of the truck.

(*d*) Insert the plug end of Cord CO-314 into the socket of Cord CD-652.

(*e*) Connect the bare leads of Cord CO-314 to the source of power and tape the resulting joints if the connection is exposed. The radio set is now ready to operate.

(4) Power for auxiliary purposes may be supplied from the power unit within a radius of 200 feet. There are two conditions under which auxiliary power may be supplied by the power unit. These are as follows:

(*a*) If the radio set is not in use at the time the auxiliary power is needed, proceed as follows:

(*1*) Remove the plug of the trailer power cord from the power socket underneath the rear of the truck.

(*2*) Insert the trailer power cord plug into the socket of Cord CD-652.

(*3*) Connect Cord CO-313 and Cord CD-652 thus providing a pair of bare leads for the auxiliary load. Connect the load, tape up the joint, and the set-up is ready for operation.

CAUTION: This system will supply up to 5 kilowatts of auxiliary power. Do not exceed this value. Consult Technical Manual TM 11-904 covering Power Unit PE-95-(*). Power Units PE-95-A, PE-95-B and PE-95-C are Ford powered. Power Units PE-95-E, PE-95-F and PE-95-G are Willys powered. Be sure you have the proper technical manual for your power unit.

(*b*) If auxiliary power is required while Radio Set SCR-299-(*) is in use, proceed as follows:

(*1*) Connect the terminals of Cord CO-313 to the a-c terminals of the power panel of the power unit.

(*2*) Connect Cord CD-652 to Cord CO-313.

(*3*) Connect CO-313 to CO-314.

(*4*) Connect the bare leads of CO-314 to the load.

CAUTION: This system described will supply one kilowatt of auxiliary power if the heater in the radio station is in operation or 2.5 kilowatts of auxiliary power when the heater is not being used.

j. ***Auxiliary Transmitting Antenna.***—(SCR-299-C and SCR-299-D only.)

(1) When the radio set is used in a fixed location and communication is carried on at frequencies lower than 4.5 megacycles, the auxiliary transmitting antenna will produce considerably higher signal strength.

(2) To install this antenna proceed as follows:

(*a*) Remove the auxiliary transmitting antenna from the seat bench where it is packed on its reel.

(*b*) Remove Mast Sections MS-49 to MS-53 inclusive from Mast Base MP-47.

(*c*) Attach the knurled screw located at the end of the auxiliary antenna to the top of Mast Base MP-47, running its stud through the lug on the antenna which acts as the electrical connection for the antenna current.

(*d*) Unroll the antenna wire from the reel together with its insulator and rope.

(*e*) Secure the end of the rope to a tree, high pole, or other support. Keep the antenna as high and as free from surrounding objects as possible, and as taut as the supports will permit. ***Never run the transmitting antenna close to the receiving antennas.***

(3) Adjustments of the tuning units and PLATE TUNING will remain exactly the same as for whip antenna operation. The settings for the controls on Antenna Tuning Unit BC-729-(*) will be different for the auxiliary antenna tuning adjustments. The frequency range of the auxiliary antenna with Antenna Tuning Unit BC-729-(*) is from 2 to about 4.5 megacycles. It will be found that considerably fewer turns of the loading coil should be used than with a whip antenna and at the higher frequency end of the range, (from about 3 to 4.5 megacycles) it will probably be necessary to set the SERIES COND. switch on the front of the antenna tuning unit to 6-8 MC. Except for this, in making the antenna tuning adjustments follow the same rules as with the whip antenna. See paragraph 9 *c* (16) to (21). ***Note:*** *When using the auxiliary transmitting antenna keep the trailer hitched to the truck. If the trailer is disconnected it will not be possible to obtain sufficient loading on the lower frequencies.*

10. Receiving.

Radio Set SCR-299-(*) is equipped with one each radio receiver BC-312-(*) and BC-342-(*).

a. ***Operation Of Receivers.*** — Complete information on their operation will be found in Technical Manual TM 11-850 for Radio Receivers BC-312-(*) and BC-342-(*) included with this radio set. In operating these receivers remember they are not separate components but interconnected parts of the radio station. To prolong the life of and obtain maximum benefit from these receivers, note the following points:

(1) The REC-SEND switches of both receivers should be at SEND at all times.

(2) Observe the automatic disabling of the receivers at all times during transmission periods unless the receiver frequency is not near the fundamental or second harmonic of the transmitter frequency.

(3) Automatic disabling of both receivers is accomplished by setting the two RECEIVER CONTROL switches of the speech amplifier at AUTO.

(4) Automatic disabling is discontinued by setting the RECEIVER CONTROL switches at MAN. (manual). Each receiver has its own switch and operates independently of the other.

(5) Sidetone may be switched to the headset jacks marked BC-312 or BC-342 on the PHONE AND SPEAKER CONTROL PANEL by setting the SIDETONE switch on the speech amplifier at ON BC-312 or ON BC-342. This permits the use of the headsets to monitor the keying of c-w transmissions.

(6) All power, antenna and output wiring to the receivers has been installed as a part of the radio station.

(7) Receiver output wiring for Loudspeakers LS-3 and for the headsets is brought out to switch connections on the PHONE AND SPEAKER CONTROL PANEL of Table MC-269-(*) where the transpose switch and jacks for headsets are located. Two jacks in parallel are provided for each receiver output so that both operators may listen to the same receiver if necessary.

(8) The transpose switch of the PHONE AND SPEAKER CONTROL PANEL transposes the speakers and phone jacks from one receiver to the other as follows:

(*a*) With the transpose switch set at NORMAL, the loudspeaker mounted next to Radio Receiver BC-342-(*) and the jacks marked BC-342 on the control panel are all connected to this receiver; the same holds true with respect to Radio Receiver BC-312-(*), and its speaker and jacks.

(*b*) With the transpose switch set at TRANSPOSE, the speaker and phone jacks normally connected to Radio Receiver BC-342-(*) are switched to Radio Receiver BC-312-(*) and the latter's speakers and phone jacks are transposed to the other receiver. Thus if one operator is tuning the transmitter, or typing, the other can monitor both receivers, switching from one to the other instantly. ***Caution*: Reread Paragraph 9 *a* (5) and 9 *f* (3).**

b. ***Remote Receiver Operation.*** — When necessary, Radio Receiver BC-312-(*) may be removed from the truck and operated at a remote point. This is accomplished as follows:

(1) Release the wing-nuts of Mounting FT-178 and disengage the rods.

(2) Cut the safety wires holding the slide fasteners of Mounting FT-162.

(3) Pull out the slide fasteners.

(4) Remove the antenna and audio output connections.

(5) Disconnect the ground wire.

(6) Disconnect Plug PL-114 of cord CD-565 from Socket SO-94 on the panel of the receiver.

(7) Remove Radio Receiver BC-312-(*) from Table MC-269-(*).

(8) From Chest CH-89 obtain the roll of wire for the antenna and Cord CD-563.

(9) Connect Plug PL-114 of Cord CD-563 to Socket SO-94 on the receiver.

(10) Remove the spare 12-volt storage battery from the spare battery box in the truck.

(11) Transport the receiver, its headset, storage battery, and antenna wire to the desired location.

(12) Observing the proper polarity, connect the battery clips of Cord CD-563 to the 12-volt storage battery.

(13) Erect a suitable receiver antenna and connect it to the ALT. SIG. ANT. terminal of the receiver.

(14) Insert plug of the cord of Headset HS-30-(*), P-20 or P-23 into the phone jack of Radio Receiver BC-312-(*). The receiver is now ready for operation.

c. ***Emergency Receiver Operation.*** — To operate Radio Receiver BC-312-(*) when the trailer is disconnected or has a dead battery, proceed as follows:

(1) Remove the 12-volt line fuse from the control panel of the power unit if the power unit is still electrically connected to the truck.

(2) Connect the truck's spare battery cord to the spare battery using the plug outlet on the spare battery box. Also connect the spare battery cord to Table MC-269-(*) at socket SO_{202}.

(3) Turn on and operate Radio Receiver BC-312-(*) as usual.

FOR MAINTENANCE INSTRUCTION AND THEORY GO ON TO SECTIONS III, IV AND V

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SECTION III — FUNCTIONING OF PARTS

11. Radio Transmitter BC-610-(*).

a. ***Mechanical Construction.*** — Radio Transmitter BC-610-(*) is assembled into a sheet steel cabinet with chassis decks. All metal parts are protected by plating or painting. The assembly consists of three principal decks or chassis on which are mounted the component parts of the transmitter together with a front panel on which are mounted external controls and indicating instruments.

(1) The upper section includes all of the radio frequency components, indicating instruments, filament supply for the radio frequency tubes and channels for plugging in tuning units to transmit at various frequencies. See figure 27 for these tuning units and the components of the top deck. On the front panel of the upper section are located meters to indicate the following: doubler-buffer plate current or intermediate amplifier plate current, intermediate amplifier or power amplifier grid current, power amplifier plate current, modulator plate current, and power amplifier filament voltage. Also there is a switch provided for selecting any one of three tuning units as well as a switch for selecting plate current reading of the buffer or intermediate amplifier tube. (On some early models the panel engravings were in error and designated the upper position of this switch as OSCILLATOR instead of BUFFER-DOUBLER. However, the meter reading obtained is that of the buffer-doubler stage.) Another switch is provided for selecting grid current of the intermediate amplifier or power amplifier tube, and there is a tuning control for resonating the power amplifier plate circuit.

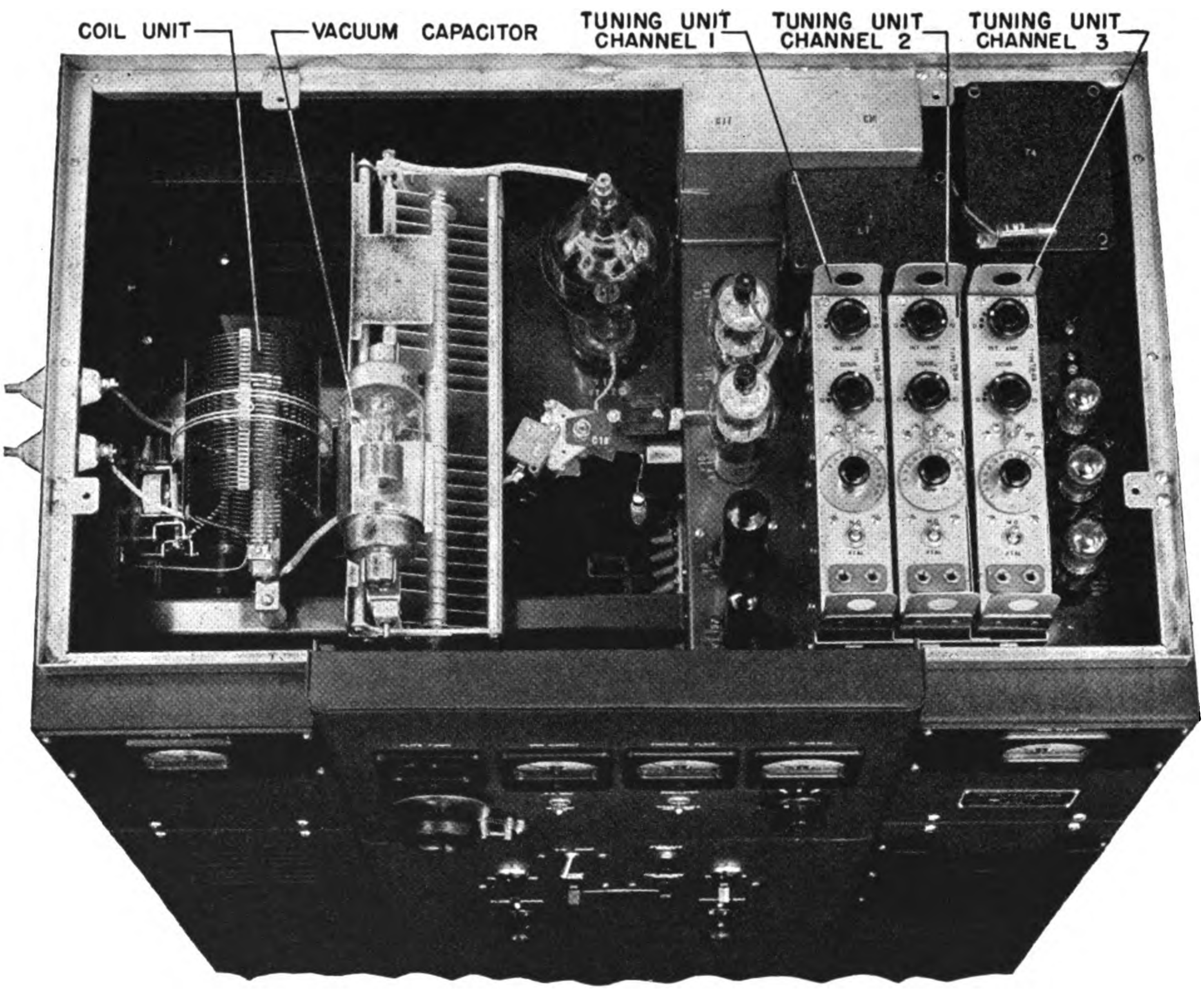


FIGURE 27. RADIO TRANSMITTER BC-610-(*), TOP VIEW, COVER REMOVED.

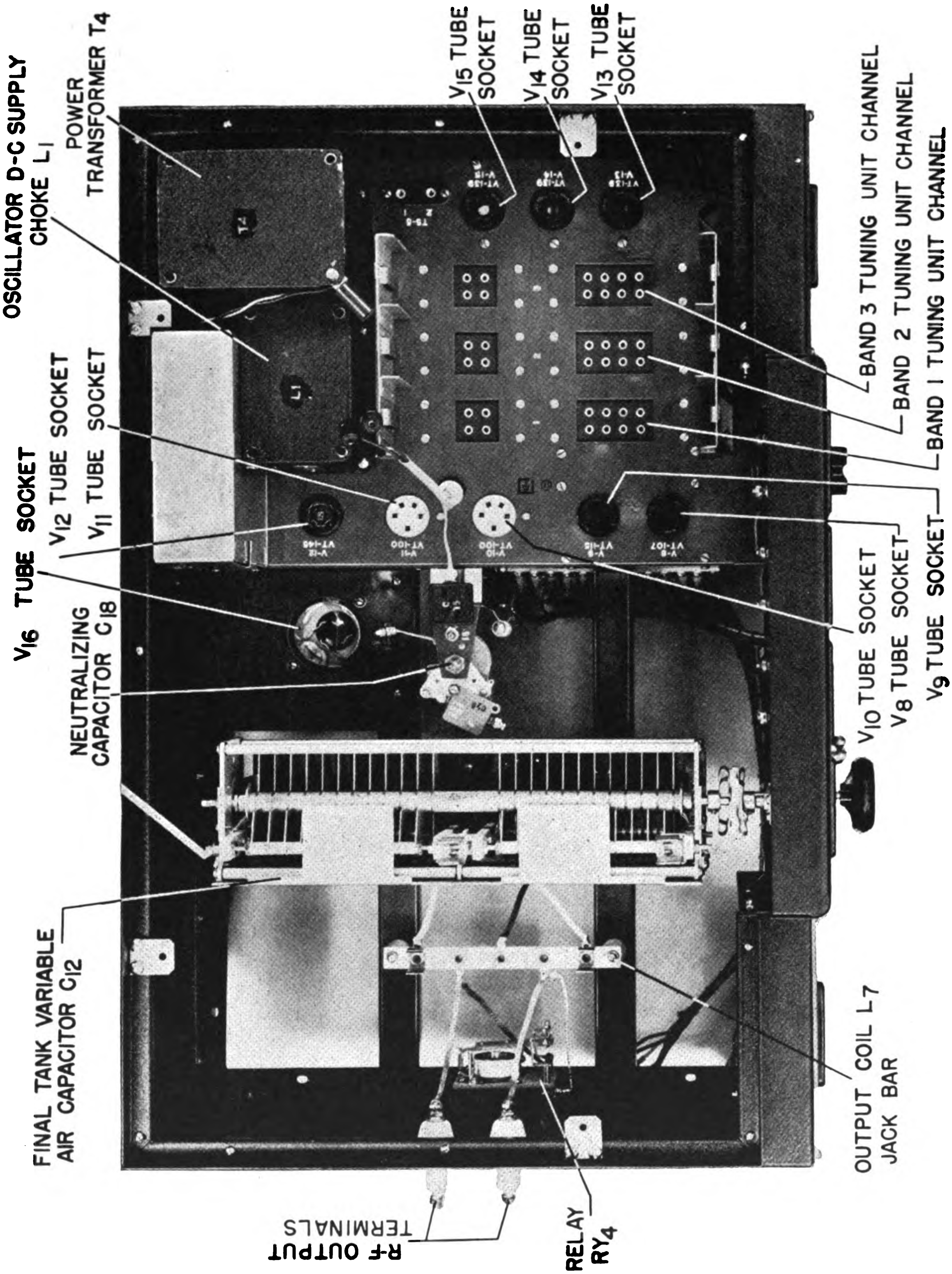


FIGURE 28. RADIO TRANSMITTER BC-610-(*), R-F SECTION, TOP VIEW, LESS TUBES, TUNING UNITS, COIL UNIT, AND VACUUM CAPACITOR.

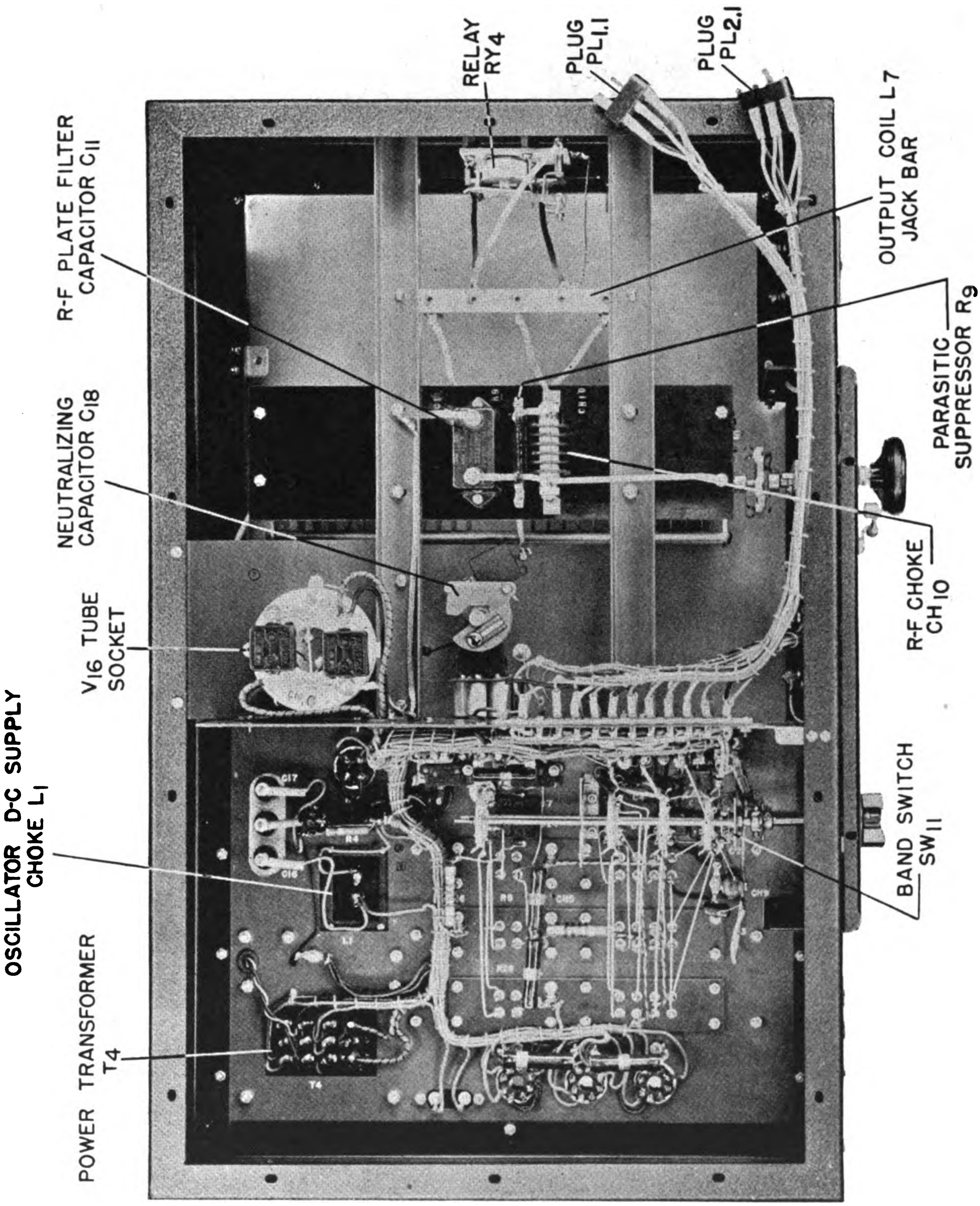


FIGURE 29. RADIO TRANSMITTER BC-610-(*), R-F SECTION, BOTTOM VIEW.

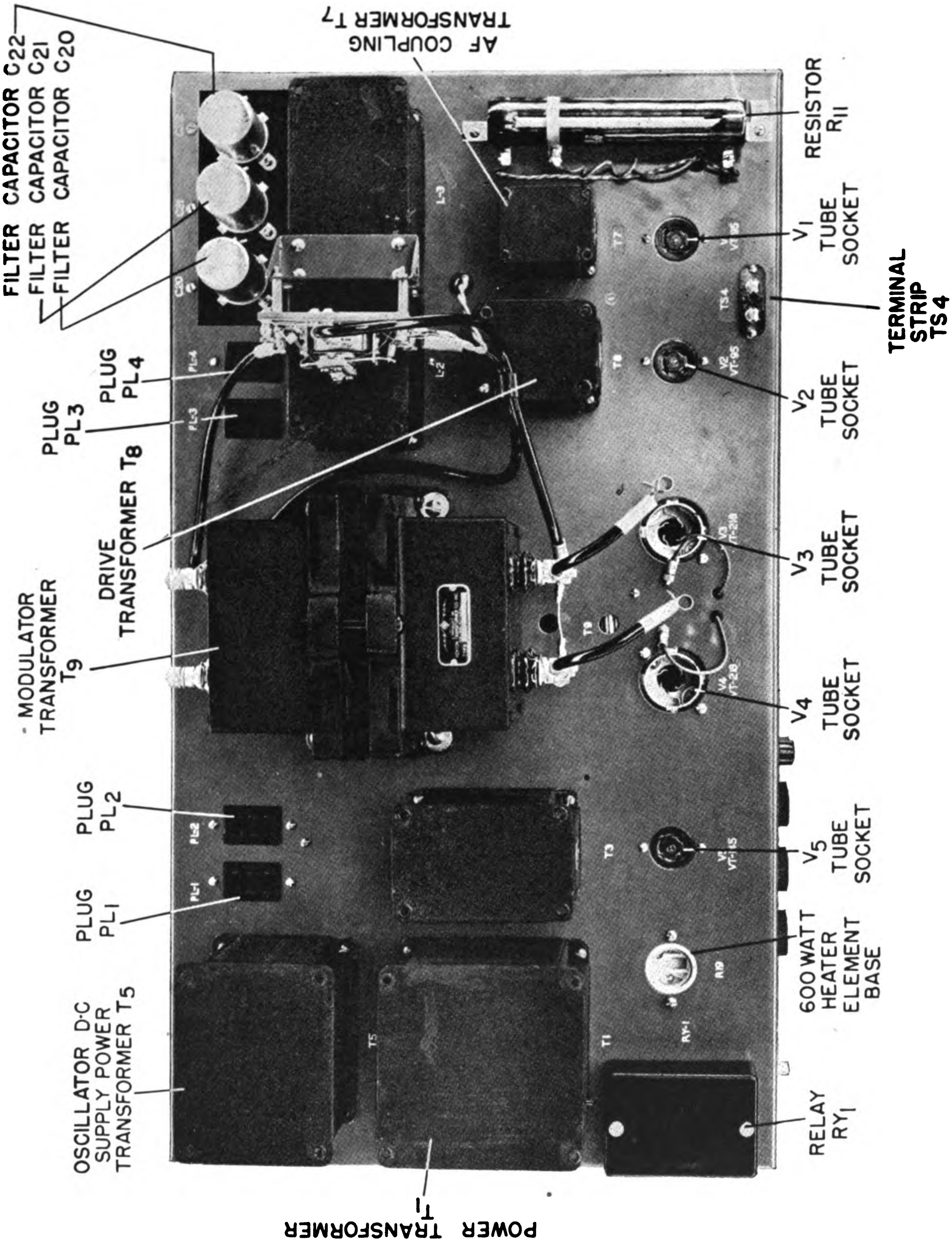


FIGURE 30. RADIO TRANSMITTERS BC-610-A, BC-610-B AND BC-610-C, MODULATOR SECTION, TOP VIEW.

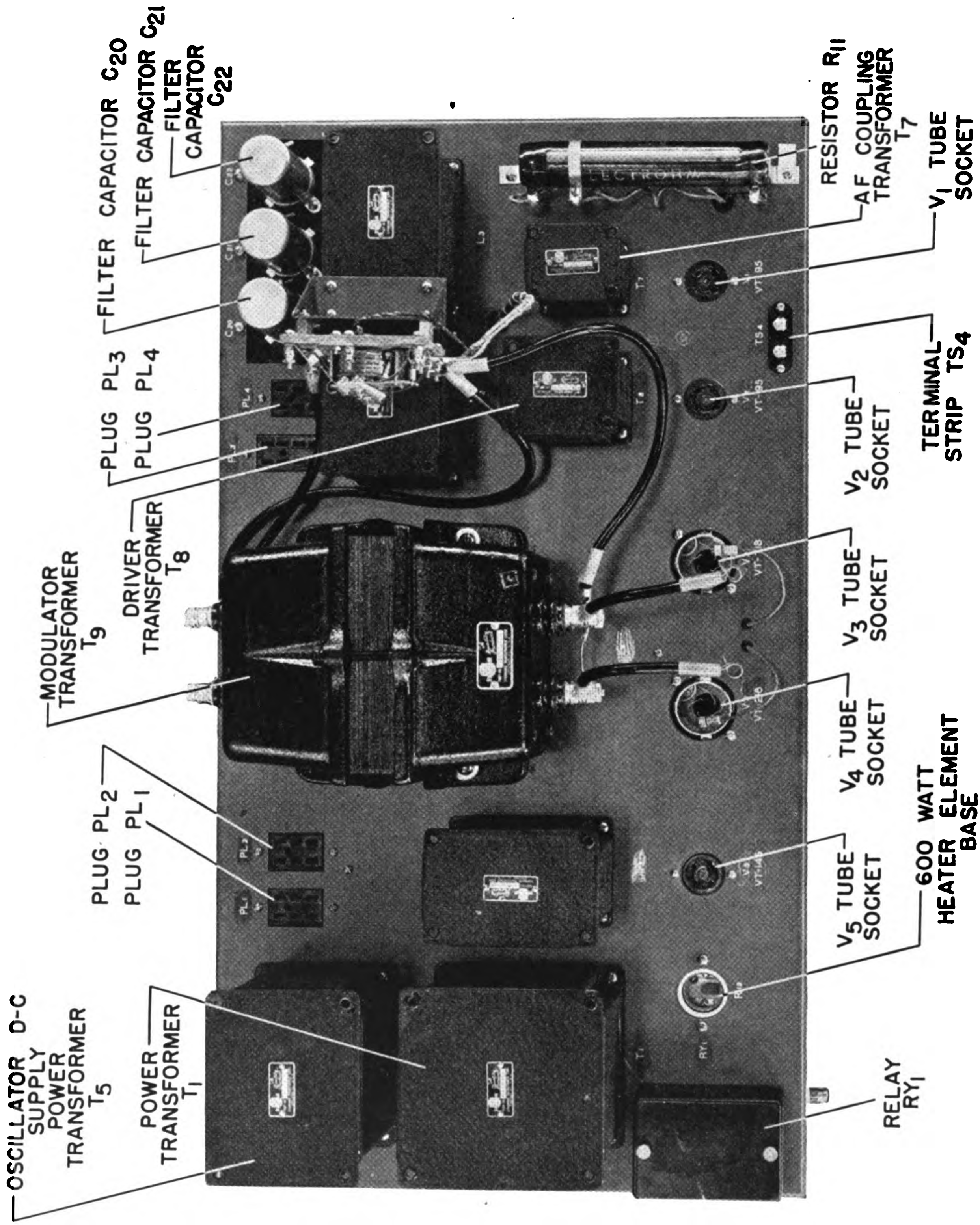


FIGURE 31. RADIO TRANSMITTER BC-610-D, MODULATOR SECTION, TOP VIEW.

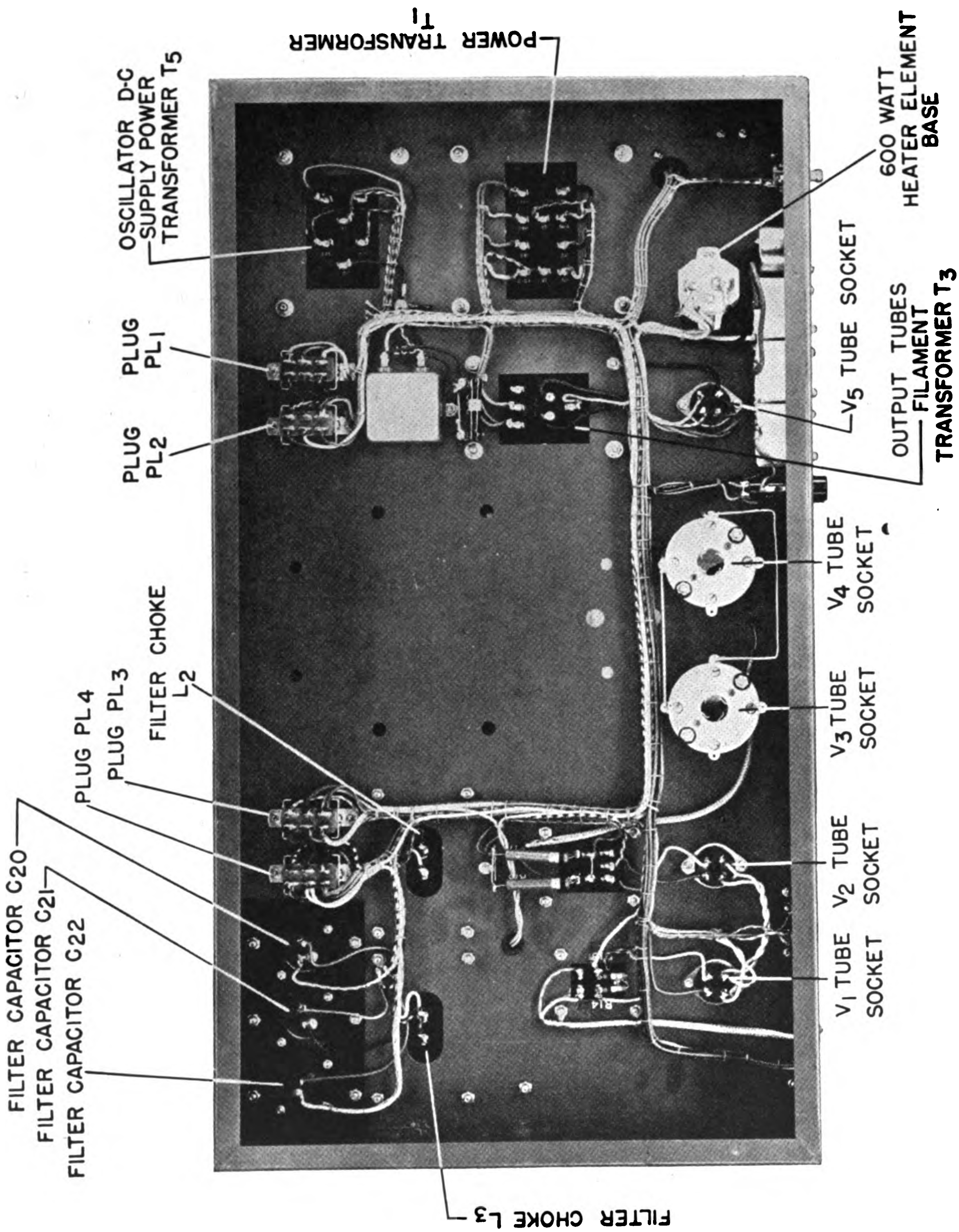


FIGURE 32. RADIO TRANSMITTERS BC-610-A, BC-610-B AND BC-610-C, MODULATOR SECTION, BOTTOM VIEW.

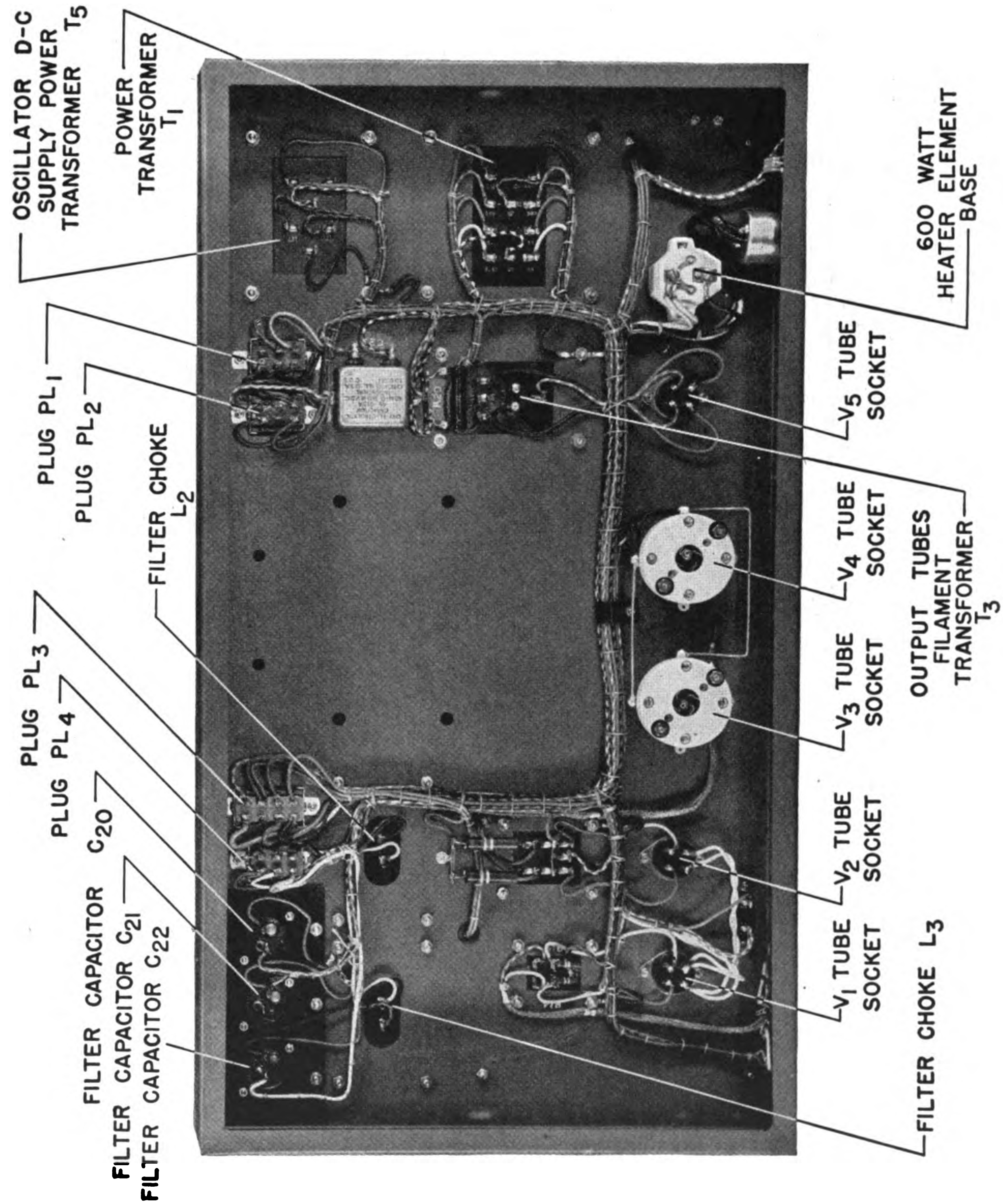


FIGURE 33. RADIO TRANSMITTER BC-610-D, MODULATOR SECTION, BOTTOM VIEW.

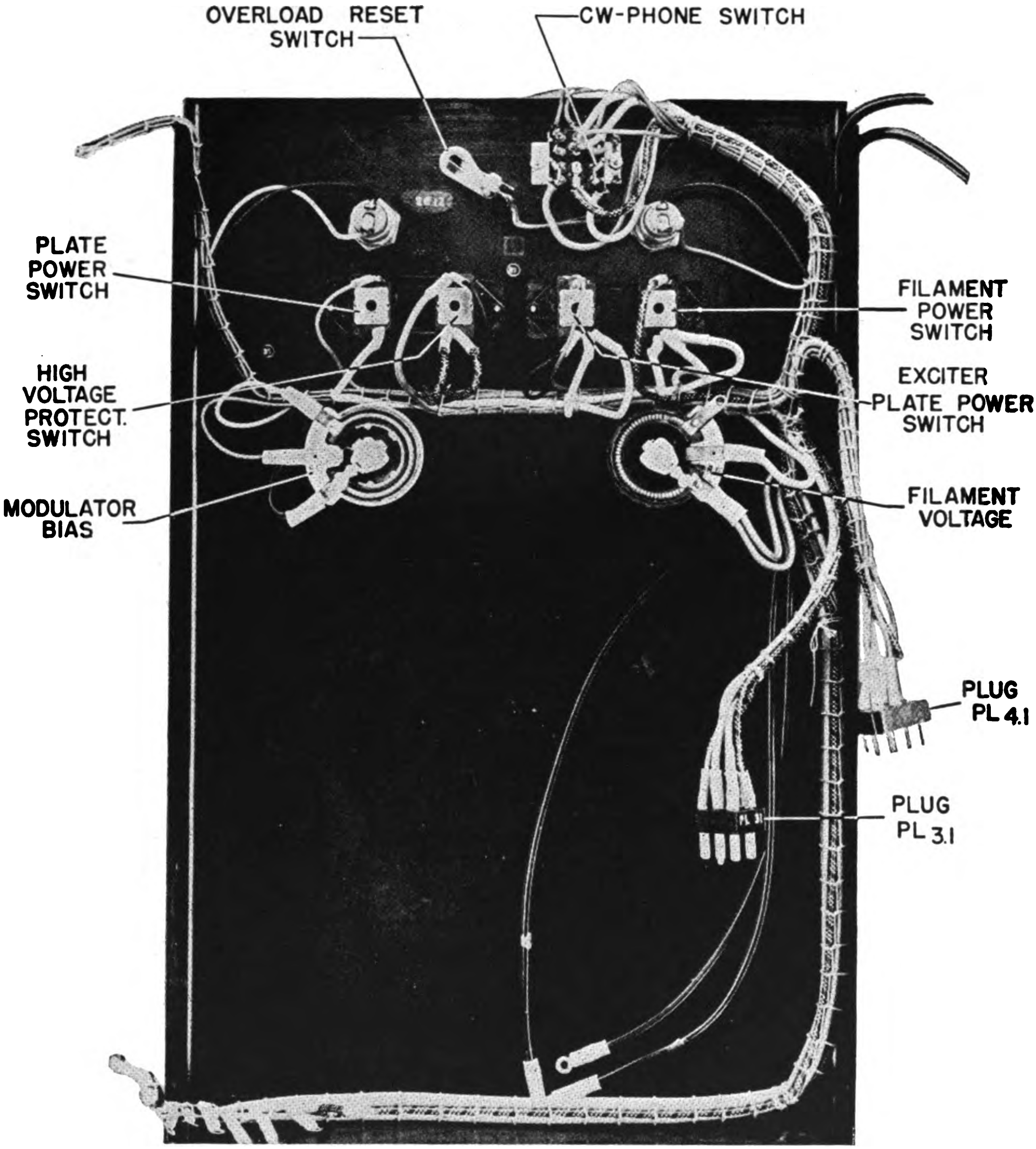


FIGURE 34. RADIO TRANSMITTER BC-610-(*), POWER CONTROL PANEL, REAR VIEW.

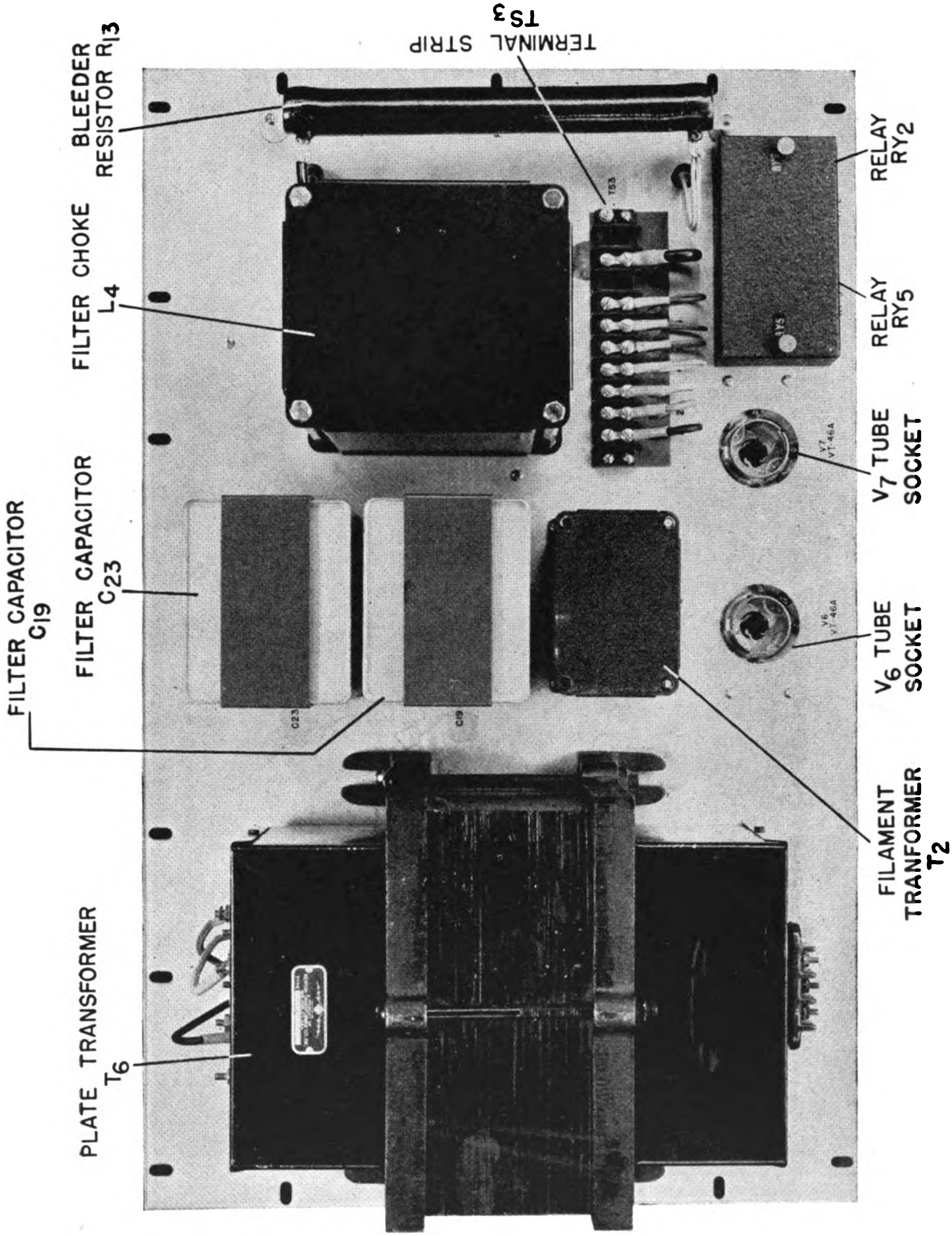


FIGURE 35. RADIO TRANSMITTER BC-610-(*), POWER SUPPLY, TOP VIEW.

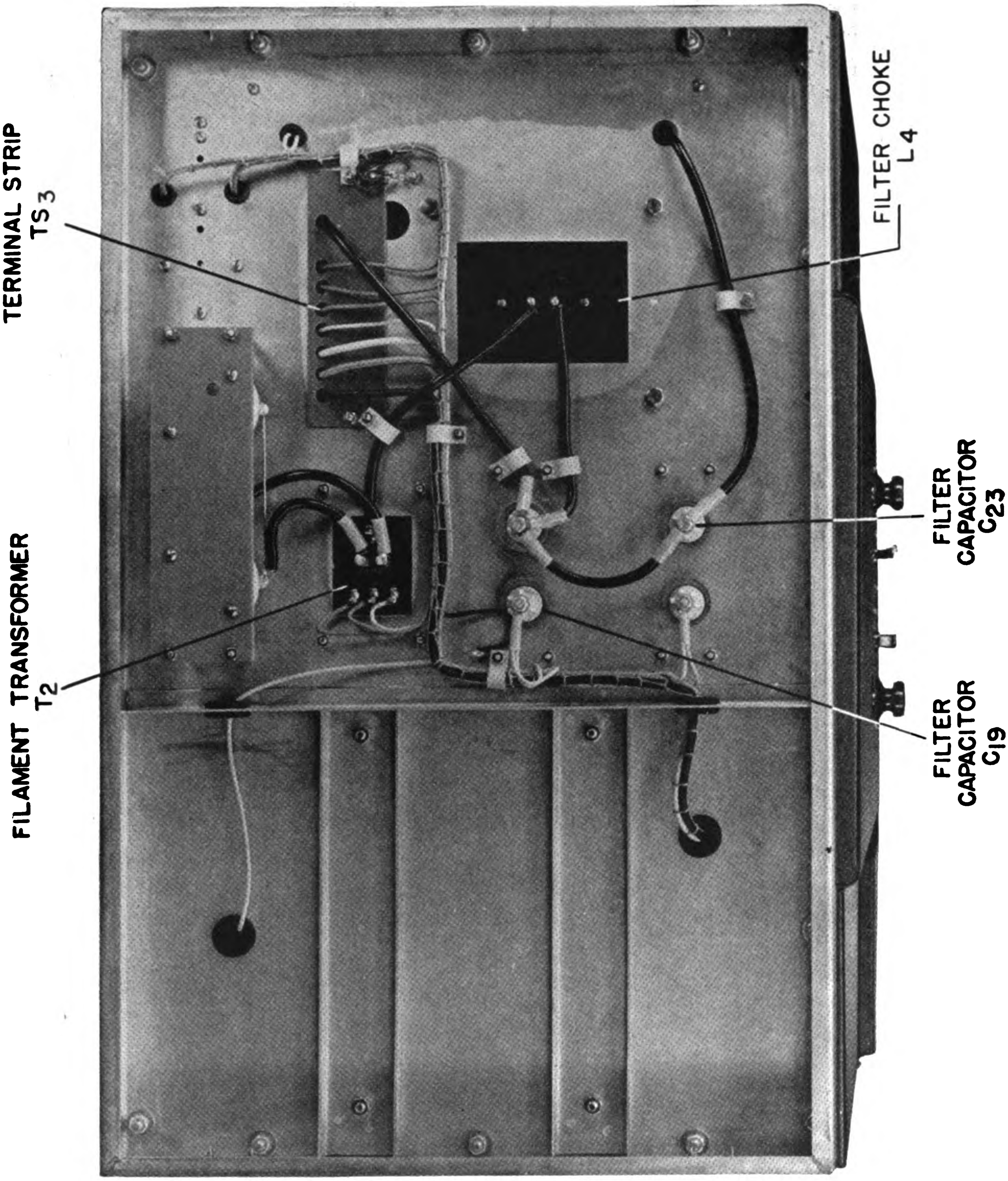


FIGURE 36. RADIO TRANSMITTER BC-610-(*), POWER SUPPLY, BOTTOM VIEW.

(2) The center chassis contains all of the audio and modulator sections which are not included as part of Speech Amplifier BC-614-(*). Also included on this chassis are power supplies for the bias and audio driver circuits as well as the plate transformer for the exciter plate voltage rectifier.

(3) The lower chassis includes the complete high-voltage power supply together with its overload relay. This chassis serves as the base for the entire transmitter and is bolted down by large wing bolts to the shock mounting cradle which holds the transmitter to the floor of the truck.

(4) The lower section of the front panel includes control switches for handling power application, the CW-PHONE switch, a reset switch for the overload relay and controls for setting the filament voltage and the modulator bias. (Radio Transmitter BC-610-D has all its fuses located on this panel in addition to the controls mentioned.)

(5) To reach the two lower sections remove the rear plate of the transmitter. To reach the top of the r-f section remove the entire top cover. This is easily removed by loosening the four wing bolts.

b. Radio Frequency Section. — Electrically, the radio frequency section of the transmitter consists of oscillator tube V_8, doubler or buffer tube V_9, intermediate amplifier tubes V_{10} and V_{11}, and power amplifier tube V_{16} together with their associated tuning circuits. (See figures 28 and 29.)

(1) Oscillator tube V_8 is a Tube VT-107 (commercial type 6V6) whose function is to generate an alternating current at a radio frequency, and hold the frequency of this alternating current constant.

(*a*) The actual frequency of oscillation is determined by a tuned circuit consisting of a master oscillator coil in parallel with a variable capacitor and a fixed capacitor. One end of this coil is connected to the grid of oscillator tube V_8 through a series capacitor, and a tap on the coil connects through capacitor C_1 to the cathode of tube V_8 to provide feedback.

(*b*) The grid of oscillator tube V_8 is returned to ground through choke CH_1 and grid resistor R_1. The cathode of V_8 is returned to ground through r-f chokes CH_2 and CH_9 (the low potential end of which is by-passed by capacitor C_3) and through the keying circuit so that operation of the key makes and breaks the generation of oscillating currents and provides for telegraph transmission.

(*c*) As an alternative to the adjustable master oscillator, crystal control of the frequency may be had by plugging a crystal into the jacks provided. The crystal is connected across the grid to cathode circuit of tube V_8 and then becomes the frequency determining element. To maintain a high impedance between cathode and ground of tube V_8, a capacitor and a coil in series are inserted into the circuit. This can be seen in figures 37 and 53, with switch SW_{15} at XTAL.

(*d*) The screen grid of oscillator tube V_8 receives its voltage at resistor R_8 and is by-passed by capacitor C_2. The screen voltage is held constant by the voltage regulator tube V_{13}, Tube VT-139 (commercial type VR-150), connected between the screen grid and ground.

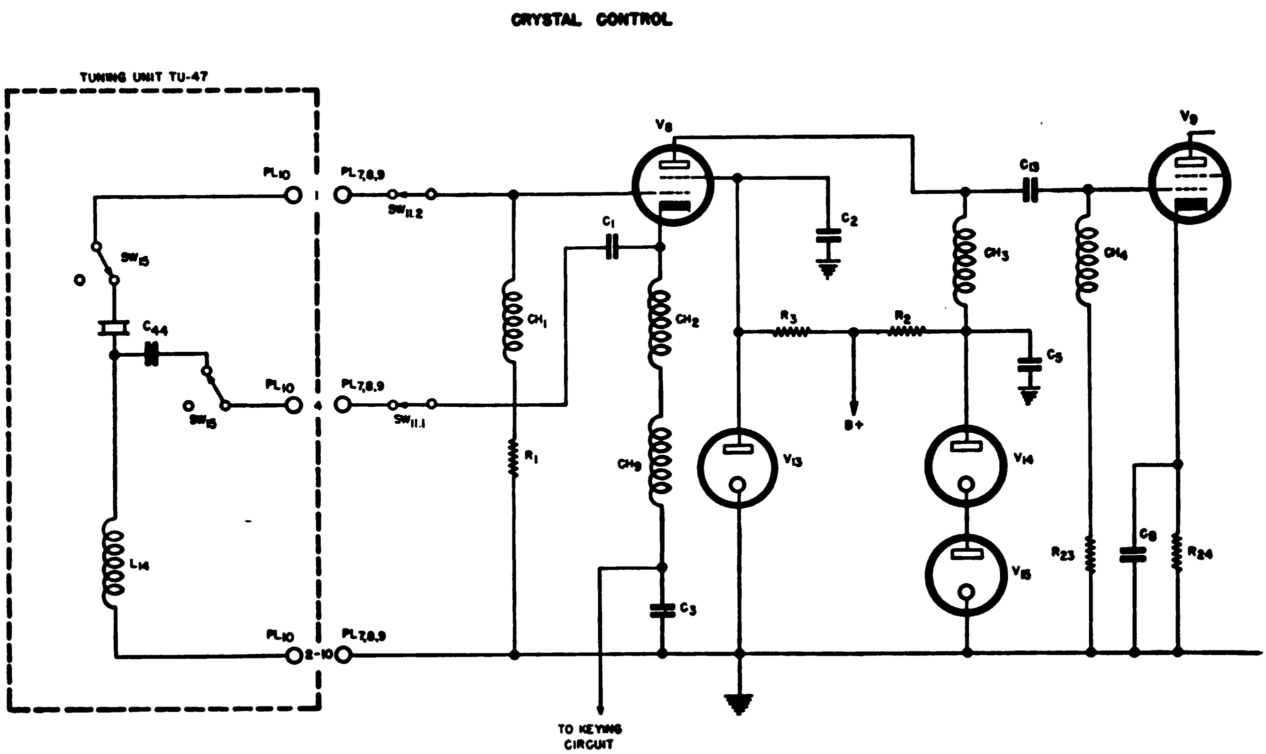
(*e*) The plate of oscillator tube V_8 receives its current through resistor R_2, and radio frequency choke CH_3. Voltage regulator tubes V_{14} and V_{15}, (VT-139) are connected in series to maintain a potential of 300 volts at the plate of tube V_8. Radio frequency voltage is isolated from the plate power circuit by by-pass capacitor C_5.

(*f*) The oscillations generated in V_8 are fed to the grid circuit of buffer or doubler tube V_9 from the plate of tube V_8 through capacitor C_{13}. The screen grid of tube V_8 acts as a shield to prevent reaction on the oscillator frequency from following stages.

(2) Doubler or buffer tube V_9 is a Tube VT-115 (commercial type 6L6).

(*a*) Tube V_9 obtains its grid voltage partly by the voltage drop across choke CH_4 and grid leak R_{23} and partly as a result of the drop across cathode resistor R_{24}, which is by-passed by capacitor C_8. Screen voltage is obtained through resistor R_{25} and is by-passed at radio frequencies by capacitor C_4. The plate circuit of tube V_9 is resonated by a tuned circuit consisting of a coil and capacitor in parallel (contained in the tuning units).

(*b*) When using master oscillator control, the plate circuit of tube V_9 is always tuned to twice the frequency of the master oscillator circuit. This further prevents reaction from the following stages.



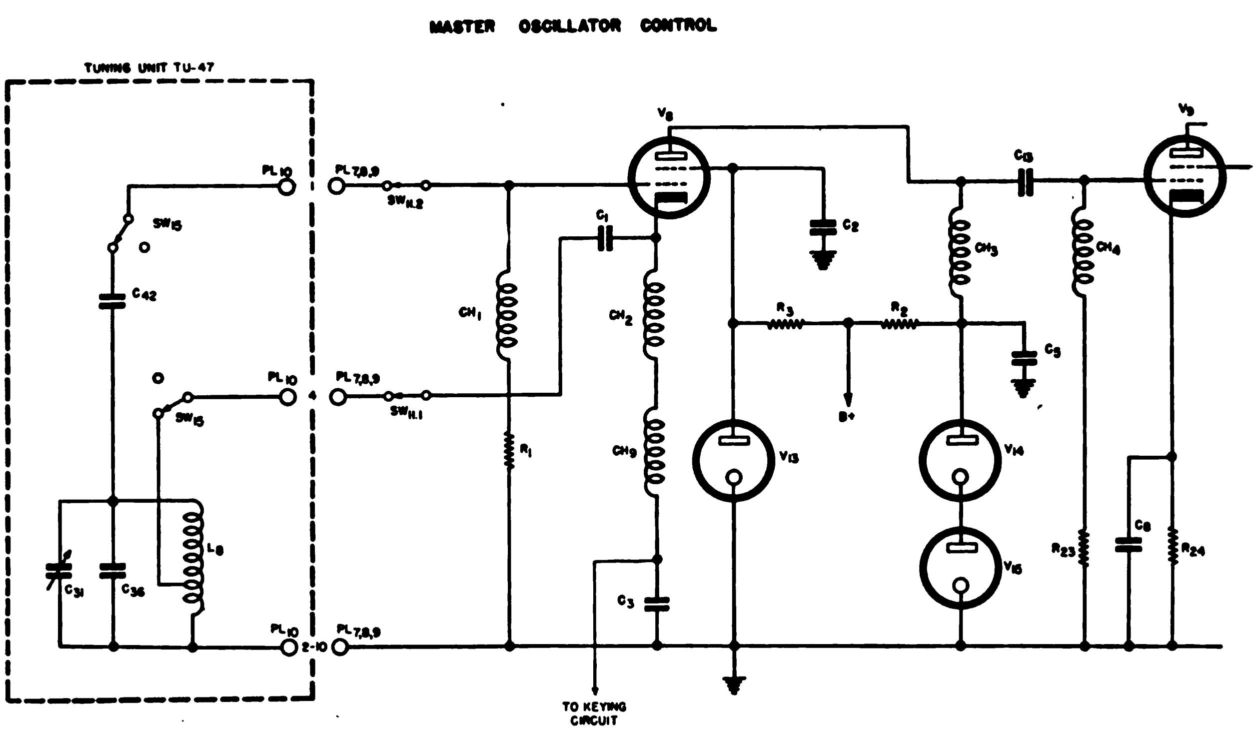


FIGURE 37. FUNCTIONAL DIAGRAM OF OSCILLATOR CIRCUITS.

(*c*) When using crystal control in the frequency range of 2 to 4 megacycles, the crystal frequency is the same as that of the output circuit of the transmitter. When operating in the frequency range of from 4 to 8 megacycles, the crystal frequency is one-half of the output frequency. In other words, tube V_9 operates as a buffer amplifier when using crystal control between 2 to 4 megacycles and operates as a frequency doubler between 4 to 8 megacycles.

(*d*) Radio frequency voltage from the tuned circuit of tube V_9 is isolated from the power circuit by radio frequency choke CH_5 and by-pass capacitor C_{26}. Radio frequency voltage from the plate of tube V_9 is fed to the grids of intermediate amplifier tubes V_{10} and V_{11} through parasitic resistors R_{21} and R_{22} and blocking capacitor C_{14}.

(3) Intermediate amplifier tubes V_{10} and V_{11} are both Tubes VT-100 (commercial type 807).

(*a*) The intermediate amplifier tubes receive their bias through r-f choke CH_7 from the main bias power supply. The direct current bias voltage is sufficient to cut off the plate curent of these tubes when no excitation voltage is present during periods when the key is up.

(*b*) The screen grids of tubes V_{10} and V_{11} are supplied with voltage through resistors R_6 and R_7 and are by-passed by capacitors C_6 and C_7.

(*c*) The plate circuits of tubes V_{10} and V_{11} are resonated by a simple tuned circuit consisting of a coil and capacitor located in the tuning unit. Plate voltage is supplied through radio frequency choke CH_6 and is by-passed by capacitor C_{24}.

(*d*) The output of the intermediate amplifier stage is fed to the grid of power amplifier tube V_{16} through capacitor C_{15}.

(4) Power amplifier tube V_{16} employs a tube VT-220 (commercial type 250TH) as a neutralized class C power amplifier.

(*a*) Grid bias voltage is supplied through choke CH_8 and is provided by the drop across resistor R_8 and the main bias voltage power supply. With the key open the direct current bias voltage is of à sufficient value to cut off the plate current of the tube. With the key closed the radio frequency voltage supplied by the intermediate amplifier stage is sufficient to cause the grid to draw a considerable amount of current (60 to 100 ma).

(*b*) The filaments of tube V_{16} are by-passed by capacitors C_9 and C_{10}.

(*c*) Plate voltage is supplied through r-f choke CH_{10} across which is connected a parasitic suppressor R_9. This plate voltage is by-passed to ground through capacitor C_{11}. The plate current is fed through the center tap of coil L_7.

(*d*) The plate circuit is tuned by a tuned circuit consisting of output coil unit L_7 and plate tuning capacitor C_{12} (in the range of 2 to 2.5 megacycles by additional padding capacitor C_{28}). This circuit is center tapped so that an equal out of phase voltage is available to feed back to the grid through blocking capacitor C_{29} and neutralizing capacitor C_{18}. Neutralizing Capacitor C_{18} cancels out the effect of the grid plate capacity so that the tube will operate stably as an amplifier without generating spurious oscillation of its own.

(*e*) The radio frequency output power is taken from the tank circuit by a coupling coil which is wound around the outside of the output coil unit. This coupling coil is short circuited by contacts on relay RY_4 when using the station's receivers. This eliminates absorption at the frequency of the transmitter that might cause an apparent decrease in receiver sensitivity at that frequency. The output power is then fed to Antenna Tuning Unit BC-729-(*).

*c. **Modulator Section.***—

(1) Audio frequency speech currents enter the transmitter at terminals 6 and 7 of plug PL_5 on the rear apron of the modulator chassis. These currents are connected to the input winding of transformer T_7, the secondary of which connects to the grids of audio driver tubes V_1 and V_2. Audio driver tubes V_1 and V_2, Tubes VT-95 (commercial type 2A3), operate as push-pull class A audio power amplifiers.

(*a*) Grid resistors R_{14} and R_{15} are used to load the secondary of transformer T_7 to provide proper termination of the incoming audio transmission line from the speech amplifier. Grid bias for tubes V_1 and V_2 is obtained by the drop across cathode resistor R_{20}, which is by-passed by capacitor C_{27}.

(*b*) The plate circuits of tubes V_1 and V_2 deliver their power to the primary of driver transformer T_8.

(c) The secondary of transformer T_8 connects to the grids of modulator tubes V_3 and V_4, and the grids are provided with loading resistors R_{16} and R_{17} to provide a more constant load to tubes V_1 and V_2.

(2) Modulator tubes V_3 and V_4 are Tubes VT-218 (commercial type 100TH). They are used in a push-pull class B amplifier in which the normal grid bias voltage is maintained at a point near the cut off value of the tubes. At this point of operation the plate current with zero audio signal is very small, and at the maximum audio signal level the current rises to several times the initial value.

(a) The grid bias voltage for tubes V_3 and V_4 is adjusted by potentiometer R_{12} which is located on the front panel. It is used to adjust the static plate current of these tubes to the normal value of 40 to 50 milliamperes.

(b) The plates of Tubes V_3 and V_4 are connected to the primary winding of modulation transformer T_9.

(c) The secondary winding of modulation transformer T_9 is, during phone operation, inserted in series with the high-voltage plate power supply of the power amplifier tube V_{16} so that the presence of speech- or voice-actuated voltages at the secondary terminals will cause a proportional fluctuation in the plate voltage of the power amplifier stage and cause the output power of the radio transmitter to vary correspondingly. In this way, the radio frequency carrier is amplitude modulated.

*d. **Power Supply.***— Power for the entire Radio Transmitter BC-610-(*) is obtained through a-c plug PL_6 from any source of 115-volt, single-phase, 50- to 60- cycle power. (See figures 50, 51 and 52.)

(1) Filament voltage for the r-f section is supplied by transformer T_4. The first winding supplies the filaments of tubes V_8, V_9, V_{10} and V_{11} with 6.3 volts A-C. The second winding with the center tap grounded supplies the filament of tube V_{16}. A third winding supplies 5 volts to the filaments of tube V_{12} which is the rectifier for the r-f exciter portion of the circuit.

(a) Tube V_{12} is a Tube VT-145 (commercial type 5Z3) which rectifies the power supplied from transformer T_5 on the center deck.

(b) The rectified power is filtered by capacitors C_{16} and C_{17} and by filter choke L_1. Resistor R_4 prevents keying surges and thus prevents a shift in the signal. Resistor R_{10} acts as a bleeder resistor to drain off any charge remaining when the plate power is removed.

(2) Filament power for the audio driver tubes V_1 and V_2 is supplied from the secondary of transformer T_1. Filament power for modulator tubes V_3 and V_4 is supplied from the secondary of transformer T_3.

(3) Transformer T_1 also supplies filament and plate power to the rectifier tube V_5, Tube VT-145 (commercial type 5Z3).

(a) Rectifier tube V_5 supplies plate power through a filter consisting of chokes L_2 and L_3 and capacitors C_{20} and C_{21} to the two audio driver tubes (V_1 and V_2). This power supply is operated with the positive terminal at ground potential.

(b) The negative potential will thus be below ground potential and is used (in addition to supplying plate power for tubes V_1 and V_2) as a source of negative bias voltage for the modulator tubes, the class C power amplifier, and the intermediate amplifier tubes. In order to obtain a power source of good regulation, a bleeder consisting of resistor R_{11} and potentiometer R_{12} is connected across the output of the filter and these elements are provided with taps for obtaining voltages of the correct value. Capacitor C_{22} is connected at the correct point in the bias supply to hold constant the bias voltage supplied to the class C power amplifier.

(4) The high voltage rectifier which is located on the lower chassis, employs tubes V_6 and V_7, which are mercury vapor rectifier Tubes VT-46A (commercial type 866-A).

(a) Filament supply for tubes V_6 and V_7 is obtained from the secondary winding of transformer T_2.

(b) Plate power is obtained from the secondary winding of transformer T_6. The primary of transformer T_6 is connected to the a-c line during transmission and is provided with a tap for raising the voltage applied to the plate of the class C amplifier when c-w transmission is being effected in order to obtain high power output.

(c) The rectified high voltage supplied by

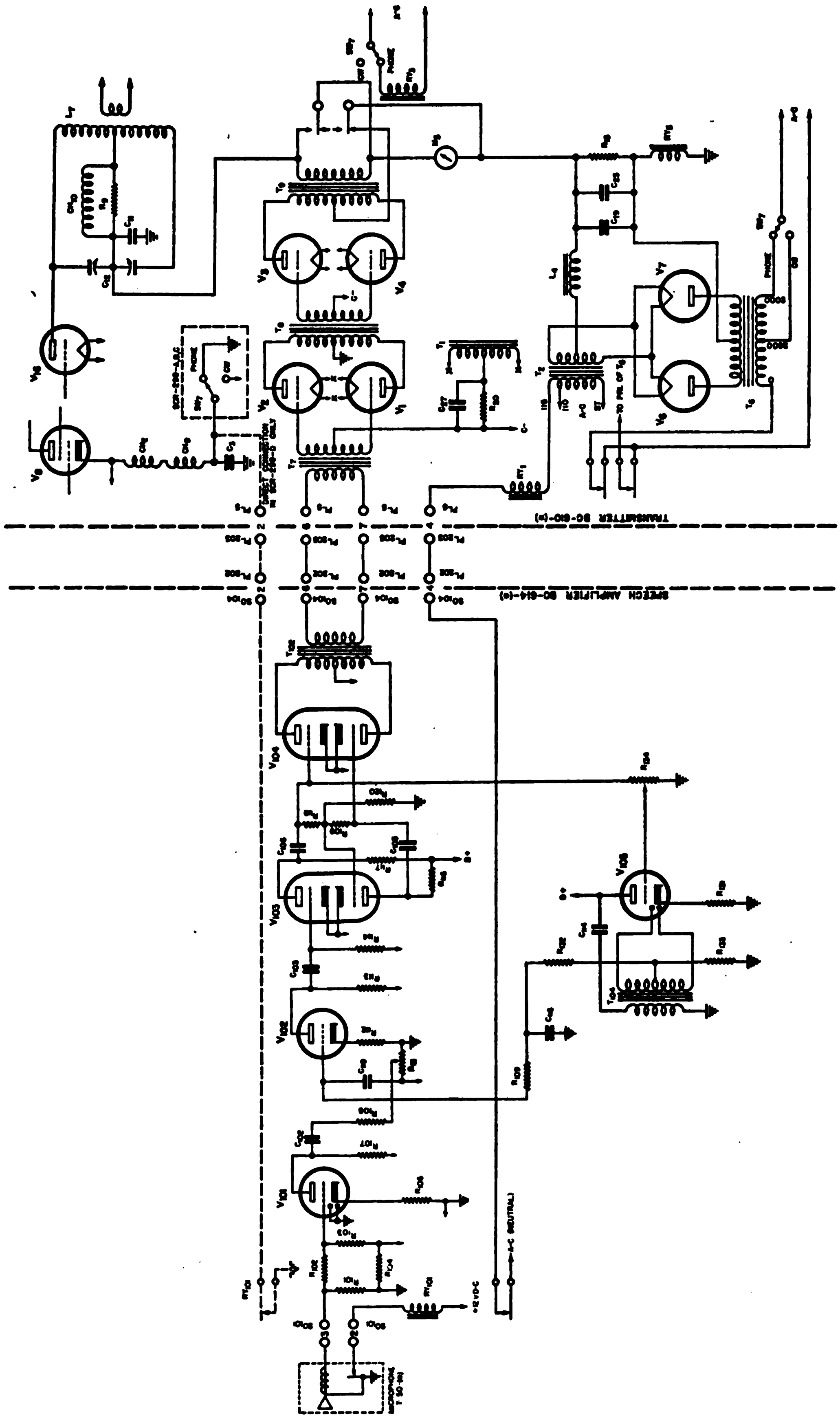
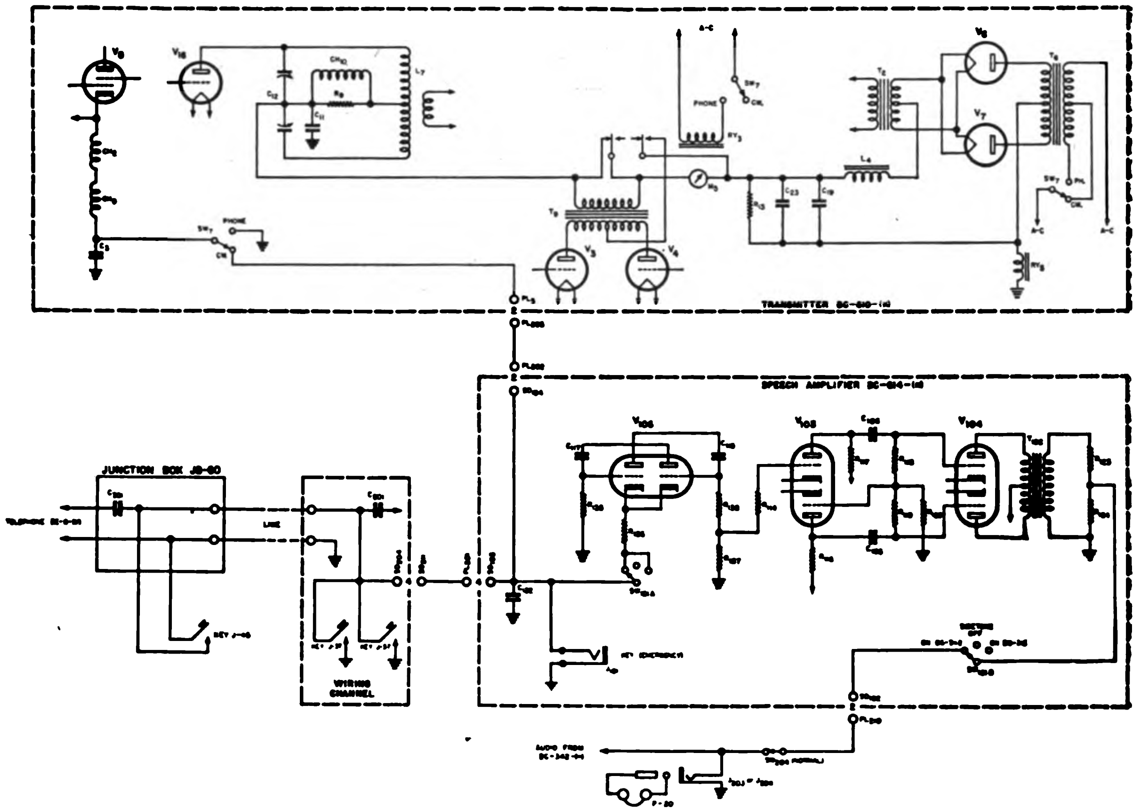


FIGURE 38. FUNCTIONAL DIAGRAM OF VOICE OPERATION.

SIGNAL CORPS

Radio Sets SCR-299-A, SCR-299-B and SCR-299-C



Radio Set SCR-299-D

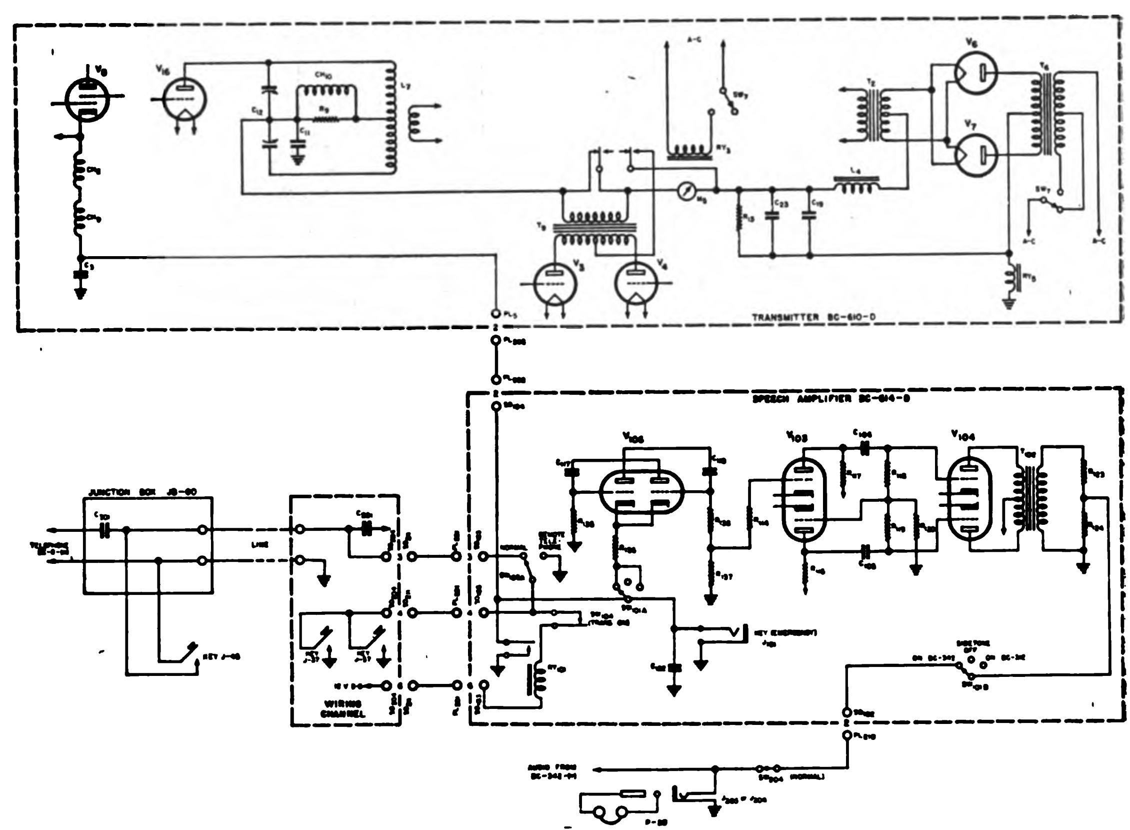


Figure 39. Functional diagram of c-w operation.

tubes V_6 and V_7 is filtered by choke L_4 and capacitors C_{19} and C_{23}. The output of the high voltage power supply has connected across it a "bleeder" which is resistor R_{13}.

*e. **Control and Metering.*** — The control and metering circuits are those which are considered necessary for the operation and protection of the equipment. (See figures 48, 49, 50, 51 and 52.)

(1) A-C power entering the equipment first passes through protective fuses FS_1 and FS_2.

(2) Filament switch SW_1 closes a circuit which applies power to the primaries of transformer T_1, T_2, T_3, and T_4. Filament voltages are adjusted to the correct values by variable resistor R_{18} on the front panel, marked FILAMENT VOLTAGE. This resistor is inserted in series with the primaries of transformers T_2, T_3, and T_4. The filament transformers and the bias power transformer are protected by fuses FS_4 and FS_5, respectively. When the filaments are turned on, power is also supplied to the speech amplifier through terminals No. 1 and No. 3 on audio power plug PL_5. Pilot Lamp LM_3 illuminates the green jewel on the front panel to indicate that the filaments have been turned on.

(3) Exciter power switch SW_8 is mounted on the front panel of the transmitter and is used to turn on plate power to the exciter stages only when adjusting the controls on the tuning units. Switch SW_8, closes the primary circuit of transformer T_5 which is, in normal operation, closed by one contact on plate power relay RY_1. Exciter power only can also be supplied without the aid of SW_8 by simply opening the top cover door over the tuning unit compartment and setting the transmitter control switch on the speech amplifier at TRANS. ON. (See paragraph 9.)

(4) During the final tuning operations both exciter plate power and high voltage plate power, are applied by closing switch SW_6 located on the front panel and marked PLATE POWER. Closing this switch operates relay RY_1, whose contacts apply power to the primaries of exciter plate transformer T_5 and high voltage plate transformer T_6 simultaneously. This same relay may also be controlled from the operating position by microphone push button or by the transmitter control switch on the panel of the speech amplifier.

(5) For the protection of the operator, several interlock switches, namely SW_5, SW_{13}, SW_{10} and SW_{11} (SW_{16} in BC-610-D), are connected in series with the coil of relay RY_1. These switches are mounted on the various doors and openings of the transmitter to prevent the application of high voltage plate power should any of the doors be opened.

(6) For the protection of the class C amplifier tube V_{16} and modulator tubes V_3 and V_4, as well as the components of the high voltage power supply, overload relay RY_5 and locking relay RY_2 are provided. If any extreme surge of current develops in the high voltage power circuit, relay RY_5 closes and thus operates relay RY_2. Relay RY_2 locks into position until the OVERLOAD RESET switch SW_{12} is pressed. Another contact on relay RY_2 opens the coil circuit to plate power relay RY_1 thus removing primary power to the high voltage plate power supply as long as RY_2 remains locked. (See figures 48 and 49.)

(7) Relay RY_3 operates in conjunction with the CW-PHONE switch SW_7.

(a) Setting the CW-PHONE switch SW_7 at PHONE supplies power to the lower voltage tap on transformer T_6 and closes relay RY_3. The contacts of relay RY_3 connect the center tap of the primary of transformer T_9 to the high voltage power supply and connect the secondary of transformer T_9 in series with the final amplifier plate power supply. SW_7 also connects the cathode of oscillator tube V_8 to ground in Radio Transmitter BC-610-C (This operation is performed by RY_{101} in Radio Transmitter BC-610-D only).

(b) When the switch SW_7 is set at CW, the cathode of oscillator tube V_8 is opened so that it may be keyed. The power source is connected to the high voltage primary tap on transformer T_6, thus providing additional output. Switch SW_7 then also releases relay RY_3, removing plate power from the modulator tubes V_3 and V_4, and short circuits the secondary of transformer T_9 to prevent voltage surges during keying.

(8) Plate pilot light LM_4 with a red indicating jewel, indicates when plate power is applied. Pilot lamps LM_1 and LM_2 serve to illuminate the P. A. PLATE TUNING scale and the interior of the tuning unit compartment to facilitate changing of coils.

(9) Filament voltmeter M_3 is connected across the filament of tube V_{16} and when this meter in-

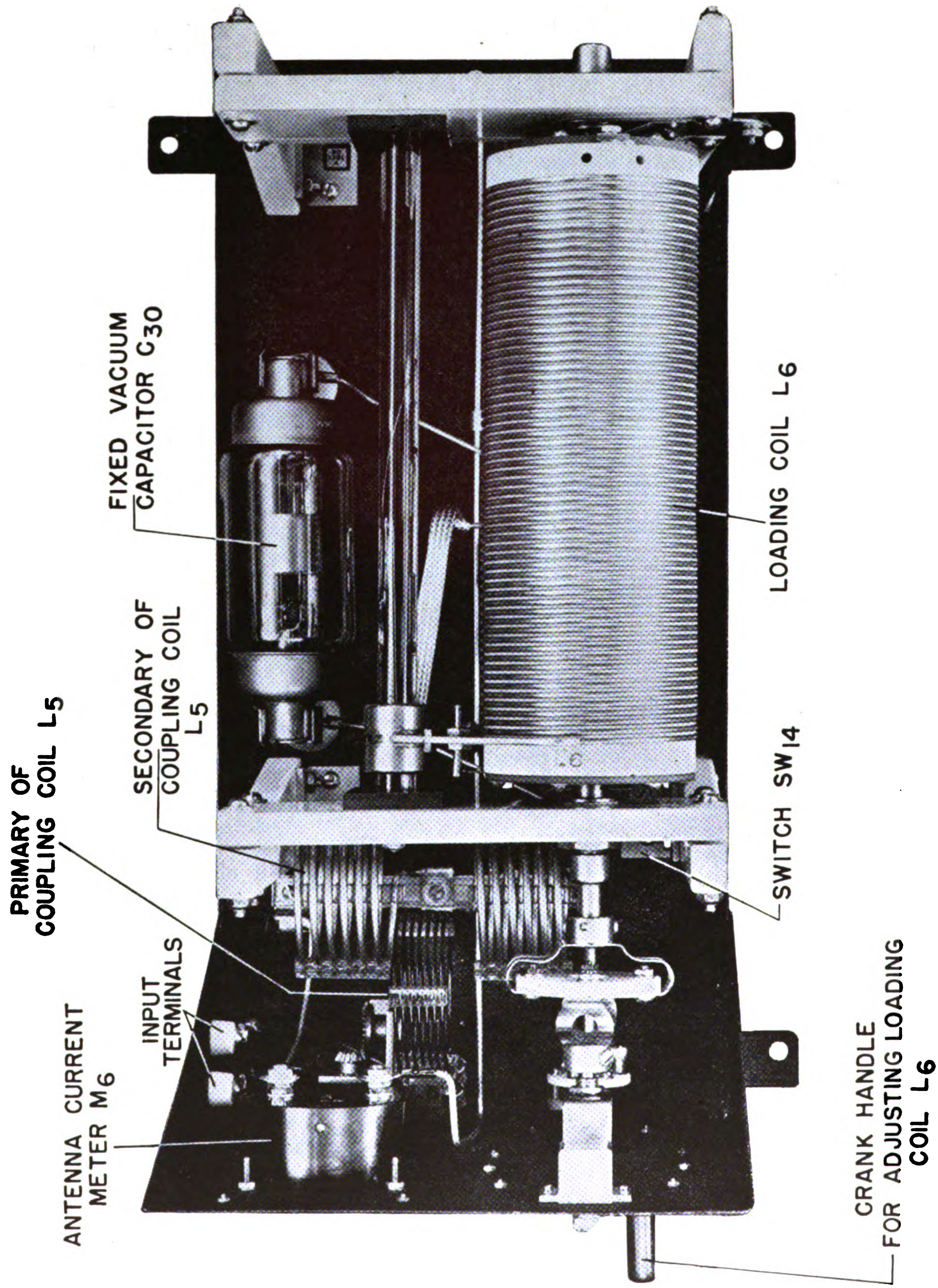


FIGURE 40. ANTENNA TUNING UNIT BC-729-(*), TOP VIEW.

dicates 5.3 volts (adjusted by filament rheostat R_{18}), the voltages on all of the filaments will be at their proper value.

(10) Meter M_2 indicates the plate currents of buffer doubler tube V_9 or intermediate amplifier tubes V_{10} and V_{11}, depending on which has been selected by switch SW_9.

(11) Meter M_1 indicates grid current of either intermediate amplifier stage V_{10} and V_{11}, or of the power amplifier stage V_{16} depending on which has been selected by switch SW_8. Resistors R_{26} and R_{27} are meter shunts which remain in the circuit at all times.

(12) Meter M_5 indicates the plate current of the class C amplifier tube V_{16}.

(13) Meter M_4 indicates the plate current of the modulator tubes V_3 and V_4.

12. Antenna Tuning Unit BC-729-(*).

a. ***Mechanical Construction.*** — Antenna Tuning Unit BC-729-(*) (see figures 40 and 63) is constructed on a metal base and metal panel with all of the principal components supported on heavy ceramic insulation. The antenna tuning unit mounts on top of the radio transmitter and couples the output of the transmitter to the whip antenna on top of the truck. Due to the tremendous radio frequency voltages developed in the antenna tuning unit, no cover is practicable without affecting the compactness of the installation. The chief components are a loading coil which is continuously variable, a coupling coil, an antenna current ammeter, and a fixed vacuum capacitor which may be switched in or out of the circuit. All controls are on the front panel. The variable antenna series loading coil is controlled by a large crank handle on the front panel which has a counting device that indicates directly the number of turns of the coil to a fraction of a turn. The connection between the transmitter and the antenna tuning unit is a low impedance transmission line. ***The connection between the antenna tuning unit and Mast Base MP-47 is a short flexible lead which must be kept clear of the surrounding equipment due to the extremely high voltage it carries.***

b. ***Electrical Design.*** — Radio frequency energy from the transmitter is fed to the primary of the adjustable coupling transformer L_5 through a concentric transmission line.

(1) The coupling between primary and secondary of coupling coil L_5 is controlled from the front of the panel, and adjusts the amount of power taken from the transmitter and fed to the antenna circuit. With the antenna circuit tuned to resonance, the coupling is adjusted until normal power amplifier plate current is obtained as indicated on the P. A. PLATE meter.

(2) In series with the coupling coil secondary are antenna current meter M_6, capacitor C_{80}, and variable inductor L_6 as well as the antenna proper.

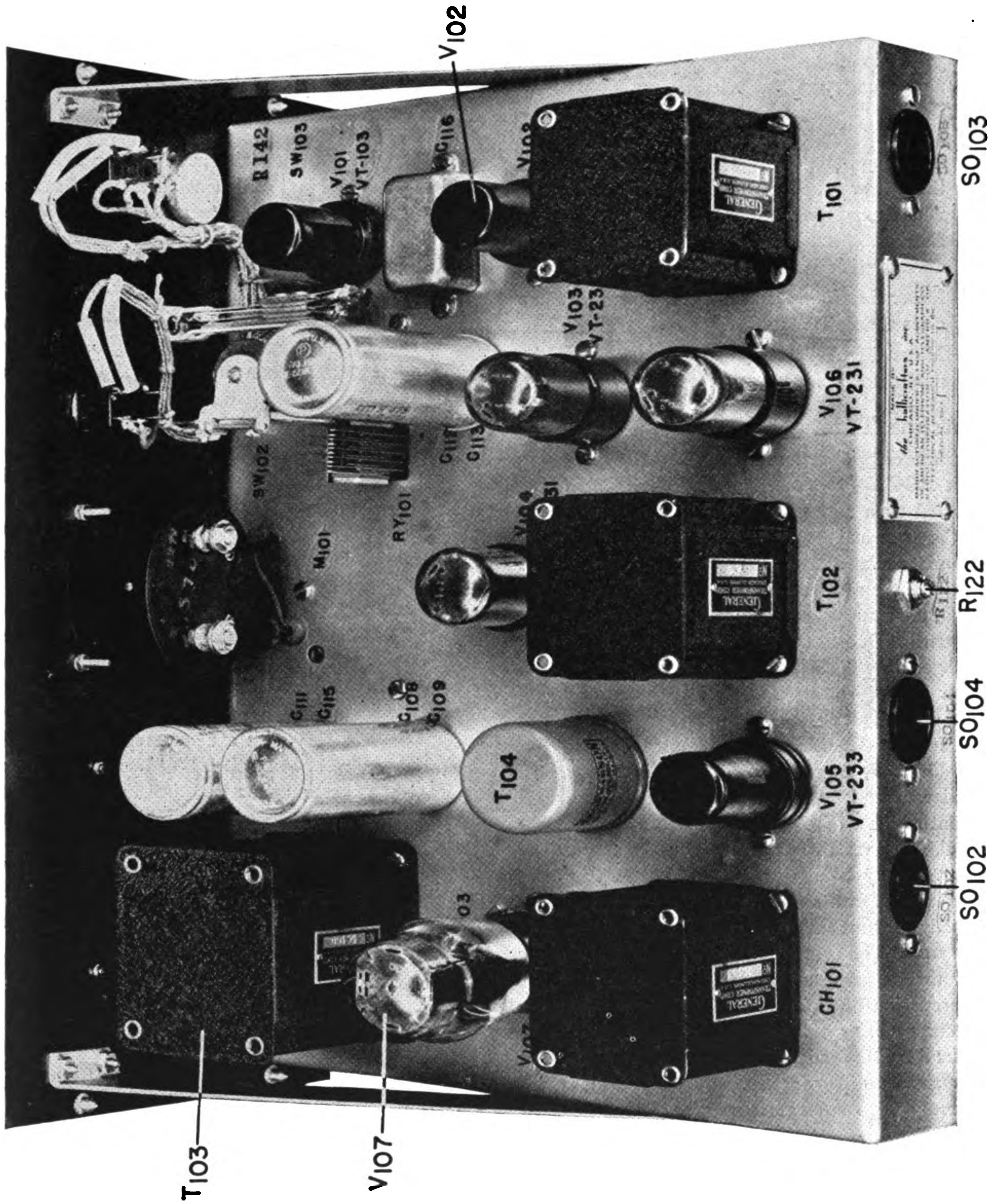
(a) The antenna current meter M_6 indicates the radio frequency current present in the antenna circuit, which is a measure of proper output and performance of the transmitter.

(b) Since the antenna has the characteristics of a capacitor in series with a resistor, antenna loading coil L_6 is provided to tune the antenna to resonance. When inductor L_6 is adjusted so that it tunes the antenna capacitance to resonance, the antenna circuit absorbs the greatest possible amount of energy from the transmitter. This is noted in practice by an increase in the plate current of the power amplifier as inductor L_6 is tuned through the resonance point.

(c) At frequencies between 6 and 8 megacycles, the antenna reactance decreases so that it becomes difficult to tune by means of inductor L_6. Over this band of frequencies, capacitor C_{80} is introduced in series with the antenna loading coil by means of switch SW_{14} so that adjustment of inductor L_6 becomes less critical. ***Note:*** Because of the short antenna a high R-F voltage is built up in the antenna tuning unit during operation. *Read the safety notice at the beginning of this instruction book and guard against receiving severe radio frequency burns.*

13. Speech Amplifier BC-614-(*).

a. ***Mechanical Construction.*** — (Refer to figures 41 to 44.) Speech Amplifier BC-614-(*) is constructed in a rectangular sheet steel cabinet which is anchored to a base equipped with rubber shock absorbers. The cabinet proper is easily demountable from the base by loosening four hasps on the side of the cabinet. All of the component electrical parts are attached either to a panel or a chassis which form an integral assembly that slides out from the front of the cabinet upon loosening four thumb screws located in the corners of the panel. The chassis contains all of the tubes and their associated circuits. The panel contains the operating controls and the volume level meter across the



NOTE: See top view of limiter transformer T_{104} in figure 42 for type used in Speech Amplifier BC-614-C.

FIGURE 41. SPEECH AMPLIFIERS BC-614-A, BC-614-B AND BC-614-C, INTERIOR VIEW.

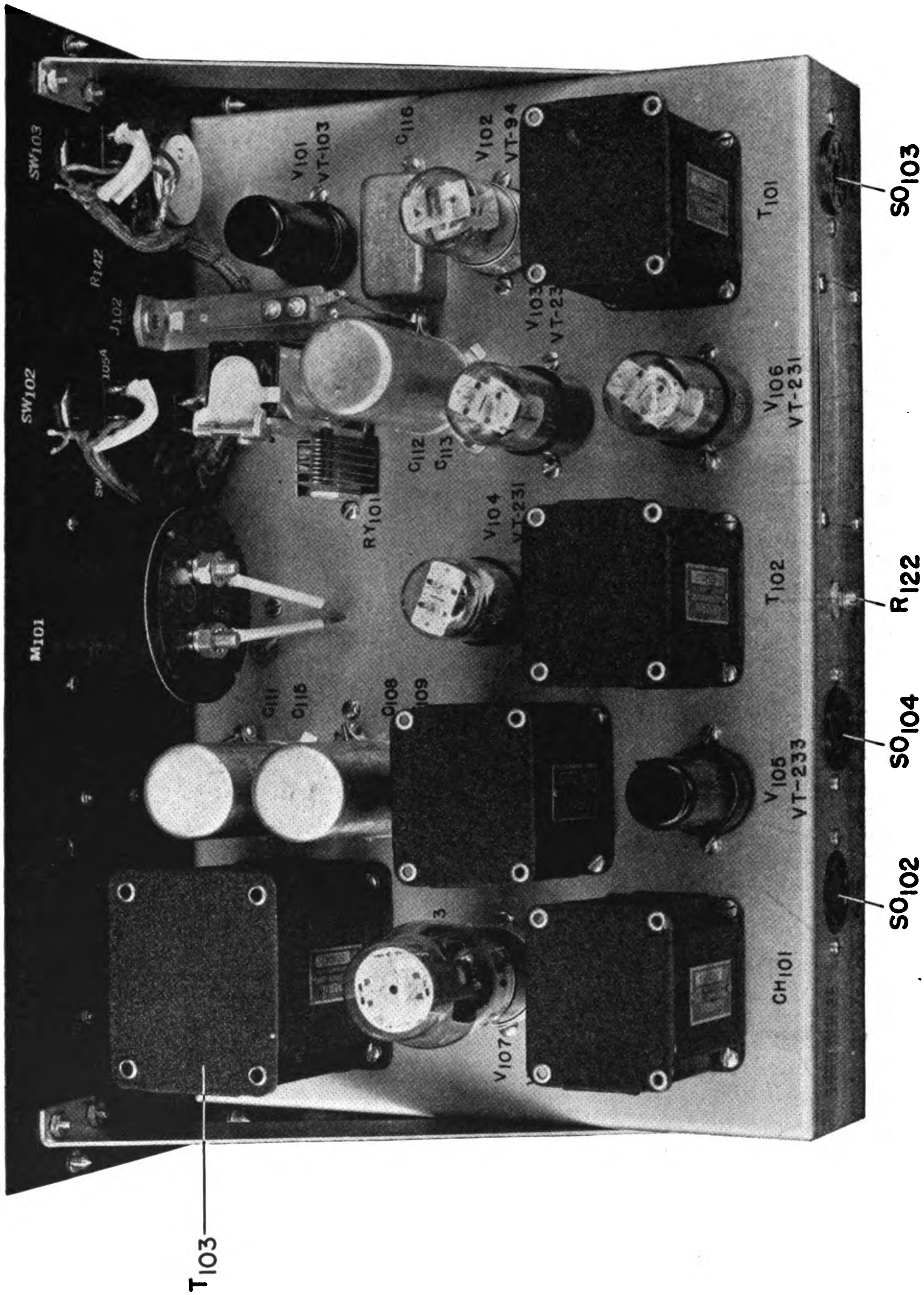
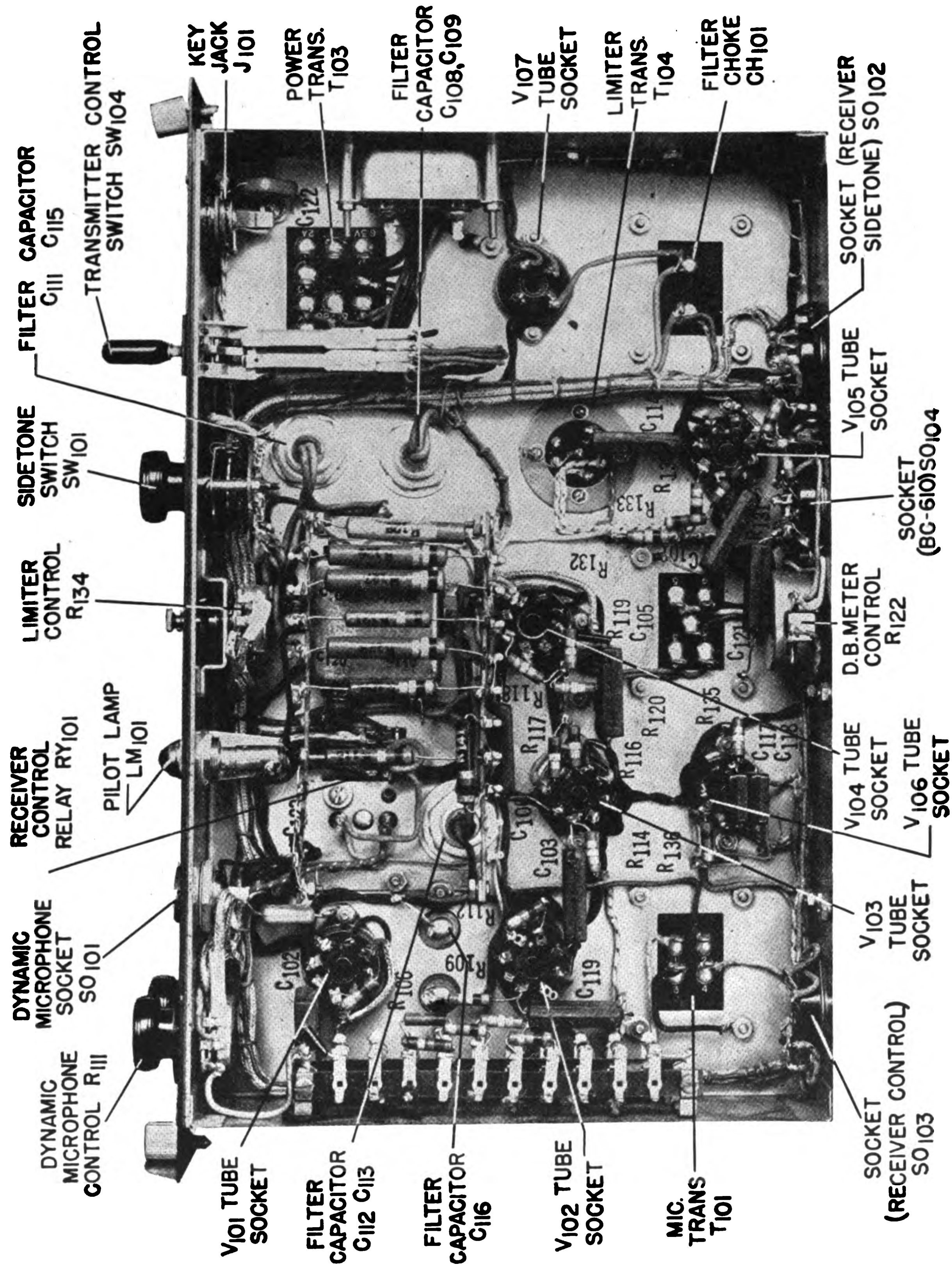


FIGURE 42. SPEECH AMPLIFIER BC-614-D, INTERIOR VIEW.



NOTE: See figure 44 for bottom view of transformer T_{104} and type of resistor boards used in Speech Amplifier BC-614-C.

FIGURE 43. SPEECH AMPLIFIERS BC-614-A, BC-614-B AND BC-614-C, BOTTOM VIEW OF CHASSIS.

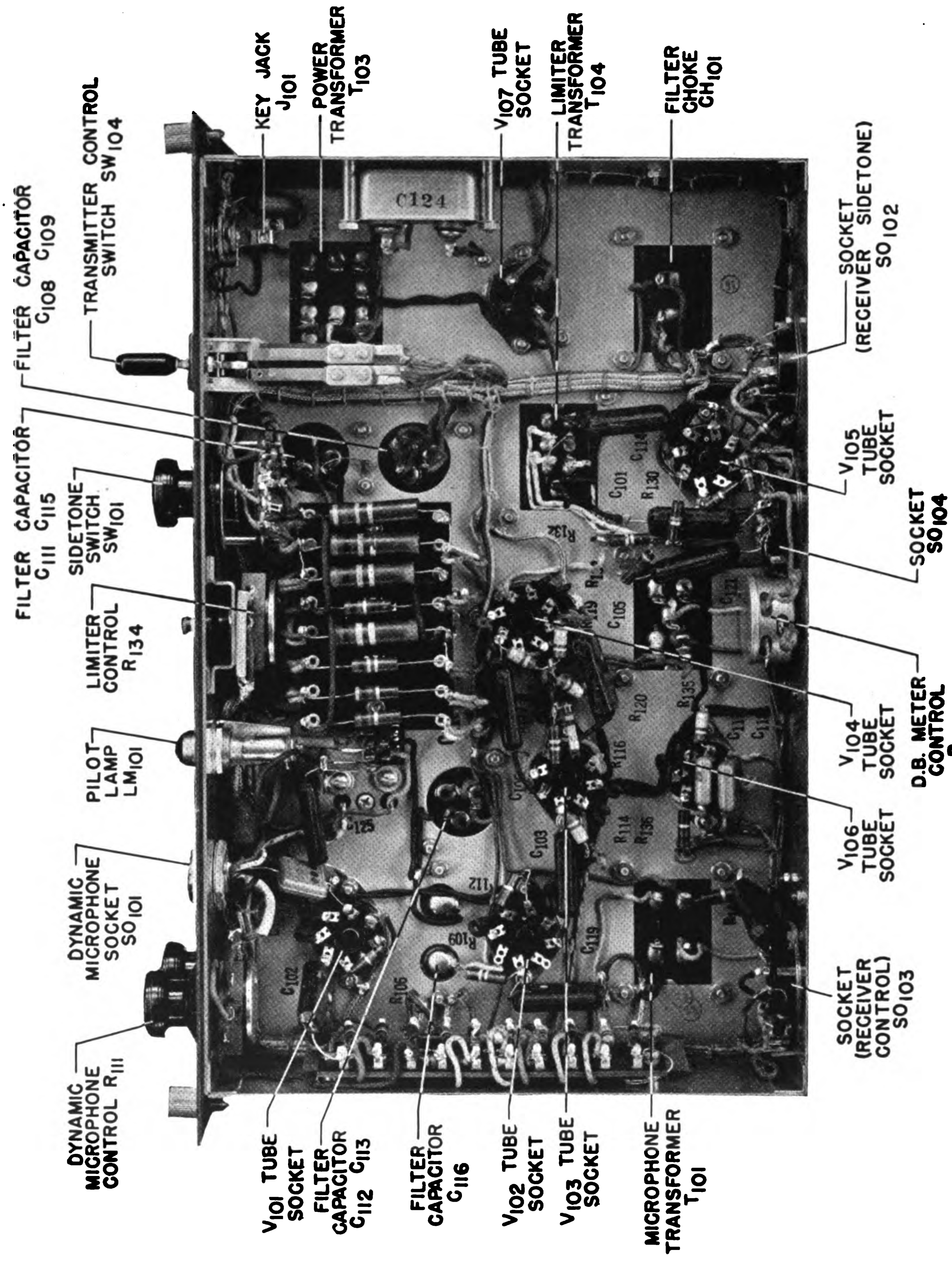


FIGURE 44. SPEECH AMPLIFIER BC-614-D, BOTTOM VIEW OF CHASSIS.

audio frequency transmission line to the transmitter's audio circuits.

b. ***Voice Circuits.*** — (Refer to figures 54 and 55.) The voice circuits include tube V_{101} (microphone input amplifier), tube V_{102} (voltage amplifier with automatically controlled grid bias), tube V_{103} (voltage amplifier and phase inverter) and tube V_{104} (push-pull output tube). Also included with the speech circuits is tube V_{105} which is an amplifier and rectifier for the voice limiter circuits.

(1) Input tube V_{101} is a Tube VT-103 (commercial type 6SQ7).

(*a*) The audio frequency voltage from Microphone T-50-(*) (dynamic microphone) enters the amplifier at terminal 3 of socket SO_{101} and appears across resistor R_{101} which is a grid leak for tube V_{101}. After passing through a network composed of resistors R_{102}, R_{103} and R_{104} (which will be explained later), the voltage is impressed on the grid of tube V_{101}.

(*b*) Grid bias for tube V_{101} is obtained by the voltage drop across cathode resistor R_{106}.

(*c*) The output voltage of the tube appears across plate resistor R_{107} and is fed through capacitor C_{102} and resistor R_{108} to the arm of gain control R_{111}. This voltage is then fed through capacitor C_{119} to the grid of tube V_{102}.

(2) Tube V_{102} is a Tube VT-94 (commercial type 6J5).

(*a*) This tube is the second voltage amplifier and receives its bias partly through resistor R_{109} from the speech limiting rectifier and partly by the drop across resistor R_{112} which is in the cathode circuit.

(*b*) Should the carbon microphone be in use, the input voltage from this microphone enters the speech amplifier through jack J_{102} and, after passing through transformer T_{101} and resistor R_{110}, appears on the arm of carbon microphone gain control R_{142}. Then it is fed to the grid of tube V_{102}.

(*c*) When it is desired to modulate the transmitter by means of either a local or remote telephone, the speech current enters the speech amplifier through terminal 5 of socket SO_{103}, passes through one of the contacts on switch SW_{104}, and then through resistor R_{105} to the grid of V_{101}. The attenuating network resistor R_{101}, R_{102}, R_{103}, R_{104} and R_{105} permit this input to be connected into the same grid circuit that is connected to the dynamic microphone without upsetting the impedance termination of either one. This network also adjusts the voltage at the grid of tube V_{101} to the proper value in either case.

(*d*) The amplified speech voltages, after passing through tubes V_{101} and V_{102} appear across the plate resistor R_{113} and are fed through capacitor C_{103} to the grid of one section of tube V_{103}.

(3) Tube V_{103} is a Tube VT-231 (commercial type 6SN7GT) and is a dual triode.

(*a*) One triode section of tube V_{103} operates as a conventional voltage amplifier. Its output voltage appears across plate resistor R_{117}, hence it is fed through capacitor C_{106} to grid of tube V_{104}.

(*b*) A portion of this grid voltage appears across resistor R_{120}, as a result of the voltage drop through resistor R_{118} (the grid leak for tube V_{104}). This portion of the voltage is fed back to the second grid of tube V_{103}. Here it is amplified and appears across plate resistor R_{116} in proper phase to be fed to the second grid of tube V_{104} through coupling capacitor C_{105} so that true push-pull action is obtained.

(*c*) The grid bias of tube V_{103} is obtained from the voltage drop across cathode resistor R_{115} which is by-passed by cathode capacitor C_{104}.

(4) Grid bias voltage of tube V_{104} (also a Tube VT-231) is obtained from the voltage drop across cathode resistor R_{121}, which is by-passed by capacitor C_{107}. As already explained, tube V_{104} acts as a push-pull amplifier and its output is delivered to the primary of output transformer T_{102}.

(*a*) The secondary of transformer T_{102} is connected to a low impedance line through which the amplified speech current is fed to the transmitter through socket SO_{104}.

(*b*) The relative strength of the output signal fed to the transmitter is registered on the OUTPUT LEVEL meter M_{101}. The meter reading is adjusted by resistor R_{122}, so that for normal speech, the indicator of the meter will be roughly in the center of the scale. This adjustment has been made at the factory and normally need not be touched.

(5) A portion of the voltage on one of the grids of tube V_{104} is fed back to volume limiter control R_{134}. This control is adjusted so that the proper amount of voltage for correct speech limiting is fed to the grid of tube V_{105} which is a Tube VT-233 (commercial type 6SR7).

(*a*) Grid bias for tube V_{105} is obtained by the voltage drop across cathode resistor R_{131}.

(*b*) The amplified voltage appearing across plate resistor R_{130} is fed through capacitor C_{114} to the primary of transformer T_{104}.

(*c*) The secondary of transformer T_{104} applies the amplified voltages to the plates of the push-pull diodes located inside tube V_{105}. The resulting rectified voltage appears across resistor R_{133}.

(*d*) This rectified voltage is both direct and alternating, but the a-c components are substantially removed by a filter network consisting of resistor R_{132} and capacitor C_{116}. This filter network has a time constant which allows the voltage appearing across capacitor C_{116} to vary in proportion to the average amplitude of the voice signal; yet it filters out the audio signal itself.

(*e*) The output potential of this filter is then applied as a variable bias voltage to the grid of tube V_{102} through resistor R_{109}. Tube V_{102} as it is used in this circuit, has the property of varying its amplification constant with grid bias variations. For example, an increase in negative grid bias voltage causes a decrease of gain in this stage of amplification.

(*f*) Should the operator talk in a much louder voice than is necessary to completely modulate the transmitter, the amplification of tube V_{102} will be decreased due to the action of speech limiting rectifier tube V_{105}. The overall gain of the amplifier is thereby reduced and the output of the amplifier will be less than if no limiting were used. This tends to limit overmodulation of the transmitter and acts to level off extreme voice peaks.

c. ***Power Supply.*** — A-C power is supplied to the speech amplifier through terminals 1 and 3 on receptacle SO_{104} from the transmitter when its FILAMENT POWER switch is closed.

(1) The a-c power is by-passed by capacitors C_{101} and C_{121} to eliminate r-f feedback from the transmitter.

(*a*) The a-c power is fed to the primary of transformer T_{103}. One secondary of transformer T_{103} supplies 6.3 volts to the filaments of all of the tubes with the exception of the rectifier tube. Filament power for the rectifier is supplied by another secondary winding which furnishes 5 volts.

(*b*) Plate power to the rectifier tube V_{107} is supplied by a secondary on transformer T_{103}.

(2) Tube V_{107} is a Tube VT-80 (commercial type 80) and its rectified output voltage is filtered by capacitors C_{108} and C_{109} and filter choke CH_{101}.

(*a*) From the output of this filter the voltage is applied to bleeder resistor R_{125} and to transformer T_{102} to supply plate voltage to tube V_{104}. It is also applied to an additional filter network consisting of resistor R_{126} and filter capacitor C_{111} to furnish plate voltage to tubes V_{103} and V_{106}. After passing through still another filter consisting of resistor R_{127} and filter capacitor C_{112}, it supplies plate voltage to tube V_{102}. Two further filters are furnished, one is composed of resistor R_{129} and capacitor C_{115} which supplies tube V_{105}, and the other is composed of resistor R_{128} and filter capacitor C_{118} which supplies voltage to tube V_{101}. The purpose of the cascade filtering is first, to substantially eliminate hum which would be amplified by the sensitive input stages; and second, to prevent reaction between cascaded stages.

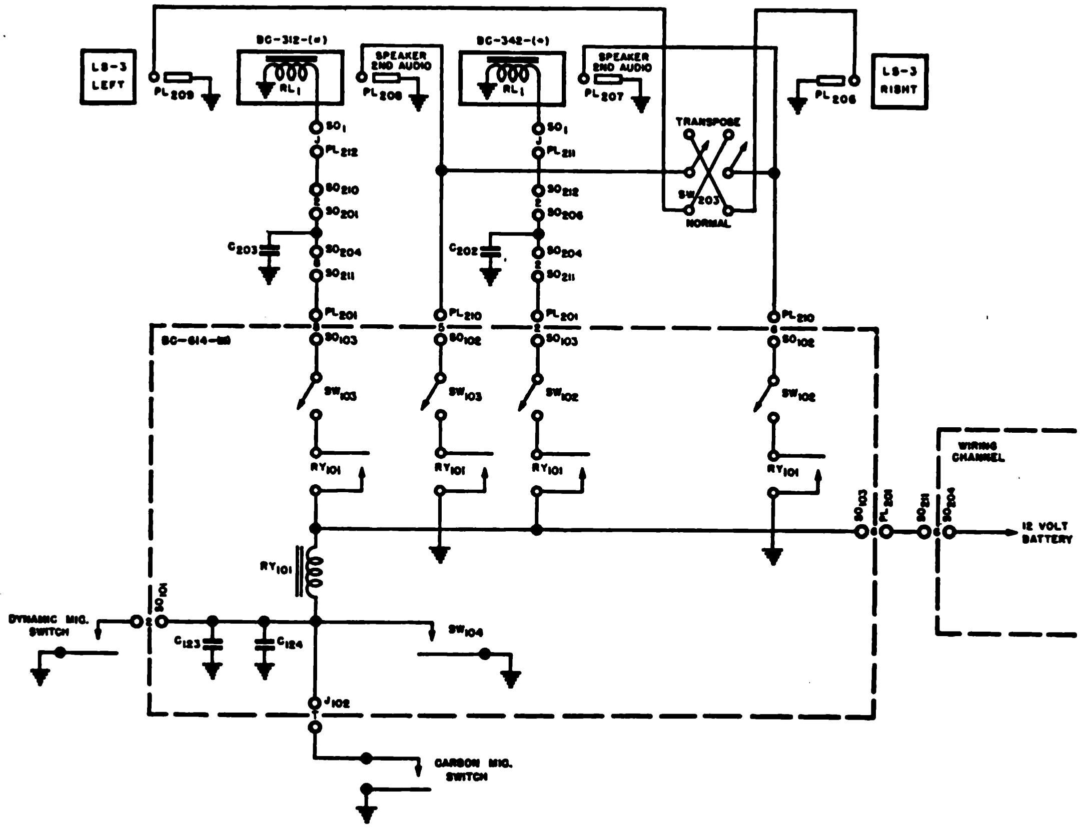
(3) Pilot lamp LM_{101} is mounted on the front panel and indicates when the speech amplifier is in operation.

d. ***Control Circuits.*** — There are two major functions performed by the control circuits of the speech amplifier, namely, the operation of the plate power relay RY_1 in the transmitter and the disabling of the receivers.

(1) The operation of the plate power relay RY_1 in the transmitter is accomplished by closing the circuit between terminals 3 and 4 of receptacle SO_{104}. This operation is performed when either switch SW_{104} is set at TRANS. ON or when relay RY_{101} is operated. Relay RY_{101} receives its power from the 12-volt d-c supply through terminal 6 of receptacle SO_{103} and is operated by the following controls:

(*a*) Switch SW_{104} (set at TRANS. ON)
Note: The REMOTE TELEPHONE-

RADIO SETS SCR-299-A, SCR-299-B AND SCR-299-C



RADIO SET SCR-299-D

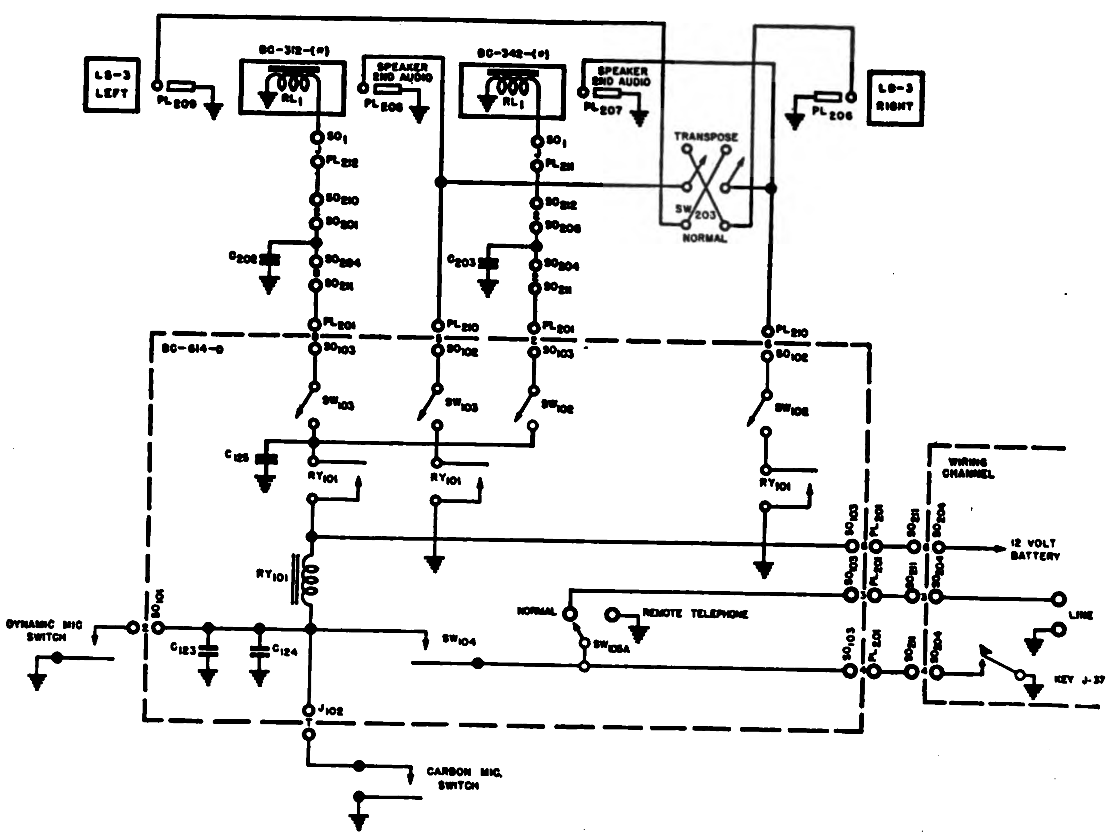


FIGURE 45. FUNCTIONAL DIAGRAM OF AUTOMATIC DISABLING CIRCUITS.

NORMAL switch on Speech Amplifier BC-614-D only must be set at REMOTE TELEPHONE.

(*b*) The push-button of Microphone T-50-(*) (when pressed).

(*c*) The push-button on Cord CD-318 used with Microphone T-30-(*) (throat) (when pressed)

(*d*) Either Key J-37 or Key J-45 (key down) **Note:** *This applies to Speech Amplifier BC-614-D only since relay RY_{101} is used to key the transmitter in addition to its normal functions in this unit.*

(2) The disabling of the receivers is accomplished either manually or automatically. When disabled manually the contacts of relay RY_{101} are simply disconnected from the disabling circuits and disabling must be done at the receiver proper. When disabling takes place automatically the contacts involved close, and operate the antenna shorting relay located within the receiver, and also short out Loudspeaker LS-3 associated with the receiver. Switch SW_{102} or SW_{103} is set at AUTO. Separate circuits are provided so that either receiver can be disabled alone without affecting the operation of the other.

e. ***CW Sidetone.***— Tube V_{106} which is a Tube VT-231 (commercial type 6SN7GT) is connected as an audio oscillator of the multivibrator type.

(1) Plate voltage is supplied at plate resistors R_{139} and R_{140}. The grid return in either case is through a grid leak being either resistor R_{135} or series resistors R_{137} and R_{138}. Coupling and feedback of the audio voltage is handled by the coupling capacitors C_{117} and C_{118}. Grid bias for the tube is obtained by the drop across cathode resistor R_{136}.

(2) The SIDETONE switch SW_{101} has three positions. The center position is OFF. The left hand position turns on the audio oscillator (when the key is pressed) and feeds the output of the oscillator through the second section of switch SW_{101} to the headphones used with Radio Receiver BC-312-(*). In the right hand position, the output is conducted to the headphones used with Radio Receiver BC-342-(*). To provide sufficient output, a portion of the audio oscillator output is delivered through resistor R_{114} to the grid of tube V_{103} where it is amplified through this tube and through tube V_{104}. The signal is then taken from the output circuit at the voltage divider network R_{123} and R_{124}, and conducted through switch SW_{101} and terminals 2 or 3 on socket SO_{102} to the appropriate receiver.

(3) Keying of tube V_{106} is accomplished by either inserting a key in Jack J_{101} or by manipulating Keys J-37. The cathode circuit of tube V_{106} is keyed in parallel with the cathode circuit of the oscillator tube in Radio Transmitter BC-610-(*).

f. ***Remote Operation.***— When remote telephone operation is desired, Telephones EE-8-(*) are connected to the speech amplifier through terminal 5 of receptacle SO_{103}. This circuit is then connected through switch SW_{104} either to the input of tube V_{101} or to terminal 4 of receptacle SO_{102}. (If Speech Amplifier BC-614-D is being operated switch SW_{105} must be set at REMOTE TELEPHONE.) The transmitter is put on the air when switch SW_{104} is set at TRANS. ON.

(1) With the transmitter control switch in the TRANS. ON position, speech coming from Telephone EE-8-(*) is fed through switch SW_{104} to the input circuits, allowing modulation of the transmitter from the remote position.

(2) When the transmitter control switch SW_{104} is set at RECEIVERS TO EE-8 the output of one of the receivers is fed through switch SW_{104} back to the line where it appears across the earpiece of the telephone.

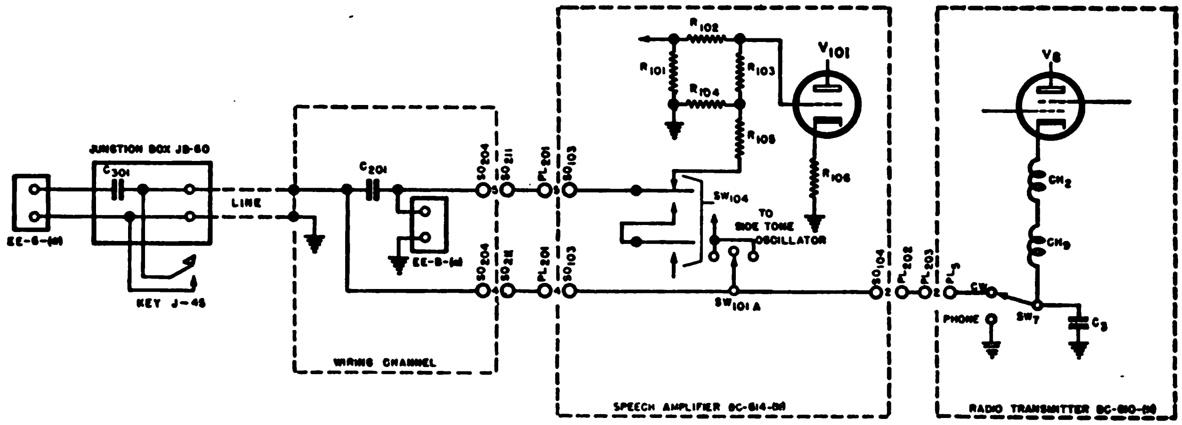
(3) With switch SW_{104} in the center position, the field telephone is not connected either to the receiver output or to the transmitter input. The entire combined circuit for remote c-w operation is shown in the simplified circuit diagrams, figure 46.

14. Table MC-269-(*).

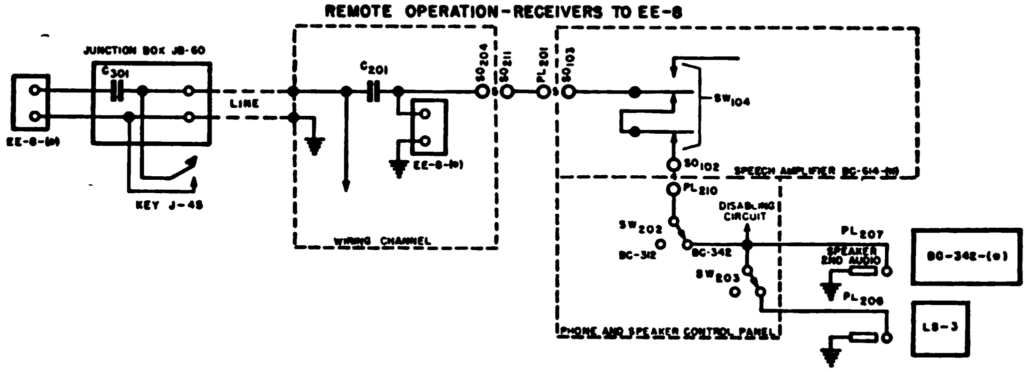
a. ***Mechanical Construction.***— Table MC-269-(*) is constructed of heavy plywood, and the top surface is covered with linoleum. It is designed to bolt to the floor of the truck against the left hand wall. This table, together with the equipment mounted on it, constitutes the complete operating position for the radio station. Figures 3 and 4 show two operating positions, each with its own light fixture for illumination, its own receiver, loudspeaker and telegraph key. Just below the front edge of the table is the PHONE AND SPEAKER CONTROL PANEL which selects either receiver the operator wishes to use for reception. The PHONE AND SPEAKER CONTROL PANEL is also equipped with jacks into which the operators may plug headphones to listen to either receiver. There is a slight difference be-

Radio Sets SCR-299-A, SCR-299-B and SCR-299-C

REMOTE OPERATION—TRANS. ON-KEY UP

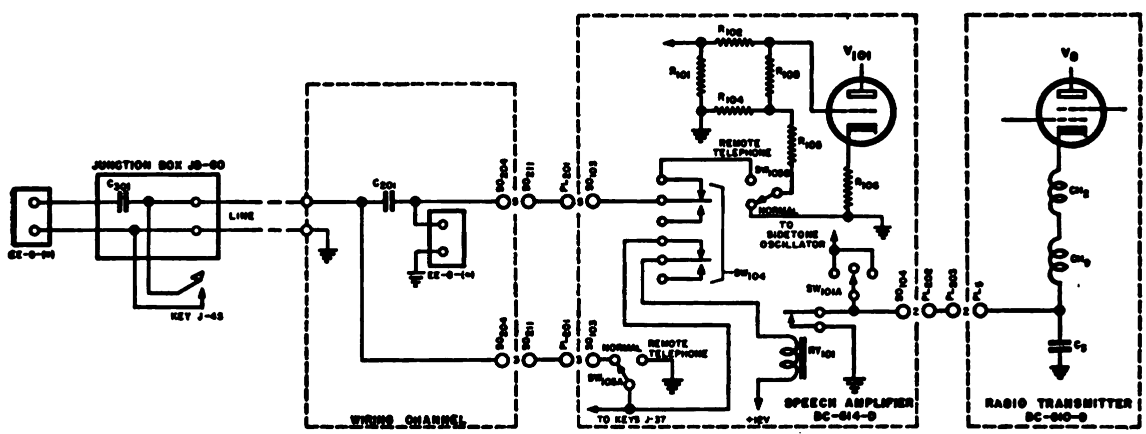


REMOTE OPERATION—RECEIVERS TO EE-8



Radio Set SCR-299-D

REMOTE OPERATION—TRANS. ON-KEY UP



REMOTE OPERATION—RECEIVERS TO EE-8

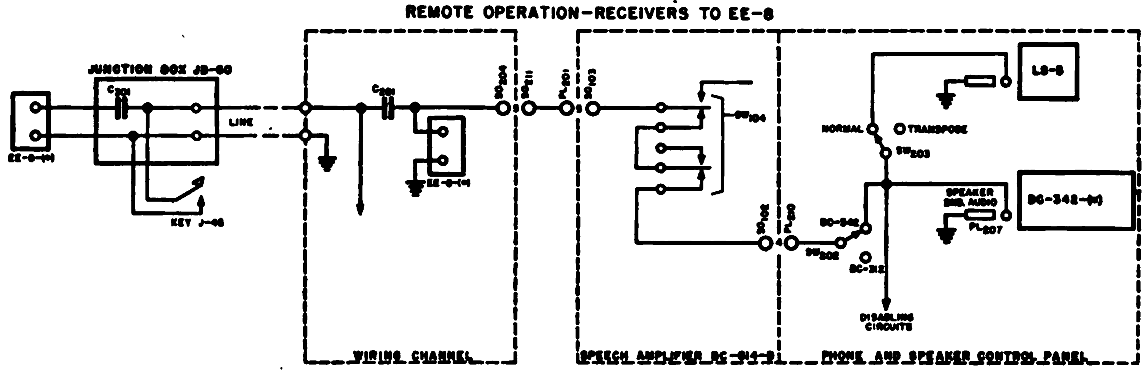


FIGURE 46. FUNCTIONAL DIAGRAM OF REMOTE OPERATION.

tween Table MC-269 and Table MC-269-A. The control center for the power unit on Table MC-269 is Control Box BC-731-(*), located at the right hand end of the table top. On Table MC-269-A, Switch SW-199-A serves a similar purpose and is located at the right hand end of the table just below the table top. Either control is connected to the power entry box, Junction Box JB-49-(*) or JB-69-A respectively. The connection is routed through the long wiring channel located at the rear of the table. This channel also serves as an electrical outlet for the various components of the radio set. For the location of the speech amplifier see figures 12 and 13. On Table MC-269 the speech amplifier is located on the shelf below the table drawer while on Table MC-269-A it is located between the operators and is mounted on the table top. At the left hand end of the table and fastened to its leg is the storage box for two Telephones EE-8-(*) equipped with a handy mounting for the headset of one of the telephone units usually left in the truck. Below the edge of the table and in front of the left hand operator is a drawer for storage of instruction books and writing material. In front of the right hand operator is a removable leaf, which, when turned over, mounts the portable typewriter. The typewriter slides into a holder on the right hand end of the table. Also in front of the right hand operator is the mounting for Microphone T-50-(*).

b. ***Electrical Circuits.*** — The power and control circuits through the cording from the power unit terminate at terminal strip TS_{201} in either Junction Box JB-49-(*) or JB-69-A. (See figures 56 and 57.) The terminals on this strip conduct a-c power, 12-volt d-c power, and the start and stop circuits that control the power unit. The a-c circuits are distributed through the fuses FS_{201}, FS_{202}, FS_{203} and FS_{204} which are located in Control Box BC-731-(*) on Table MC-269 or in Junction Box JB-69-A on Table MC-269-A. Control Box BC-731-(*) of Table MC-269 also includes a voltmeter M_{201}, which indicates the a-c line voltage.

(1) Fuse FS_{201} protects the circuits connected to the receptacles marked LIGHTS SO_{207} and SPARES SO_{203} on Table MC-269 (See figure 56). On Table MC-269-A fuse FS_{201} protects the circuits connected to the receptacles marked LIGHTS SO_{205} and SPARES SO_{203}. (See figure 57.) In either case this fuse protects the light fixtures and repair tools or appliances that are operated from these outlets.

(2) Fuse FS_{202} protects the circuit connected to receptacles SO_{209} which is the transmitter.

(3) Fuse FS_{203} protects the circuit connected to receptacle SO_{208} which is the electric heater located under the table.

(4) Fuse FS_{204} protects the circuits connected to receptacle SO_{205} on Table MC-269 which supplies a-c power to Radio Receiver BC-342-(*). On Table MC-269-A fuse FS_{204} protects the circuits connected to receptacle SO_{207}, namely, Radio Receiver BC-342-(*) and lamp LM_{201}.

(5) The 12-volt d-c terminal of terminal strip TS_{201} is wired to receptacles SO_{201}, SO_{202}, and SO_{204}.

(*a*) Through receptacle SO_{201}, power is supplied to Radio Receiver BC-312-(*).

(*b*) Through receptacle SO_{202}, power is available for any additional 12-volt d-c equipment or for charging the spare 12-volt storage battery located inside the truck.

(*c*) Through receptacle SO_{204} on terminal 6, 12-volt d-c power is supplied to the speech amplifier to operate relay RY_{101} and further, to operate the antenna shorting relays in Radio Receivers BC-342-(*) and BC-312-(*) during automatic disabling. The automatic disabling circuits are carried from receptacle SO_{204} to either receptacle SO_{206} or SO_{201}. The leads from the two Keys J-37 (or J-44) mounted on the top of Table MC-269-(*) also terminate at receptacle SO_{204}. The two ungrounded leads of both Keys J-37 (or J-44) connect to terminal 4 of this receptacle and the circuit then proceeds on to the speech amplifier in the form of a single conductor in the operating control cord. Receptacle SO_{204} also handles the circuit from the telephones (remote or local) on terminal 5. The remote keying circuit is handled by terminal 4 on Table MC-269 and by terminal 3 on Table MC-269-A.

(6) The cord between the speech amplifier and the transmitter (this cord is commonly referred to as the transmitter control cord) runs through the wiring channel on Table MC-269-(*) but is not otherwise interconnected with its circuits.

(7) The receiver output circuits which are all connected to the PHONE AND SPEAKER CONTROL PANEL are independent of the power and control circuits already described. Basically the functions of the PHONE AND SPEAKER CONTROL PANEL are the same for Table MC-269 as for Table MC-269-A. These functions are to transpose two headset channels and two speaker channels; to

select the desired receiver for the field telephones.

(a) With either type of installation plug PL_{207} and plug PL_{208} must be plugged into the SPEAKER 2ND AUDIO jack of Radio Receivers BC-342-(*) and BC-312-(*) respectively. From these plugs the audio output of the receiver is conducted through a shielded cable to switch SW_{203} on the PHONE AND SPEAKER CONTROL PANEL. Both cables terminate separately at the two pole connections of switch SW_{203} which is a double-pole, double-throw type of toggle switch. (See figures 56 and 57.) The usual transposing connections have been applied to this switch so that the two loudspeakers that are connected to the contacts of this switch through shielded cables and plugs PL_{206} and PL_{209} receive the audio signals from their associated receivers with the NORMAL setting of the switch or exchange receivers with the TRANSPOSE setting of the switch.

(b) The headsets receive their signals in a slightly different manner, depending on the type of table. Table MC-269 has been equipped with plugs PL_{204} and PL_{205} (Plug PL-55) to be plugged into the PHONES 1ST AUDIO jack of Radio Receivers BC-312-(*) and BC-342-(*), respectively. From these plugs the audio output of the receivers is fed to switch SW_{204}. On Table MC-269-A the audio for the headset is taken from the speaker output circuit and attenuated by resistors R_{201} and R_{202}. This attenuated signal is also fed to switch SW_{204}. From this point in the circuit both types of tables are wired alike. The two signal voltages for the headsets appear at the switch terminals in such a manner that when the switch is set at NORMAL the headset jacks, J_{201}, J_{202}, J_{203}, and J_{204} receive the signal voltage from the receiver normally supplying them. When the switch is set at TRANSPOSE, the two pairs of headset jacks exchange receivers.

(c) For remote operation the PHONE AND SPEAKER CONTROL PANEL is provided with switch SW_{202} which selects the receiver output channel to be fed to the remote telephone line. The signal is picked up at switch SW_{203} by a pair of wires, one for each receiver output channel, and fed to switch SW_{202} where the desired channel is selected and passed on to terminal 4 on plug PL_{210}. The channel passes through the speech amplifier and back through the wiring channel at receptacle SO_{201} and on to the telephone line.

(d) Another function of plug PL_{210} is to provide circuits through terminals 2 and 3 for sidetone signals from the speech amplifiers. The sidetone signal is fed to either receiver so that the operator may monitor his telegraphic transmissions through the headset circuit.

(e) The remaining function of plug PL_{210} is to provide a circuit through terminals 5 and 6 for automatically short circuiting either loudspeaker during automatic disabling when press-to-talk operation is used. Relay RY_{101}, located inside the speech amplifier, grounds the loudspeaker circuit when operated by the microphone push button or the transmitter control switch.

c. ***Remote Operation.*** — Two field telephones, EE-8-(*) together with one or two Reels DR-4 containing Wire W-110-B are readily removable from the truck and form an independent field telephone system. When used in conjunction with the radio station, one telephone is left in its position on the table and the other one removed to the remote point together with Junction Box JB-60. Junction Box JB-60 allows the remote operator either to communicate with the radio station by means of his field telephone or to key the transmitter remotely by plugging Key J-45 into the jack on Junction Box JB-60.

(1) During c-w transmission a direct wire connection to the keying circuit is obtained from Jack J_{301} on the remote terminal box, through the line, into the line terminals at Table MC-269-(*), and through terminal 3 or 4 of socket SO_{204} depending on the table connections. (See figures 56 and 57.)

(2) When remote modulation of the transmitter is used the field telephone at the remote end is connected through capacitor C_{301}, through the line, through capacitor C_{201} into terminal No. 5 on receptacle SO_{204}. These last two mentioned capacitors allow ringing and talking between the two field telephones and allow voice modulation of the transmitter without requiring a metallic circuit which would close the keying circuit of the transmitter.

SECTION IV — MAINTENANCE

Caution: Maintenance and servicing should be attempted only by competent personnel who are thoroughly acquainted with the dangers involved. (See Safety Notice.)

15. Regular Inspection And Service.

To insure reliable operation of Radio Set SCR-299-(*), it is of the utmost importance that its major components be frequently inspected. *When placed in continuous service, thorough inspection should be made at least once every twenty-four hours.*

a. ***Components Covered by Separate Instruction Books or Technical Manuals.*** — Operating personnel should read carefully and note well the chapters entitled "Maintenance" in the instruction books or technical manuals covering Radio Receivers BC-312-(*) and BC-342-(*), the Frequency Meter Set SCR-211-(*), Telephone EE-8-(*), and Power Unit PE-95-(*).

Caution: The instructions pertaining to the maintenance of Power Unit PE-95-(*) are extremely important since the radio station is primarily dependent on this source of power. Power Units PE-95-A, PE-95-B and PE-95-C are Ford powered. Power Units PE-95-E, PE-95-F and PE-95-G are Willys powered. Be sure you have the proper technical manual for your power unit.

b. ***Outline of Inspection Checks.*** — (Power Unit PE-95-(*).)

(1) See to it that the power unit is properly inspected and serviced at least once every twenty-four hours when in continuous service and that *closest attention be accorded to oil pressure and engine temperature when in operation.*

(2) Keep an accurate record of all changes of oil, water and anti-freeze.

(3) Make every effort to change the oil promptly, when the time limit for so doing expires. Neglecting to do so will result in damage to the engine.

c. ***Outline of Inspection Checks.*** — (Major Components.) The major components of Radio Set SCR-299-(*) located within Truck K-51-(*), should be checked for proper operating condition as hereinafter outlined and results should be recorded in the station's log every single day that it is in operation.

(1) Check the power cable from trailer to truck. It must be held firmly in place both at the trailer and beneath the truck and should have sufficient slack to permit the trailer to swing at right angles to the truck.

(2) Check and tighten the large wing nut holding conduit fittings where power cable enters floor of the truck.

(3) Check and tighten power cable binding posts at the power unit instrument panel and wing nuts in Junction Box JB-49-(*) or JB-69-A.

(4) Make certain that Trailer K-52-(*) tail light plug fits firmly into socket at rear of truck.

(5) Check trailer tail and stop lights and replace burnt out lamps when necessary.

(6) Check Telephone EE-8-(*) batteries and replace if necessary.

(7) Check batteries in Frequency Meter Set SCR-211-(*).

(8) Check truck pintle making certain that trailer eye hook is securely held; make certain that the cotter pin is secure in the pintle. *Never drive without checking condition of the cotter pin* for should it be missing, or should it in any manner break or fall out, the power unit will surely break away from the truck when riding over rough roads.

(9) Check and tighten the wing head bolts and wing nuts holding the following:

- (*a*) Table MC-269 to floor.
- (*b*) Chest CH-89 to floor.
- (*c*) Heater to floor.
- (*d*) Radio Transmitter BC-610-(*) to cradle.
- (*e*) Cradle to floor.
- (*f*) Speech Amplifier BC-614-(*) to shelf.
- (*g*) Reels DR-4 to sides of truck.

(10) Check and tighten turnbuckles holding the following:

- (*a*) Table MC-269 to wall.
- (*b*) Chest CH-88 to wall.
- (*c*) Reels DR-4 to sides of truck.

(11) Check for proper contact and proper position, the following plug connections:

- (*a*) BC-312-(*) at PL-114 and at outlet under table.
- (*b*) BC-342-(*) at PL-114 and at outlet under table.
- (*c*) The transmitter power cord at outlet at right side of table.
- (*d*) Lighting fixture cords at outlet under table.

(e) Heater cord at outlet under table.
(f) Both ends Cord CD-564 from BC-342-(*) to a-c outlet under table.
(g) Plugs in rear sockets of BC-610-(*).
(h) Plugs in rear sockets of BC-614-(*).

(12) Check for proper quantity of —
(a) Tuning Units. (Boxes)
(b) Coil Units. (Tank Coils)
(c) Headsets HS-30-(*) or P-23.
(d) Microphones T-50-(*) and T-30-(*).
(e) Keys J-44 (or J-37) and J-45.
(f) Trouble lamps.
(g) Fire extinguishers.

(13) Check on quantity of spare —
(a) Antenna mast sections.
(b) Batteries for EE-8-(*) and SCR-211-(*).
(c) Tubes and pilot lights.
(d) Radio parts.
(e) Electric lamps.

(14) Climb on roof of truck and tighten all antenna mast sections using gas pliers.

(15) Check condition of and clean all antenna insulators.

(16) Check condition and tighten wires from truck feed through insulator to Mast Bases MP-22.

(17) Check condition of and tighten cables from truck feed through insulators to BC-312-(*) and BC-342-(*) antenna binding posts.

(18) Tighten wing nuts on the four Mountings FT-178.

(19) Check Mountings FT-162 of BC-312-(*) and BC-342-(*) making certain that locking wires are in place.

(20) Make sure all thumb screws, holding front panels of BC-312-(*), BC-342-(*) and BC-614-(*) in their cabinets, are tightened securely.

(21) Check for proper operation and condition of —
(a) All Plugs PL-55 and PL-68.
(b) Both receivers.
(c) Transmitter and speech amplifier.
(d) All phones, keys and microphones.

(22) Never fail to have on hand the following:
(a) Soldering iron.
(b) Rosin core solder.
(c) Friction tape.
(d) Gas pliers.
(e) Cutting pliers.
(f) Small, medium, and large screw drivers.
(g) Knife.
(h) Machine oil.
(i) Tool equipment TE-48.

(23) Check condition of spare 12-volt storage battery; add water and recharge if necessary.

d. ***Cleaning.*** — The equipment must be kept clean for best service life. At regular intervals (every two to four days), blow dust out of the equipment and clean the antenna tuning inductance with a dry rag or with carbon tetrachloride if available. At greater intervals (every two to three months) check the relay contacts for accumulation of dirt or pitting. The contacts may be cleaned with very fine sandpaper, or with an ignition file.

e. ***To Recharge The Spare 12-Volt Battery.*** — To recharge the spare 12-volt battery, proceed as follows:

(1) Turn off Radio Receiver BC-312-(*).

(2) Connect truck spare battery cord with plug on battery box and make sure the other end of this cord is connected to socket SO_{202} in Table MC-269.

(3) Start the power unit and run normally until battery is charged.
Note: All equipment except Radio Receiver BC-312-(*) may be used during the charging period. If urgently needed for communication this receiver may be operated, but its drain on the d-c current supply leaves insufficient margin for charging the battery.

f. ***Checking Transmitter Performance.*** — The normal, maximum and minimum currents and voltages of the principal circuits of Radio Transmitter BC-610-(*) are listed in the Chart of Performance Characteristics, Section V. These readings should serve as a guide to proper performance. No strict interpretation should be made of readings under the heading "normal" as these are subject to some variation. However, the maximum and minimum limits should not be exceeded. A wide variation beyond the extreme limits would indicate improper tuning adjustments or a defective component (usually a fuse, crystal or tube).

16. Removal Of Equipment.

Whenever it becomes necessary to remove any of the major components of Radio Set SCR-299-(*) from within the truck proceed as follows:

a. If at all possible, move the truck in such a position as to jack knife the trailer and the rear of the truck will become more readily accessible.

b. Remove Chest CH-88 (wall). (Requires two men.)

(1) Loosen and unclasp both turnbuckles.
(2) Grasp cabinet firmly with both handles.
(3) Unclasp all four trunk clasps.
(4) Set Chest CH-88 on Chest CH-89 (seat bench).
(5) Lower to ground.

c. Remove Chest CH-89 (seat bench). (Requires two men.)
(1) Unscrew the 6 wing head bolts holding it to floor.
(2) Lower the chest from floor of truck to ground, holding by its handles.

d. Remove Table MC-269. (Requires four men.)
(1) Remove Chest CH-89 as outlined above in paragraph *c*.
(2) Loosen and unclasp both turnbuckles.
(3) Remove wing nuts holding legs of table to the floor mounting bolts.
(4) Remove antenna leads to Radio Receivers BC-312-(*) and BC-342-(*).
(5) Remove Mountings FT-178 holding BC-312-(*) and BC-342-(*).
(6) Remove all cords and plugs to the receivers.
(7) Remove both receivers from the Mountings FT-162.
(8) Disconnect the spare battery cord from table by removing plug at battery box and at d-c receptacle under table.
(9) Remove the transmitter power cord from a-c receptacle at right hand side of table.
(10) Remove the transmitter control cord and the operating control cord located at rear of Speech Amplifier BC-614-(*).
(11) Open cover of Junction Box JB-49-(*) or JB-69-A.
(12) Disconnect and tape up the a-c terminals.
(13) Disconnect and tape up the control terminals.
(14) Disconnect and tape up the d-c terminals.
(15) Remove the electric heater.
(16) Unclasp the 4 trunk clasps holding Speech Amplifier BC-614-(*) to mounting base.
(17) Disconnect all plugs and connectors from microphones or key, from front of speech amplifier.
(18) Pull out table drawer to provide clearance.
(19) Remove Speech Amplifier BC-614-(*) from mounting base.
(20) Close table drawer.
(21) Remove both Telephones EE-8-(*) from their compartments.
(22) Table should now be light enough and free to move, but first make certain nothing will interfere with its removal.
(23) Move table along wall of truck toward the rear for about three or four inches or enough to clear the floor mounting bolts.
(24) Now move table over toward the center aisle of the truck.
(25) Tilt the table over, slightly sidewise, enough to clear the roof at the rear of the truck without striking lighting fixtures, and pass table outward before lowering.

e. Remove Radio Transmitter BC-610-(*). (Requires four men.)
(1) Remove Chest CH-88 as noted in paragraph 16 *b*.
(2) Remove Chest CH-89 as noted in paragraph 16 *c*.
(3) Disconnect the transmitter power cord from rear outlet of the transmitter.
(4) Disconnect the transmitter control cord from the octal socket at the rear of the transmitter.
(5) Disconnect antenna lead from Antenna Tuning Unit BC-729-(*).
(6) Disconnect r-f feeder from the transmitter to the antenna tuning unit.
(7) Disconnect all ground wires from the transmitter and the antenna tuning unit.
(8) Remove wing nuts holding the antenna tuning unit to top of transmitter.
(9) Remove Antenna Tuning Unit BC-729-(*) from top of transmitter.
(10) Unscrew the long wrench nuts holding cradle of the transmitter to the floor of the truck.
(11) Move transmitter with its cradle directly toward right wall, to center of truck.
(12) Remove the 4 large wing head bolts holding transmitter in its cradle.
(13) Grasp the 4 handles, lift transmitter directly out of cradle and place on floor.
(14) Move the transmitter around into the center aisle and toward the rear of the truck.
(15) It will now be necessary to have three of the men on the ground ready to assist in lowering the transmitter from floor of truck to ground.
(16) Grasp the 4 handles firmly, lower directly to ground.
(17) Cradle now can be removed from truck if desired.

17. Procedure In Case Of Equipment Failure.

***Caution*:** Do not change fuses or make repairs with the high voltage on, for under this condition a potential of 2000 to 2500 volts d-c is present on all three decks of the transmitter.

a. Failure of this equipment to operate properly will usually be found to result from the following:

(1) Improperly connected power cable between the power unit and the truck.

(2) Worn, broken, or disconnected cords or plugs.

(3) Defective fuses.

(4) Burned relay contacts due to overloads.

(5) Wires broken from excessive vibration.

(6) Defective tubes.

(7) Inactive (dirty or cracked) crystal.

b. When failure is encountered check the above items before initiating a detailed examination of the component parts of the system.

c. Check fuses at an early stage in shooting trouble. Do not continue to burn out fuses before looking elsewhere to determine the basic source of trouble. (Insertion of an electric lamp in place of a fuse will often prove helpful in tracing source of difficulty if fuses continue to burn out.)

18. Locating Trouble.

There is no substitute for patience, common sense and thoroughness in overcoming any trouble-shooting problem. In general, the first step is to locate the *region* where the trouble exists, such as Power Unit PE-95-(*), Operators Table MC-269, Radio Transmitter BC-610-(*), Speech Amplifier BC-614-(*), etc. Next, determine the *circuit* at fault within this region; and finally by painstaking use of a test meter, a logical process of elimination will lead to the *component part* causing the trouble. (In an emergency, if no test meter is available, one can be improvised by disconnecting a meter from the equipment.) The following symptoms and causes may assist in localizing a possible source of trouble in Radio Set SCR-299-(*):

SYMPTOM	LIKELY CAUSE
a. Power Unit PE-95-(*) refuses to start when the START button is pushed on Control Box BC-731-(*) or Switch SW-199-A.	(1) START and STOP leads interchanged or disconnected either at the junction box or in the trailer terminal board. (2) Discharged battery in the power unit might operate the relay but refuse to turn over the engine.
b. No filament voltage in Radio Transmitter BC-610-(*).	(1) One or all fuses FS_1, FS_2, FS_4 and FS_5 are burned out. (2) Defective FILAMENT POWER switch. (3) Defective filament resistor, R_{18}. (4) Damaged power cord or poor plug contacts. (5) V_{13}, V_{14}, and V_{15} are not in their sockets.
c. No excitation indicated on P.A. GRID CURRENT meter of Radio Transmitter BC-610-(*).	(1) Tuning unit improperly installed or missing. (2) BAND SWITCH not set to proper channel. (3) M.O.-XTAL switch on coil box in wrong position. (4) Failure in keying circuits in operators' table MC-269. (5) Fuse FS_4 burned out. (6) Omission of or defective tubes on exciter deck. (7) Open r-f choke, CH_8. (8) EXCITER PLATE POWER switch not turned on for tune-up purposes. (9) Tuning unit not properly tuned.
d. No final amplifier plate current indicated on the P.A. PLATE meter of Radio Transmitter BC-610-(*). (Assuming that the necessary P.A. grid current is present.)	(1) "Reset" necessary on overload relay. (2) Fuse FS_8 burned out. (3) Interlock switches are not all closed due to faulty closing of door if back screen has not been removed. (4) Short circuit in high voltage circuit continually tripping out the overload relay.

SYMPTOM	LIKELY CAUSE
	(5) Poor or no cable connection with Speech Amplifier BC-614-(*). (6) Defective rectifier tubes (VT-46-A) or inoperative due to extreme cold. (7) Missing output coil unit, L_7. It may be improperly installed on jack bar. (8) V_6 and V_7 plate caps removed. (9) 600 watt heater element used for tuning up on low power is defective or missing. (See R_{19}.)
e. Excessive power amplifier plate current indicated on the P.A. PLATE meter of Radio Transmitter BC-610-(*).	(1) R-f choke, CH_8, is open. (2) Improper tuning of output circuit i.e. wrong coil unit, L_7, failure to use vacuum capacitor C_{28} below 2.5 megacycles, etc. (3) Too much antenna coupling. (4) Grid cap on V_{16} is loose or removed. (5) No bias voltage due to blown fuse, FS_5, or defective rectifier, V_5. (6) Voltage breakdown between center tap of L_7 and the coupling link.
f. Plate voltage of Radio Transmitter BC-610-(*) final amplifier remains on after being switched off.	(1) Relay RY_1, has frozen during a *severe* overload. (***Caution***: Leave plug out of socket PL_6 while working on this relay.)
g. Excessive modulator plate current indicated on MOD. PLATE meter of Radio Transmitter BC-610-(*).	(1) Fuse FS_5 blown. (2) Improper adjustment of the bias voltage controlled by the MODULATOR BIAS control on the front panel. (3) Acoustical feedback caused by GAIN control on Speech Amplifier BC-614-(*) advanced too far. (4) Grid caps of V_3 and V_4 are disconnected. (5) Lack of bias voltage because of defective tube V_5 or blown fuse FS_5.
h. No antenna current indicated on ANTENNA CURRENT meter of Antenna Tuning Unit BC-729-(*).	(1) Incorrect control settings. (See tuning charts.) (2) Sections of transmitting antenna missing. (3) Coupling coil too loosely coupled to L_5 in the antenna tuner. (4) Grounding bonds disconnected. (5) Vacuum capacitor is shorted out by the change over switch if operating above 6 megacycles; or it is not shorted out if operating below 6 megacycles.
i. Receiver disabling circuits fail to operate.	(1) SEND-REC. switch on panel of Radio Receiver BC-312-(*) or BC-342-(*) is at REC. instead of SEND as it should be. (2) The 12-volt battery not connected to Table MC-269, (when operating without the power unit). (3) Worn or defective cables on Table MC-269.
j. Microphone "push-to-talk" switch fails to operate.	(1) The 12-volt battery not connected to Table MC-269 (when operating from commercial a-c supply). (2) Poor or broken microphone connection to Speech Amplifier BC-614-(*). (3) Faulty switch inside the microphone.

19. Normal Voltage Readings.

The Tube Socket Layout Diagrams Showing Voltages (Figures 69 and 70), Section V, are furnished for the information and guidance of *servicing* personnel. The values are approximate and will vary slightly with different units and different measuring equipment. The voltage readings represent those to be found in normal operation. The use of these data, combined with a logical circuit analysis, will usually disclose the source of trouble. (See also paragraph 25, Table of Continuity Checks for Cables and Terminal Boards, and paragraph 26, Table of Data for Checking Transformers, Chokes and Inductors.)

20. Cleaning Crystals.

a. Crystals are mechanically fragile, consequently holders should not be opened for cleaning or inspection unless absolutely certain that crystal is inoperative.

b. Use extreme care in handling crystal.

c. When cleaning is necessary, proceed as follows:

(1) Remove cover screws and cover.

(2) Remove crystal and electrodes.

(3) Carefully holding by edges, separately wash crystal and electrodes, using either —

(*a*) carbon tetrachloride, or

(*b*) soap and water with a thorough final rinsing in clear water.

(4) Dry with a clean lintless cloth.

(5) Reassemble crystal and electrodes in holder, still holding by edges.

(6) Replace cover plate.

21. Access To Components.

a. For access to the various transmitter decks when servicing outside of truck.

(1) Disconnect the pair of leads connected to TS_5 on the exciter deck.

(2) Unscrew four wing bolts holding the cover down and lift straight up to remove.

(3) Remove seven wing bolts holding the back cover.

(4) Remove all tubes for safe keeping.

(5) Lay the transmitter on its *right side* (side opposite feed-through insulators) to gain access to the bottoms of the exciter chassis, modulator chassis and power supply chassis.

b. For extensive work on the radio frequency stages:

(1) Disconnect four wires which are tied into a small cable from the terminal strip, TS_1, on the exciter chassis apron.

(2) Disconnect both leads from the P.A. PLATE meter, M_5.

(3) Disconnect the twisted pair feeding the coil on the antenna change-over relay, RY_4.

(4) Disconnect the black heavy high tension lead from the final tank capacitor mounting strip.

(5) Remove two plugs, $PL_{1\cdot1}$ and $PL_{2\cdot1}$ from their sockets, PL_1 and PL_2.

(6) Remove fourteen screws and nuts which tie the upper lip of the modulator deck to the lower lip of the r-f deck.

(7) Lift the r-f deck from the remaining units.

c. For access to the wiring on Table MC-269.

(1) Remove five round head machine screws from the back cover plate of the wiring channel.

(2) Loosen the wood screw holding the cross brace to the center leg.

(3) Slide the back plate of the wiring channel in either direction to remove it.

22. Neutralization.

Radio Transmitter BC-610-(*) has been adjusted for neutralization and will not require adjustment in the field, unless the neutralizing capacitor C_{18} had been tampered with. If this is the case, readjust as follows:

a. Install Tuning Unit TU-52 and associated coil unit.

b. Disconnect from transmitter output terminals the two leads to the antenna tuning unit.

c. Set FILAMENT POWER switch at ON.

Note: In this operation high voltage plate power is not applied, so the transmitter control switch on the speech amplifier must be left at TRANS. OFF; the PLATE POWER switch on the transmitter is set at OFF.

d. Set P.A. GRID-INT. AMP. GRID switch to P.A. GRID.

e. Set EXCITER PLATE POWER switch to ON.

f. Adjust controls of the tuning unit to resonance at some frequency near the high frequency end of the range.

g. Adjust PLATE TUNING wheel slowly through resonance. (If neutralization is faulty, resonance will be indicated by a sharp dip in the reading of the GRID CURRENT meter.)

h. Adjust neutralizing capacitor C_{18}, little by little, checking after each adjustment, until rotating the PLATE TUNING wheel through resonance causes only a slight dip in the reading of the GRID CURRENT meter. (When properly neutralized this dip will not exceed 3 ma.)

23. Modulation Limiter.

a. The modulation limiter in Speech Amplifier BC-614-(*) has been properly set to provide a minimum of 3 db compression at 100% modulation, and no change in setting is recommended. Readjustment should be made only in the event that the MOD. LIMITER control definitely has been tampered with; no adjustment in the field is recommended unless an audio oscillator is available.

b. If necessary, adjustment of the modulation limiter control is accomplished as follows:

(1) See that the speech amplifier and the transmitter are connected for operation but PLATE POWER switch on transmitter is OFF and the transmitter control switch is set to TRANS. OFF.

(2) Set FILAMENT POWER switch at ON.

(3) Set CW SIDETONE switch at OFF.

(4) Remove metal plate covering the MOD. LIMITER screw adjustment control.

(5) Turn this MOD. LIMITER control to the extreme left.

(6) Set CW-PHONE switch of transmitter at PHONE.

(7) Set transmitter control switch at ON and make sure that the transmitter is completely tuned for high power phone operation. Make sure that the plate current of the modulator is adjusted to 40 ma. with no modulation.

(8) Apply 400 cycles output of audio oscillator between ground and input terminal of either microphone jack. Connections to DYNAMIC MIC. 2 jack SO_{101} for example, would be: ground of audio oscillator to lower terminal #1, and other lead to terminal #3.

(9) Adjust microphone gain control or audio oscillator output control until MOD. PLATE meter reads 225 ma.

(10) Turn MOD. LIMITER screw adjustment control to the right until MOD. PLATE meter decreases to 160 ma. Set transmitter control switch at OFF. The modulation limiter has now been adjusted for normal operation; the metal plate should be put back in place and firmly secured; the audio oscillator may be replaced by the microphone and operation of the equipment resumed.

24. Use Of Triumph Model 333 Analyzer.

a. The Triumph Analyzer supplied with Radio Set SCR-299-(*) can be used for the following purposes:

(1) Voltage measurements (both direct and alternating) from less than one volt to 3,000 volts.

(2) Continuity tests.

(3) Determining values of resistors, zero to 10 megohms.

(4) Direct current measurements, from 0.1 milliampere to 15 amperes.

b. Directions for setting the analyzer will be found on the chart in its cover.

c. ***Resistance Measurements.*** — To test any resistor.

(1) Set the analyzer switches and make test prod connections as indicated in the chart for the range into which the resistor falls.

(2) Short the test prods and adjust the meter for full scale deflection (ZERO OHMS) by use of OHMS ADJUST knob.

(3) Now touch the test prods to the ends of the resistor, at least one end of which should be disconnected from the circuit.

(4) Read the ohms on the OHMS scale, and multiply that reading by the value indicated on the OHMS range on the rotary selector switch. ***Note:*** The OHMS adjustment must be made every time the range switch is changed from one range to another.

d. ***Measuring Alternating and Direct Voltage.* — *CAUTION*:** Whenever approximate *voltage, current,* or *DB level* is not known, always begin measurements with *highest range* to prevent damaging the instrument by an overload.

(1) Refer to chart for correct settings of controls, switches, jacks, and test prods before making any measurements.

(2) The DECIBEL calibration is for use across 500 ohm lines and loads. The scale is read directly in db.

(3) The OUTPUT jacks are for measuring the voltage or db level of any a-c or audio voltage. Internal circuits are made through a .1 µf isolating capacitor inside the instrument, and in such cases alternating current or audio superimposed on a d-c voltage may be read without harm to the analyzer.

e. ***High Voltage Measurement. — CAUTION: It is extremely dangerous to make this measurement. The high voltage in Radio Transmitter BC-610-(*) is lethal. Do not make this measurement, except as a last resort, and then always arrange to have someone else present. The recommended procedure for measuring the high voltage is as follows:***

(1) Insulate analyzer well above ground by placing it on dry boards or other insulating material at least one inch thick on Table MC-269.

(2) Set analyzer controls to proper positions for

measuring 3000 volts D-C as indicated on analyzer chart.

(3) Remove coil unit L_7.

(4) Place red (positive) test lead prod into center jack of jack bar.

(5) Connect black (negative) test lead to any convenient ground on the transmitter frame.

(6) Open right-hand cover door (over tuning boxes) to open its interlock switch. (This switch will be used in step 13 to close the circuit.)

(7) Fasten down the interlock switch at the left hand cover door so its circuit is closed.

(8) See that back screen is in place so its interlock is closed.

(9) Arrange the red (positive) test prod and cord so that it is extremely well insulated; it should be carefully supported free and clear from the door and frame of the transmitter and any components.

(10) **STAND CLEAR OF THE RED (POSITIVE) TEST LEAD AND SEE THAT NEITHER YOU NOR OTHER PERSONNEL COME IN CONTACT WITH IT WHEN VOLTAGE IS ON.**

(11) Set PLATE POWER switch of transmitter up, to ON.

(12) **PUT YOUR LEFT HAND IN YOUR POCKET.**

(13) With your right hand, turn on the high voltage by pressing the interlock switch at the right-hand cover door.

(14) Read the voltage indication on the analyzer and release the interlock switch.

(15) Set PLATE POWER switch to OFF and remove fastening from left-hand cover interlock when finished.

f. Internal Batteries. — The self-contained batteries of the Triumph Analyzer consist of two 7½-volt "C" batteries (Burgess No. 5540 or equivalent), and one 1½-volt heavy duty No. 2 dry cell. These may be replaced by removing the four screws from the front panel. Remove the batteries by loosening the screws holding the brackets which hold the batteries in place. Be sure to observe the polarity when replacing batteries. The 1½-volt battery is held in place by spring clamps. Be sure to cut out a section of the battery paper cover to permit a good connection to the zinc shell.

25. Table of Continuity Checks for Cables and Terminal Boards.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Power Supply Terminal Board TS_8	TS_8	1		Terminal "0" of Transformer T_6	0
		2		Terminal "2600" of Transformer T_6	0
		3		Terminal "2000" of Transformer T_6	0
		4		Terminal "ST" of Transformer T_2	0
		5		Terminal "100" of Transformer T_2	0
		5		Terminal 7 of Terminal Strip TS_8	0
		6		The open contact on Relay RY_2	700
		8		Terminal "CT" of Transformer T_2	50
		9		Ground or chassis	0
Leads connecting to Power Supply Terminal Board TS_8		1		Terminal 8 of Plug $PL_{4.1}$	0
		1	SW_4 at NORMAL	Terminal 7 of Plug $PL_{4.1}$	0
		2ABC*	SW_7 at CW	Terminal 11 of Plug $PL_{8.1}$	0
		2D*	SW_7 at CW. Fuses FS_2 and FS_8 must be in operating condition.	Terminal 7 of Plug $PL_{8.1}$	0
		3ABC*	SW_7 at PHONE	Terminal 11 of Plug $PL_{8.1}$	0
		3D*	SW_7 at PHONE. Fuses FS_2 and FS_8 must be in operating condition.	Terminal 7 of Plug $PL_{8.1}$	0
		4	SW_{12} Closed (not pressed)	Terminal 6 of Terminal Board TS_8	0

* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
		5ABC*	SW_7 at PHONE	Terminal 12 of Plug $PL_{1.1}$	0
		5D*	SW_7 at PHONE	Terminal 2 of Plug $PL_{3.1}$	0
		7ABC*		Terminal 12 of Plug $PL_{3.1}$	0
		7D*		Terminal 8 of Plug $PL_{3.1}$	0
		8		Terminal "+" of Meter M_5	0
		9		Terminal 9 of Plug $PL_{4.1}$	500
Modulator Socket PL_1	PL_1	7		Any convenient ground point	0
		8		Terminal 2 on Socket PL_5	0
		9		To Terminal 11 on Socket PL_1	80
		10		Terminal "CT" of Transformer T_8	0
		12ABC*		Terminal 10 on Socket PL_8	250
Modulator Socket PL_2	PL_2	7ABC*		Terminal 8 on Socket PL_8	0
		7D*		Terminal 4 on Socket PL_8	0
		8ABC*		Terminal 9 on Socket PL_8	0
		8D*		Terminal 5 on Socket PL_3	0
		10		Terminal 4 on Socket PL_5	0
		11		Tap on Resistor R_{11}	0
		12ABC*	Switch SW_5 closed.	Terminal 12 on Socket PL_3	200
		12D*	Switch SW_5 closed.	Terminal 8 on Socket PL_8	200
Modulator Socket PL_8	PL_8	1D*		Terminal 1 on Socket PL_5	0
		2D*		Terminal 6 on Socket PL_3	250
		3D*		One side of the a-c line at Socket PL_6	0
		7ABC*	Fuse FS_1 must be in operating order	One side of the a-c line at Socket PL_6	0
		7D*		One side of the a-c line at Socket PL_6	0
		11ABC*	Fuses FS_2 and FS_3 must be in operating order	One side of the a-c line at Socket PL_6	0
Modulator Socket PL_4	PL_4	7		Terminal 8 of Socket PL_4	16
		9		Terminal "CT" of 500-0-500 winding of Transformer T_1	2750
		10		Terminal "F" of Transformer T_8	0
		11		Terminal 4 of Socket PL_5	0
		12ABC*		Terminal 9 of Socket PL_8	1.5
		12D*		Terminal 5 of Socket PL_3	1.5
Modulator Plug Connector $PL_{1.1}$	$PL_{1.1}$	7		Any convenient ground point	0
		8AB*	Switch SW_7 at CW	Terminal 2 of Terminal Board TS_1	0
		8C*	Switch SW_7 at CW	Terminal 3 of Terminal Board TS_1	0
		8D*		Terminal 3 of Terminal Board TS_1	0
		9AB*		Terminal 3 of Terminal Board TS_1	0
		9CD*		Terminal 4 of Terminal Board TS_1	0
		10AB*		Terminal 5 of Terminal Board TS_1	0
		10CD*		Terminal 6 of Terminal Board TS_1	0
		11AB*		Terminal 4 of Terminal Board TS_1	0
		11CD*		Terminal 5 of Terminal Board TS_1	0

* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Modulator Plug Connector $PL_{2.1}$	$PL_{2.1}$	7AB*		Terminal 6 of Terminal Board TS_1	0
		7CD*		Terminal 7 of Terminal Board TS_1	0
		8AB*		Terminal 7 of Terminal Board TS_1	0
		8CD*		Terminal 8 of Terminal Board TS_1	0
		10		Terminal 10 of Terminal Board TS_1	0
		11		Terminal 9 of Terminal Board TS_1	0
		12		Terminal 11 of Terminal Board TS_1	0
Modulator Plug Connector $PL_{3.1}$	$PL_{3.1}$	1D*	Fuse FS_5 must be in operating order.	Terminal 5 of Plug $PL_{3.1}$	0
		3D*	Fuse FS_1 must be in operating order. Switch SW_1 at ON.	Terminal 6 of Plug $PL_{3.1}$	0
		4D*	Switch SW_{12} closed.	Terminal 6 of Terminal Strip TS_3	0
		5D*	Fuses FS_2 and FS_4 must be in operating order.	Terminal 7 of Plug $PL_{3.1}$	0
		7ABC*	Switch SW_1 at ON.	Terminal 10 of Plug $PL_{3.1}$	0
		8ABC*		Terminal 4 of Terminal Strip TS_3	0
		9ABC*		Terminal 5 of Terminal Strip TS_3	0
Modulator Plug Connector $PL_{4.1}$	$PL_{4.1}$	10		Variable arm of MODULATOR BIAS control R_{12}	0
		11	Switch SW_6 at ON	Variable arm of FILAMENT VOLTAGE control R_{18}	0
		12	Switch SW_3 at ON	Variable arm of FILAMENT VOLTAGE control R_{18}	0
Modulator Socket Connector PL_5	PL_5	1ABC*	Fuses FS_2, FS_4 and FS_5 in operating condition	One side of the a-c line at Socket PL_6	0
		1D*		Terminal 1 of Socket PL_3	0
		3ABC*		Terminal 10 at Socket PL_3	0
		3D*		Terminal 6 at Socket PL_3	0
		6		Terminal 7 of Socket PL_5	35
		8		Any convenient ground point	0
		AB* CD*			
Exciter Terminal Board TS_1	TS_1	– 1		Any convenient ground point	0
		2 3		Terminal 8 at tube socket of Tube V_8	60
		3 4		Terminal 2 or 3 at tube socket of Tube V_{12}	0
		4 5		Terminal 3 or 2 at tube socket of Tube V_{12}	0
		5 –		Terminal 1 at Terminal Board TS_2	0
		– 6		Terminal 2 at Terminal Board TS_2	0
		6 7	Tubes V_{13}, V_{14} and V_{15} must be in their sockets	Terminal "100" of Transformer T_4	0
		7 8		Terminal "ST" of Transformer T_4	0
		8 –		Terminal 4 at Terminal Board TS_2	0
		9 9		Terminal 6 at Terminal Board TS_2	0
		10ABC*	Switches SW_{10}, SW_{11} and SW_{13} closed	Terminal 11 at Terminal Board TS_1	0
		10D*	Switches SW_{10}, SW_{13} and SW_{16} closed	Terminal 11 at Terminal Board TS_1	0

* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No. AB*	Term or Lead No. CD*	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Exciter Terminal Board TS_2	TS_2	2	3		Terminal "F" of tube socket of Tube V_{16}	0
		3	4		Terminal "F" of tube socket of Tube V_{16}	0
		4	–	Switch SW_8 at INT. AMP. GRID	Terminal "+- of Meter M_1	0
		5	5		Grid connection of Tube V_{16}	1000
		7	7		Terminal 3 of tube socket of Tube V_{10} or V_{11}	70
		8	8		Terminal "CT" of 5 volt 3 amp. winding on Transformer T_4	125
		9	9		Terminal 4 of tube socket of Tube V_9	50,000
		10	10		Terminal 2 of tube socket of Tube V_{10} or V_{11}	20,000
		11	11		Ungrounded filament terminal of Tubes V_8, V_9, V_{10}, and V_{11}	0
		12	12		Any convenient ground point	0
Leads Connecting to Exciter Terminal Board TS_2	TS_2	1	2		Terminal "+" of Meter M_4	0
		2	3		A terminal of Meter M_8	0
		3	4		Other terminal of Meter M_8	0
		5	5	Switch SW_8 at P. A. GRID	Terminal "—" of Meter M_1	0
		6	6		Terminal "+" of Meter M_1	0
		7	7	Switch SW_8 at INT. AMP. GRID	Terminal "—" of Meter M_1	0
		8	8		Terminal "+" of Meter M_2	0
		9	9	Switch SW_9 at BUFFER-DOUBLER †	Terminal "—" of Meter M_2	0
		10	10	Switch SW_9 at INTERMEDIATE AMPLIFIER	Terminal "—" of Meter M_2	0
		11	11		"Hot" lead on lamp socket	0
		12	12		Any convenient ground point	0
Exciter chassis tuning unit sockets PL_7, PL_8 and PL_9	PL_7, PL_8 and PL_9	1		Switches $SW_{11.1}$, $SW_{11.2}$, $SW_{11.3}$, $SW_{11.4}$ and $SW_{11.5}$ are in No. 1 position for the following checks on PL_7, PL_8 and PL_9	Terminal 5 at tube socket of Tube V_8	0
		2			Any convenient ground point	0
		3			Terminal 4 at tube socket of Tube V_9	80,000
		4			Terminal on Capacitor C_1 opposite to connection from this capacitor to the cathode of Tube V_8	0
		5			Terminal 4 at tube socket of Tube V_9	50,000
		6			Terminal 4 at tube socket of Tube V_9	70,000
		7			Terminal 6 at Socket PL_7, PL_8 and PL_9	20
		8			Terminal 3 at tube socket of Tube V_9	0
		10			Any convenient ground point	0
		11			Terminal 10 at Terminal Board TS_2	20
		12			Plate caps of Tubes V_{10} and V_{11}	0

† Some early sets were marked OSCILLATOR.
* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Speech Amplifier BC-614-(*) Low Level Mic. Socket SO_{101}	SO_{101}	1		Any convenient ground point	0
		2ABC*	Switch SW_{104} at TRANS. ON	Any convenient ground point	0
		2		Terminal 6 at Socket SO_{103}	200
		3		Terminal 2 at socket of Tube V_{101}	500,000
Speech Amplifier BC-614-(*) Receiver Sidetone Socket SO_{102}	SO_{102}	1		Any convenient ground point	0
		2	Switch SW_{101}B at ON BC-342	Any convenient ground point	1430AB* 7500CD*
		3	Switch SW_{101}B at ON BC-312	Any convenient ground point	1430AB* 7500CD*
		4	Switch SW_{104} at RECEIVERS TO EE-8	Terminal 5 at Socket SO_{103}	0
		5	Switch SW_{103} at AUTO. Hold Relay RY_{101} closed.	Any convenient ground point	0
		6	Switch SW_{102} at AUTO. Hold Relay RY_{101} closed	Any convenient ground point	0
Speech Amplifier BC-614-(*) Receiver Control Socket SO_{103}	SO_{103}	1		Any convenient ground point	0
		2	Switch SW_{102} at AUTO. Hold Relay RY_{101} closed	Terminal 6 at Socket SO_{103}	0
		3D*	Switch SW_{105} at NORMAL	Terminal 4 at Socket SO_{103}	0
		4ABC*		Terminal 2 at Socket SO_{104}	0
		4D*	Switch SW_{104} at TRANS. ON	Terminal 6 at Socket SO_{103}	200
		7D*	Switch SW_{104} at TRANS. ON	Terminal 4 at Socket SO_{103}	50
		8	Switch SW_{103} at AUTO. Hold Relay RY_{101} closed	Terminal 6 at Socket SO_{103}	0
Speech Amplifier BC-614-(*) Transmitter Control Socket SO_{104}	SO_{104}	1	Switch SW_{104} at TRANS. ON	Terminal 4 at Socket SO_{104}	16
		2D*	Hold Relay RY_{101} closed.	Any convenient ground point	0
		3		Terminal 1 at Socket SO_{104}	16
		6		Terminal 7 at Socket SO_{104}	35
		8		Any convenient ground point	0
Table MC-269-(*) Socket for Receiver BC-312	SO_{201}	1		Terminal "—12V" at Terminal Board TS_{201}	0
		2		Terminal 8 at Socket SO_{204}	0
		3		Any convenient ground point	0
		4		Terminal "+12V" at Terminal Board TS_{201}	0

* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Table MC-269-(*) Socket for external battery connection	SO_{202}	Copper terminal in either outlet		Terminal "+12V" at Terminal Board TS_{201}	0
		Remaining two terminals in each outlet		Terminal "—12V" at Terminal Board TS_{201}	0
Table MC-269-(*) Socket SO_{203}	SO_{203}	Either terminal of both outlets	Fuse FS_{201} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
Table MC-269-(*) Socket for operating control cord to BC-614	SO_{204}	1		Any convenient ground point	0
		2		Terminal 2 at Socket SO_{206}	0
		3[D*]		Ungrounded terminal of the EE-8 line terminals at Junction Box JB-69-A	0
		4[ABC*]		Ungrounded side of the Keys J-37 (or J-44) and the ungrounded terminal of the EE-8 line connection at Junction Box JB-49-(*)	0
		4[D*]		Ungrounded side of the Keys J-37	0
		5		Ungrounded lead connected to Telephone EE-8 for truck use only	0
		6		Terminal "+12V" at Terminal Board TS_{201}	0
Table MC-269-(*) Socket SO_{205}	SO_{205}	Either terminal of both outlets[ABC*]	Fuse FS_{204} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
		Either terminal of both outlets[D*]	Fuse FS_{201} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
Table MC-269-(*) Socket for Receiver BC-342-(*)	SO_{206}	1		Terminal "—12V" at Terminal Board TS_{201}	0
		3		Any convenient ground point	0
Table MC-269-(*) Socket SO_{207}	SO_{207}	Either terminal of both outlets[ABC*]	Fuse FS_{201} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
		Either terminal of both outlets[D*]	Fuse FS_{204} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0

* Applies only to models indicated.

25. Table of Continuity Checks for Cables and Terminal Boards — Continued.

Part	Ref. No.	Term or Lead No.	Switch Adjustments When Measuring	Where Measured To	Resistance Ohms
Table MC-269-(*) Socket SO_{208}	SO_{208}	Either terminal	Fuse FS_{203} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
Table MC-269-(*) Socket SO_{209}	SO_{209}	Either terminal	Fuse FS_{202} must be in operating condition	Either AC terminal at Terminal Board TS_{201}	0
Table MC-269-(*) terminal board in Junction Box JB-49-(*) or JB-69-A	TS_{201}	GND[ABC*]	Push the START button of Switch SW_{201}	Terminal START at Terminal Board TS_{201}	0
		GND[ABC*]	Push the STOP button of Switch SW_{201}	Terminal STOP at Terminal Board TS_{201}	0
		START[D*]	Push the START button of Switch SW_{201}	Any convenient ground point	0
		STOP[D*]	Push the STOP button of Switch SW_{201}	Any convenient ground point	0
Plug PL_{210} on cable to phone and speaker control panel	PL_{210}	1		Any convenient ground point	0
		2[ABC*]		Tip of BC-342 phone plug PL_{205}	0
		2[D*]		Tip of BC-342 speaker 2nd audio plug PL_{207}	5000
		2[D*]		Terminal 6 at Plug PL_{210}	5000
		2	Switch SW_{204} at NORMAL	Tip contacts of Jacks J_{203} and J_{204}	0
		2	Switch SW_{204} at TRANSPOSE	Tip contacts of Jacks J_{201} and J_{202}	0
		3[ABC*]		Tip of BC-312 phone plug PL_{204}	0
		3[D*]		Tip of speaker 2nd audio plug PL_{208}	5000
		3[D*]		Terminal 5 at Plug PL_{210}	5000
		3	Switch SW_{204} at NORMAL	Tip contacts of Jacks J_{201} and J_{202}	0
		3	Switch SW_{204} at TRANSPOSE	Tip contacts of Jacks J_{203} and J_{204}	0
		4	Switch SW_{202} at BC-342	Tip of speaker 2nd audio plug PL_{207}	0
		4	Switch SW_{202} at BC-312	Tip of speaker 2nd audio plug PL_{208}	0
		5	Switch SW_{203} at NORMAL	Tip of Speaker Plug PL_{209}	0
		5	Switch SW_{203} at TRANSPOSE	Tip of Speaker Plug PL_{206}	0
		6	Switch SW_{203} at NORMAL	Tip of Speaker Plug PL_{206}	0
		6	Switch SW_{203} at TRANSPOSE	Tip of Speaker Plug PL_{209}	0

* Applies only to models indicated.

26. Table of Data for Checking Transformers, Chokes and Inductors.

Note: Resistances less than 1 ohm are given as zero.
All measurements are made with windings disconnected from associated circuit.

Component	Circuit Symbol	Windings or Terminals	D-C Resistance (Ohms)	Inductance (Microhenries)
a. Radio Transmitter BC-610-(*) and Antenna Tuning Unit BC-729-(*).—				
R-F Choke	CH_1		20	1000
R-F Choke	CH_2		20	1000
R-F Choke	CH_3		20	1000
R-F Choke	CH_4		25	2500
R-F Choke	CH_5		20	1000
R-F Choke	CH_6		20	1000
R-F Choke	CH_7		20	1000
R-F Choke	CH_8		20	1000
R-F Choke	CH_9		42	10000
R-F Choke	CH_{10}		8.5	2500
Filter Choke	L_1		125	$6x10^6$
Filter Choke	L_2		125	$6x10^6$
Filter Choke	L_3		125	$6x10^6$
Filter Choke	L_4		68	$11x10^6$
Ant. Coupling Coil	L_5			6
Ant. Loading Coil	L_6			100
Final Amplifier Plate Coils	L_7			
2.0-3.4 MC. Range				51.5
3.4-4.4 MC. Range				31.5
4.4-5.7 MC. Range				17.3
5.7-8.0 MC. Range				10.0
	Tuning Unit* Tuning Box**			
Master Osc. Grid Coil	L_8 (TU-47) or (A)			96.0
Master Osc. Grid Coil	L_9 (TU-48) or (B)			55.5
Master Osc. Grid Coil	L_{10} (TU-49) or (C)			41.0
Master Osc. Grid Coil	L_{11} (TU-50) or (D)			21.4
Master Osc. Grid Coil	L_{12} (TU-51) or (E)			14.1
Master Osc. Grid Coil	L_{13} (TU-52) or (F)			8.1
Crystal Osc..Cathode Coil	L_{14} (TU-47) or (A)			28.8
Crystal Osc. Cathode Coil	L_{15} (TU-48) or (B)			12.0
Crystal Osc. Cathode Coil	L_{16} (TU-49) or (C)			9.2
Crystal Osc. Cathode Coil	L_{17} (TU-50) or (D)			66.0
Crystal Osc. Cathode Coil	L_{18} (TU-51) or (E)			22.8
Crystal Osc. Cathode Coil	L_{19} (TU-52) or (F)			18.0
Buffer-Doub'er Plate Coil	L_{20} (TU-47) or (A)			36.3
Buffer-Doubler Plate Coil	L_{21} (TU-48) or (B)			30.8
Buffer-Doubler Plate Coil	L_{22} (TU-49) or (C)			20.6
Buffer-Doubler Plate Coil	L_{23} (TU-50) or (D)			12.6
Buffer-Doubler Plate Coil	L_{24} (TU-51) or (E)			8.6
Buffer-Doubler Plate Coil	L_{25} (TU-52) or (F)			5.66
Intermediate Amp. Plate Coil	L_{26} (TU-47) or (A)			36.3
Intermediate Amp. Plate Coil	L_{27} (TU-48) or (B)			30.8
Intermediate Amp. Plate Coil	L_{28} (TU-49) or (C)			20.6
Intermediate Amp. Plate Coil	L_{29} (TU-50) or (D)			12.6
Intermediate Amp. Plate Coil	L_{30} (TU-51) or (E)			8.6
Intermediate Amp. Plate Coil	L_{31} (TU-52) or (F)			5.66

* SCR-299-C and SCR-299-D
** SCR-299-A and SCR-299-B

26. Table of Data for Checking Transformers, Chokes and Inductors — Continued.

Component	Circuit Symbol	Windings or Terminals	D-C Resistance (Ohms)	Inductance (Microhenries)
Power Transformer	T_1	117 volt primary	1.5	
		2.5 V. at 5.0 A. secondary	0	
		5.0 V. at 3.0 A. secondary	0	
		500-0-500 secondary	110	
Filament Transformer	T_2	117 V. primary	11	
		100 V. primary	10	
		2.5 V. at 10 A. secondary	0	
Filament Transformer	T_3	105 volt primary	3	
		5 V. at 16 A. secondary	0	
Power Transformer	T_4	100 V. primary	1.5	
		5 V. at 10.5 A. secondary	0	
		6.3 V. at 3.5 A. secondary	0	
		5 V. at 3 A. secondary	0	
Power Transformer	T_5	115 V. primary	1.5	
		435-0-435 secondary	80	
Power Transformer	T_6	2000 V. primary tap	0	
		2600 V. primary tap	0	
		Total secondary	140	
Audio Transformer	T_7	500 line primary	35	
		"G" to "G" secondary	950	
		"G" to "CT" secondary	475	
Audio Transformer	T_8	"P" to "P" primary	200	
		"P" to "CT" primary	100	
		"G" to "G" secondary	170	
		"G" to "CT" secondary	85	
Modulation Transformer	T_9	"P" to "P" primary	300	
		"P" to "B" primary	150	
		"P" to "B plus" secondary	120	
Relay Winding	RY_1		425	
Relay Winding	RY_2		700	
Relay Winding	RY_3		250	
Relay Winding	RY_4		480	
Relay Winding	RY_5		6	

b. Speech Amplifier BC-614-(*).—

Audio Transformer	T_{101}	1 to 2	11	
		3 to 4	13.5	
Audio Transformer	T_{102}	1 to 3	660	
		2 to 3 or 1 to 2	330	
		4 to 5	35	
Power Transformer	T_{103}	115 V. primary	16	
		6.3 V. at 2 A. secondary	0	
		5 V. at 2 A. secondary	0	
		250-0-250 secondary	800	
Audio Transformer	T_{104}	2 to 3	2150	
		8 to 5	5000	
		8 to 7 or 6 to 5	2500	
Filter Choke	CH_{101}		700	29
Relay Winding	RY_{101}		200	

27. Characteristics of Vacuum Tubes.

Signal Corps Tube —	VT-46A	VT-80	VT-94	VT-95	VT-100	VT-103	VT-107	VT-115	VT-139	VT-145	VT-218	VT-220	VT-231	VT-233
Commercial Type —	866/866-A	80	6J5	2A3	807	6SQ7	6V6	6L6	VR-150-30	5Z3	100TH	250TH	6SN7-GT	6SR7
Type	Mercury Vapor Half wave Rectifier	High Vacuum Full Wave Rectifier	Triode	Triode	Beam Power	Duplex Diode Triode	Beam Power	Beam Power	Voltage Regulator	High Vacuum Full Wave Rectifier	Triode	Triode	Twin Triode	Duplex Diode Triode
A-C Filament Voltage	2.5	5.0	6.3	2.5	6.3	6.3	6.3	6.3		5.0	5.0	5.0	6.3	6.3
A-C Filament Current (amperes)	5.0	2.0	0.3	2.5	0.9	0.3	0.45	0.9		3.0	6.5	10.5	0.6	0.3
D-C Plate Voltage			250	300	600	250	300	375	150		2000	2500	250	250
D-C Screen Voltage					250		150	200						
D-C Grid Bias Voltage			—8.0	—62	—50	—2.0	—25	—35				—220	—8.0	—9.0
Max. A-C Voltage Per Plate		400								500				
Max. Inverse Peak Voltage	10,000	1400								1400				
D-C Plate Current (milliamperes)			9.0	40	100	0.8	35	88			225	290	9.0	9.5
D-C Screen Current (milliamperes)					9.0		5	9						
D-C Grid Current (milliamperes)					3.0		3.0	3.5				70		
Max. D-C Output Current (ma.)	250	110							30	250				
Plate Dissipation (watts)					25		12	20			100	250		
Approx. Grid Driving Power (watts)					0.22			0.18				42		
Approx. Output Power (watts)				15	37.5			17			380	600		0.3
Plate Resistance (ohms)			7700	800		91,000							7700	8500
Transconductance (micromhos)			2600	5250		1100							2600	1900
Amplification Factor			20	4.2		100					30	32	20	16
Load Resistance (ohms)				3000							16,000			10,000

SECTION V — SUPPLEMENTARY DATA

28. Chart of Performance Characteristics.

Description	Indicating Meter	Meter* Switch Position	Normal	Limits Maximum	Limits Minimum
Line Voltage (a-c)			115 v	125 v	105 v
Filament Voltage	FIL. VOLTAGE		5.0 v	5.3 v	4.9 v
Buffer-Doubler Plate Current	EXCITATION PLATE	BUFFER-DOUBLER	35 ma		25 ma
Intermediate Amplifier Grid Current	GRID CURRENT	INT. AMP. GRID	3 ma	8 ma	2 ma
Intermediate Amplifier Plate Current	EXCITATION PLATE	INTERMEDIATE AMPLIFIER	150 ma	175 ma	
P. A. Grid Current (PLATE POWER OFF)	GRID CURRENT	P. A. GRID	75-100 ma		60 ma
P. A. Grid Current (PLATE POWER ON)	GRID CURRENT	P. A. GRID	65- 80 ma		50 ma
P. A. Plate Current (PHONE)	P. A. PLATE		250 ma	260 ma	200 ma
P. A. Plate Current (CW)	P. A. PLATE		290 ma	300 ma	200 ma
Mod. Plate Current (no mod.)	MOD. PLATE		40 ma	50 ma	35 ma
Mod. Plate Current (100% mod.)	MOD. PLATE		200 ma		
Power Output (voice)			320 watts		210 watts
Power Output (cw)			500 watts		325 watts
Input Level to BC-614-(*) (max. gain) for 100% mod.			46 db below 1.73 v		40 db below 1.73 v
Hum Level			40 db below 100% mod.		35 db below 100% mod.

29. Table of Tuning Components.

Tuning Unit *	Tuning Box **	Frequency Range
TU-47	A	2.0 to 2.5 megacycles
TU-48	B	2.5 to 3.2 megacycles
TU-49	C	3.2 to 4.0 megacycles
TU-50	D	4.0 to 5.0 megacycles
TU-51	E	5.0 to 6.35 megacycles
TU-52	F	6.35 to 8.0 megacycles

Coil Unit *	Tank Coil **	Frequency Range
C-387	51A438 (with Vacuum Capacitor CA-423)	2.0 to 2.55 megacycles
C-387	51A438	2.55 to 3.4 megacycles
C-388	51A439	3.4 to 4.4 megacycles
C-389	51A440	4.4 to 5.7 megacycles
C-390	51A441	5.7 to 8.0 megacycles

* SCR-299-C and SCR-299-D
** SCR-299-A and SCR-299-B

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
a. Radio Transmitter BC-610-(*).—					
R_1	3Z4540	Resistor, 30,000 ohm 10%, ½ watt, type BT-½	Tube V_8 grid bias	IRC	23BX303E
R_2[CD*]		Resistor, 5,600 ohm 5%, 20 watt, type 20VWQ	Tube V_8 plate voltage stabilizing	U	24BH562D
R_2[AB*]		Resistor 7,500 ohm 5%, 20 watt, type 20VWQ	Tube V_8 plate voltage stabilizing	U	24BH752D
R_3	3Z6615-38	Resistor, 15,000 ohm 5%, 20 watt, type 20VWQ	Tube V_8 screen dropping	U	24BH153D
R_4	3Z4607	Resistor, 750 ohm 10%, 1 watt, type BT-1	Filter network	IRC	23BW751E
R_5	3Z6610-68	Resistor, 10,000 ohm 5%, 20 watt, type 20VWQ	Tube V_9 plate voltage dropping	U	24BH103D
R_6	3Z6620-12	Resistor, 20,000 ohm 10%, 2 watt, type BT-2	Tube V_{10} screen voltage dropping	IRC	23BV203E
R_7	3Z6620-12	Resistor, 20,000 ohm 10%, 2 watt, type BT-2	Tube V_{11} screen voltage dropping	IRC	23BV203E
R_8	3Z6100-6	Resistor, 1,000 ohm 5%, 10 watt, type BD	Tube V_{16} grid bias	O	24BG102D
R_9	3Z6070-5	Resistor, 700 ohm 5%, 20 watt, type X1022	Tube V_{16} plate choke shunt	U	24A804
R_{10}	3Z6640-16	Resistor, 40,000 ohm 5%, 20 watt, type E	Exciter power supply bleeder	U	24BJ403D
R_{11}	3Z6250-27	Adj. Tap Resistor, 2,500 ohm 5%, 100 watt, type DIVEU	Bias supply bleeder	O	24A806
R_{12}	2Z7261	Potentiometer, 500 ohm, 50 watt, type PR-50	Tubes V_3 and V_4 bias voltage control	IRC	25A502
R_{13}	3Z6675-15	Resistor, 75,000 ohm, 200 watt, type 0924	Final amp. H. V. supply bleeder	O	24B803
R_{14}	3Z4550	Resistor, 100,000 ohm 10%, ½ watt, type BT-½	Trans. T_7 secondary loading	IRC	23BX104E
R_{15}	3Z4550	Resistor, 100,000 ohm 10%, ½ watt, type BT-½	Trans. T_7 secondary loading	IRC	23BX104E
R_{16}	3Z6620-12	Resistor, 20,000 ohm 10%, 2 watt, type BT-2	Trans. T_8 secondary loading	IRC	23BV203E
R_{17}	3Z6620-12	Resistor, 20,000 ohm 10%, 2 watt, type BT-2	Trans. T_8 secondary loading	IRC	23BV203E
R_{18}	3Z7015-3	Rheostat, 15 ohm, 75 watt, type PR-75	Fil. voltage control	IRC	25A501
R_{19}	3Z6001F6-2	Resistor, 16 ohm 600 W. heater element, type 415-A	Trans. T_6 primary voltage dropping	EAE	24A801
R_{20}	3Z6075-16	Resistor, 750 ohm 5%, 10 watt, type BD	Tubes V_1 and V_2 cathode bias	O	24BG751D
R_{21}	3Z6005-13	Resistor, 50 ohm 5%, ½ watt, type BW-½	Tube V_{10} grid parasitic suppressor	IRC	24BX500D
R_{22}	3Z6005-13	Resistor, 50 ohm 5%, ½ watt, type BW-½	Tube V_{11} grid parasitic suppressor	IRC	24BX500D
R_{23}	3Z6630-18	Resistor, 30,000 ohm 10%, 2 watt, type BT-2	Tube V_9 grid bias	IRC	23BV303E
R_{24}	3Z6050-52	Resistor, 500 ohm 5%, 10 watt, type BD	Tube V_9 cathode bias	O	24BG501D
R_{25}	3Z6650-7	Resistor, 50,000 ohm 10%, 2 watt, type BT-2	Tube V_9 screen dropping	IRC	23BV503E
R_{26}	3Z6010-27	Resistor, 100 ohm 5%, 1 watt, type BW-1	Shunt for meter M_1	IRC	24BW101D
R_{27}	3Z6010-27	Resistor, 100 ohm 5%, 1 watt, type BW-1	Shunt for meter M_1	IRC	24BW101D
R_{28}	3Z6620-52	Resistor, 20,000 ohm 5%, 20 watt, type BROHI	Tube V_9 plate dropping	O	24BH203D
C_1	3DA6-23	Fixed capacitor, 0.006 μf 20%, mica, 300 V. D-C, type 1W	Tube V_8 cathode coupling	CD	47BV602F
C_2	3DA6-23	Fixed capacitor, 0.006 μf 20%, mica, 300 V. D-C, type 1W	Tube V_8 screen by-pass	CD	47BV602F
C_3	3DA6-23	Fixed capacitor, 0.006 μf 20%, mica, 300 V. D-C, type 1W	Tube V_8 cathode return by-pass	CD	47BV602F
C_4	3DA6-23	Fixed capacitor, 0.006 μf 20%, mica, 300 V. D-C, type 1W	Tube V_9 screen by-pass	CD	47BV602F
C_5	3DA6-23	Fixed capacitor, 0.006 μf 20%, mica, 300 V. D-C, type 1W	Tube V_8 plate return by-pass	CD	47BV602F
C_6	3DA2-73	Fixed capacitor, 0.002 μf 20%, mica, 500 V. D-C, type 1460	Tube V_{11} screen by-pass	A	47BW202F

* Applies only to models indicated.

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Radio Transmitter BC-610-(*) — Continued.					
C_7	3DA2-73	Fixed capacitor, 0.002 µf 20%, mica, 500 V. D-C, type 1460	Tube V_{10} screen by-pass	A	47BW202F
C_8	3DA6-23	Fixed capacitor, 0.006 µf 20%, mica, 300 V. D-C, type 1W	Tube V_9 cathode by-pass	CD	47BV602F
C_9	3DA10-127	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type 1450	Tube V_{16} fil. by-pass	A	47BX103F
C_{10}	3DA10-127	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type 1450	Tube V_{16} fil. by-pass	A	47BX103F
C_{11}	3DA2-85	Fixed capacitor, 0.002 µf 5%, mica, 6000 V. D-C, special	Tube V_{16} plate return by-pass	A	47A003
C_{12}	3D9150V-4	Variable capacitor, 150 µf max., air, 7000 V. D-C, type 150DD70, special	Final amp. plate tuning	JO	48C075
C_{13} CD*		Fixed capacitor, 150 µµf 20%, mica, 500 V. D-C, type 1460	Coupling between tubes V_8 and V_9	A	47BW151F
C_{13} AB*		Fixed capacitor, 100 µµf 20%, mica, 500 V. D-C, type 1460	Coupling between tubes V_8 and V_9	A	47BW101F
C_{14}	3DA2-84	Fixed capacitor, 0.0002 µf 10%, mica, 500 V. D-C, type 1460	Coupling between tube V_9 and tubes V_{10} and V_{11}	A	47BW201E
C_{15}	3DA2-86	Fixed capacitor, 0.002 µf 20%, mica, 600 V. D-C, type 1450	Coupling between tubes V_{10} and V_{11} and tube V_{16}	A	47BX202F
C_{16}	3DB8-33	Fixed capacitor, 8 µf —5+20%, oil, 1000 V. D-C, special, dual unit, see C_{17}	Exciter power supply input filter	IC	45B022
C_{17}	3DB8-33	Fixed capacitor, 8 µf —5+20%, oil, 1000 V. D-C, special, dual unit, see C_{16}	Exciter power supply input filter	IC	45B022
C_{18}	3D9005VE5	Variable capacitor, 5.5 µµf max., air, 7000 V. D-C, type 6G70	Final amp. neutralizing	JO	48A076
C_{19}	3DB3.8	Fixed capacitor, 3 µf —10+20%, oil, 4000 V. D-C, type 7459, special	Final amp. H. V. supply filter	IC	46B008
C_{20}	3DB8-34	Fixed capacitor, 8 µf —10+50%, elect., 600 V. D-C, type 60B5	Bias power supply filter	IC	45A028
C_{21}	3DB8-34	Fixed capacitor, 8 µf —10+50%, elect., 600 V. D-C, type 60B5	Bias power supply filter	IC	45A028
C_{22}	3DB40-7	Fixed capacitor, 40 µf —10+50%, elect., 450 V. D-C, type 010458B	Mod. bias filter	IC	45A029
C_{23}	3DB3.8	Fixed capacitor, 3 µf —10+20%, oil, 4000 V. D-C, type 7459, special	Final amp. H. V. supply filter	IC	46B008
C_{24}	3DA6-15	Fixed capacitor, 0.006 µf 20%, mica, 600 V. D-C, type 1450	Tubes V_{10} and V_{11} plate by-pass	A	47BX602F
C_{25}	3DA6-23	Fixed capacitor, 0.006 µf 20%, mica, 300 V. D-C, type 1W	Tube V_8 filament by-pass	CD	47BV602F
C_{26}	3DA6-10	Fixed capacitor, 0.006 µf 20%, mica, 500 V. D-C, type 1460	Tube V_9 plate by-pass	A	47BW602F
C_{27}	3DB40.8	Fixed capacitor, 40 µf —10+65%, elect., 100 V. D-C, special	Tubes V_1 and V_2 cathode by-pass	IC	45A015

C_{28}	3D423	Fixed capacitor CA-423, 50 μμf, Vacuum, 32000 V. A-C, type VC-50	Final amp. padding	EM	48B081
C_{29}	3DA1-80	Fixed capacitor, 0.001 μf 10%, mica, 2500 V. D-C, type 1447, low loss	Neutralizing H. V. isolation	A	47BZ102E-L
CH_1	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_8 grid return r-f choke	GU	53A026
CH_2	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_8 cathode return r-f choke		
CH_3	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_8 plate return r-f choke		
$CH_4{}^{AB*}$	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_9 grid return r-f choke		
$CH_4{}^{CD*}$	3C308-3	R-F choke, 2.5 μh 5%, 25 ohm d-c resistance, type 4979	Tube V_9 grid return r-f choke	GU	53A033
CH_5	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_9 plate return r-f choke		
CH_6	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tubes V_{10} and V_{11} plate return r-f choke		
CH_7	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tubes V_{10} and V_{11} grid return r-f choke		
CH_8	3C363	R-F choke, 1 μh 10%, 20 ohm d-c resistance, type 4885	Tube V_{16} grid return r-f choke		
CH_9	3C550	R-F choke, 10 μh 10%, 42 ohm d-c resistance, type 4886	Tube V_8 cathode return r-f choke	GU	53A025
CH_{10}	3C562	R-F choke, 2.5 μh 10%, 8.5 ohm d-c resistance, 500 ma. max. current	Tube V_{16} plate return r-f choke	SWI	51A431
FS_1	3Z2025	Fuse, 25 amp. 125 V., type 5725	Line fuse	FG	39A202
FS_2	3Z2025	Fuse, 25 amp. 125 V., type 5725	Line fuse	FG	39A202
FS_3	3Z2020	Fuse, 20 amp. 125 V., type 5720	Transformer T_6 primary	FG	39A203
FS_4		Fuse, 5 amp. 125 V., type 1030	Protects T_2, T_3, T_4, T_5, RY_1, RY_2, RY_3, RY_4 and LM_3	LF	39A316
FS_5	3Z603.2	Fuse, 3 amp. 125 V., type 1043	Protects T_1 and BC-614 power supply primaries	LF	39A301
L_1	3C560	Reactor, 6 henries @ 250 ma., 125 ohm d-c resistance, type 10C13	Exciter power supply filter	ST	56B018
L_2	3C560	Reactor, 6 henries @ 250 ma., 125 ohm d-c resistance, type 10C13	Bias power supply filter	ST	56B018
L_3	3C560	Reactor, 6 henries @ 250 ma., 125 ohm d-c resistance, type 10C13	Bias power supply filter	ST	56B018
L_4	3C560-1	Reactor, 11 henries @ 500 ma., 68 ohm d-c resistance, 5000 V. D-C test, type 10C16	Final amp. supply filter	ST	56B013
$L_7{}^{AB*}$	3C1087	Coil unit, pri. inductance 51.5 μh, 3 turn link	2.0 to 3.4 mc final amp. tank coil	BW	51A438
$L_7{}^{AB*}$	3C1087-1	Coil unit, pri. inductance 31.5 μh, 3 turn link	3.4 to 4.4 mc final amp. tank coil	BW	51A439
$L_7{}^{AB*}$	3C1087-2	Coil unit, pri. inductance 17.3 μh, 4 turn link	4.4 to 5.7 mc final amp. tank coil	BW	51A440
$L_7{}^{AB*}$	3C1087-3	Coil unit, pri. inductance 10.0 μh, 4 turn link	5.7 to 8.0 mc final amp. tank coil	BW	51A441
$L_7{}^{CD*}$		Coil unit C-387, pri. inductance 51.5 μh, 3 turn link	2.0 to 3.4 mc final amp. tank coil	BW	51C472
$L_7{}^{CD*}$		Coil unit C-388, pri. inductance 31.5 μh, 3 turn link	3.4 to 4.4 mc final amp. tank coil	BW	51C473
$L_7{}^{CD*}$		Coil unit C-389, pri. inductance 17.3 μh, 4 turn link	4.4 to 5.7 mc final amp. tank coil	BW	51C474
$L_7{}^{CD*}$		Coil unit C-390, pri. inductance 10.0 μh, 4 turn link	5.7 to 8.0 mc final amp. tank coil	BW	51C475
LM_1	2Z5927	Lamp, 6.3 V. 250 ma., bayonet base, type 44	Final tank tuning dial illumination	GE	39A003
LM_2	2Z5927	Lamp, 6.3 V. 250 ma., bayonet base, type 44	Tuning unit compartment illumination	GE	39A003
LM_3	2Z5886-1	Lamp, 120 V. 6 W., candelabra base, type S6,clear	Fil. "ON-OFF" indicator	FG	39A002
LM_4	2Z5886-1	Lamp, 120 V. 6 W., candelabra base, type S6,clear	H. V. power supply "ON-OFF" indicator	FG	39A002

The word Special indicates part made for, or by the Contractor.
* Applies only to models indicated.

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Radio Transmitter BC-610-(*) — Continued.					
M_1	3F910-13	Milliameter, 0-100 ma. D-C, type DO-53	Tubes V_{16}, V_{10}, and V_{11} grid current indicator	GE	82A030
M_2	3F930-10	Milliameter, 0-300 ma. D-C, type DO-53	Tubes V_9, V_{10} and V_{11} plate current indicator	GE	82A031
M_3	3F8010-8	Voltmeter, 0-10 V. A-C, type DO-53	Tube V_{16} fil. voltage indicator	GE	82A033
M_4	3F930-10	Milliameter, 0-300 ma. D-C, type DO-53	Tubes V_3 and V_4 plate current indicator	GE	82A031
M_5	3F950-20	Milliameter, 0-500 ma. D-C, type DO-53	Tube V_{16} plate current indicator	GE	82A032
PL_1	2Z8639.1	Socket, 6 contact female, type S-406-AB	Socket on mod. chassis for plug $PL_{1.1}$	HJ	10A011
PL_2	2Z8639.1	Socket, 6 contact female, type S-406-AB	Socket on mod. chassis for plug $PL_{2.1}$	HJ	10A011
PL_3 ABC*	2Z8639.1	Socket, 6 contact female, type S-406-AB	Socket on mod. chassis for plug $PL_{3.1}$	HJ	10A011
PL_3 D*		Socket, 8 contact female, type S-408-AB	Socket on mod. chassis for plug $PL_{3.1}$	HJ	10A061
PL_4	2Z8639.1	Socket, 6 contact female, type S-406-LAB	Socket on mod. chassis for plug $PL_{4.1}$	HJ	10A011
$PL_{1.1}$	2Z7228.25	Plug, 6 contact male, type P-406-LAB	R-F section to mod. chassis cable plug	HJ	10A002
$PL_{2.1}$	2Z7228.25	Plug, 6 contact male, type P-406-LAB	R-F section to mod. chassis cable plug	HJ	10A002
$PL_{3.1}$ ABC*	2Z7228.25	Plug, 6 contact male, type P-406-LAB	Panel to mod. chassis cable plug	HJ	10A002
$PL_{3.1}$ D*	2Z7228.42	Plug, 8 contact male, type P-408-LAB	Panel to mod. chassis cable plug	HJ	10A060
$PL_{4.1}$	2Z7228.25	Plug, 6 contact male, type P-406-LAB	Panel to mod. chassis cable plug	HJ	10A002
PL_5	2Z8659-6	Socket, octal, bakelite, type MIP-8	Speech amp. input connection on BC-610	AP	6A035
PL_6	2Z3099-1	Socket, male (twist lock type), 20 amp. 250 V., type 8808	110 V. a-c power input connection on BC-610	HB	10A041
PL_7	2Z8639-5	Socket, 12 terminal bakelite, type 12-42	Channel 1 tuning unit socket	HJ	81B074
PL_8	2Z8639-5	Socket, 12 terminal bakelite, type 12-42	Channel 2 tuning unit socket	HJ	81B074
PL_9	2Z8639-5	Socket, 12 terminal bakelite, type 12-42	Channel 3 tuning unit socket	HJ	81B074
RY_1	2Z7717	Relay, DPDT 117 V. A-C, type 251	Trans. plate power "ON-OFF"	GML	21A020
RY_2	2Z7717.5	Relay, DPDT 117 V. A-C, type G32423	Overload protector	GD	21A006
RY_3	2Z7717.2	Relay, DPDT 117 V. A-C, type 400	"Phone-CW" switching	AE	21B001
RY_4	2Z7717.3	Relay, DPDT 117 V. A-C, type 1702 MX	Ant. short-out	LR	21A003
RY_5	2Z7717.4	Relay, DPST 700 MA. D-C, type C32422	Overload protection in H. V.	GD	21A007
SW_1	3Z9851	Switch, SPST toggle, type P&S #1311	Fil. "ON-OFF"	FG	60A088
SW_3	3Z9851	Switch, SPST toggle, type P&S #1311	Exciter plate power "ON-OFF"	FG	60A088
SW_4		Switch, SPST toggle, type P&S #1311, special	High voltage protect switch	FG	60A089
SW_5	3Z9812-2	Switch, SPST interlock, type 3592D	Trans. rear cover safety	HH	60A091
SW_6	3Z9851	Switch, SPST toggle, type P&S #1311	Trans. plate power "ON-OFF"	FG	60A088
SW_7	3Z9854-14	Switch, 4PDT toggle, type 8885K1	"Phone-CW" switching	CH	60A087
SW_8	3Z9845-15	Switch, DPDT toggle, type 8363KS	M1 meter switching	CH	60A106
SW_9	3Z9845-15	Switch, DPDT toggle, type 8363KS	M2 meter switching	CH	60A106
SW_{10}	3Z9812-2	Switch, SPST interlock, type 3592D	Trans. top cover safety	HH	60A108
SW_{11} ABC*	3Z9812-2	Switch, SPST interlock, type 3592D	Final tank coil cover door safety	HH	60A108

$SW_{11.1}$, $SW_{11.2}$, $SW_{11.3}$, $SW_{11.4}$, $SW_{11.5}$	2C6500A/S1	Switch assy., 4 section, isolantite wafers	Tube V_8 cathode circuit switching; Tube V_8 grid circuit switching; Tube V_9 plate supply circuit switching; Tube V_9 plate circuit switching; Tubes V_{10} and V_{11} plate circuit switching	CRL	60B053
SW_{12}	3Z79824-274	Switch, SPST momentary push button, type PS-3	Overload relay reset	U	60A092
SW_{13}	3Z9812-2	Switch, SPST interlock, type 3592D	Tuning unit compartment	HH	60A108
SW_{16} D*	3Z9812-2	Switch, SPST interlock, type 3592D	Final tank coil compartment	HH	60A108
T_1	2Z9613.3	Transformer; Prim. 117 V. A-C, Sec. (1) 1000 V. C.T. @ 220 ma. (2) 2.5 V. C.T. @ 5 amps. (3) 5 V. C.T. @ 10 amps., type 10P33	Fil. supply for tubes V_1, V_2 and V_5 and bias supply voltage	ST	52A050
T_2	2Z9611	Transformer; Prim. 115-100 V. A-C, Sec. 2.5 V. C.T. @ 10 amps., 6000 V. RMS breakdown test between windings, type 10P34	Fil. supply for tubes V_6 and V_7	ST	52A041
T_3	2Z9614.1	Transformer; Prim. 115-100 V. A-C, Sec. 5 V. C.T. @ 16 amps., type 10P35	Fil. supply for tubes V_3 and V_4	ST	52B052
T_4	2Z9614.2	Transformer; Prim. 115-100 V. A-C, Sec. (1) 5 V. C.T. @ 10.5 amps. (2) 6.3 V. C.T. @ 3.5 amps. (3) 5 V. C.T. @ 3.0 amps., type 10P36	Fil. supply for tubes V_8, V_9, V_{10}, V_{11}, V_{12}, and V_{16}	ST	52B049
T_5	2Z9612	Transformer; Prim. 125-115 V. A-C, Sec. 870 V. C.T. @ 250 ma., type 10P37	Plate trans. of exciter power supply	ST	52B051
T_6	2Z9612.1	Transformer; Prim. 117 V. A-C, Tapped to provide Sec. voltage of 5000 V. or 4000 V. C.T. @ 500 ma., type 10P43	Plate trans. of high voltage power supply	ST	52C046
T_7	2Z9636	Transformer; Prim. 500 ohms, Sec. 20,000 ohms C.T., audio, type 10A21	Interstage, BC-614 to grids of tubes V_1 and V_2	ST	55B029
T_8	2Z9632.2	Transformer; Prim. 5000 ohms, Ratio 1:1.35, ½ Prim. to ½ Sec., audio, type 10A22	Driver tubes V_1 and V_2 plates to mod. tubes V_3 and V_4 grids	ST	55B030
T_9	2Z9634.3	Transformer; Prim. 16000 ohms C.T., Sec. 8330 ohms C.T. @ 250 ma., modulation trans., type 10A38	Mod. tubes V_3 and V_4 plates to final amp. high voltage circuit	ST	55C028
TS_1	2Z9412	Terminal strip, special 12 terminal, type 12-6	Exciter chassis cable connections	HJ	81A075
TS_2	2Z9412	Terminal strip, special, 12 terminal, type 12-6	Exciter chassis cable connections	HJ	81A075
TS_3	2Z9408.1	Terminal block, special, 8 terminal, type 10-142	H. V. power supply chassis cable connections	HJ	88A005
TS_4	2Z9402	Terminal strip, standard 2 terminal, type 1720	A-C outlet for relay, RY_4	CN	88A020
TS_5	2Z9402.1	Tip jack strip, standard 2 jack, type 1490	A-C outlet for cover interlocks	CN	88A003
V_1	2T95	Tube, triode, type VT-95	Audio amplifier	RCA	90XVT-95
V_2	2T95	Tube, triode, type VT-95	Audio amplifier	RCA	90XVT-95
V_3	2T218	Tube, triode, type VT-218	Class "B" modulator	EM	90XVT-218
V_4	2T218	Tube, triode, type VT-218	Class "B" modulator	EM	90XVT-218
V_5	2T145	Tube, duo-diode, type VT-145	Bias supply rect.	RCA	90XVT-145
V_6	2T46A	Tube, diode, type VT-46A	H. V. supply rect.	RCA	90XVT-46A
V_7	2T46A	Tube, diode, type VT-46A	H. V. supply rect.	RCA	90XVT-46A
V_8	2T107A	Tube, pentode, type VT-107A	R-F oscillator	RCA	90XVT-107A

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30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Radio Transmitter BC-610-(*) — Continued.					
V_9	2T115A	Tube, pentode, type VT-115A	Buffer-doubler	RCA	90XVT-115A
V_{10}	2T100	Tube, pentode, type VT-100	Intermediate amp.	RCA	90XVT-100
V_{11}	2T100	Tube, pentode, type VT-100	Intermediate amp.	RCA	90XVT-100
V_{12}	2T145	Tube, duo-diode, type VT-145	Exciter supply rect.	RCA	90XVT-145
V_{13}	2T139	Tube, diode, gas filled, type VT-139	Tube V_8 screen voltage regulator	RCA	90XVT-139
V_{14}	2T139	Tube, diode, gas filled, type VT-139	Tube V_8 plate voltage regulator	RCA	90XVT-139
V_{15}	2T139	Tube, diode, gas filled, type VT-139	Tube V_8 plate voltage regulator	RCA	90XVT-139
V_{16}	2T220	Tube, triode, type VT-220	Final r-f amplifier	EM	90XVT-220
b. Antenna Tuning Unit BC-729-(*).—					
C_{30}	3D423	Fixed capacitor CA-423, 50 μμf, vacuum, 32000 V. A-C, type VC-50	Impedance matching cap.	EM	48B081
L_5	3C302B	R-F coil, 7 turn variable link coupling coil, special	Ant. variable link coupling	BW	51A483
L_5	3C302B-1	R-F coil, 6 μh split winding coil, special	Ant. pick up inductor	BW	51B485
L_6	3C302B-2	R-F coil, variable inductance, special	Ant. loading inductor	BW	51C486
M_6	3F1015-18	Ammeter, 0-15 amp., R-F, type DO-53	Ant. current indicator	GE	82A028
SW_{14}^{AB*}	3Z9825-29	Switch, DPST rotary ant. range switch assy., special	Ant. series cap. shorting	H	1X124
SW_{14}^{CD*}		Switch, SPST rotary ant. range switch assy., special	Ant. series cap. shorting	BW	60B114
c. Tuning Units for Radio Transmitter BC-610-(*).—					
(1) Tuning unit TU-47 (2.0 to 2.5 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{32}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Buffer-Doubler tuning capacitor	JO	48A084
C_{34}		Variable capacitor, air, 150 μμf max., type MC1857	Int. Amp. tuning capacitor	BUD	48A086
C_{36}	3D140-1	Fixed capacitor, 140 μμf 5% ceramic, T.C. —0.00015, 500 V. D-C, type C-865	Master Osc. padding capacitor	GU	47A021
C_{42}	3D9040-10	Fixed capacitor, 40 μμf 5% ceramic, T.C. zero, 500 V. D-C, type C-872	Grid coupling capacitor	GU	47A019
C_{44}	3D9250-20	Fixed capacitor, 250 μμf 10%, mica, 500 V. D-C, type 5W	Cathode coupling capacitor	CD	47BU251E
C_{47}		Fixed capacitor, 75 μμf 20%, mica, 500 V. D-C, type 5W	Crystal coupling capacitor	CD	47BU750F
L_8	3C1090	R-F coil, 96 μh, tapped, special, type 4846	Master Osc. inductor	GU	51A468
L_{14}	3C1090-6	R-F coil, 28.8 μh, single winding, special, type 4881	Crystal Osc. inductor	GU	51A450
L_{20}	3C1090-12	R-F coil, 36.3 μh, single winding, special, type 4872	Buffer-Doubler inductor	GU	51A456
L_{26}	3C1090-12	R-F coil, 36.3 μh, single winding, special, type 4872	Int. Amp. inductor	GU	51A456

PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prongs	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112
(2) Tuning unit TU-48 (2.5 to 3.2 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{33}	3D9100V-8	Variable capacitor, air, 100 μμf max., type 100K8	Buffer-Doubler tuning capacitor	JO	48A083
C_{35}	3D9100V-9	Variable capacitor, air, 100 μμf max., type MC1855	Int. Amp. tuning capacitor	BUD	48A085
C_{37}	3D9155-1	Fixed capacitor, 155 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-866	Master Osc. padding capacitor	GU	47A011
C_{43}	3D9050-61	Fixed capacitor, 50 μμf 5%, ceramic, T.C. zero 500 V. D-C, type C-873	Grid coupling capacitor	GU	47A049
C_{45}	3D9400-16	Fixed capacitor, 400 μμf 10%, mica, 500 V. D-C, type 5W	Cathode coupling capacitor	CD	47BU401E
L_{9}	3C1090-1	R-F coil, 55.5 μh, tapped, special, type 4847	Master Osc. inductor	GU	51A467
L_{15}	3C1090-7	R-F coil, 12.0 μh, single winding, special, type 4882	Crystal Osc. inductor	GU	51A451
L_{21}	3C1090-13	R-F coil, 30.8 μh, single winding, special, type 4873	Buffer-Doubler inductor	GU	51A457
L_{27}	3C1090-13	R-F coil, 30.8 μh, single winding, special, type 4873	Int. Amp. inductor	GU	51A457
PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prongs	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112
(3) Tuning unit TU-49 (3.2 to 4.0 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{33}	3D9100V-8	Variable capacitor, air, 100 μμf max., type 100K8	Buffer-Doubler tuning capacitor	JO	48A083
C_{35}	3D9100V-9	Variable capacitor, air, 100 μμf max., type MC1855	Int. Amp. tuning capacitor	BUD	48A085
C_{38}	3D9135-2	Fixed capacitor, 135 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-867	Master Osc. padding capacitor	GU	47A010
C_{43}	3D9050-61	Fixed capacitor, 50 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-873	Grid coupling capacitor	GU	47A049
L_{10}	3C1090-2	R-F coil, 41.0 μh, tapped, special, type 4848	Master Osc. inductor	GU	51A469
L_{16}	3C1090-8	R-F coil, 9.2 μh, single winding, special, type 4883	Crystal Osc. inductor	GU	51A452
L_{22}	3C1090-14	R-F coil, 20.6 μh, single winding, special, type 4874	Buffer-Doubler inductor	GU	51A458
L_{28}	3C1090-14	R-F coil, 20.6 μh, single winding, special, type 4874	Int. Amp. inductor	GU	51A458
PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prong	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112
(4) Tuning unit TU-50 (4.0 to 5.0 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{33}	3D9100V-8	Variable capacitor, air, 100 μμf max., type 100K8	Buffer-Doubler tuning capacitor	JO	48A083
C_{35}	3D9100V-9	Variable capacitor, air, 100 μμf max., type MC1855	Int. Amp. tuning capacitor	BUD	48A085

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30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE.	CONTR'S DWG. OR PART NO.
Tuning unit TU-50 (4.0 to 5.0 mc.) — Cont'd					
C_{39}	3D9170-1	Fixed capacitor, 170 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-868	Master Osc. padding capacitor	GU	47A012
C_{43}	3D9050-61	Fixed capacitor, 50 μμf 5%, ceramic, T.C. zero, 500 V. D-C, type C-873	Grid coupling capacitor	GU	47A049
C_{46}	3D9100-67	Fixed capacitor, 100 μμf —0+20%, mica, 500 V. D-C, type 5W	Cathode coupling capacitor	CD	47A071
L_{11}	3C1090-3	R-F coil, 21.4 μh, tapped, special, type 4849	Master Osc. inductor	GU	51A470
L_{17}	3C1090-9	R-F coil, 66.0 μh, single winding, special, type 4884	Crystal Osc. inductor	GU	51A453
L_{23}	3C1090-15	R-F coil, 12.6 μh, single winding, special, type 4875	Buffer-Doubler inductor	GU	51A459
L_{29}	3C1090-15	R-F coil, 12.6 μh, single winding, special, type 4875	Int. Amp. inductor	GU	51A459
PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prongs	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112
(5) Tuning unit TU-51 (5.0 to 6.35 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{33}	3D9100V-8	Variable capacitor, air, 100 μμf max., type 100K8	Buffer-Doubler tuning capacitor	JO	48A083
C_{35}	3D9100V-9	Variable capacitor, air, 100 μμf max., type MC1855	Int. Amp. tuning capacitor	BUD	48A085
C_{40}	3D9160	Fixed capacitor, 160 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-869	Master Osc. padding capacitor	GU	47A020
C_{42}	3D9040-10	Fixed capacitor, 40 μμf 5%, ceramic, T.C. zero, 500 V. D-C, type C-872	Grid coupling capacitor	GU	47A019
C_{45}	3D9400-16	Fixed capacitor, 400 μμf 20%, mica, 500 V. D-C, type 5W	Cathode coupling capacitor	CD	47BU401F
L_{12}	3C1090-4	R-F coil, 14.1 μh, tapped, special, type 4850	Master Osc. inductor	GU	51A471
L_{18}	3C1090-10	R-F coil, 22.8 μh, single winding, special, type 4900	Crystal Osc. inductor	GU	51A454
L_{24}	3C1090-16	R-F coil, 8.6 μh, single winding, special, type 4876	Buffer-Doubler inductor	GU	51A460
L_{30}	3C1090-16	R-F coil, 8.6 μh, single winding, special, type 4876	Int. Amp. inductor	GU	51A460
PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prongs	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112
(6) Tuning unit TU-52 (6.35 to 8.0 mc.)					
C_{31}	3D9140V-7	Variable capacitor, air, 140 μμf max., type 140K8	Master Osc. tuning capacitor	JO	48A084
C_{33}	3D9100V-8	Variable capacitor, air, 100 μμf max., type 100K8	Buffer-Doubler tuning capacitor	JO	48A083
C_{35}	3D9100V-9	Variable capacitor, air, 100 μμf max., type MC1855	Int. Amp. tuning capacitor	BUD	48A085
C_{41}	3D9185-1	Fixed capacitor, 185 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-870	Master Osc. padding capacitor	GU	47A018

C_{42}	3D9040-10	Fixed capacitor, 40 μμf 5%, ceramic, T.C. —0.00015, 500 V. D-C, type C-872	Grid coupling capacitor	GU	47A019
C_{45}	3D9400-16	Fixed capacitor, 400 μμf 20%, mica, 500 V. D-C, type 5W	Cathode coupling capacitor	CD	47BU401F
L_{13}	3C1090-5	R-F coil, 8.1 μh, tapped, special, type 4851	Master Osc. inductor	GU	51A482
L_{19}	3C1090-11	R-F coil, 18.0 μh, single winding, special, type 4901	Crystal Osc. inductor	GU	51A455
L_{25}	3C1090-17	R-F coil, 5.66 μh, single winding, special, type 4877	Buffer-Doubler inductor	GU	51A461
L_{31}	3C1090-17	R-F coil, 5.66 μh, single winding, special, type 4877	Int. Amp. inductor	GU	51A461
PL_{10}	2Z7228-10.1	Plug, 12 prong, bakelite, type Z-149	Tuning unit base & terminal prongs	GU	81A073
SW_{15}	3Z9858-3	Switch, DPDT, toggle	"MO-XTAL" switching	HH	60A112

d. Speech Amplifier BC-614-(*). —

R_{101}	3Z6801-16	Fixed resistor, 1,000,000 ohm 20%, ½ watt, type BT-½	Gain dividing component at grid of tube V_{101}	IRC	23BX105F
R_{102}	3Z6801-16	Fixed resistor, 1,000,000 ohm 20%, ½ watt, type BT-½	Gain dividing component at grid of tube V_{101}	IRC	23BX105F
R_{103}	3Z4548	Fixed resistor, 200,000 ohm 10%, ½ watt, type BT-½	Gain dividing component at grid of tube V_{101}	IRC	23BX204E
R_{104}	3Z6010-18	Fixed resistor, 100 ohm 10%, ½ watt, type BT-½	Gain dividing component at grid of tube V_{101}	IRC	23BX101E
R_{105}	3Z4528	Fixed resistor, 5,000 ohm 10%, ½ watt, type BT-½	Gain dividing component at grid of tube V_{101}	IRC	23BX502E
R_{106}	3Z4525	Fixed resistor, 1,000 ohm 10%, ½ watt, type BT-½	Cathode bias for tube V_{101}	IRC	23BX102E
R_{107}	3Z4550	Fixed resistor, 100,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{101}	IRC	23BX104E
R_{108}	3Z4548	Fixed resistor, 200,000 ohm 10%, ½ watt, type BT-½	Mixer isolating resistor	IRC	23BX204E
R_{109}	3Z4533	Fixed resistor, 500,000 ohm 10%, ½ watt, type BT-½	Mod. limiter isolating resistor	IRC	23BX504E
R_{110}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Mixer isolating resistor	IRC	23BX254E
R_{111}	2Z7298-3	Variable resistor, 1 megohm, 20%, special	Low level gain control	CRL	25C043G
R_{112}	3Z4525	Fixed resistor, 1,000 ohm 10%, ½ watt, type BT-½	Cathode bias for tube V_{102}	IRC	23BX102E
R_{113}	3Z4550	Fixed resistor, 100,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{102}	IRC	23BX104E
R_{114}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{103}	IRC	23BX254E
R_{115}	3Z6050-53	Fixed resistor, 500 ohm 10%, 1 watt, type BW-1	Cathode bias for tube V_{103}	IRC	23BW501E
R_{116}	3Z4550	Fixed resistor, 100,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{103}	IRC	23BX104E
R_{117}	3Z4550	Fixed resistor, 100,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{103}	IRC	23BX104E
R_{118}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{104}	IRC	23BX254E
R_{119}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{104}	IRC	23BX254E
R_{120}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{103}	IRC	23BX254E
R_{121}	3Z6050-53	Fixed resistor, 500 ohm 10%, 1 watt, type BW-1	Cathode bias for tube V_{104}	IRC	23BW501E
R_{122}	3Z7298-5	Variable resistor, 15,000 ohm 20%, wire wound, type 25	Level meter control	CT	25C052G
R_{123}^{CD*}	3Z4540	Fixed resistor, 30,000 ohm 10%, ½ watt, type BT-½	Side tone output divider network	IRC	23BX303E
† R_{123}^{AB*}	3Z4528	Fixed resistor, 5,000 ohm 10%, ½ watt, type BT-½	Side tone output divider network	IRC	23BX502E
R_{124}^{CD*}		Fixed resistor, 10,000 ohm 10%, ½ watt, type BT-½	Side tone output divider network	IRC	23BX103E
† R_{124}^{AB*}	3Z526	Fixed resistor, 2,000 ohm 10%, ½ watt, type BT-½	Side tone output divider network	IRC	23BX202E

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* Applies only to models indicated.

† When necessary to replace R_{123}, R_{124}, or R_{137} in SCR-299-A and SCR-299-B, replace *all three* with values indicated for SCR-299-C and SCR-299-D.

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Speech Amplifier BC-614-(*) — Continued.					
R_{125}	3Z6675-10	Fixed resistor, 75,000 ohm 10%, 2 watt, type BT-2	Power supply bleeder	IRC	23BV753E
R_{126}	3Z6620-12	Fixed resistor, 20,000 ohm 10%, 2 watt, type BT-2	Audio decoupling for tube V_{103}	IRC	23BV203E
R_{127}	3Z6650-7	Fixed resistor, 50,000 ohm 10%, 2 watt, type BT-2	Audio decoupling for tube V_{102}	IRC	23BV503E
R_{128}	3Z6650-8	Fixed resistor, 50,000 ohm 10%, 1 watt, type BT-1	Audio decoupling for tube V_{101}	IRC	23BW503E
R_{129}	3Z6620-12	Fixed resistor, 20,000 ohm 10%, 2 watt, type BT-2	Audio decoupling for tube V_{105}	IRC	23BV203E
R_{130}	3Z4531	Fixed resistor, 50,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{105}	IRC	23BX503E
R_{131}	3Z4525	Fixed resistor, 1,000 ohm 10%, ½ watt, type BT-½	Cathode bias for tube V_{105}	IRC	23BX102E
R_{132}	3Z4533	Fixed resistor, 500,000 ohm 10%, ½ watt, type BT-½	Mod. limiter audio filter	IRC	23BX504E
R_{133}	3Z6803-3	Fixed resistor, 3,000,000 ohm 20%, ½ watt, type BT-½	Diode load of tube V_{105}	IRC	23BX305F
R_{134}	2Z7298-4	Variable resistor, 500,000 ohm 20%, special	Mod. limiter control	CRL	25C038G
R_{135}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{106}	IRC	23BX254E
R_{136}	3Z4524	Fixed resistor, 500 ohm 10%, ½ watt, type BT-½	Cathode bias for tube V_{106}	IRC	23BX501E
R_{137} CD*		Fixed resistor, 15,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{106}	IRC	23BX153E
† R_{137} AB*	3Z4540	Fixed resistor, 30,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{106}	IRC	23BX303E
R_{138}	3Z4562	Fixed resistor, 250,000 ohm 10%, ½ watt, type BT-½	Grid resistor for tube V_{106}	IRC	23BX254E
R_{139}	3Z4528	Fixed resistor, 5,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{106}	IRC	23BX502E
R_{140}	3Z4528	Fixed resistor, 5,000 ohm 10%, ½ watt, type BT-½	Plate resistor for tube V_{106}	IRC	23BX502E
R_{141}	3Z6030-11	Fixed resistor, 300 ohm 10%, 1 watt, type BW-1	Mic. voltage filter	IRC	23BW301E
R_{142}	2Z7298-3	Variable resistor, 1 megohm, 20%, special	Carbon mic. gain control	CRL	25C043G
R_{143} D*		Fixed resistor, 50 ohm 10%, ½ watt, type BW-½	Surge suppressor	IRC	24BX500E
R_{144}	3Z6050-21	Fixed resistor, 500 ohm 10%, 1 watt, type BT-1	Microphone supply bleeder	IRC	23BV501E
C_{101}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	A-C power line filter	MIC	46AG103F
C_{102}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Tube V_{101} to tube V_{102} audio coupling	MIC	46AG103F
C_{103}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Tube V_{102} to tube V_{103} audio coupling	MIC	46AG103F
C_{104}		Fixed capacitor, 10. µf —10+75%, electrolytic, 25 V. D-C, special, four units, see C_{107}, C_{110}, C_{120}	Cathode by-pass for tube V_{103}	IC	42A049
C_{105}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Tube V_{103} to tube V_{104} audio coupling	MIC	46AG103F
C_{106}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Audio coupling between tubes V_{103} and V_{104}	MIC	46AG103F
C_{107}		Fixed capacitor, 10. µf —10+75%, electrolytic, 25 V. D-C, special, four units, see, C_{104}, C_{110}, C_{120}	Cathode by-pass for tube V_{104}	IC	42A049
C_{108}		Fixed capacitor, 8. µf —10+75%, electrolytic, 475 V. D-C, special dual unit, see C_{109}	Power supply input filter	IC	42A048
C_{109}		Fixed capacitor, 8. µf —10+40%, electrolytic, 475 V. D-C, special, dual unit, see C_{108}	Power supply output filter	IC	42A048
C_{110}		Fixed capacitor, 30. µf —10+40%, electrolytic, 25 V. D-C, special, four units, see C_{104}, C_{107}, C_{120}	Mic. voltage filter	IC	42A049

C_{111}		Fixed capacitor, 8. µf —10+40%, electrolytic, 475 V. D-C, special, dual unit, see C_{115}	Audio decoupling for tube V_{103}	IC	42A048
C_{112}		Fixed capacitor, 8. µf —10+40%, electrolytic, 475 V. D-C, special, dual unit, see C_{113}	Audio decoupling for tube V_{102}	IC	42A048
C_{113}		Fixed capacitor, 8. µf —10+40%, electrolytic, 475 V. D-C, special, dual unit, see C_{112}	Audio decoupling for tube V_{101}	IC	42A048
C_{114}	3DA10-128	Fixed capacitor, .01 µf 20%, mica, 600 V. type MP-4134	Plate coupling for tube V_{105}	MIC	46AG103F
C_{115}		Fixed capacitor, 8. µf —10+40%, electrolytic, 475 V. D-C, special, dual unit, see C_{111}	Audio decoupling for tube V_{105}	IC	42A048
C_{116}	3DA350-5	Fixed capacitor, 0.35 µf 10%, paper, 400 V. D-C, type 7476	Mod. limiter audio filter	IC	41A016
C_{117}	3DA2-71	Fixed capacitor, 0.002 µf 20%, mica, 500 V. D-C, type 1467	Plate coupling for tube V_{106}	A	47BV202F
C_{118}	3DA2-71	Fixed capacitor, 0.002 µf 20%, mica, 500 V. D-C, type 1467	Plate coupling for tube V_{106}	A	47BV202F
C_{119}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Audio coupling for tube V_{102}	MIC	46AG103F
C_{120}		Fixed capacitor, 30. µf —10+75%, electrolytic, 25 V. D-C, special, four units, see C_{104}, C_{107}, C_{110}	Mic. voltage filter	IC	42A049
C_{121}	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	A-C line filter	MIC	46AG103F
C_{122}	3DA2-71	Fixed capacitor, 0.002 µf 20%, mica, 500 V. D-C, type 1467	Key circuit r-f filter	A	47BV202F
C_{123}	3DA2-71	Fixed capacitor, 0.002 µf 20%, mica, 500 V. D-C, type 1467	Relay circuit r-f filter	A	47BV202F
C_{124}	3DA350-5	Fixed capacitor, 0.35 µf 10%, mica, bathtub, 400 V. D-C, type 7476	Relay circuit r-f filter	IC	41A016
$C_{125}{}^{D*}$	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Surge filter	MIC	46AG103F
$C_{126}{}^{D*}$	3DA10-128	Fixed capacitor, 0.01 µf 20%, mica, 600 V. D-C, type MP-4134	Surge filter	MIC	46AG103F
$RY_{101}{}^{ABC*}$	2Z7650	Relay, 12 V. D-C, special, type C	Automatic control	CPC	21-021
$RY_{101}{}^{D*}$	2Z7650.5	Relay, 12 V. D-C, special type A11731	Automatic control	CPC	21B033
SO_{101}	2Z3013.1	Socket, 3 contact, female, chassis connector, type PC3F	Dynamic mike input	AP	10A046
SO_{102}	2Z8659-7	Socket, 6 prong, rivet mounting, bakelite, type MIP-6	Receiver side tone output	AP	6A054
SO_{103}	2Z8659-6	Socket, octal, rivet mounting, bakelite, type MIP-8	Receiver control input	AP	6A035
SO_{104}	2Z8659-6	Socket, octal, rivet mounting, bakelite, type MIP-8	BC-614 output to BC-610	AP	6A035
SW_{101A} SW_{101B}	3Z9825-34	Switch, 2 pole 3 pos., rotary, special	Receiver side tone "ON-OFF" Receiver side tone switching	CRL	60B083
SW_{102}	3Z845-15	Switch, DPDT, toggle, type 8363KS	BC-342 "AUTO-MAN" switching	CH	60A106

The word Special indicates part made for, or by the Contractor.

* Applies only to models indicated.

† When necessary to replace R_{123}, R_{124}, or R_{187} in SCR-299-A and SCR-299-B, replace *all three* with values indicated for SCR-299-C and SCR-299-D.

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Speech Amplifier BC-614-(*) — Continued.					
SW_{103}	3Z9845-15	Switch, DPDT, toggle, type 8363KS	BC-312 "AUTO-MAN" switching	CH	60A106
SW_{104}	3Z9818-1	Switch, 2 way locking lever key switch, type A7697	Transmitter control switch	CPC	60A113
$SW_{105A}{}^{D*}$ $SW_{105B}{}^{D*}$	3Z9845-15	Switch, DPDT, toggle, type 8363KS	REMOTE TELEPHONE-NORMAL Switching	CH	60A106
T_{101}	2Z9631.3	Transformer, Prim. Imp. 1250 ohm, Sec. Imp. 125 ohms, type 2D131	Carbon mic. to tube V_{102} grid	GTC	55A035
T_{102}	2Z9632.4	Transformer, Prim. Imp. 18,000 ohms, Sec. Imp. 500 ohms, type 2A99	BC-614 output trans.	GTC	55B022
T_{103}	2Z9613.2	Transformer, Prim. 117 V. A-C, Sec. (1) 500 V. C.T. at 25 M.A. (2) 6.3 V. C.T. at 2 amps. (3) 5 V. at 2 amps., type 5C160	Plate and fil. power trans.	GTC	52B042
T_{104}	2Z9634.2	Transformer, Prim. Imp. 10,000 ohms, Sec. Imp. 80,000 ohms, type 2A109	Mod. limiter transformer	GTC	55A036
CH_{101}	3C548	Reactor, 29 henries @ 25 ma., D-C, type 1C103	Filter	GTC	56B014
J_{101}	2Z5524	Jack, 2 circuit, standard headphone type, type 2A	Key input	U	36A002
J_{102}	2Z5522	Jack, 3 circuit telephone type, type 248A	Carbon mike input	U	36A007
LM_{101}	2Z5927	Lamp, 6.3 V. 250 ma., bayonet base, type 44	"ON-OFF" Indicator	GE	39A003
M_{101}	3F3306	Level meter, —10 to +6 DB, bakelite case, model 47	Mod. level indicator	SM	82A029
V_{101}	2T103	Tube, duo diode triode, Type VT-103	A-F amplifier	RCA	90XVT103
V_{102}	2T94	Tube, triode, Type VT-94	A-F amplifier	RCA	90XVT94
V_{103}	2T231	Tube, duo triode, Type VT-231	A-F Amp. and Phase Inv.	RCA	90XVT231
V_{104}	2T231	Tube, duo triode, Type VT-231	A-F amplifier	RCA	90XVT231
V_{105}	2T233	Tube, duo diode triode, Type VT-233	Mod. limiter	RCA	90XVT233
V_{106}	2T231	Tube, duo triode, Type VT-231	Side-Tone osc.	RCA	90XVT231
V_{107}	2T80	Tube, duo diode, Type VT-80	Power supply rectifier	RCA	90XVT80
e. Cordage. —					
F_1	3E1318	Cord CD-318, 2 conductor, rubber covered	Connection for Microphone T-30-()	G	114A707
$F_2{}^{CD*}$	3E2315	Cord CO-315, 6 conductor, rubber covered, length 45 inches	Connection between junction box and socket SO_{300}	H	87A068
$F_3{}^{CD*}$	3E2652	Cord CD-652, 6 conductor, rubber covered, length 100 feet	Extension connection between PE-95-(*) and socket SO_{300}	H	87C070
$F_4{}^{CD*}$	3E2316	Cord CO-316, 6 conductor, rubber covered, length 8 feet and 4 inches	Regular connection between PE-95-(*) and socket SO_{300}	H	87C069
$F_5{}^{CD*}$	3E2313	Cord CO-313, 2 conductor, rubber covered, length 100 feet	A-C power cord extension	H	87A071

F_6[CD*]	3E2314	Cord CO-314, 2 conductor, rubber covered, length 3 feet	Adapter for commercial power line connection	H	87A072
F_7	3E4142-6	Cord CD-563, 2 conductor, rubber covered, length 6 feet	Connection between the spare battery and BC-312	H	87B031
F_8	3E4142-7	Cord CD-564, 2 conductor, rubber covered, length 3 feet	A-C connection between the wiring channel and BC-342	H	87A032
F_9	3E4142-8	Cord CD-565, 4 conductor, rubber covered, length 4 feet	Power and control connection between the wiring channel and BC-312	H	87A034
F_{10}	3E4142-9	Cord CD-566, 3 conductor, rubber covered, length 4 feet	Control connection between the wiring channel and BC-342	H	87A035
F_{11}	3E4142-12	Cable assy., 2 conductor, rubber covered, length 10 feet	Power connection between the wiring channel and BC-610	H	87A044
F_{12}	3E4142-10	Cable assy., 8 conductor, rubber covered, length 10 feet	Control connection between BC-614 and BC-610	H	87B033
F_{13}	3E4142-11	Cable assy., 8 conductor, rubber covered, length 30 inches	Operating control connection between BC-614 and the wiring channel	H	87B036
F_{14}	3E4142-13	Cord CD-587, 2 conductor, rubber covered, length 16 feet	Connection between the spare battery box and the wiring channel	H	87A058
F_{15}[AB*]	3E4142	Cord CD-556, 2 conductor, rubber covered, shielded, length 15 feet	A-C power cord, PE-95 to JB-49	H	87A024
F_{16}[AB*]	3E4142-1	Cord CD-557, 2 conductor, rubber covered, shielded, length 100 feet	A-C power cord, extension	H	87A025
F_{17}[AB*]	3E4142-2	Cord CD-558, 2 conductor, rubber covered, shielded, length 15 feet	D-C power cord, PE-95 to JB-49	H	87A026
F_{18}[AB*]	3E4142-3	Cord CD-559, 2 conductor, rubber covered, shielded, length 100 feet	D-C power cord, extension	H	87A027
F_{19}[AB*]	3E4142-4	Cord CD-560, 3 conductor, rubber covered, shielded, length 15 feet	PE-95 control cord, PE-95 to JB-49	H	87A028
F_{20}[AB*]	3E4142-5	Cord CD-561, 3 conductor, rubber covered, shielded, length 100 feet	PE-95 control cord, extension	H	87A029
F_{21}[AB*]		Cord, 2 conductor, rubber covered, shielded, length 200 feet	A-C power cord, emergency	G	

***f. Control Box BC-731-(*)*[ABC*]*.*—**

FS_{201}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for lights	FG	39A201
FS_{202}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for BC-610	FG	39A201
FS_{203}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for heater	FG	39A201
FS_{204}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for BC-342	FG	39A201
M_1	3F8150-40	Voltmeter, 0-150 V. A-C, 25 to 125 cycles, type AO-22	A-C line voltage indicator	GE	82A027

* Applies only to models indicated.

30. List of Replaceable Parts for Radio Sets SCR-299-A, SCR-299-B, SCR-299-C and SCR-299-D — Continued.

REF. SYMBOL	SIG. C. STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. CODE	CONTR'S DWG. OR PART NO.
Control Box BC-731-(*)[ABC*] — Continued.					
SW_{201}	3Z9824-273	Switch, DPST, double push button, type BB6XI	PE-95 "START-STOP"	SD	60B147
TS_{202}	2Z4905.2	Terminal strip, 5 terminal, bakelite body, type 5-140	Junctions for internal wiring	HJ	88A035
g. Junction Box JB-49-(*)[ABC*]. —					
C_{201}	3DB1.7483	Fixed capacitor, 1. µf —6+14%, paper, 200 V. D-C, type 7483	Line isolating capacitor	IC	46A001
TS_{201}	2Z9410.2	Terminal strip, 10 hole, bakelite base, special	Terminal strip for power connections to Table MC-269	H	88B001
h. Switch SW-199-A[D*]. —					
SW_{201}		Switch, DPST, double push button, type 202	PE-95 "START-STOP"	CF	60A148
i. Junction Box JB-69-A[D*]. —					
C_{201}	3DB1.7483	Same as C_{201}	Line isolating capacitor		
TS_{201}		Terminal strip, 10 hole, bakelite base, special	Terminal strip for power connections to Table MC-269-A	H	88B077
FS_{201}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for light	FG	39A201
FS_{202}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for BC-610	FG	39A201
FS_{203}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for heater	FG	39A201
FS_{204}	3Z2030	Fuse, 30 amp. 125 V., type 4330	Main fuse for BC-342	FG	39A201
j. Junction Box JB-60. —					
C_{301}		Same as C_{201}	Line isolating capacitor		
k. Wiring Channel. —					
C_{202}	3DB1.7483	Same as C_{201}	Transient filter in control circuit		
C_{203}	3DB1.7483	Same as C_{201}			
SO_{201}		Socket, 4 contact receptacle, female, type 92-C	Power and control for Receiver BC-312	AP	10A030
SO_{202}		Socket, 3 contact duplex, female, receptacle, twist lock, type 7580	Spare battery connection	HB	10A031

SO_{203}		Socket, 2 contact duplex, female, receptacle, twist-tite, type 9200	Power outlet for power tools and trouble lamps	HB	6A052
SO_{204}		Socket, 8 contact male receptacle, type PO8M-1	Outlet for operating control cord to BC-614	AP	10A033
SO_{205}		Socket, 2 contact duplex receptacle, female, twist lock, type 7540	A-C outlet	HB	10A032
SO_{206}		Same as SO_{201}	Power source for Receiver BC-342		
SO_{207}		Same as SO_{205}	A-C outlet		
SO_{208}		Socket, 2 contact receptacle, female, twist lock, type 7210	A-C outlet for heater	HB	10A034
SO_{209}		Same as SO_{208}	A-C outlet for Radio Transmitter BC-610		
TS_{202} D*		Terminal strip, 4 terminal, bakelite body, special	Junction for internal wiring	H	88A076
1. Phone and Speaker Control Panel.—					
R_{201} D*	3Z4528	Resistor, 5000 ohm, 10%, ½ watt, carbon, type 504	Audio attenuation for headsets	ER	23BX502E
R_{202} D*	3Z4528	Same as R_{201}	Audio attenuation for headsets		
SW_{202}	3Z9845-15	Switch, DPDT, toggle, type 8363KS	Receiver channel selector for the field telephone	CH	60A106
SW_{203}	3Z9845-15	Same as SW_{202}	TRANSPOSE-NORMAL switching		
SW_{204}	3Z9845-15	Same as SW_{202}	TRANSPOSE-NORMAL switching		
J_{201}	2Z5524	Jack, JK-24, single circuit, per Signal Corps Drawing SC-D-553-F	Headphone outlet	AL	36A005
J_{202}	2Z5524	Same as J_{201}	Headphone outlet		
J_{203}	2Z5524	Same as J_{201}	Headphone outlet		
J_{204}	2Z5524	Same as J_{201}	Headphone outlet		
PL_{204} ABC*		Plug PL-55, per Signal Corps Drawing SC-D-339-H	PHONES 1ST. AUDIO plug for Receiver BC-312	REM	10A019
PL_{205} ABC*		Same as PL_{204}	PHONES 1ST AUDIO plug for Receiver BC-342		
PL_{206}	2Z7168	Plug PL-68, per Signal Corps Drawing SC-D-275-F	Plug connection for Loud-speaker LS-3 (right)	REM	10A020
PL_{207}	2Z7168	Same as PL_{206}	SPEAKER 2ND AUDIO plug for Receiver BC-342		
PL_{208}	2Z7168	Same as PL_{206}	SPEAKER 2ND AUDIO plug for Receiver BC-312		
PL_{209}	2Z7168	Same as PL_{206}	Plug connection for Loud-speaker LS-3 (left)		
PL_{210}		Plug, 6 prong male with cable clamp, type PM6-11	Plug connection to Speech Amplifier BC-614	AP	10A018

The word Special indicates part made for, or by the Contractor.

* Applies only to models indicated.

31. Index of Manufacturers.

Abbrev.	Name and Address
A	Aerovox Corp. New Bedford, Mass.
AE	Advance Electric Co. Los Angeles, Calif.
AL	Alden Products Co. Brockton, Mass.
AP	American Phenolic Corp. Chicago, Illinois
BUD	Bud Radio, Inc. Cleveland, Ohio
BW	Barker & Williamson Upper Darby, Pa.
CD	Cornell-Dubilier Electric Corp. South Plainfield, N. J.
CF	Colt Patent Fire Arms Mfg. Co. Hartford, Conn.
CH	Cutler-Hammer, Inc. Milwaukee, Wis.
CN	Cinch Mfg. Co. Chicago, Illinois
CPC	C. P. Clare & Co. Chicago, Illinois
CRL	Centralab Milwaukee, Wis.
CT	Chicago Telephone Supply Elkhart, Ind.
EAE	Eagle Electrolic Co., Inc. Brooklyn, N. Y.
EM	Eitel McCullough Inc. San Bruna, Calif.
ER	Erie Resistor Co. Erie, Pa.
FG	Effengee Supply Co., Inc. Chicago, Illinois
G	Government Stock
GD	Guardian Electric Mfg. Co. Chicago, Illinois
GE	General Electric Co. Chicago, Illinois
GML	G. M. Laboratories Chicago, Illinois
GTC	General Transformer Corp. Chicago, Illinois
GU	E. I. Guthman Co. Chicago, Illinois
H	The Hallicrafters Co. Chicago, Illinois
HB	Harvey Hubbel, Inc. Bridgeport, Conn.
HH	Hart & Hegeman Electric Co. Hartford, Conn.
HJ	Howard B. Jones Co. Chicago, Illinois
IC	Industrial Condenser Chicago, Illinois
IRC	International Resistance Co. Philadelphia, Pa.
JO	E. F. Johnson Co. Waseca, Minn.
LF	Littlefuse, Inc. Chicago, Illinois
LR	Leach Relay Co. Los Angeles, Calif.
MIC	Micamold Radio Corp. Brooklyn, N. Y.
O	Ohmite Mfg. Co. Chicago, Illinois
RCA	RCA Manufacturing Co., Inc. Camden, N. J.
REM	Remler Co. Ltd., San Francisco, Calif.
SD	Square D Milwaukee, Wis.
SM	Simpson Electric Co. Chicago, Illinois
ST	Standard Transformer Corp. Chicago, Illinois
SWI	S. W. Inductor Co. Chicago, Illinois
U	Utah Produce Co. Chicago, Illinois

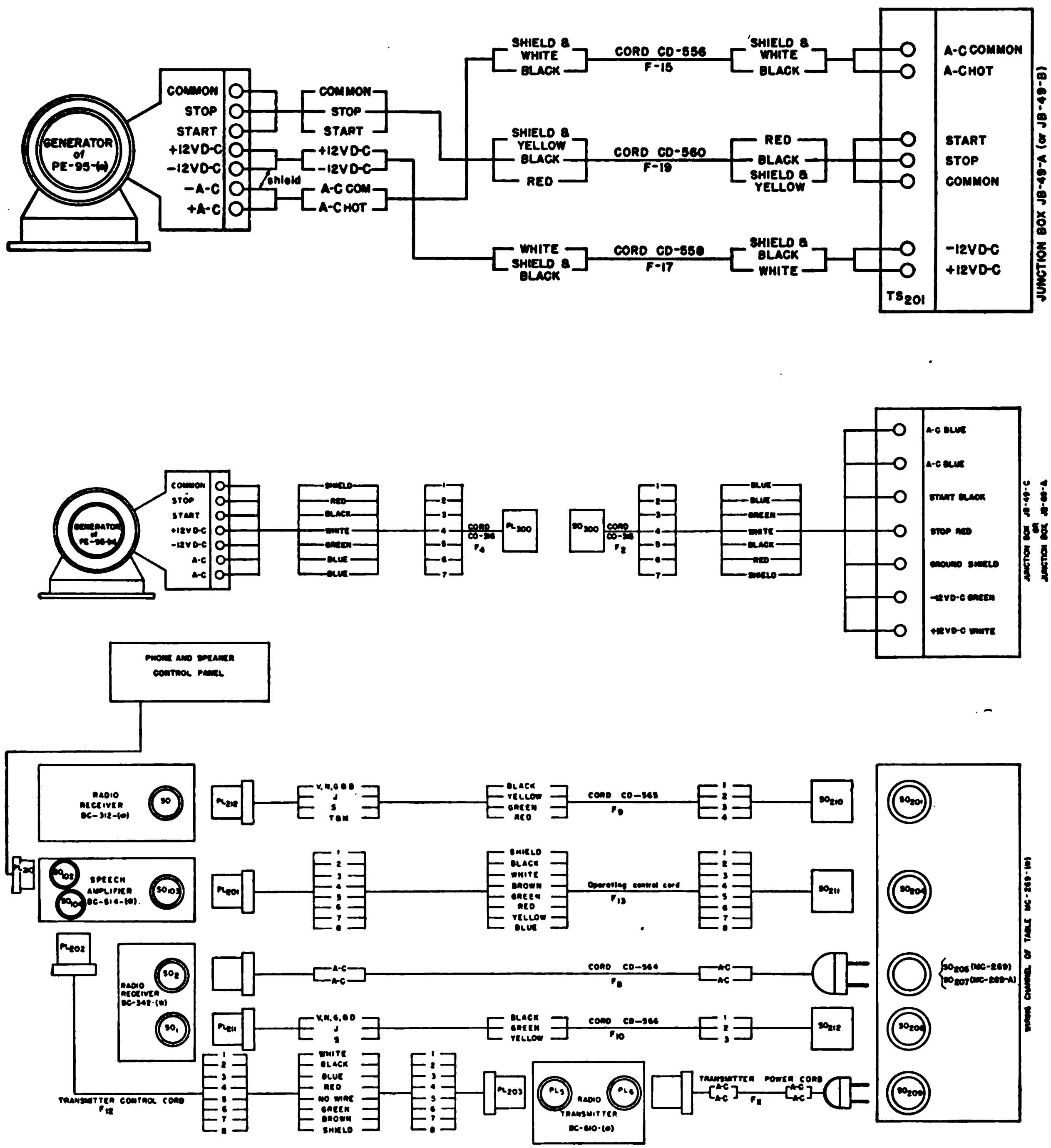


FIGURE 47. RADIO SET SCR-299-(*), CORDING DIAGRAM.

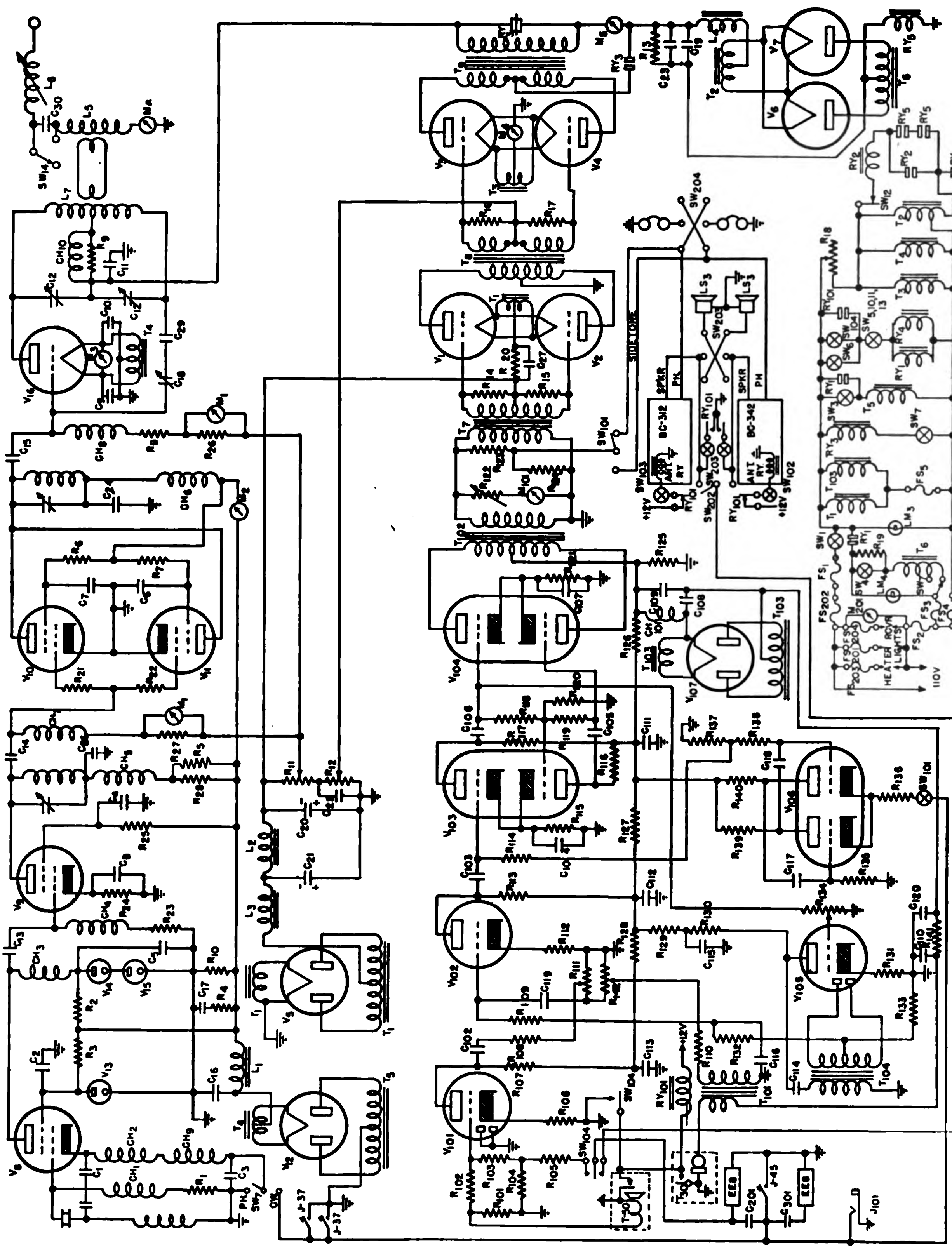


FIGURE 48. RADIO SETS SCR-299-A, SCR-299-B AND SCR-299-C, OVER-ALL SCHEMATIC CIRCUIT DIAGRAM, SIMPLIFIED.

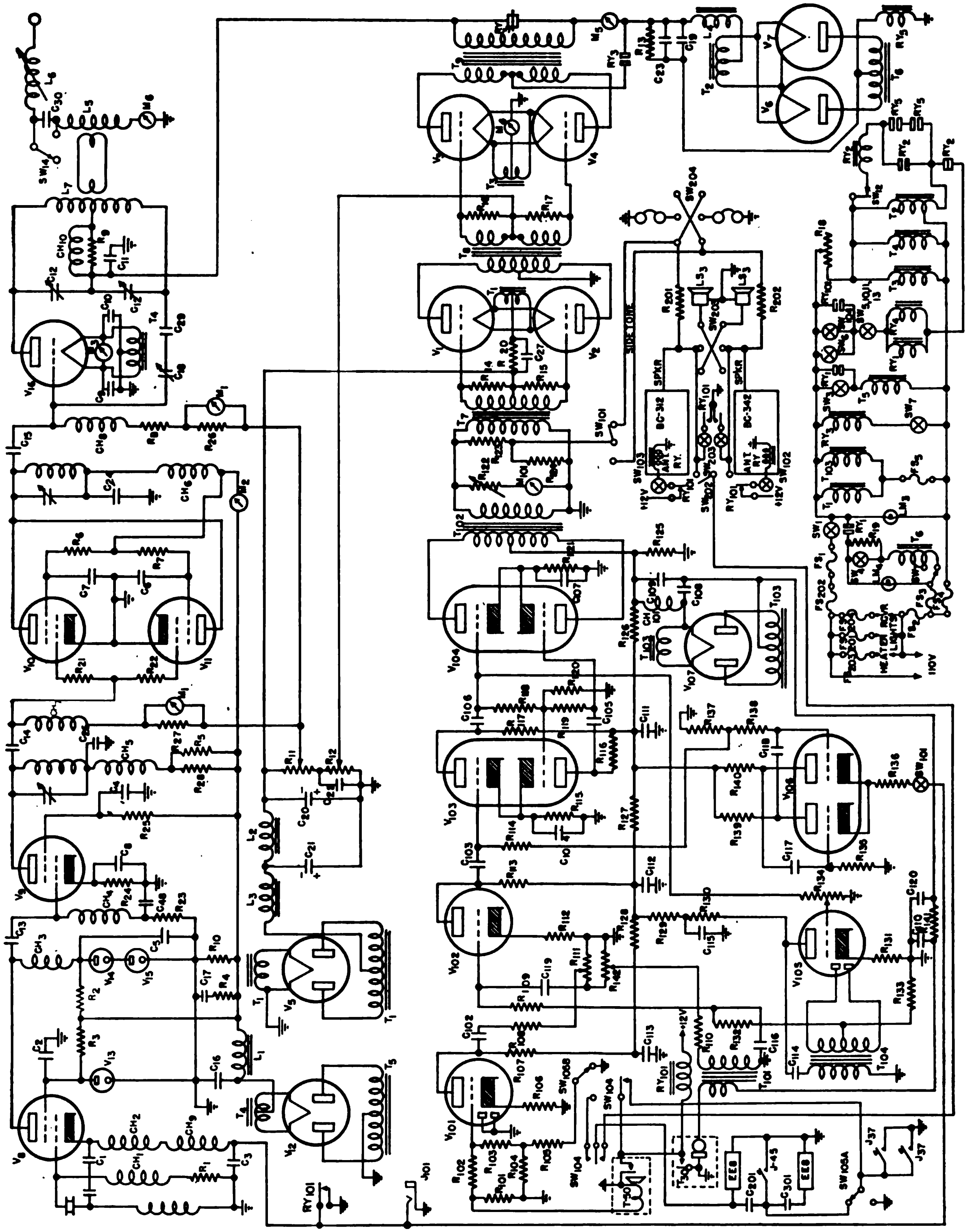
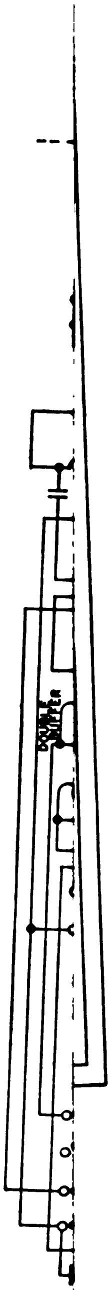
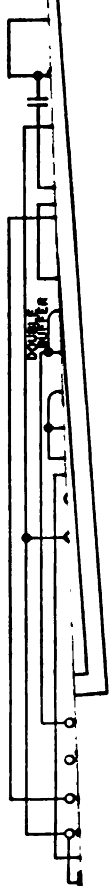


FIGURE 49. RADIO SET SCR-299-D, OVER-ALL SCHEMATIC CIRCUIT DIAGRAM, SIMPLIFIED.



FIG



FIG

RADIO SETS SCR-299-A, SCR-299-B, SCR-299-C, and SCR-299-D

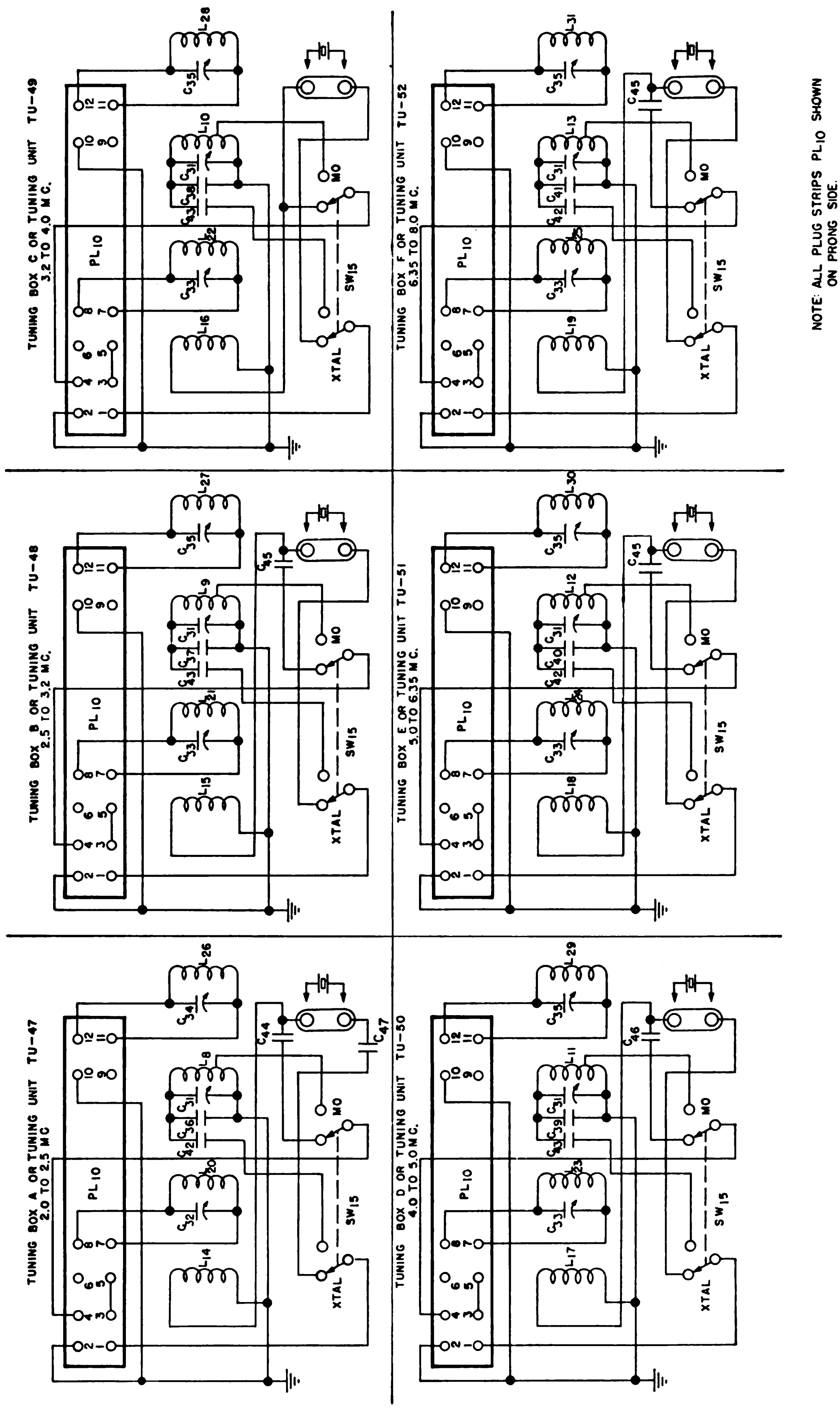


FIGURE 53. TUNING UNITS FOR RADIO TRANSMITTER BC-610-(*), SCHEMATIC WIRING DIAGRAM.

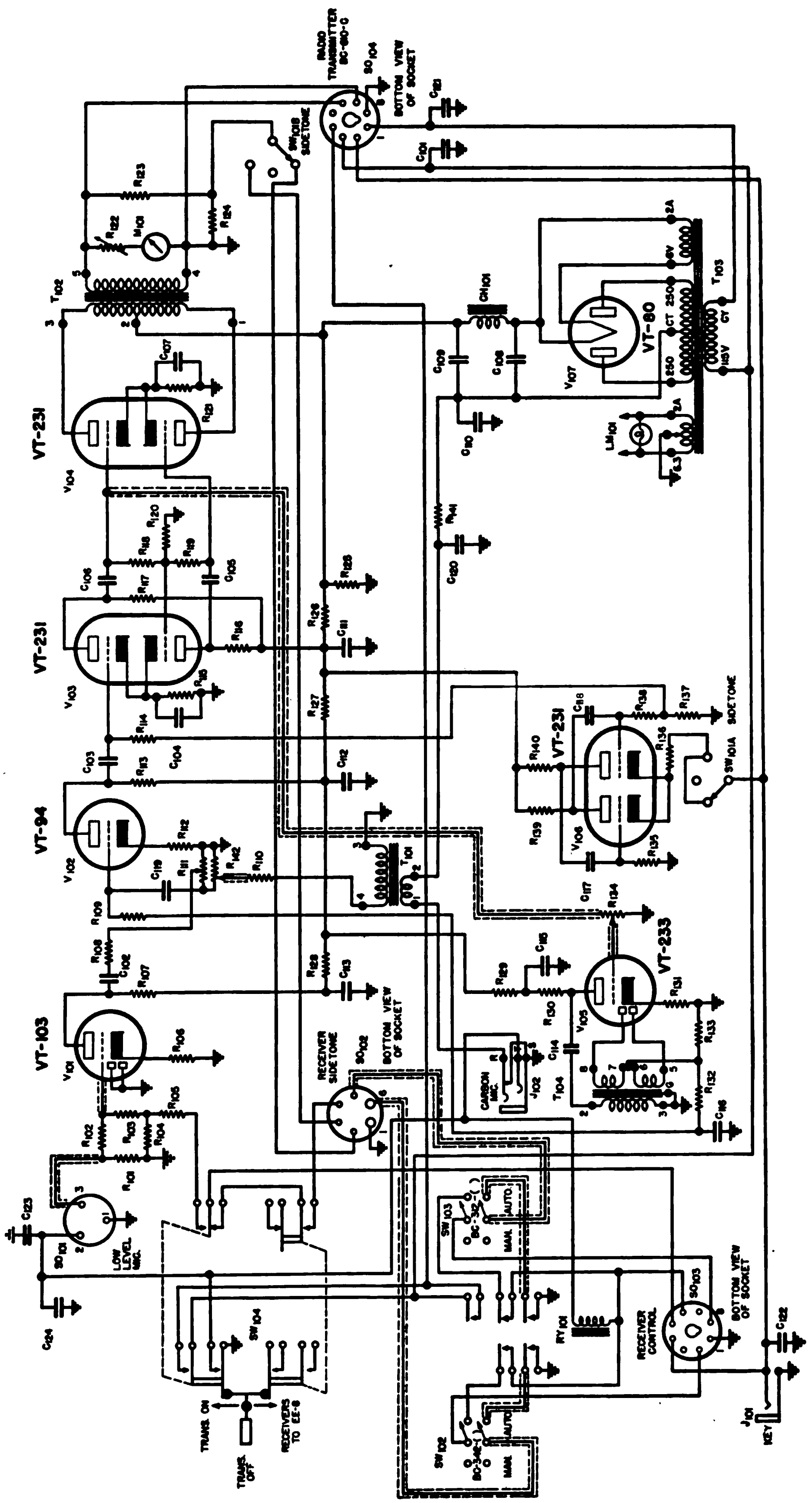


FIGURE 54. SPEECH AMPLIFIERS BC-614-A, BC-614-B AND BC-614-C, SCHEMATIC WIRING DIAGRAM.

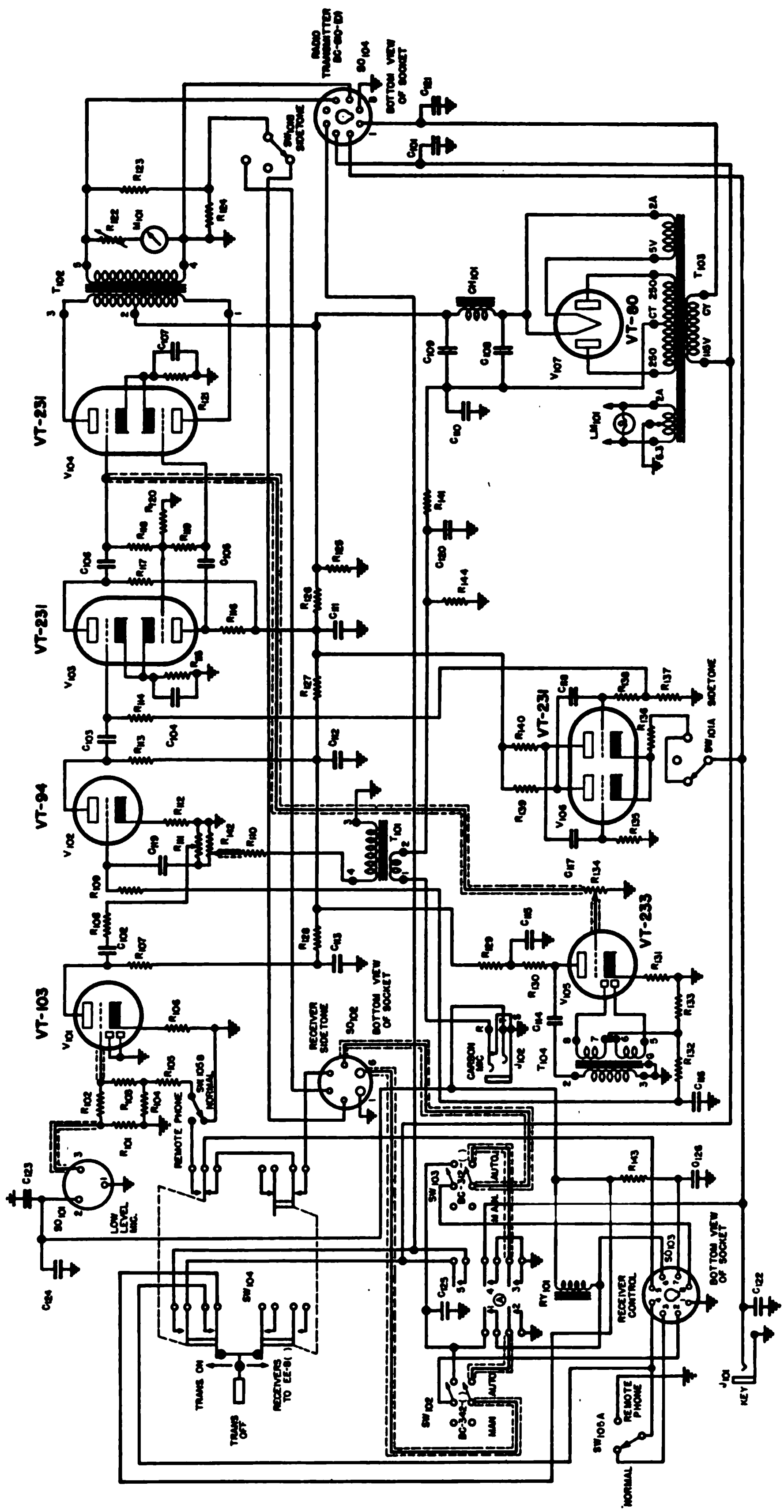


Figure 55. Speech Amplifier BC-614-D, schematic wiring diagram.

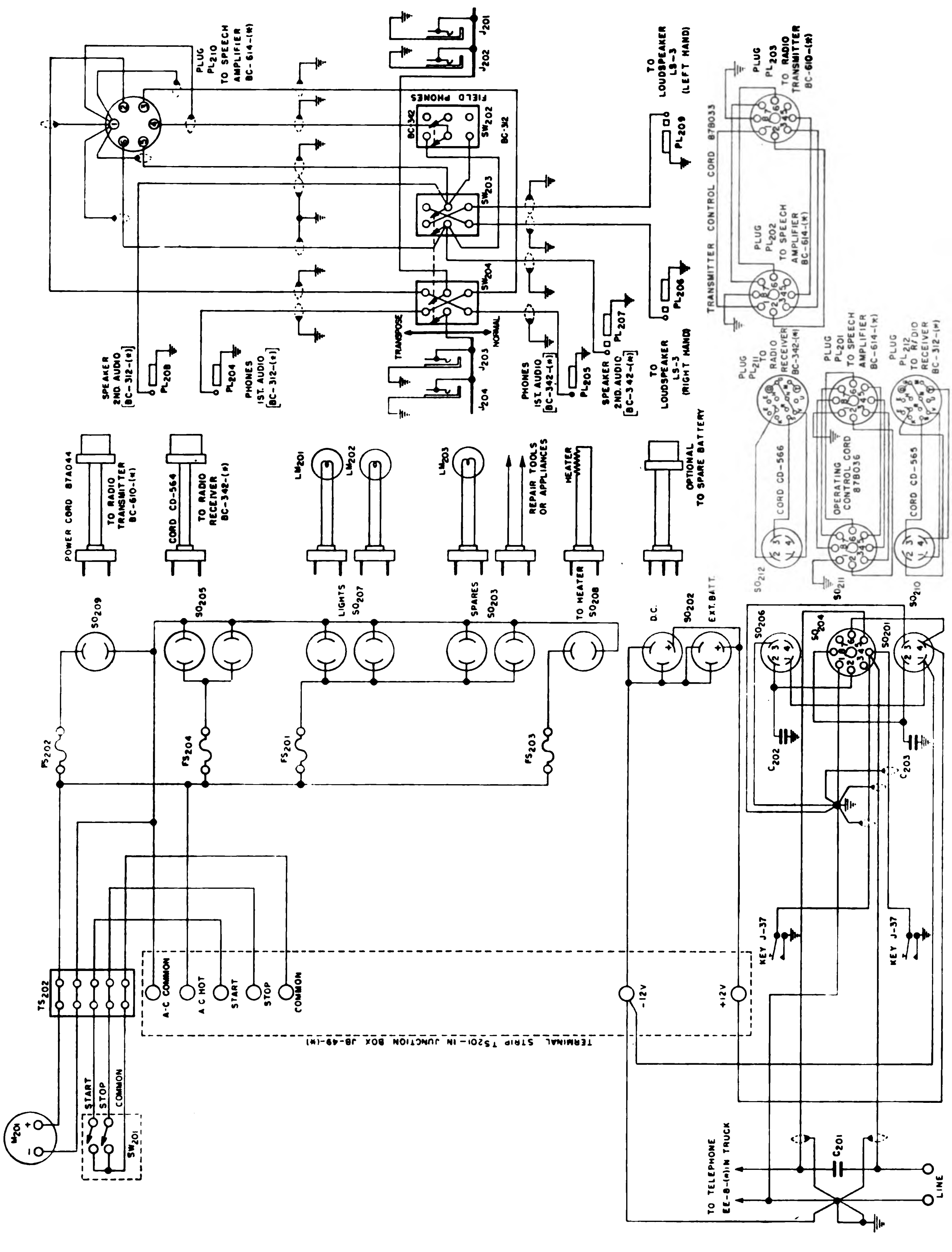


FIGURE 56. TABLE MC-269 AND ASSOCIATED COMPONENTS, SCHEMATIC WIRING DIAGRAM.

RADIO SETS SCR-299-A, SCR-299-B, SCR-299-C, and SCR-299-D

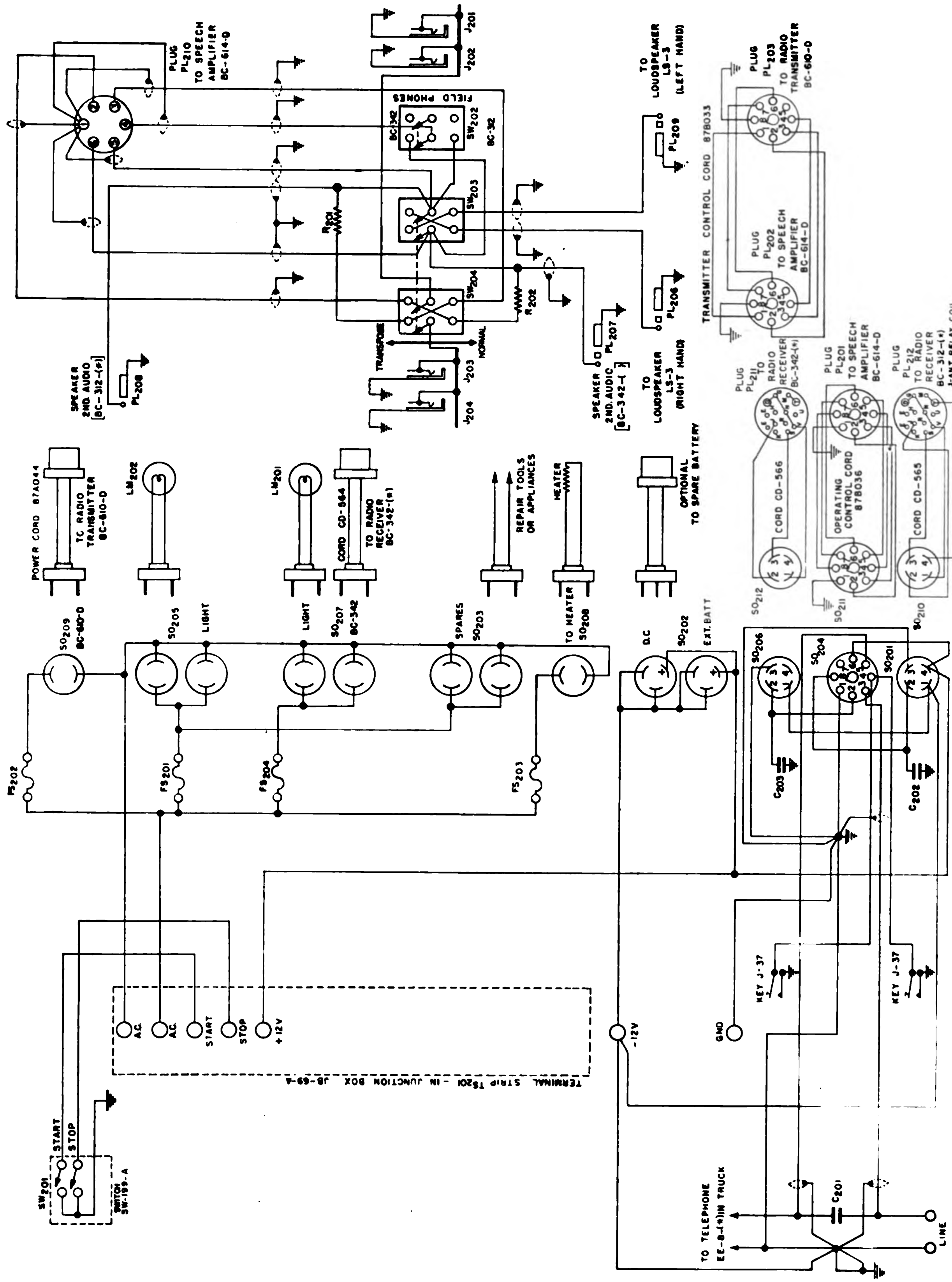


FIGURE 57. TABLE MC-269-A AND ASSOCIATED COMPONENTS, SCHEMATIC WIRING DIAGRAM.

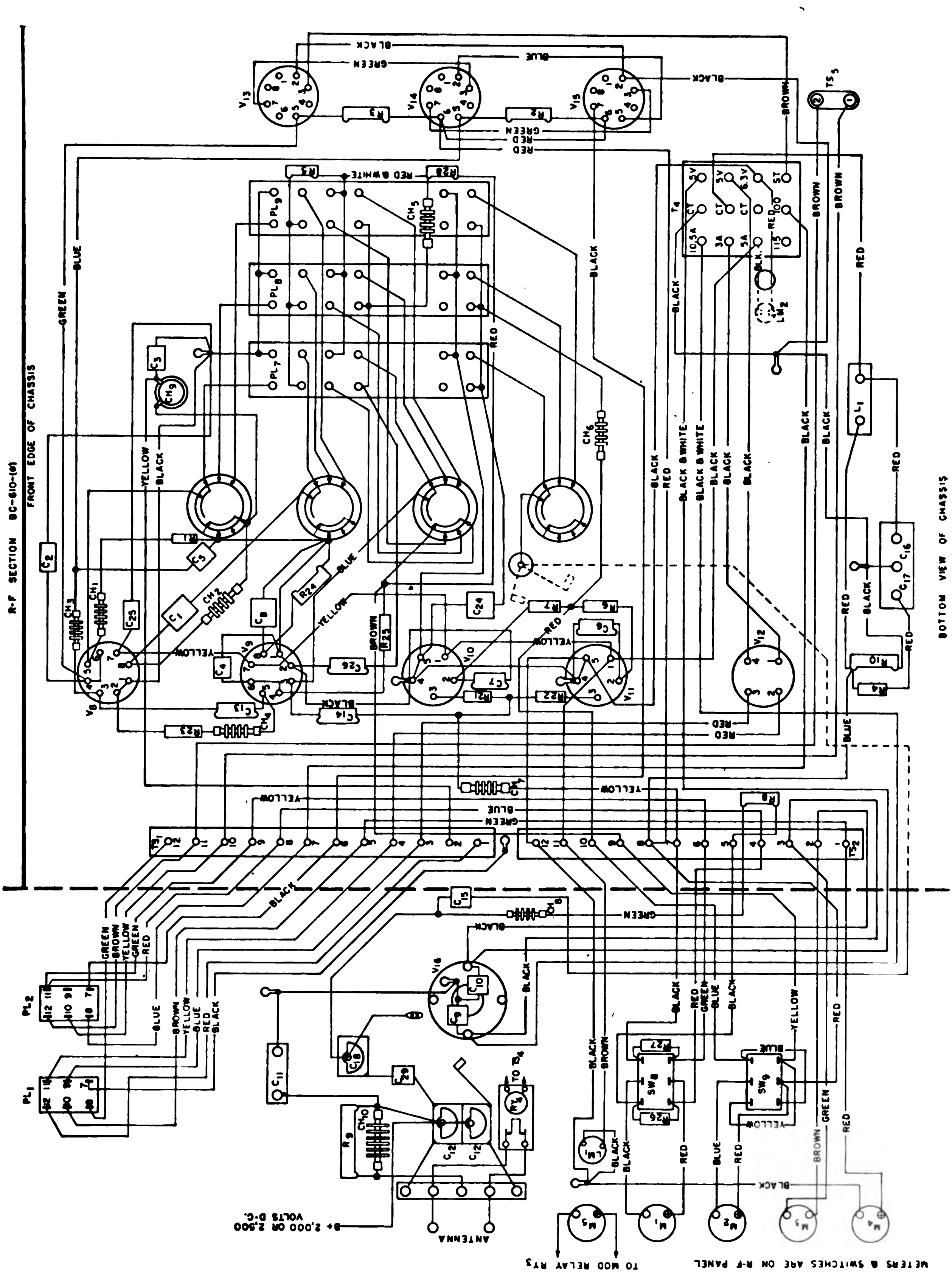


FIGURE 58. RADIO TRANSMITTERS BC-610-A AND BC-610-B, R-F SECTION, PRACTICAL WIRING DIAGRAM.

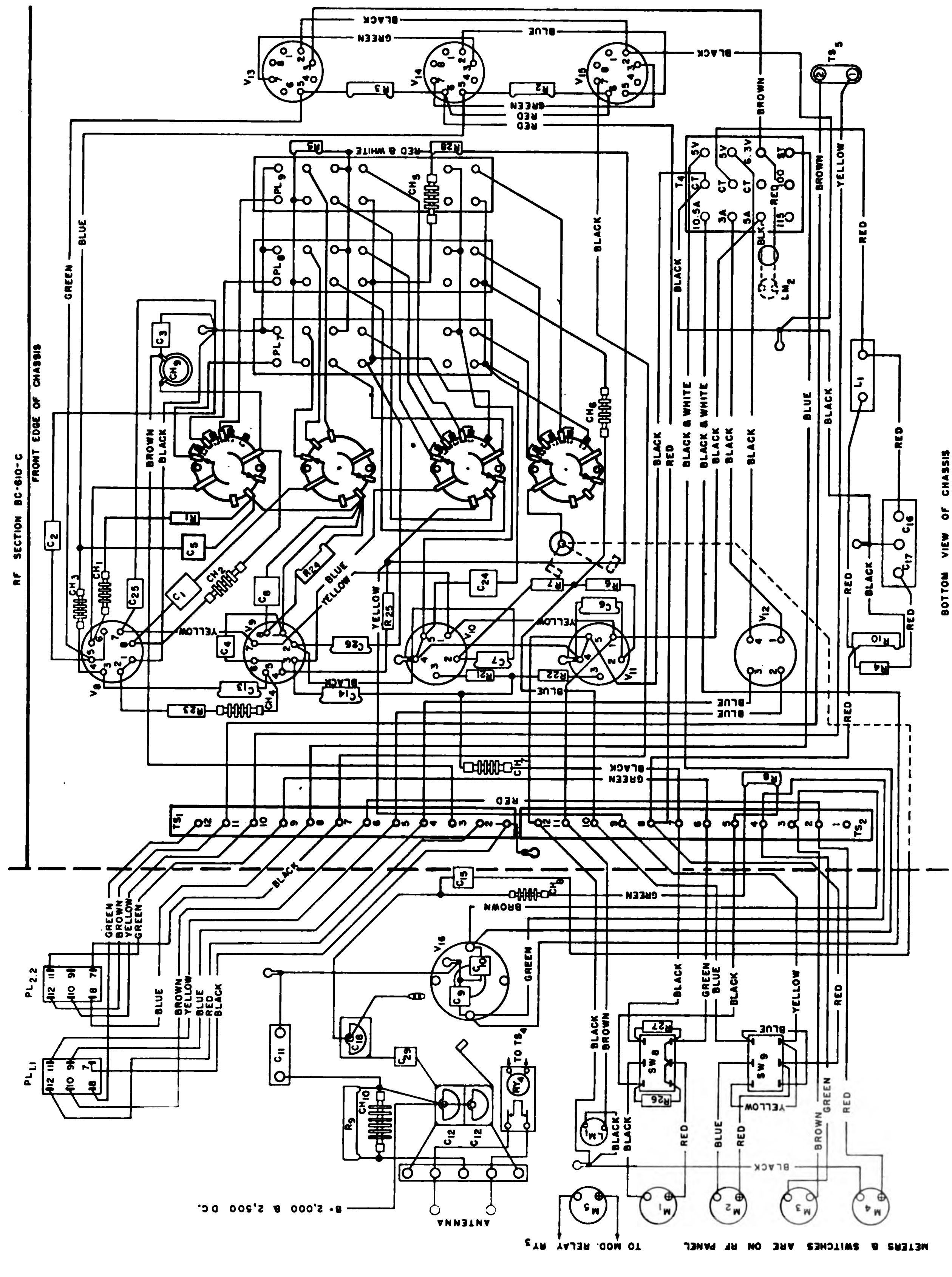


FIGURE 59. RADIO TRANSMITTER BC-610-C, R-F SECTION, PRACTICAL WIRING DIAGRAM.

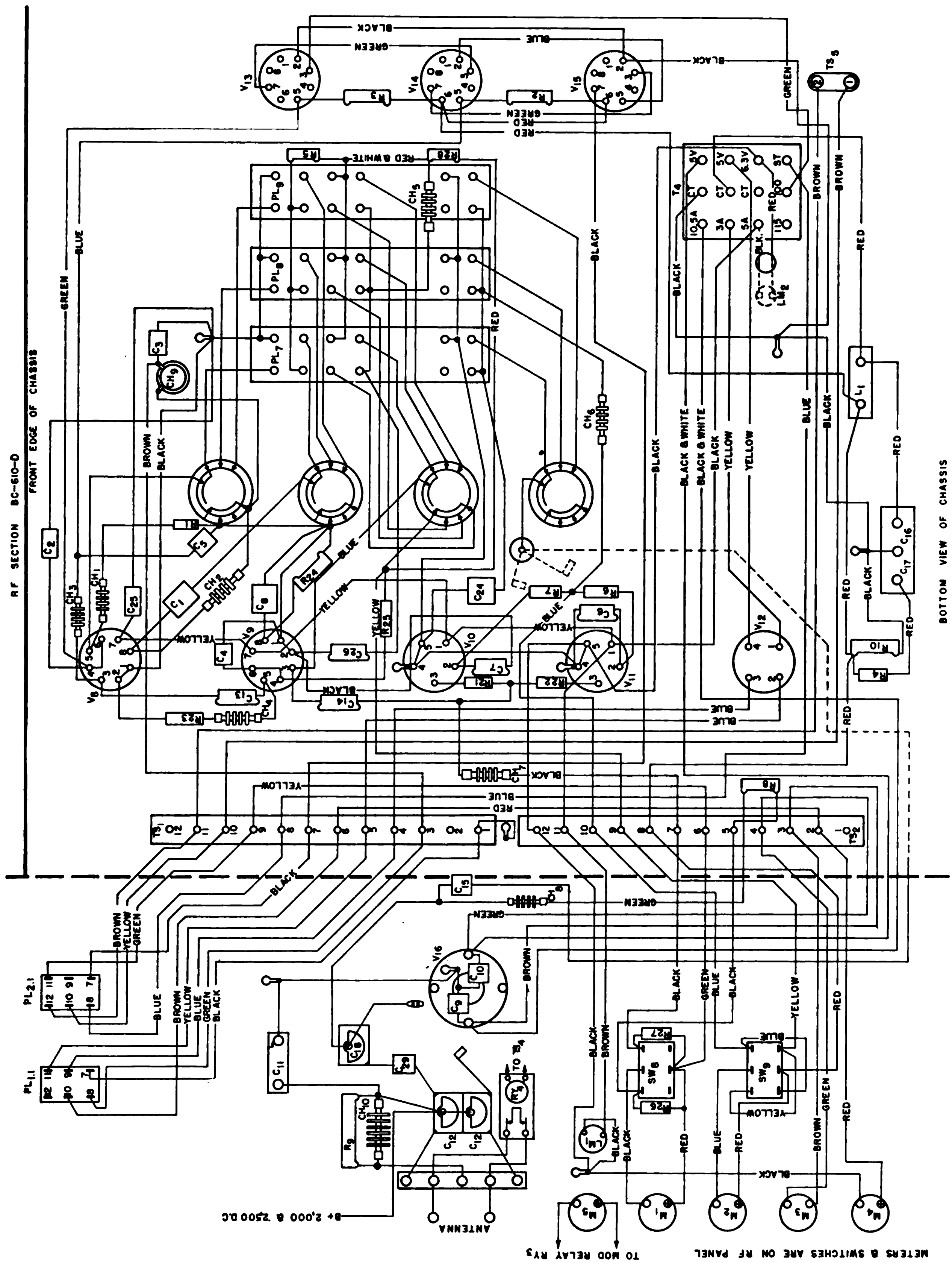


FIGURE 60. RADIO TRANSMITTER BC-610-D, R-F SECTION, PRACTICAL WIRING DIAGRAM.

RADIO

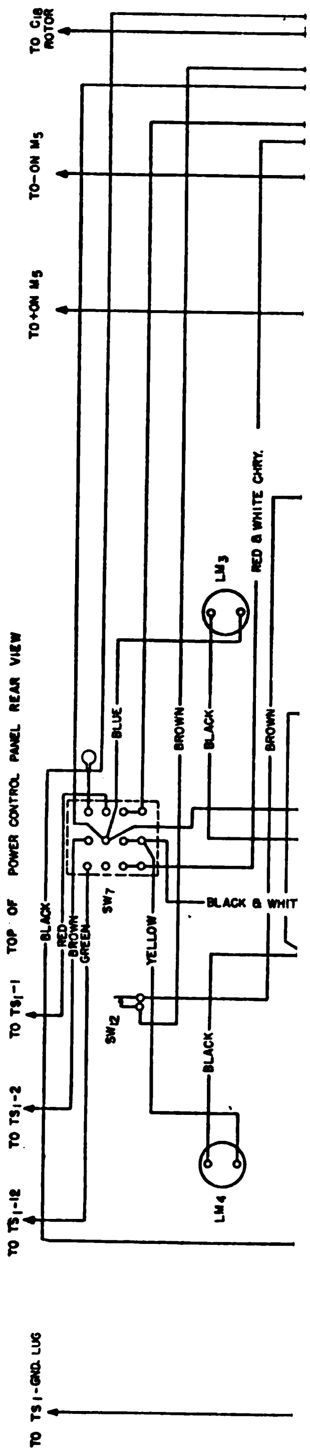


FIGURE 61. RADIO TRA

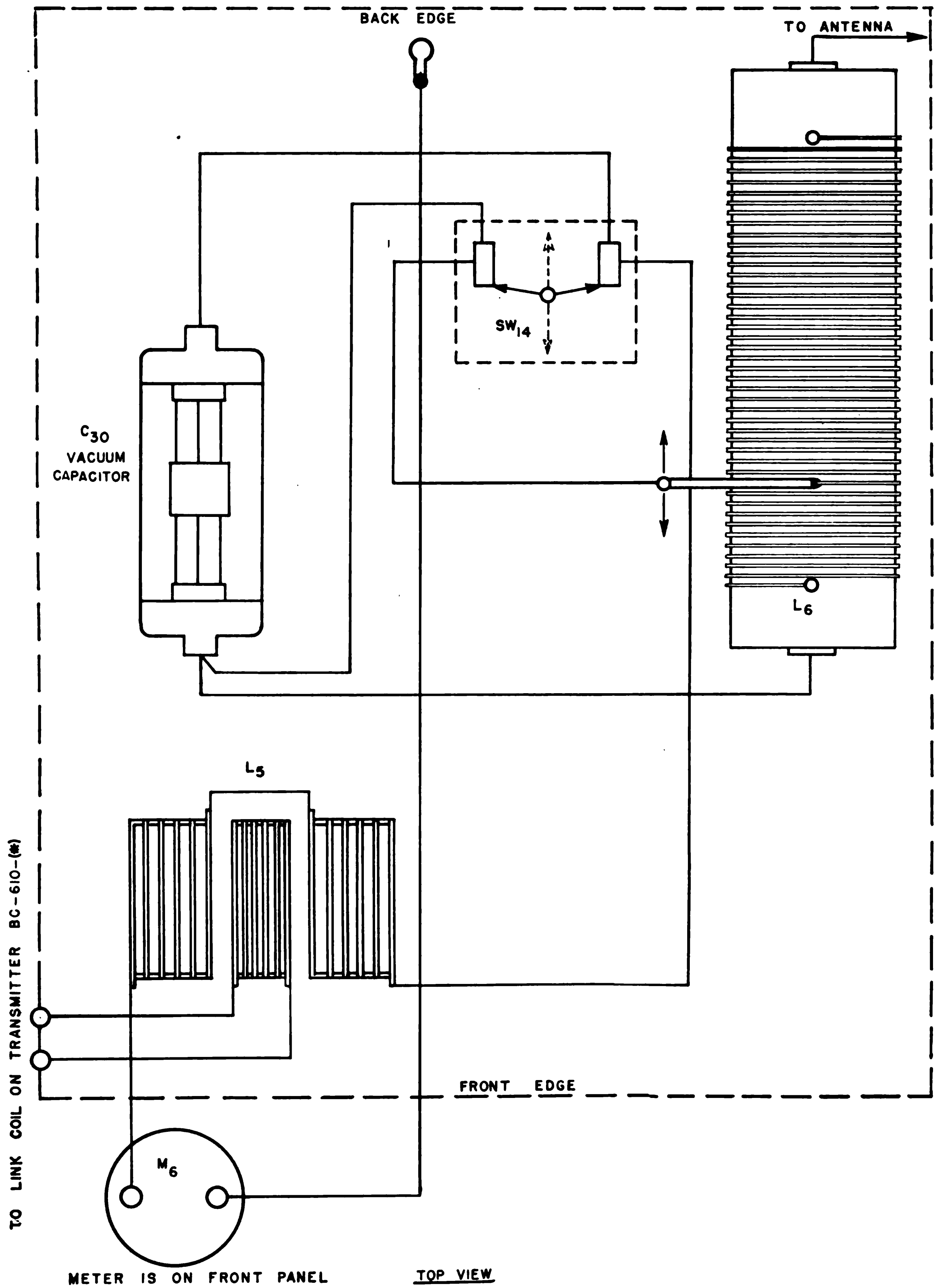


FIGURE 63. ANTENNA TUNING UNIT BC-729-(*), PRACTICAL WIRING DIAGRAM.

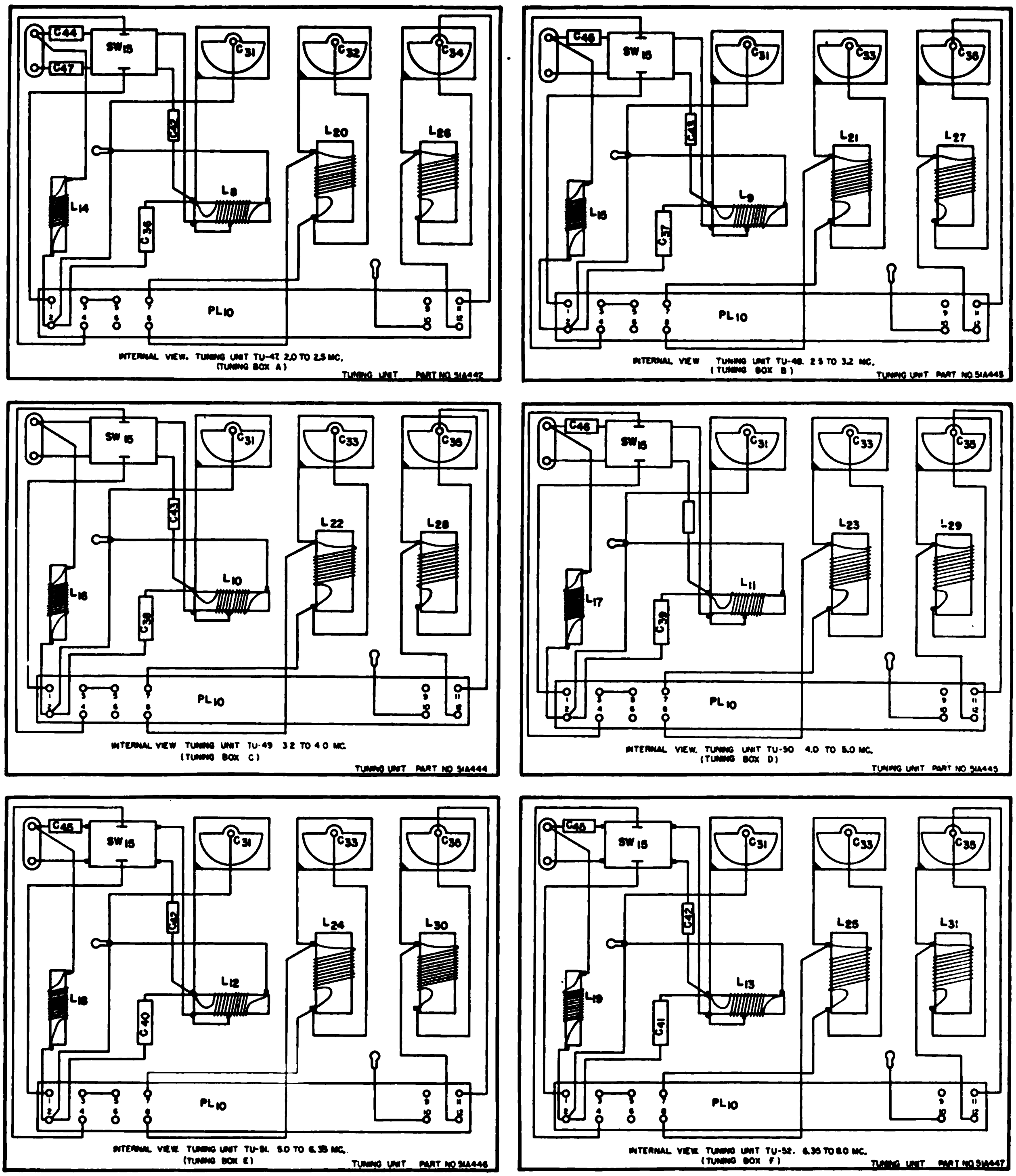


FIGURE 64. TUNING UNITS FOR RADIO TRANSMITTER BC-610-(*), PRACTICAL WIRING DIAGRAM.

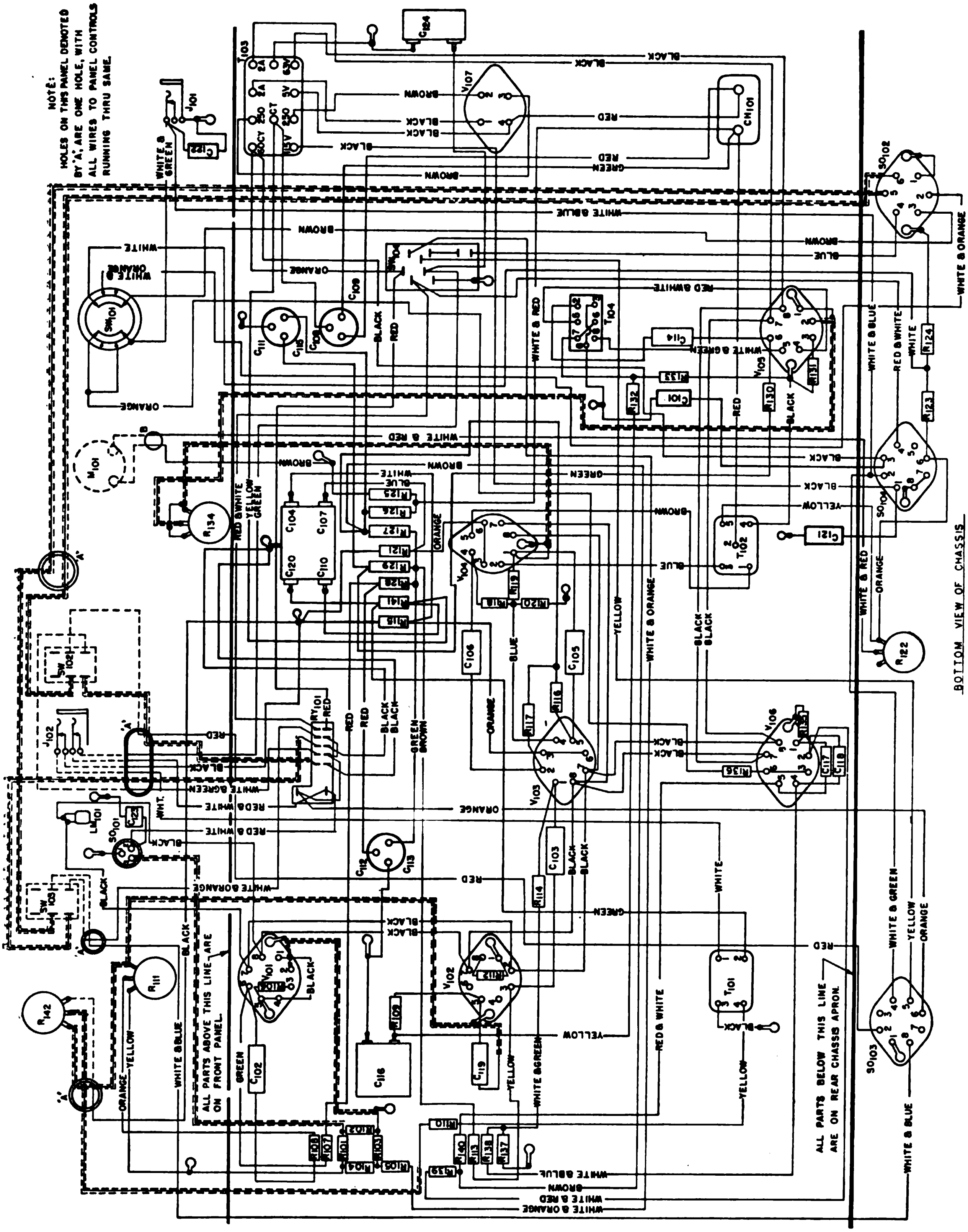


FIGURE 65. SPEECH AMPLIFIERS BC-614-A, BC-614-B AND BC-614-C, PRACTICAL WIRING DIAGRAM.

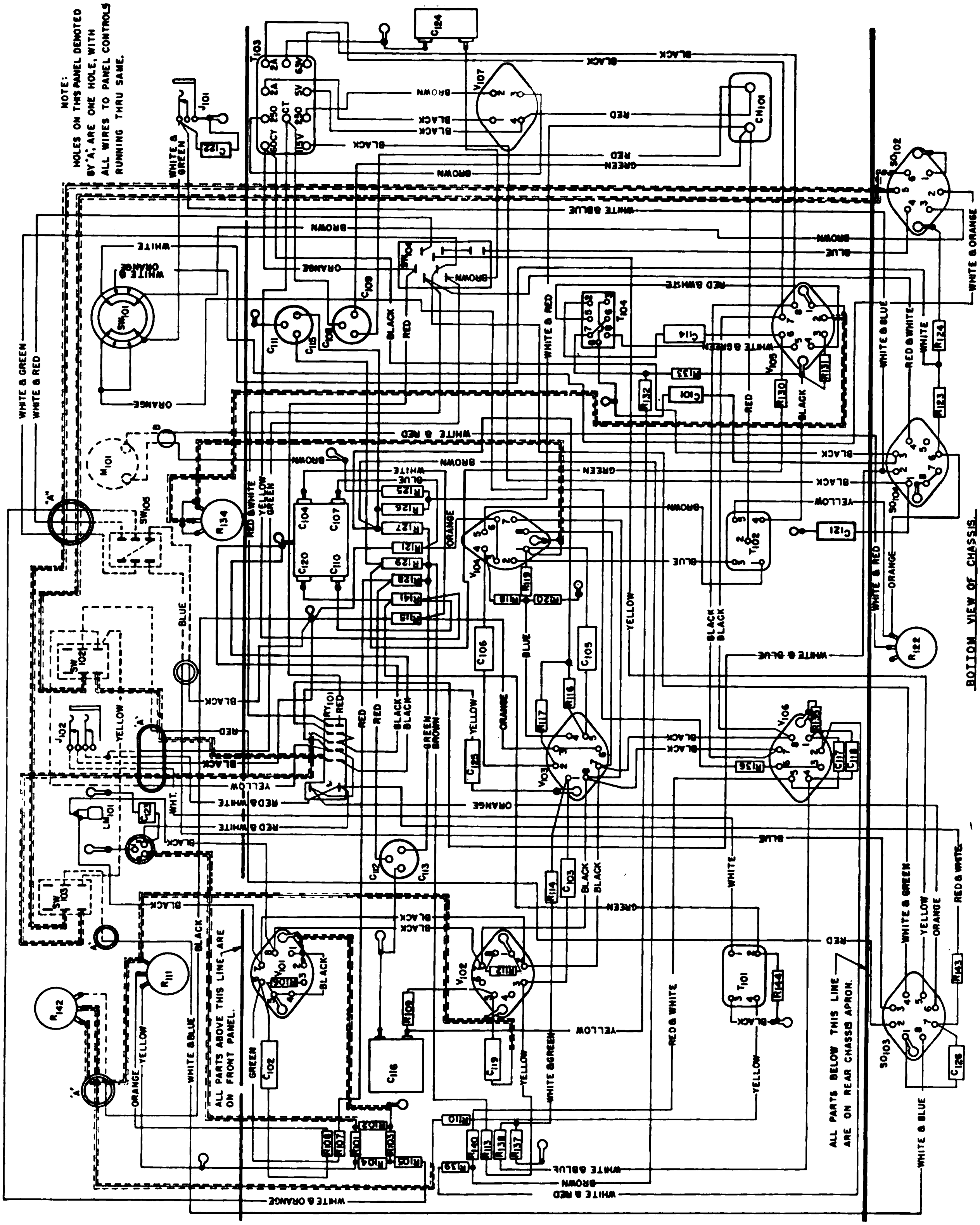


FIGURE 66. SPEECH AMPLIFIER BC-614-D, PRACTICAL WIRING DIAGRAM.

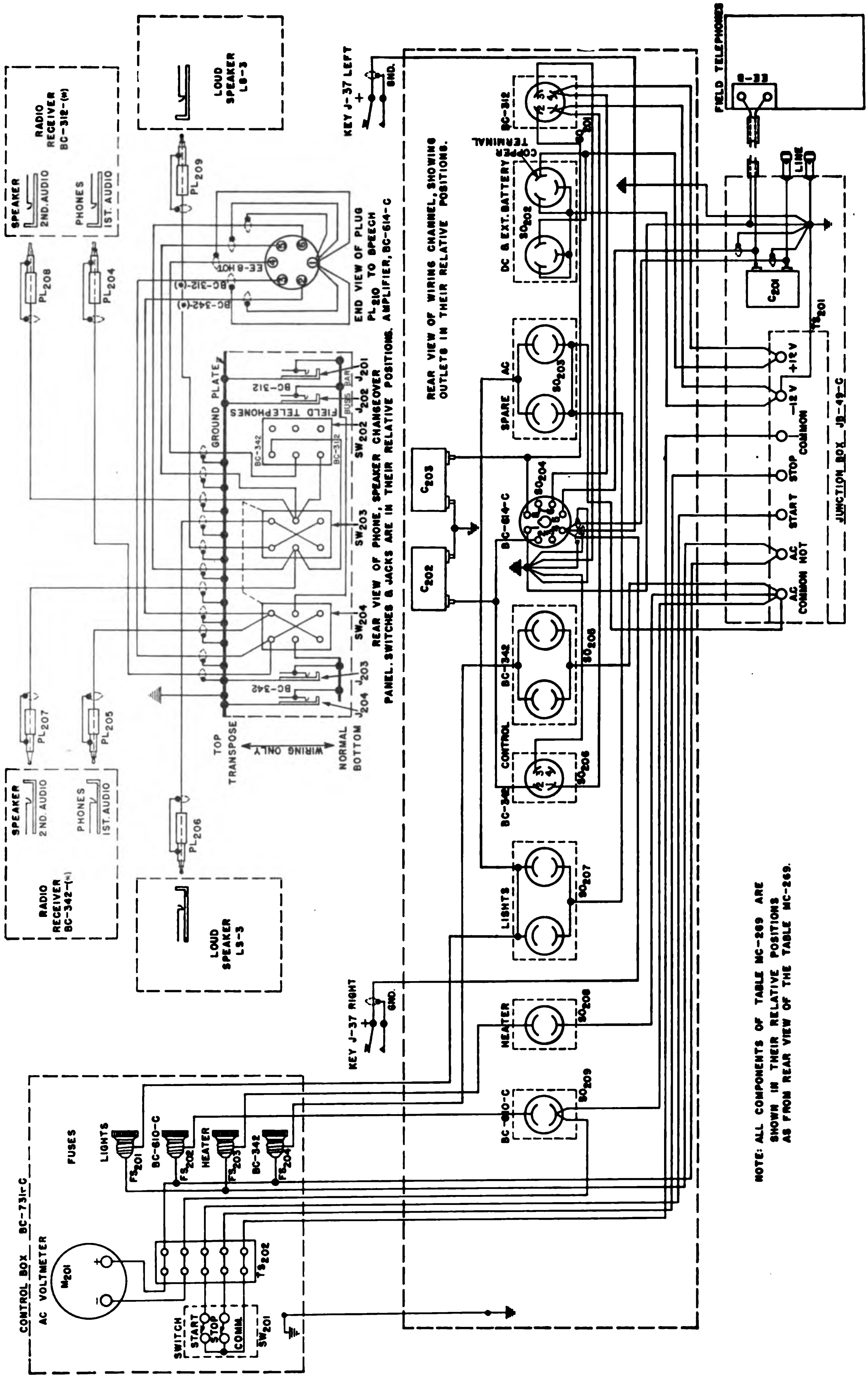


FIGURE 67. TABLE MC-269 AND ASSOCIATED COMPONENTS, PRACTICAL WIRING DIAGRAM.

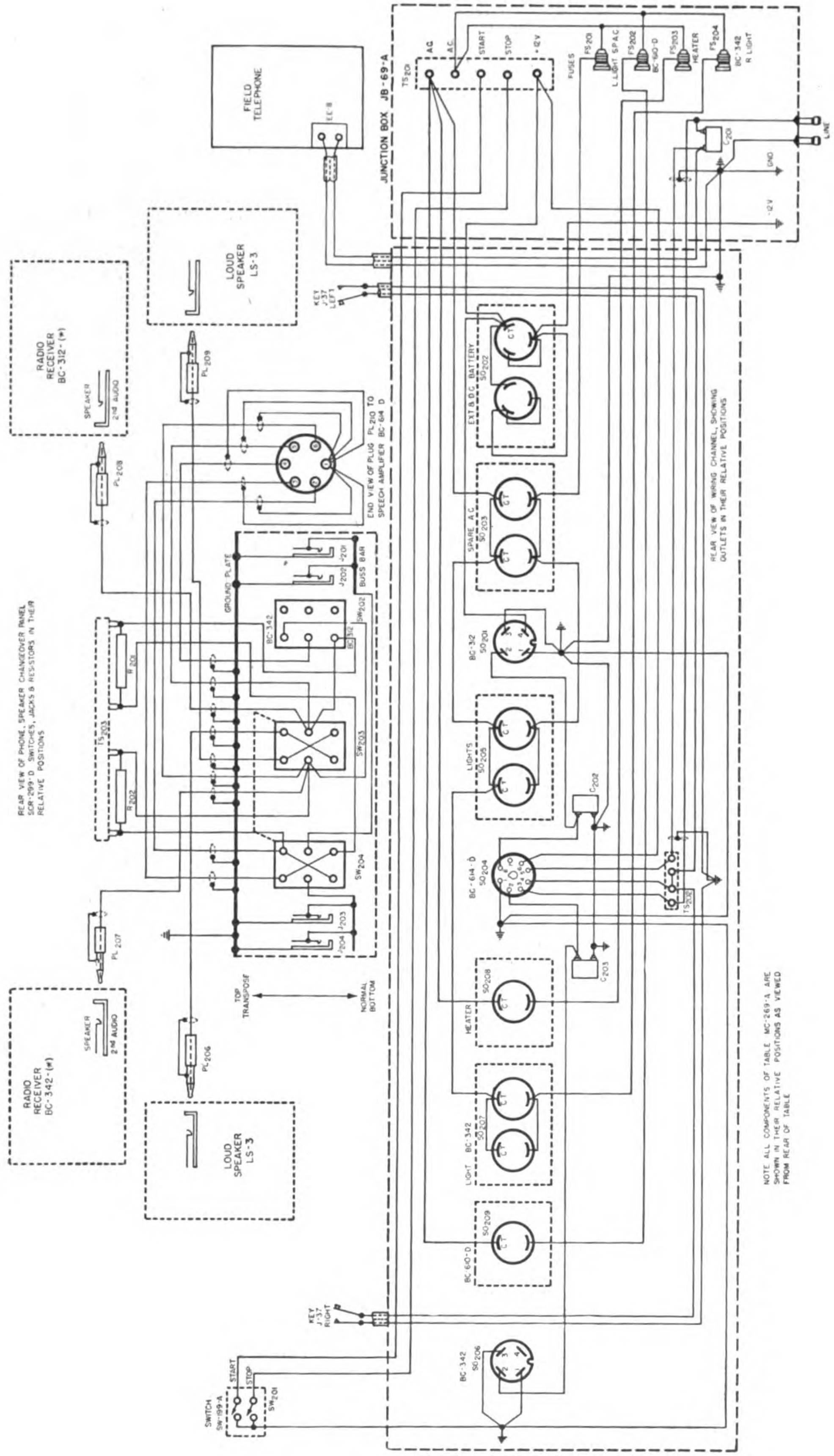


FIGURE 68. TABLE MC-269-A AND ASSOCIATED COMPONENTS, PRACTICAL WIRING DIAGRAM.

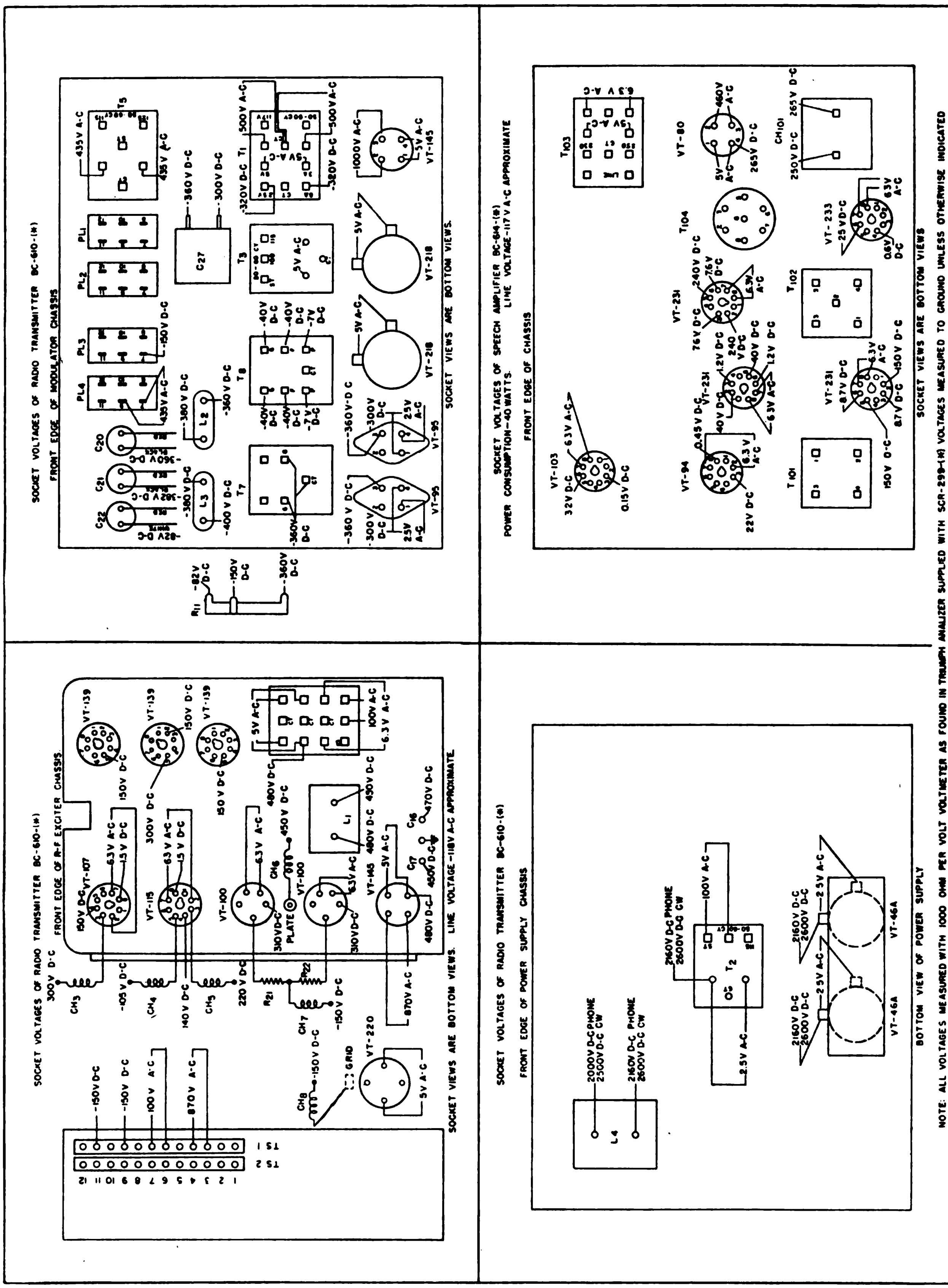


FIGURE 69. TUBE SOCKET LAYOUT DIAGRAMS SHOWING VOLTAGES ON RADIO TRANSMITTERS BC-610-A, BC-610-B AND BC-610-C.

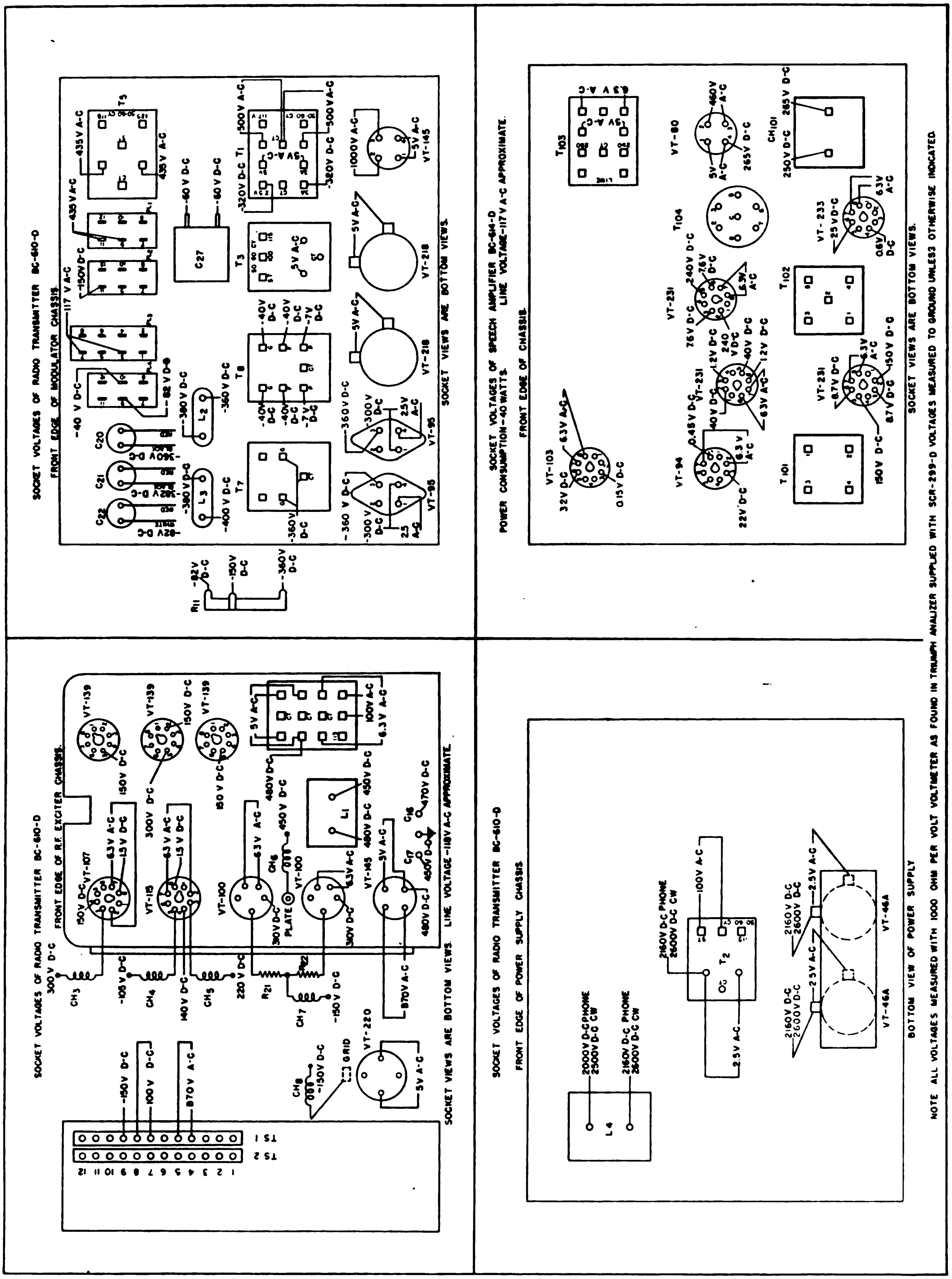


FIGURE 70. TUBE SOCKET LAYOUT DIAGRAMS SHOWING VOLTAGES ON RADIO TRANSMITTER BC-610-D.

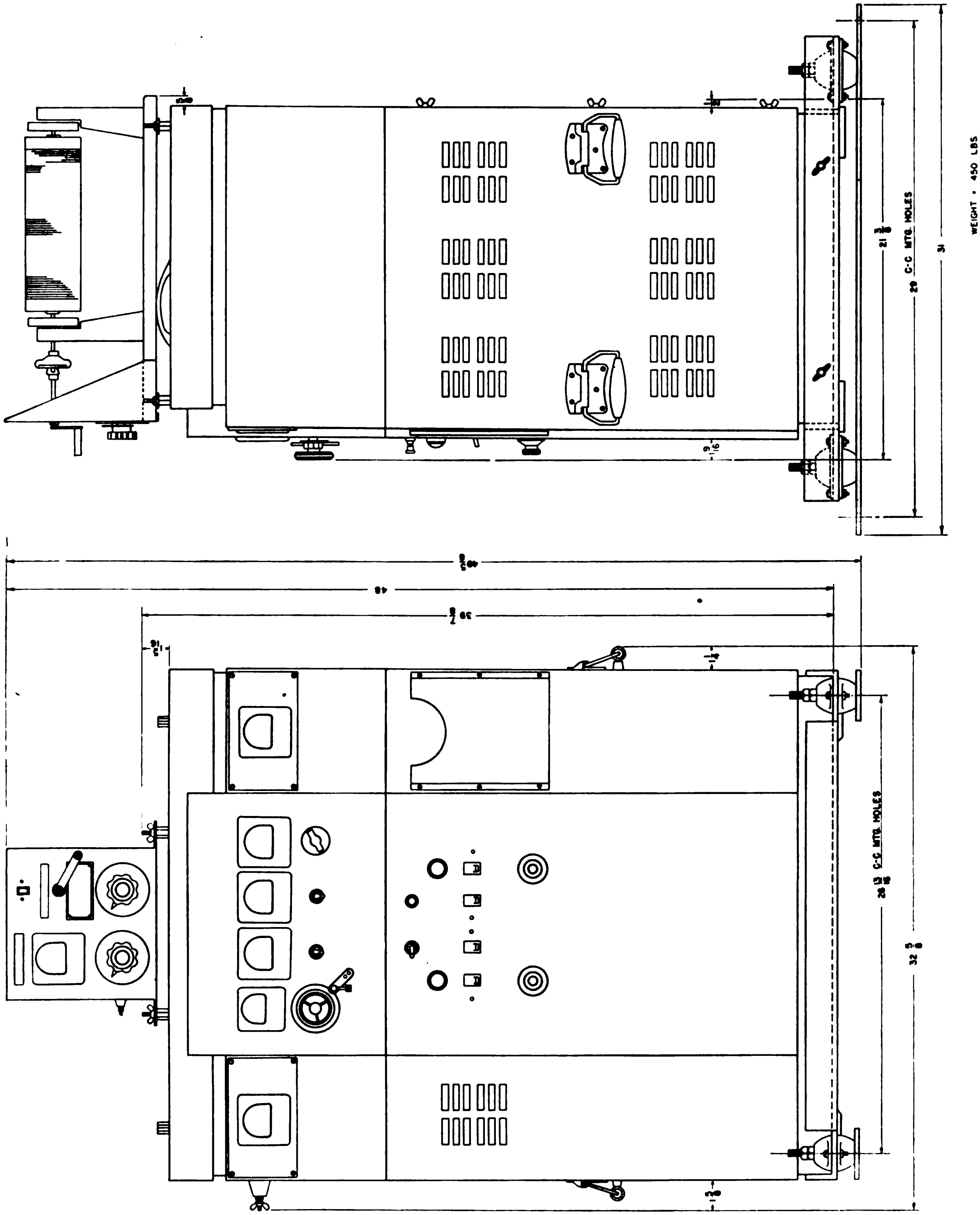


FIGURE 71. OUTLINE DIMENSIONAL SKETCH OF RADIO TRANSMITTER BC-610-(*) WITH ANTENNA TUNING UNIT BC-729-(*).

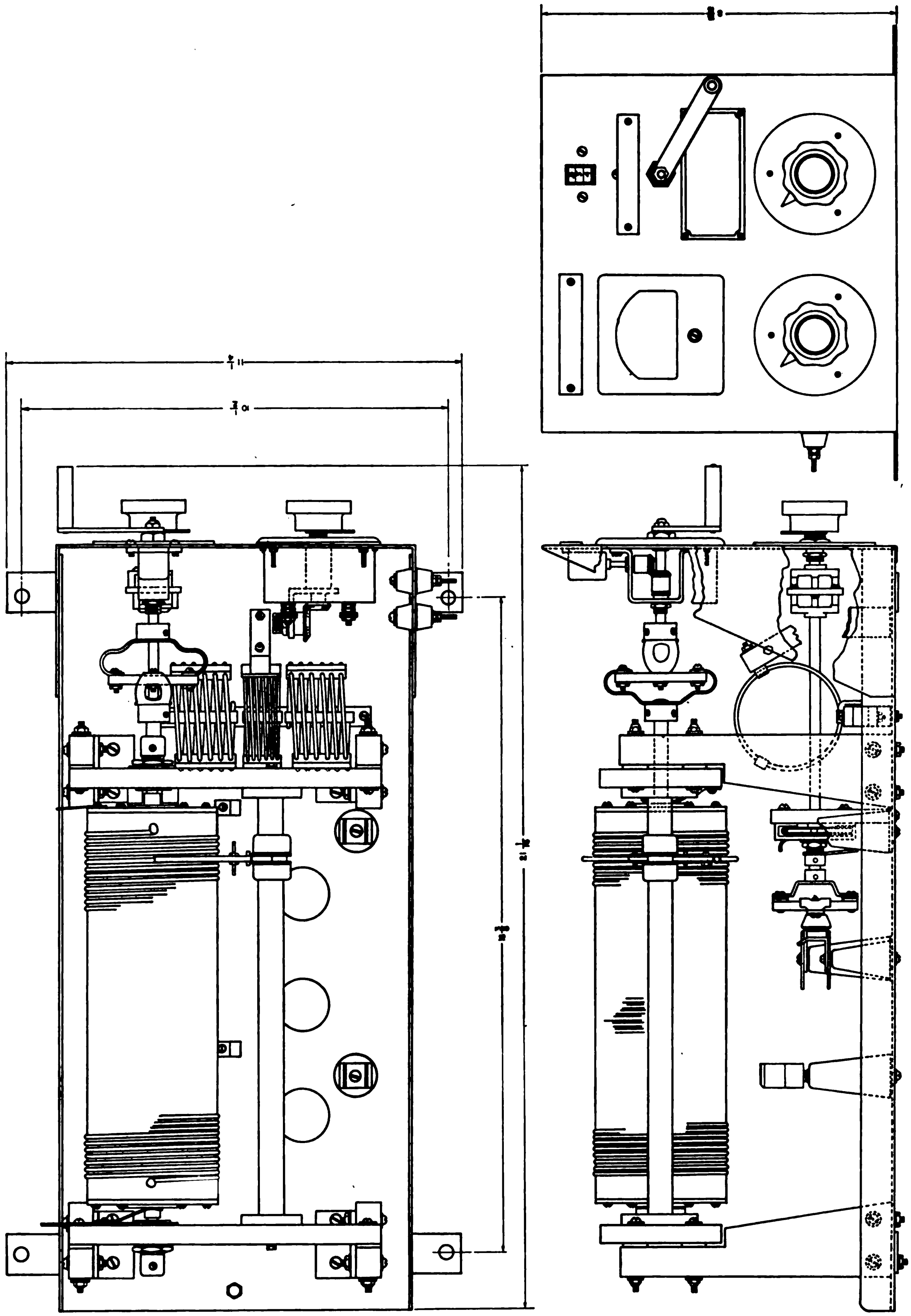


FIGURE 72. OUTLINE DIMENSIONAL SKETCH OF ANTENNA TUNING UNIT BC-729-(*).

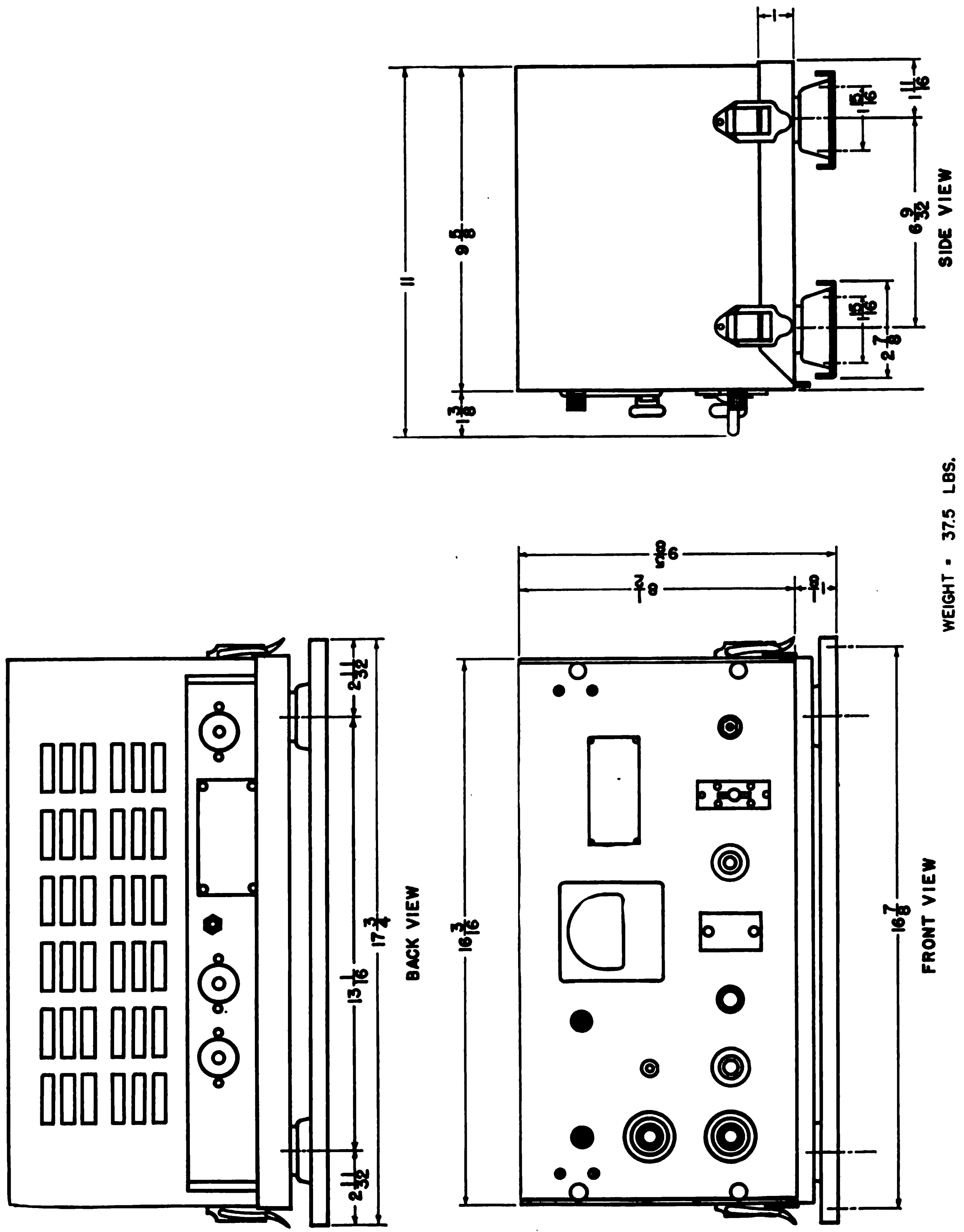


FIGURE 73. OUTLINE DIMENSIONAL SKETCH OF SPEECH AMPLIFIER BC-614-(*).

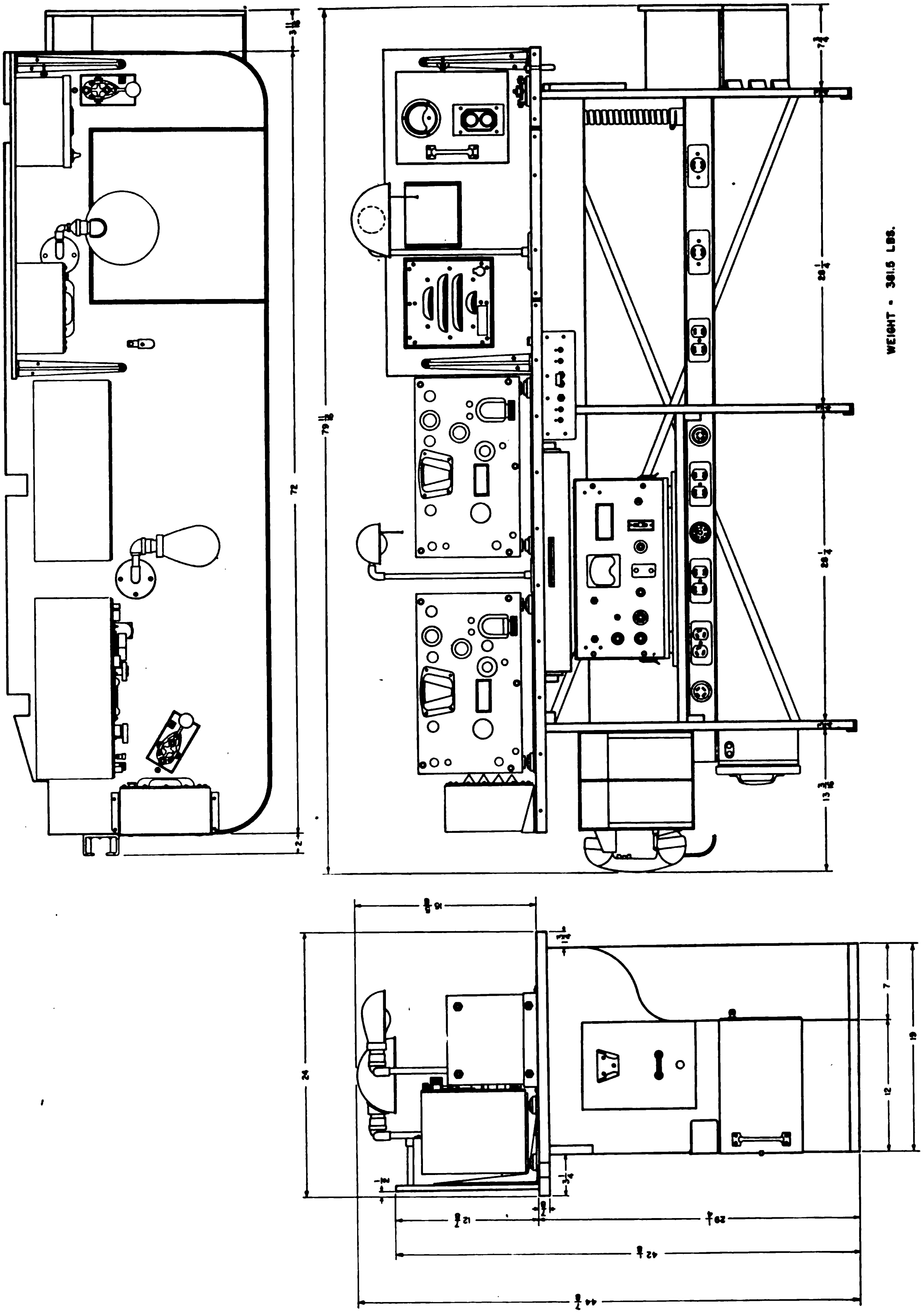


FIGURE 74. OUTLINE DIMENSIONAL SKETCH OF TABLE MC-269.

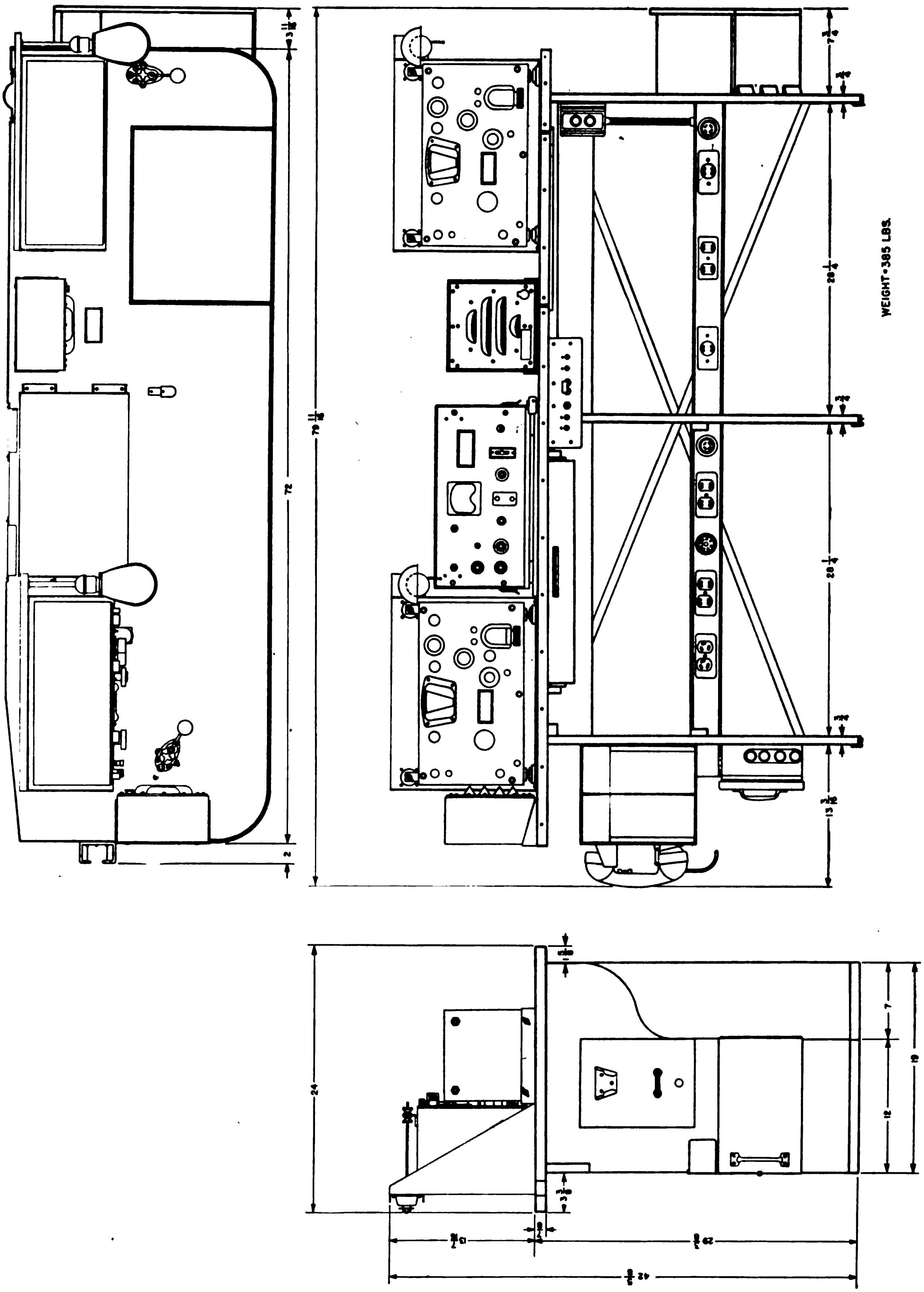


FIGURE 75. OUTLINE DIMENSIONAL SKETCH OF TABLE MC-269-A.

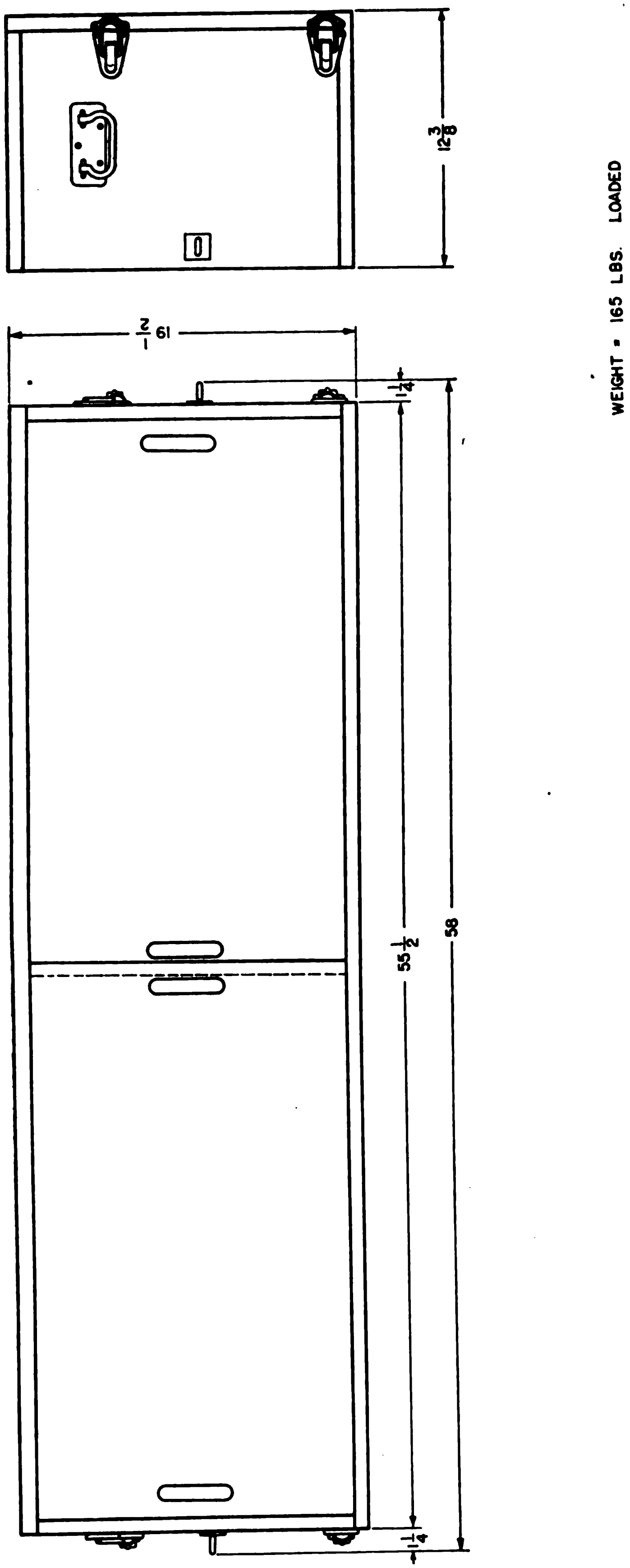


FIGURE 76. OUTLINE DIMENSIONAL SKETCH OF CHEST CH-88.

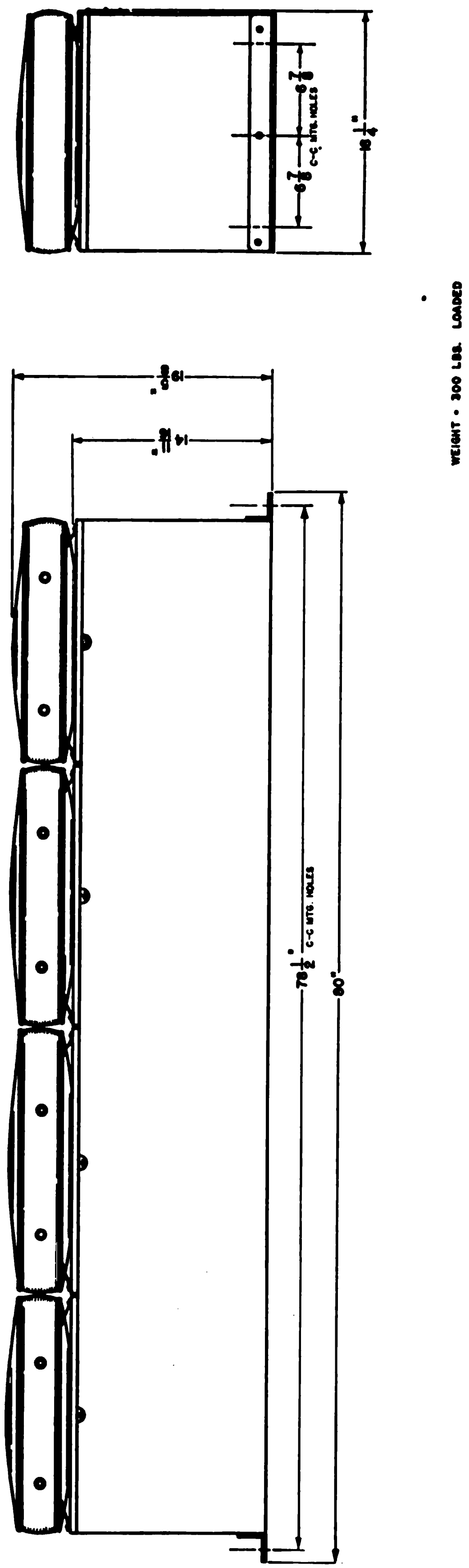


FIGURE 77. OUTLINE DIMENSIONAL SKETCH OF CHEST CH-89.

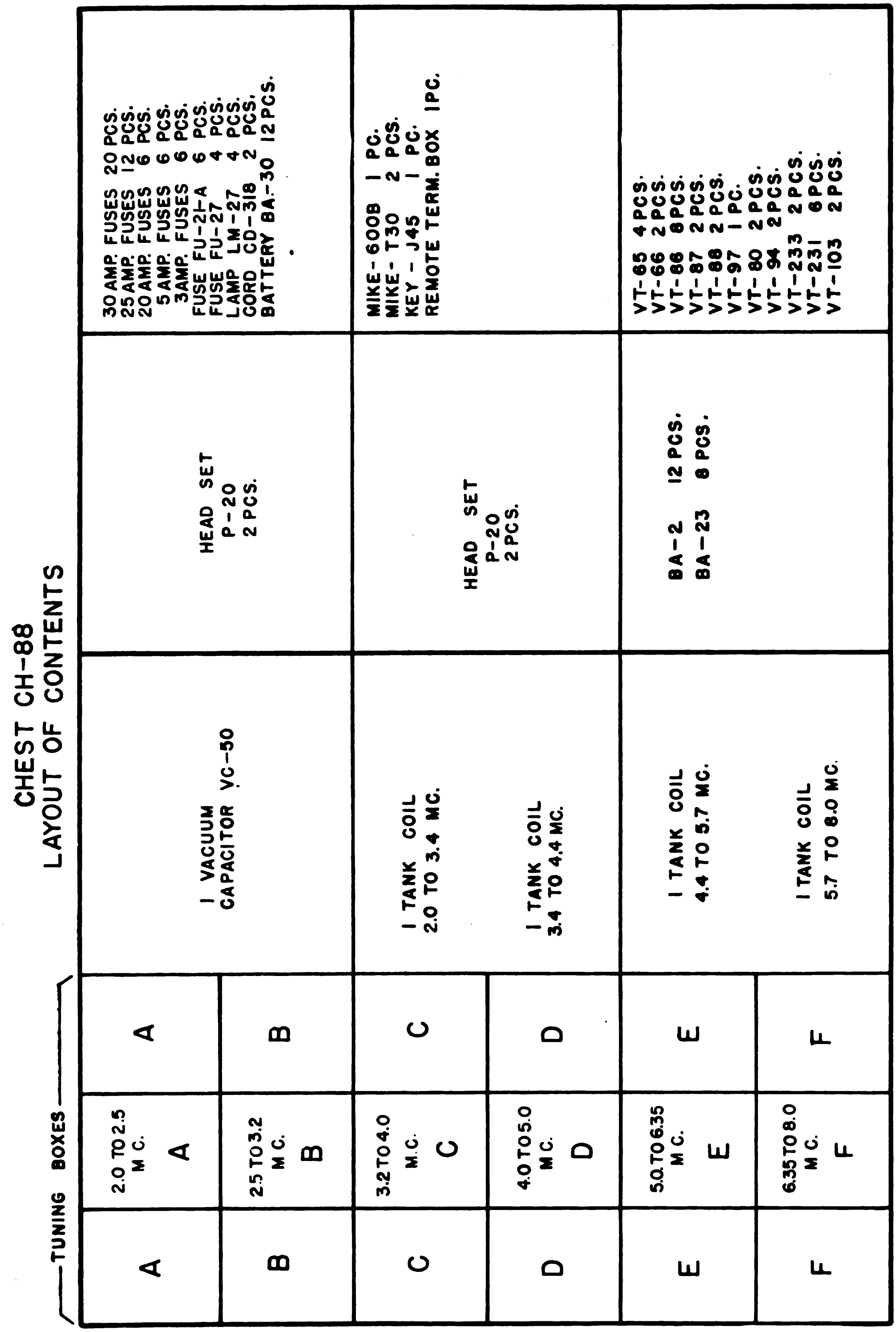


FIGURE 78. CHART FOR CHEST CH-88 (SCR-299-A AND SCR-299-B).

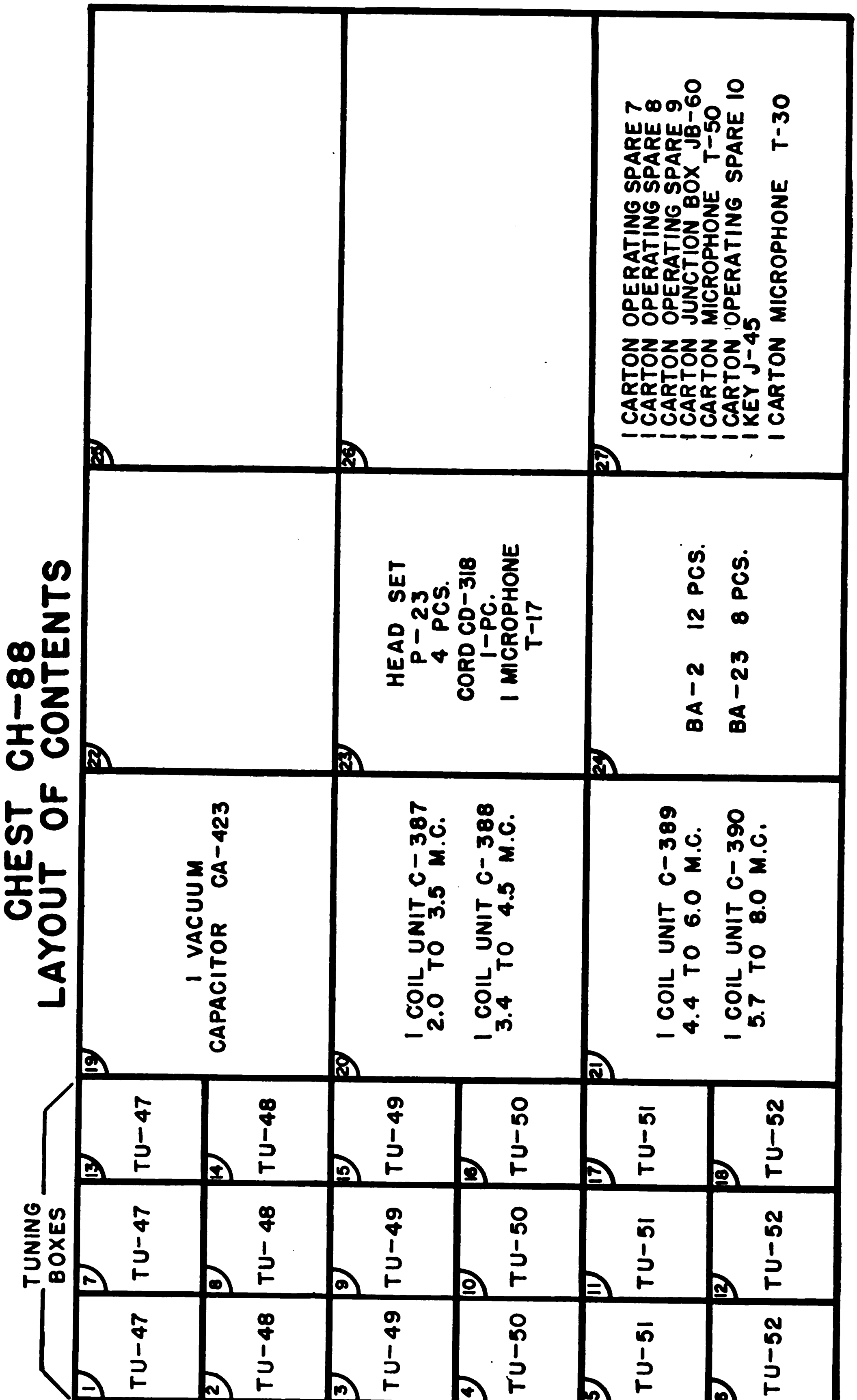


FIGURE 79. CHART FOR CHEST CH-88 (SCR-299-C AND SCR-299-D).

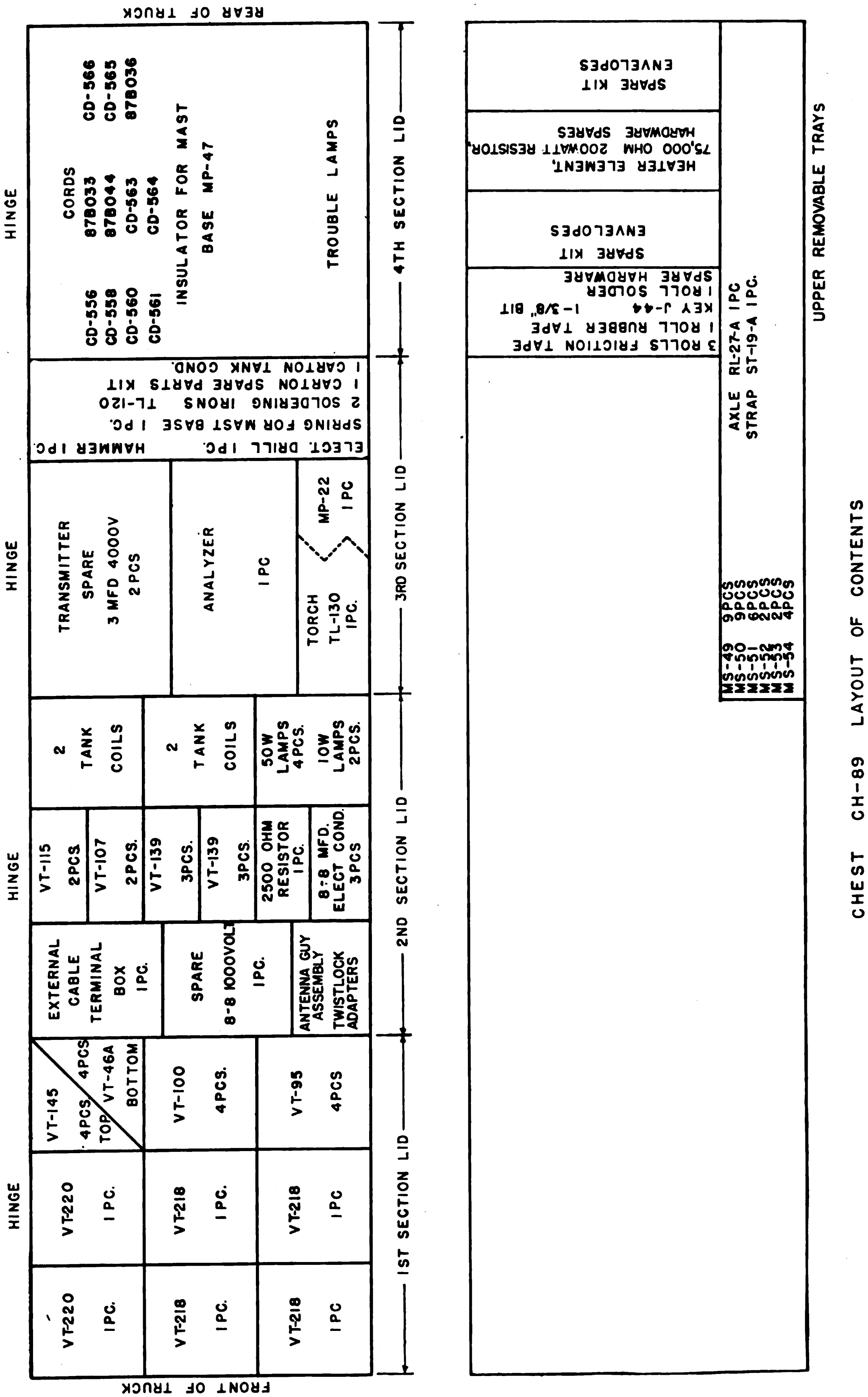


FIGURE 80. CHART FOR CHEST CH-89 (SCR-299-A AND SCR-299-B).

RADIO SETS SCR-299-A, SCR-299-B, SCR-299-C, and SCR-299-D

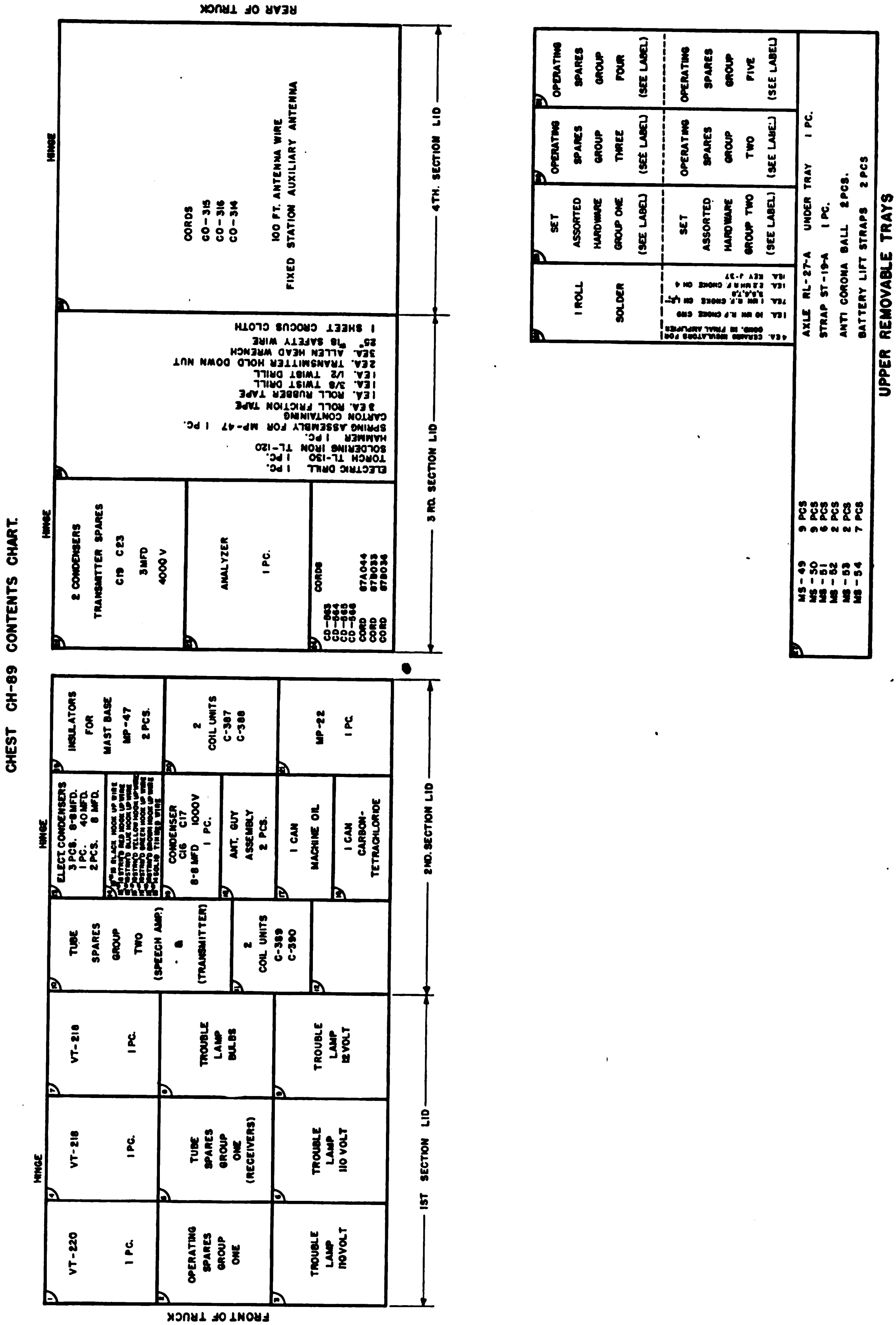


FIGURE 81. CHART FOR CHEST CH-89 (SCR-299-C AND SCR-299-D).

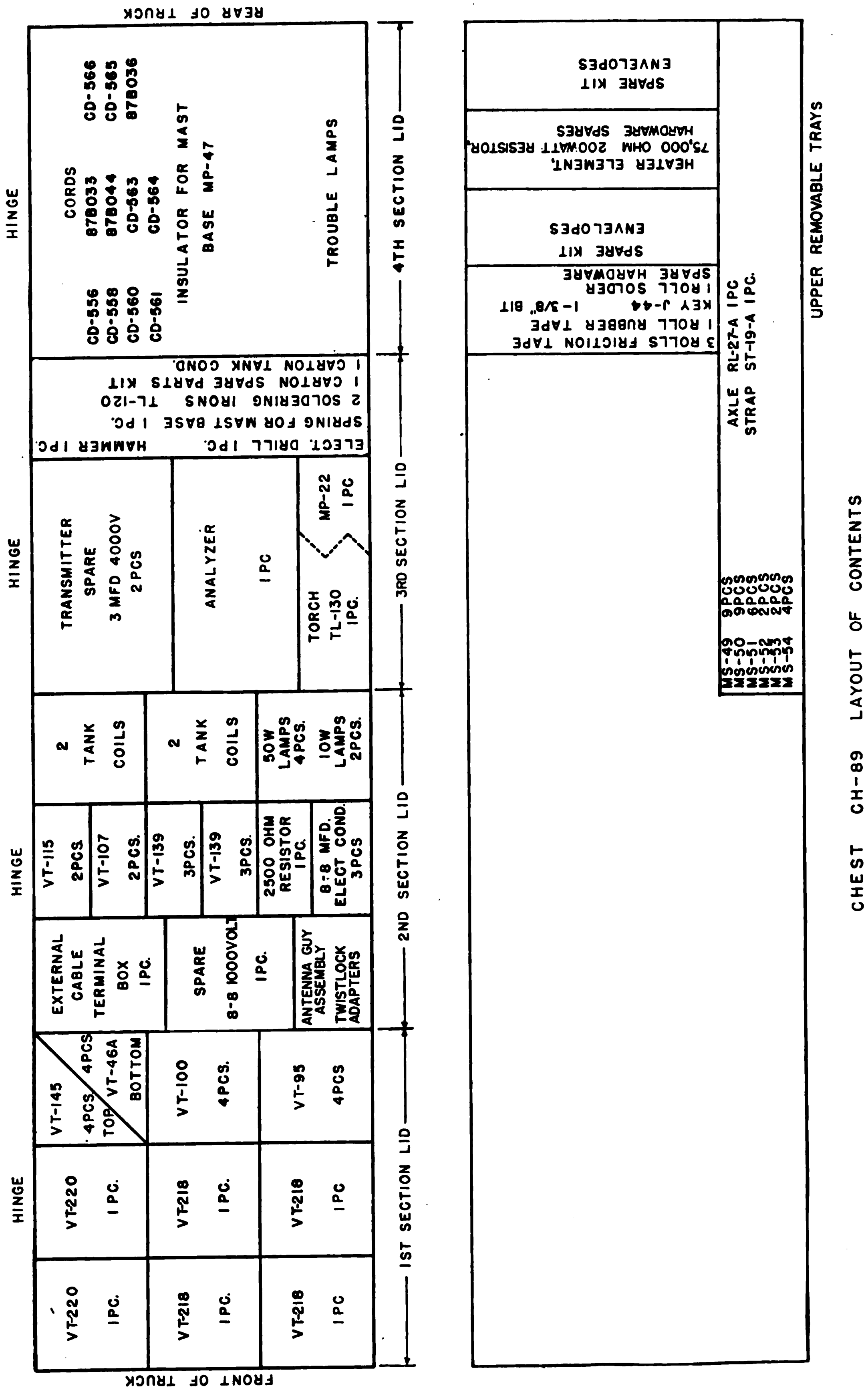


FIGURE 80. CHART FOR CHEST CH-89 (SCR-299-A AND SCR-299-B).

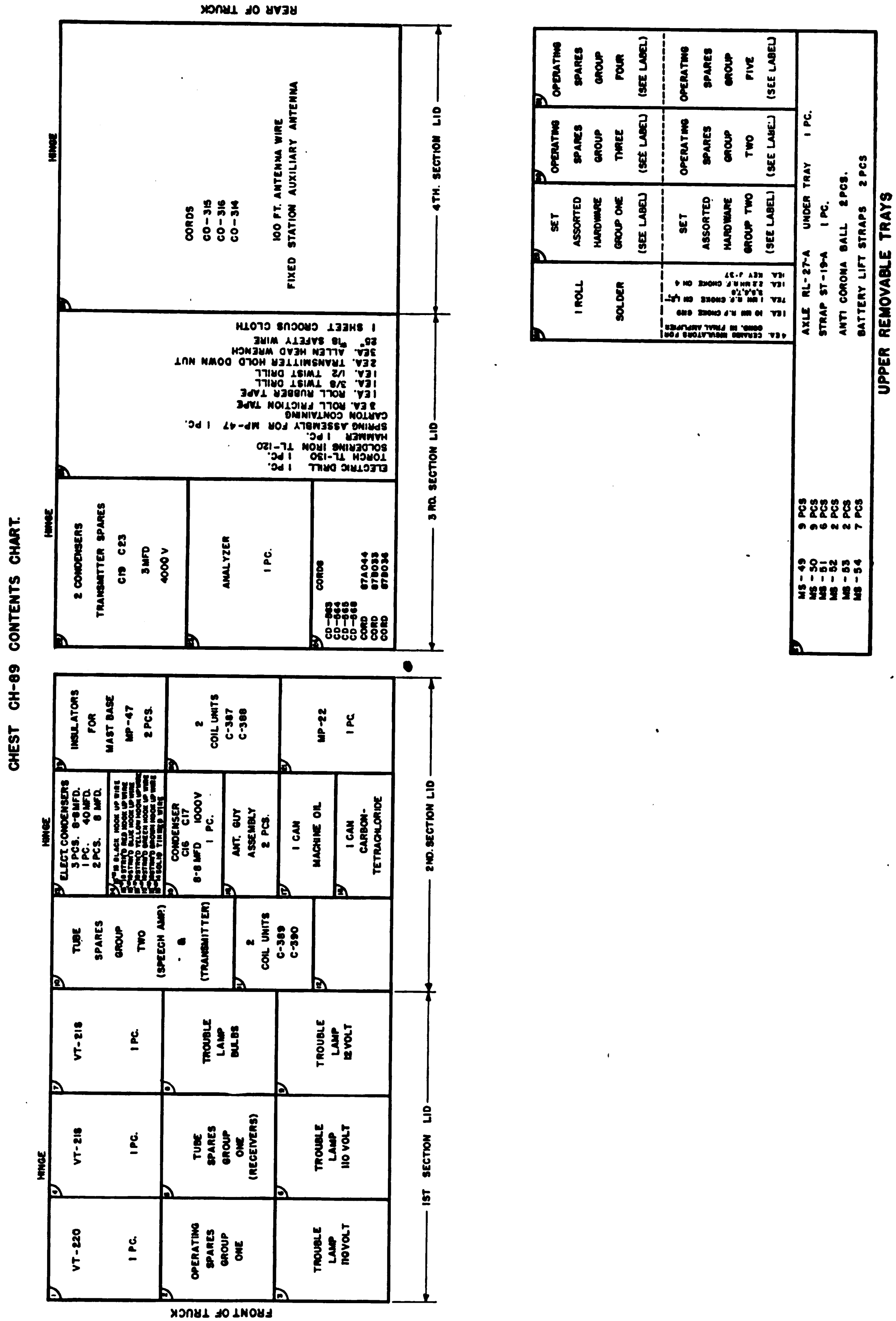


FIGURE 81. CHART FOR CHEST CH-89 (SCR-299-C AND SCR-299-D).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-47

Frequency Range 2.0-2.5 MC.
NOTE — Use Vacuum Condenser CA-423
APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
2000	2000	C-387	10	0.5	2.0	10	8.8
2050	2050	C-387	21	1.0	2.25	21	10.0
2100	2100	C-387	30	1.5	2.50	30	12.0
2150	2150	C-387	40	2.0	3.0	40	14.0
2200	2200	C-387	47	2.5	3.5	47	16.0
2250	2250	C-387	54	3.0	5.0	52	18.1
2300	2300	C-387	60	4.0	6.0	60	19.0
2350	2350	C-387	67	5.0	6.5	67	21.0
2400	2400	C-387	73	5.5	7.0	73	22.5
2450	2450	C-387	80	6.0	7.5	79	24.0
2500	2500	C-387	86	6.5	8.0	86	25.5
NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )							

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 82. TUNING CHART OF TUNING UNIT TU-47 FOR RADIO TRANSMITTER BC-610-(*).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-48

Frequency Range 2.5-3.2 M C.

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
2500	2500	C-387	15	3	5	10	27.3
2550	2550	C-387	23	3.5	5.25	15	28.5
2600	2600	C-387	31	4.0	5.5	18	29.3
2650	2650	C-387	36	4.25	6.0	22	30.0
2700	2700	C-387	42	4.5	6.25	26	31.0
2750	2750	C-387	47	5.5	6.5	30	31.8
2800	2800	C-387	53	6.0	7.0	35	33.2
2850	2850	C-387	58	6.25	7.25	38	33.8
2900	2900	C-387	64	6.5	7.75	42	34.0
2950	2950	C-387	69	7.0	8.0	46	35.0
3000	3000	C-387	75	7.5	8.5	50	36.0
3050	3050	C-387	80	8.0	8.75	54	36.7
3100	3100	C-387	86	8.5	9.25	58	37.4
3150	3150	C-387	91	8.75	9.5	62	38.2
3200	3200	C-387	97	9.0	10.0	63	39.3

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 83. TUNING CHART OF TUNING UNIT TU-48 FOR RADIO TRANSMITTER BC-610-(*).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-49

Frequency Range 3.2-4.0 M C.

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
3200	3200	C-387	26	1.5	1.5	63	39.3
3250	3250	C-387	31	2.0	2.0	65	39.4
3300	3300	C-387	37	2.5	2.5	68	39.6
3350	3350	C-387	42	3.0	3.0	70	39.7
3400	3400	C-387	47	3.5	3.5	73	39.8
3450	3450	C-388	52	4.0	4.0	22	40.4
3500	3500	C-388	56	4.5	5.0	25	40.8
3550	3550	C-388	60	5.0	5.5	28	41.2
3600	3600	C-388	64	5.25	5.75	31	41.7
3650	3650	C-388	69	5.5	6.0	35	42.2
3700	3700	C-388	73	6.0	6.5	38	42.8
3750	3750	C-388	76	6.25	6.75	40	43.1
3800	3800	C-388	80	6.5	7.0	43	43.4
3850	3850	C-388	83	7.0	7.5	46	43.9
3900	3900	C-388	86	7.5	8.0	48	44.3
3950	3950	C-388	90	8.0	8.5	51	44.7
4000	4000	C-388	95	8.5	9.0	53	45
NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )							

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 84. TUNING CHART OF TUNING UNIT TU-49 FOR RADIO TRANSMITTER BC-610-(*).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-50

Frequency Range 4.0-5.0 M C.

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
4000	2000	C-388	3	1.0	2.5	53	45
4050	2025	C-388	11	2.0	3.0	55	45.8
4100	2050	C-388	18	2.5	3.5	58	46.2
4150	2075	C-388	23	2.75	4.0	60	46.8
4200	2100	C-388	28	3.0	4.75	63	47.0
4250	2125	C-388	33	3.25	5.0	65	47.9
4300	2150	C-388	37	3.5	5.5	68	48.1
4350	2175	C-388	42	4.0	6.0	70	48.3
4400	2200	C-389	46	4.25	6.25	12	48.8
4450	2225	C-389	50	4.5	6.5	15	49.0
4500	2250	C-389	53	4.75	6.75	18	49.2
4550	2275	C-389	57	5.0	7.0	20	49.5
4600	2300	C-389	61	5.5	7.25	23	49.8
4650	2325	C-389	65	5.75	7.5	25	50.0
4700	2350	C-389	69	6.0	7.75	28	50.2
4750	2375	C-389	73	6.25	7.8	31	50.5
4800	2400	C-389	76	6.5	8.0	34	51.0
4850	2425	C-389	80	6.75	8.25	36	51.2
4900	2450	C-389	83	7.0	8.5	39	51.5
4950	2475	C-389	86	7.5	8.75	42	52.0
5000	2500	C-389	88	8.0	9.0	44	52.4
NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )							

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 85. TUNING CHART OF TUNING UNIT TU-50 FOR RADIO TRANSMITTER BC-610-(*).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-51

Frequency Range. 5.0-6.35 M C.

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
5000	2500	C-389	9	3.0	3.0	44	52.4
5050	2525	C-389	13	3.0	3.0	46	52.6
5100	2550	C-389	18	4.0	4.0	48	52.9
5150	2575	C-389	22	4.0	4.0	50	53.1
5200	2600	C-389	26	4.0	4.0	52	53.4
5250	2625	C-389	29	5.0	5.0	54	53.6
5300	2650	C-389	33	5.0	5.0	56	53.8
5350	2675	C-389	37	5.0	5.0	57	54.1
5400	2700	C-389	40	5.5	5.5	59	54.3
5450	2725	C-389	43	5.5	5.5	61	54.5
5500	2750	C-389	47	5.5	5.5	63	54.8
5550	2775	C-389	50	6.0	6.0	65	55.0
5600	2800	C-389	54	6.0	6.0	67	55.3
5650	2825	C-389	57	6.0	6.0	69	55.5
5700	2850	C-389	60	7.0	7.0	70	55.7
5750	2875	C-390	63	7.0	7.0	14	56.0
5800	2900	C-390	65	7.0	7.0	16	56.2
5850	2925	C-390	68	7.0	7.0	18	56.4
5900	2950	C-390	70	7.5	7.5	20	56.7
5950	2975	C-390	73	7.5	7.5	21	57.0
6000	3000	C-390	75	7.5	7.5	23	47.5
6100	3050	C-390	80	7.5	7.5	27	47.9
6200	3100	C-390	84	7.5	7.5	31	48.3
6300	3150	C-390	89	8.0	8.0	35	48.8
6350	3175	C-390	92	8.0	8.0	37	49.0

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 86. TUNING CHART OF TUNING UNIT TU-51 FOR RADIO TRANSMITTER BC-610-(*).

TUNING CHART OF RADIO TRANSMITTER BC-610-(*)

for

Tuning Box TU-52

Frequency Range 6.35-8.0 M C.

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KC.	CRYSTAL FREQUENCY (IF USED)	COIL UNIT	TUNING CONTROLS				
			M.O.	DOUB.	INT. AMP.	PLATE TUNING	ANTENNA TUNING
6350	3175	C-390	3	3.5	4.0	37	49.0
6400	3200	C-390	8	4.0	4.5	40	49.2
6500	3250	C-390	16	4.5	5.0	44	49.6
6600	3300	C-390	23	5.0	6.0	46	49.9
6700	3350	C-390	29	5.0	6.0	49	50.3
6800	3400	C-390	35	5.0	6.0	52	50.6
6900	3450	C-390	41	6.5	7.0	56	51.0
7000	3500	C-390	46	6.5	7.0	58	51.3
7100	3550	C-390	52	6.5	7.0	62	51.6
7200	3600	C-390	56	7.0	7.5	65	51.9
7300	3650	C-390	61	7.5	8.0	66	52.2
7400	3700	C-390	65	7.5	8.0	68	52.5
7500	3750	C-390	70	7.5	8.0	70	52.8
7600	3800	C-390	75	8.0	8.5	72	53.1
7700	3850	C-390	79	8.0	8.5	75	53.3
7800	3900	C-390	84	8.0	8.5	77	53.6
7900	3950	C-390	89	8.5	9.0	79	53.9
8000	4000	C-390	95	9.0	9.0	80	54.2

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

NOTE: See paragraph 29, page 98 for listing of equivalent "Tuning Boxes" and "Tank Coils" used with SCR-299-A and SCR-299-B.

FIGURE 87. TUNING CHART OF TUNING UNIT TU-52 FOR RADIO TRANSMITTER BC-610-(*).

[A. G. 062.11 (6-2-43)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION: I Bn and H 1(5); I Bn 11(5); I C 11(8)
(For explanation of symbols see FM 21-6)

TM 11-281

WAR DEPARTMENT TECHNICAL MANUAL

RADIO SETS SCR-399-A AND SCR-499-A

WAR DEPARTMENT • MARCH 1945

TM 11-281

WAR DEPARTMENT TECHNICAL MANUAL

RADIO SETS SCR-399-A AND SCR-499-A

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TECHNICAL MANUAL

RADIO SETS SCR-399-A AND SCR-499-A

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 11 May 1948

TM 11-281, 31 March 1945, is changed as follows:

Change supersession note on title page and page 3 of manual to read as follows: This manual supersedes TM 11-281, 4 September 1943; TM 11-813, 5 June 1943; TB 11-281-1, 13 October 1944; and TB 11-281-2, 25 November 1944.

Change all references to "Chests CH-112-A and CH-119-A" to read "CH-112-B and CH-119-B."

Change all references to "Microphone T-30-(*) (throat)" to read "Microphone T-45 (lip)."

Delete all references to "Tool Equipment TE-48."

Change all references to "Mast Base MP-48" to read "Mast Base AB-15/GR."

On the following pages, substitute "two 6-volt Storage Batteries BB-221/U" for batteries mentioned thereon:

Page	*Paragraph, line, or item*
9	par. 5, items 7 and 16
11	item 10
23	par. 24, line 2
26	line 18
28	Box No. 6
29	Box No. 21

On the following pages, change "PS" to read "PL":

Page	*Paragraph*
72	69
75	76*c*
77	85*e* (3), 86*d*, 87*c*, 88*c*
78	91*c* (3)

Make the following changes or additions to pages as indicated:

Page 4, paragraph 1*b*: Add "TM 11-962D, Rectifier RA-63-D" to list of technical manuals.

Page 8, paragraph 4*b*: Change the last sentence in the right-hand column to read: "Mast Base AB-15/GR mounted in Mast Base Bracket MP-50-A and Mast Sections MS-116-A, 117-A, and 118-A."

Page 9, paragraph 5:

Add to "Radio Set SCR-399-A" column: "2 coaxial lead assembly; 1 in use, 1 spare."

Change "Cord CD-201-A" to read "Cord CD-201." Change quantity of this cord in each column to read "2."

Change entry of Cord CD-318-A to read: "for Microphone T-45."

Change quantity of Cord CD-335 from "2" to "1" in first column.

Delete "Cord CD-1117" and associated quantities.

Page 10, paragraph 5 (Radio Set SCR-399-A column):

Delete the following: "Frame FM-62-A; for spare tire."

Change "Mast Base MP-48" to read "Mast Base AB-15/GR."

Change "Mast Base Bracket MP-50-A" to read: "for Mast Base AB-15/GR."

Change quantity of "Mast Sections MS-51, MS-52, and MS-53" from 6 to 2; 1 in use, 1 spare.

Add the following items after "Mast Section MS-54":

3 Mast Section MS-116-A; 2 in use, 1 spare.
3 Mast Section MS-117-A; 2 in use, 1 spare.
3 Mast Section MS-118-A; 2 in use, 1 spare.

Page 11, paragraph 5: Change the quantity from 20 to 2 in each column for the component "Each ceramic insulator used for the power-amplifier variable capacitor."

Pages 79 and 80, paragraphs 103 and 104: Delete "L" from OPERATIONS list.

Page 80, paragraph 107*b*: For Items Nos. 1, 2, 5, 6, 7, and 8, indicate that the "L" operation shall be performed on a monthly basis.

Change reference to 1st and 2d echelon in echelon column to "organizational maintenance."

12. Antenna System

* * * * *

b. RECEIVING ANTENNA. (Superseded.) Mast base AB-15/GR, mounted in Mast Base Bracket MP-50-A, and Mast Sections MS-116-A, MS-117-A, and MS-118-A, make up a receiving antenna. Two receiving antennas are used, since each receiver is operated from a separate whip antenna.

AGO 1877A—May 771948°—48

29. Installation of Radio Set SCR–399–A

a. Mobile Installation. If Radio Set * * * use is recommended:

* * * * *

(5) Bolt Mast Base Brackets MP–50–A with Mast Bases **AB–15/GR** to the rear of the shelter. (See fig. 26.) Attach the short * * * see paragraph 33.

* * * * *

33. Installation of Antennas on Radio Set SCR–399–A

a. Select the following items from Chest CH–89–A:

* * * * *

(4) Two Mast Sections **MS–116.**

(5) Three Mast Sections **MS–117.**

(6) Three Mast Sections **MS–118.**

* * * * *

c. Assemble the left-hand receiving antenna (fig. 26) as follows:

(1) Screw Mast Section **MS–116** into **MS–117.** Use two pairs * * * ½-inch friction tape.

(2) Screw Mast Section **MS–118** into Mast Section **MS–117.**

(3) Screw Mast Section **MS–118** into Mast Base **AB–15/GR** on the left rear corner of the shelter.

* * * * *

67. Meaning of Preventive Maintenance

* * * * *

Note. (Superseded.) The operations in sections I and II are organizational maintenance. Some operations in sections III and V are field or base maintenance.

CHAPTER 3
PREVENTIVE MAINTENANCE

Section VI (Added). WINTERIZATION AND DUSTPROOFING

116.1 Winterization

a. GENERAL. Special precautions are necessary to prevent poor performance or total operational failure of equipment in subzero temperatures. Most signal equipment can be used in winter if difficulties common in low temperatures are anticipated and precautions taken to prevent them. For operation purposes, place equipment in heated rooms whenever possible. Refer to TB SIG 66, Winter Maintenance of Signal Equipment, for complete information. The following problems may be encountered:

(1) *Steel.* Steel shrinks and becomes brittle in subzero temperatures.

(2) *Glass.* Glass is especially susceptible to sudden temperature changes. The difference between a low-air temperature and the warmth of a man's breath may be sufficient to shatter a lens.

(3) *Rubber.* Prewar rubber resists cold weather well, while certain types of synthetic rubber are unreliable and become brittle.

(4) *Canvas.* Canvas freezes and loses its pliability in cold weather.

(5) *Lubricants.* Lubricants become stiff, causing drag and also causing moving parts to stick. Refer to section III for lubrication instructions.

b. RADIO SET SCR–399–A AND SCR–499–A. Under winter, or other low temperature operating conditions, satisfactory performance may be expected provided the high-voltage power supply rectifier tubes V6 and V7 (Tubes JAN–866A/866 (VT–46–A)) are replaced with type 3B28. The type 3B28 tubes will function at extremely low temperatures, whereas the JAN–866A/866 tube may be unreliable due to failure of the mercury to ionize. As with other electronic equipment, when placing the radio set in service after a long period of storage or inactivity at low temperatures, allow maximum possible warm-up time prior to actual operation. The warming of equipment before application of power will permit proper functioning of components, especially electrolytic capacitors, and prevent the failure or destruction of these and other components due to their low temperature characteristics.

116.2 Dustproofing

a. GENERAL. Signal Corps equipment operated in desert localities is affected by the extremely high temperatures and the amount of dirt, dust, sand, and other foreign matter in the air. Take care to keep such elements from filtering into lubricated parts. Cover the equipment when it is not in use. Thorough cleanliness is imperative. Instead of merely adding new lubricants at regular intervals, whenever practicable, clean and lubricate all moving parts. If possible, inspect and clean the equipment daily. In any case, inspect the air filters and similar protective devices every day and clean them whenever necessary. Refer to TB SIG 75, Desert Maintenance of Signal Corps Equipment. Some of the problems encountered are the following:

(1) *Lubricants.* Lubricants become thin and drain from moving metal and fiber parts rapidly. Refer to section III for lubrication instructions.

(2) *Foreign matter.* Foreign matter, such as dirt, dust, and sand, acts as an abrasive, causing excessive wear, clogging air cleaners, and impeding the flow of air.

b. DUSTPROOFING KIT MC–610. Refer to MWO SIG 11–281–9 for details of installing Dustproofing Kit MC–610 on the radio transmitter and antenna tuning unit.

195. War Department Unsatisfactory Equipment Report (fig. 151)

* * * * *

b. (Superseded.) When trouble in equipment used by the Air Force occurs more often than repair personnel consider normal, AF Form No. 54 (Unsatisfactory Report) should be forwarded to Headquarters, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio.

APPENDIX I (Superseded)

IDENTIFICATION TABLE OF REPLACEABLE PARTS

Note. The fact that an item appears in this technical manual is not sufficient basis for requisitioning it. Requisitions must cite an authorized basis, such as T/O & E, TE, TA, T/BA, SIG 6, SIG 7 & 8, list of allowances of expendable material, or other authorized supply basis. Pamphlets of the Department of the Army Supply Catalog applicable to the equipment covered in this manual are listed in paragraph 1 below.

1. Department of the Army Supply Pamphlet Reference

The following information was compiled on 2 October 1947. The appropriate pamphlets of the Department of the Army Supply Catalog for Radio Sets SCR–399–A and SCR–499–A are—

Organizational Maintenance Allowance and Field Basic Maintenance Stockage Guide

SIG 7 & 8—SCR–399–A
SIG 7 & 8—SCR–499–A

For an index of available catalog pamphlets, see the latest issue of War Department Supply Catalog SIG 1 & 2.

APPENDIX II

REFERENCES

8. Other Technical Publications

* * * * * * *

FM 24-18	Radio Communication.
MWO SIG 11-281-2	**Modification of Radio Sets SCR-399-A and SCR-499-A in Mounting of Rectifier Tubes VT-46-A to Prevent Flashover.**
MWO SIG 11-281-5	**Replacement of Neutralizing High Voltage Isolation Capacitor in Radio Sets SCR-399-A and SCR-499-A.**
MWO SIG 11-281-6	**Modification of Radio Sets SCR-399-A and SCR-499-A; To Improve Operation of High Voltage Control Circuit in Radio Transmitter BC-610-E.**
MWO SIG 11-281-9	**Modification of Radio Sets SCR-399-A and SCR-499-A; To Prevent Entrance of Dust, Insects, and Other Foreign Matter into Radio Transmitter BC-610-E and Tuning Unit BC-939-A.**
MWO SIG 11-281-10	**Modification of Tail-Gate and Ventilator Fan Motor on Trucks used to Carry Radio Set SCR-399-A.**
TB SIG 5	**Defense Against Radio Jamming.**

* * * * * * *

TM 11-2737	Installation of Radio and Interphone Equipment in Shelter HO-17 (when published).
TM 11-4043	**Speech Amplifiers BC-614-A, -B, -C, -D, -E, and -F, Repair Instructions.**
TM 11-4057	**Radio Transmitter BC-6510-A, -B, -C, -D, and -E, Repair Instructions.**
TM 38-250	Basic Maintenance Manual.

[AG 300.7 (27 Feb 48)]

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For explanation of distribution formula see TM 38-405.

U. S. GOVERNMENT PRINTING OFFICE: 1949

TECHNICAL MANUAL

RADIO SETS SCR-399-A AND SCR-499-A

CHANGES No. 2 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 27 November 1950

TM 11-281, 31 March 1945, is changed as follows:

Change Speech Amplifier BC-614-E to read Speech Amplifier **BC-614-E or BC-614-H** in the following places in the manual:

Page 11, paragraph 5, item 10.
Page 12, paragraph 5, items 16 through 20.
Page 12, paragraph 6, line 10.
Page 13, figure 7, caption on illustration.
Page 15, paragraph 8*b*, line 5.
Page 17, paragraph 15, line 10.
Page 18, figure 11, caption on illustration.
Page 20, paragraph 22*d*, line 4.
Page 20, paragraph 22*h*, lines 3, 5, and 9.
Page 26, paragraph 27, table I, item 2 in Chest CH-120-A list.
Page 33, paragraph 32*a* (2), line 2.
Page 33, paragraph 32*a* (10), line 2.
Page 42, paragraph 43, heading.
Page 45, paragraph 46*e* (1), heading.
Page 53, paragraph 49, step 3, line 5.
Page 54, paragraph 49, step 6, line 5.
Page 68, paragraph 66*m*, heading.
Page 79, paragraph 102, heading.
Page 80, paragraph 107*b*, item 9.
Page 85, paragraph 114, heading.
Page 106, paragraph 131, heading.
Page 106, figure 51, caption and block caption.
Page 106, paragraph 132, heading.
Page 107, figure 52, caption and block caption.
Page 123, section III, heading.
Page 132, figure 89, block caption.
Page 135, paragraph 162, line 6.
Page 136, figure 96, block caption.
Page 137, figure 97, block caption.
Page 138, figure 98, block caption.
Page 139, figure 99, block caption.
Page 140, paragraph 164, line 14.
Page 150, paragraph 179, line 5.
Page 154, paragraph 183, heading.
Page 156, paragraph 189*d* (5), line 2.
Page 156, paragraph 192, heading and line 1.
Page 157, paragraph 197, line 2.
Page 168, figure 116, caption.
Page 169, figure 117, caption.
Figure 121, note at socket SO5.
Figure 122, note at socket SO5.
Page 181, figure 135, caption.
Page 189, table VIII*b*, heading.
Page 205, figure 150, caption.
Page 210, figure 155, block caption.

8. Speech Amplifiers BC-614-E and BC-614-H

a. The **speech** amplifier is shock-mounted to the top of Junction Box JB-70-A in Chest CH-120-A (**fig. 8**). For convenient removal, * * * approximately 31 pounds.

* * * * *

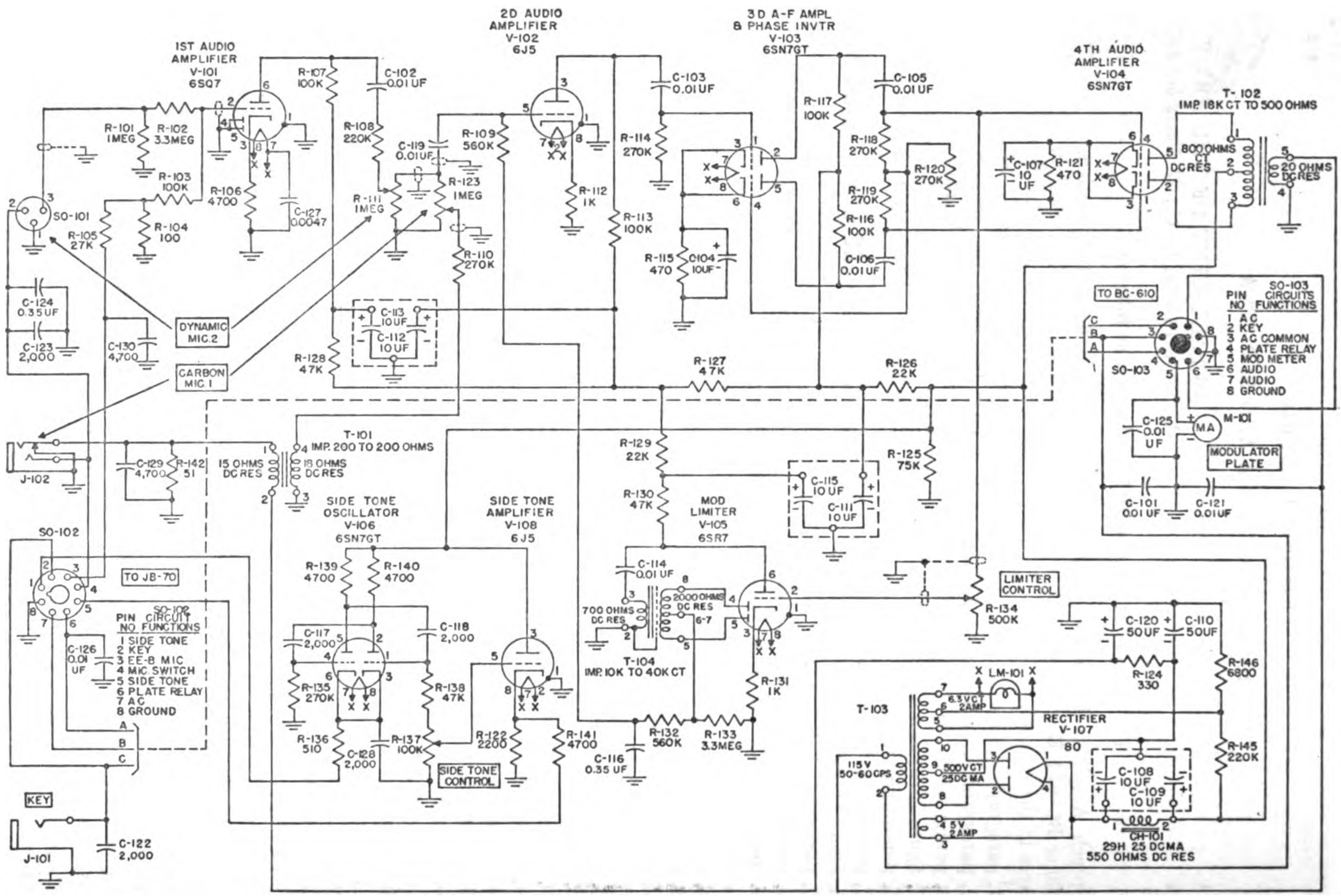
c. (Added) Speech Amplifier BC-614-H differs from previous models by the addition of two resistors: R-145 (220,000 ohms) and R-146 (6,800 ohms). These resistors are located between the high-voltage output lead of the rectifier and ground. They form a dividing network which prevents conduction between the heater and cathode of tube V-101. This results in a reduction in hum in the output of the amplifier. Speech Amplifier BC-614-H also has been modernized by usage of JAN-type components.

43. Speech Amplifier BC-614-E or BC-614-H Controls

* * * * *

g. The eight-pin receptacle * * * Junction Box JB-70-A. **In Radio Set AN/GRC-26, Cord CD-566 and Junction Box JB-70-A are not included. The connector marked TO JB-70 is used to connect Special Purpose Cable Assembly CX-1152/U; the other end of the cable assembly connects to Radioteletypewriter Control C-535/GRC-26.**

Figure 84. Speech Amplifier BC-614-E power supply—functional diagram.



NOTES:
RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
CAPACITOR VALUES IN UUF UNLESS OTHERWISE SPECIFIED.

TM 281-C2-1

Figure 123.1 (Added). Speech Amplifier BC-614-H, schematic diagram.

150. Power Supply

(figs. 84 and 123.1)

Plate and filament * * * of the transmitter. **The power supply section of Speech Amplifier BC–614–H (fig. 123.1) differs from previous models by the addition of two resistors, R–145 (220,000 ohms) and R–146 (6,800 ohms). These resistors form a voltage-dividing network between the high-voltage lead and ground. The junction of the two resistors, which is at a small positive potential, is connected to the center tap of the filament winding of the power transformer. This places the heater at a small positive potential with respect to the tube cathode, preventing conduction from heater to cathode in tube V–101, thus greatly reducing the hum in the amplifier.**

168. Changes in Speech Amplifiers BC–614–E and BC–614–H

* * * * *

c. (Added) Speech Amplifier BC–614–H differs slightly from the E model. The H model has been modernized by usage of JAN-type components. Two resistors, R–145 (220,000 ohms) and R–146 (6,800 ohms), have been added in the power supply of the speech amplifier to reduce hum.

APPENDIX I

IDENTIFICATION TABLE OF PARTS (Superseded)

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, T/BA, SIG 7 & 8, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalogs applicable to the equipment covered in this manual are SIG 7 & 8-10-BC-610 and SIG 7 & 8-10-BC-614. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

2. Identification Table of Parts for Radio Transmitters BC-610-A, -B, -C, -D, -E, and -F

Ref. symbol	Designation by models A	B	C	D	E	F	Name of part and description	Function of part	Signal Corps stock No.
							RADIO TRANSMITTER BC-610-A, B, C, D, E, F: AM and CW; freq range 2-18 mc; output over 400 w on CW, 300 w on voice.	Transmits r-f signals	2C6500
						(*)	TECHNICAL BULLETIN (TB SIG 220)	Covers operation of the F model	(Order through AGO channels).
					(*)	---	TECHNICAL MANUAL (TM 11-281)	Covers operation of the E model	(Order through AGO channels).
	(*)	(*)	(*)	(*)	(*)	(*)	TECHNICAL MANUAL (TM 11-4057)	Covers repair instructions of A through F models.	(Order through AGO channels).
TS-5	(*)	(*)	(*)	(*)	(*)	---	BOARD, terminal: 2 jack term; 2" lg x 1 1/16" wd x 7/8" d o/a.	Tip jack strip for top cover interlock leads.	2Z9402.1
TS-4	(*)	(*)	(*)	(*)	(*)	---	BOARD, terminal: two Bind H screw term on bakelite strip; 2" lg x 1 1/16" wd x 1/16" thk.	A-c outlet for relay RY-4 leads	2Z9402
TS-3 TS-2 TS-14	(*) --- ---	(*) --- ---	(*) --- ---	(*) --- ---	(*) --- ---	--- (*) (*)	BOARD, terminal: general purpose; term strip; 10 brass nickel pl term, ea w/2 brass nickel pl Bind H screws; 9/16" between ctr of term w/barriers; 6 15/32" lg x 1 5/16" wd x 5/8" thk.	TS-3: Strip for leads from h-v power supply section. TS-2: Strip for r-f section leads. TS-14: Strip for h-v power section leads.	2Z9410.11
TS-1 TS-2	(*) (*)	(*) (*)	(*) (*)	(*) (*)	(*) (*)	--- ---	BOARD, terminal: 12 binding screw and solder lug term; bakelite, vacuum impr; 6 7/8" lg x 1 1/16" wd, base 1/8" thk.	R-f section lead strips	2Z9412.27
TS-3	---	---	---	---	---	(*)	BOARD, terminal: cable connection; six #8-32 brass, nickel pl screw term w/feedthru solder lug; 4 11/32" lg x 1 5/16" wd x 5/8" thk o/a.	H-v section lead strip	3Z770-6.49
TS-1 TS-9	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	BOARD, terminal: cable connection; twelve #8-32 brass, nickel pl screw term w/feedthru solder lug; 7 23/32" lg x 1 5/16" wd x 5/8" thk o/a.	TS-1: R-f section lead strip TS-9: Modulator section lead strip.	3Z770-12.40
TS-11	---	---	---	---	---	(*)	BOARD, terminal: cable connection; fourteen #8-32 brass, nickel pl screw term w/feedthru solder lug; 8 27/32" lg x 1 5/16" wd x 5/8" thk o/a.	Modulator section lead strip	3Z770-14.19
TS-13	---	---	---	---	---	(*)	BOARD, terminal: 8 term lugs; 5 5/16" lg x 1 1/16" wd x 5/8" h.	Modulator section lead strip	2Z9408.134
	(*)	(*)	(*)	(*)	(*)	---	BRACKET: "Z" shaped; spring grip type	Resistor support	2Z1231-1
	(*)	(*)	(*)	(*)	(*)	---	BRACKET: "Z" shaped; spring grip type	Resistor support	2Z1247.1
C-28	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR CA-423: vacuum; 50 uuf ±2%	Power amplifier padding	3D423
C-13	(*)	(*)	---	---	---	---	CAPACITOR, fixed: mica; 100 uuf ±10%; 500 vdcw; JAN type CM20B101K.	Coupling between tubes V-8 and V-9.	3K2010121
C-13	---	---	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica; 150 uuf ±10%; 500 vdcw; JAN type CM20B151K.	Coupling between tubes V-8 and V-9.	3K2015121
C-14	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica; 200 uuf ±5%; 2500 vdcw; JAN type CM45B201J; (330 uuf in F model).	Coupling between tube V-9 and tubes V-10 and V-11.	3K4520122

2. Identification Table of Parts for Radio Transmitters BC–610–A, –B, –C, –D, –E, and –F—Continued

Ref. symbol	Designation by models A	B	C	D	E	F	Name of part and description	Function of part	Signal Corps stock No.
C–29	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica; 200 uuf ±5%; 5000 vdcw; JAN type CM70B201J; (220 uuf in F model).	Neutralizing h-v isolation	3K7020122
C–8	---	---	---	---	(*)	(*)	CAPACITOR, fixed: mica; 300 uuf ±5% 500 vdcw; JAN type CM20B301J; (330 uuf in F model).	Tube V–9 cathode bypass	3K2030122
C–15	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica; 2000 uuf ±5%; 2500 vdcw; JAN type CM50B202J; (2200 uuf in F model).	Coupling between tubes V–10 and V–11 and tube V–16.	3K5020222
C–11	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica; 2000 uuf ±5%; 5000 vdcw; max body dimen $2\frac{5}{16}$″ lg x $1\frac{27}{32}$″ wd x $1\frac{17}{64}$″ h; JAN type CM70B202J.	Tube V–16 plate return bypass	3K7020222
C–6	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed; paper; 2000 uuf ±20%; 800 vdcw; JAN type CN30A202M.	C–6: Tube V–11 screen bypass	3DA2–191
C–7	(*)	(*)	(*)	(*)	(*)	(*)		C–7; Tube V–10 screen bypass	
C–24	---	---	---	---	(*)	---	CAPACITOR, fixed: paper; 5000 uuf ±20%; 1000 vdcw	Tubes V–10 and V–11 plate return bypass.	3DA5–108
C–26	(*)	(*)	(*)	(*)	(*)	---	CAPACITOR, fixed: paper; 6000 uuf ±10%; 1500 vdcw; HS metal case; JAN type CP26A1EH602K.	Tube V–9 plate return bypass	3DA6–98
C–1	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: paper; 6000 uuf ±20%; 600 vdcw; JAN type CN41A602M.	C–1: Tube V–8 cathode coupling	3DA6–101
C–2	(*)	(*)	(*)	(*)	(*)	(*)		C–2: Tube V–8 screen bypass	
C–3	(*)	(*)	(*)	(*)	(*)	(*)		C–3: Tube V–8 cathode return bypass.	
C–5	(*)	(*)	(*)	(*)	(*)	(*)		C–5: Tube V–8 plate return bypass.	
C–25	(*)	(*)	(*)	(*)	(*)	(*)		C–25: Tube V–8 filament bypass	
C–4	(*)	(*)	(*)	(*)	(*)	---		C–4: Tube V–9 screen bypass	
C–4	---	---	---	---	---	(*)	CAPACITOR, fixed: paper; 6000 uuf ±20%; 1000 vdcw; JAN type CN42E602M.	C–4: Tube V–9 screen bypass	3DA6–127
C–24	---	---	---	---	---	(*)		C–24: Tubes V–10 and V–11 plate return bypass,	
C–26	---	---	---	---	---	(*)		C–26: Tube V–9 plate return bypass.	
C–8	(*)	(*)	(*)	(*)	---	---	CAPACITOR, fixed: mica; 6200 uuf ±5%; 500 vdcw; JAN type CM35B622J.	C–8: Tube V–9 cathode bypass	3K3562222
C–24	(*)	(*)	(*)	(*)	---	---	CAPACITOR, fixed: mica; 6200 uuf ±5%; 600 vdcw; JAN type CM45B622J; (original value 6000 uuf).	C–24: Tubes V–10 and V–11 plate return bypass.	3K4562222
C–9	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: paper; 2 sect; 50,000 uuf ±15% ea sect; 600 vdcw ea sect; JAN type CP53B4FF503L.	Tube V–16 filament bypasses	3DA50–291
C–10	(*)	(*)	(*)	(*)	(*)	(*)			
C–19	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: paper; 4 uf +40% −15%; 4000 vdcw; JAN type CP70E1DM405X.	High-voltage power supply filters	3DB4–335
C–23	(*)	(*)	(*)	(*)	(*)	(*)			
C–16	---	---	---	---	---	(*)	CAPACITOR, fixed: paper; 8 uf +20% −10%; 1000 vdcw; JAN type CP70B1DG805V.	Exciter power supply filters	3DB8–214
C–17	---	---	---	---	---	(*)			
C–20	(*)	(*)	(*)	(*)	(*)	---	CAPACITOR, fixed; paper; single sect; 8 uf +20% −10%; 600 vdcw.	Bias power supply filters	3DB8–161
C–21	(*)	(*)	(*)	(*)	(*)	---			

C-20	---	---	---	---	---	(*)	CAPACITOR, fixed: paper; 8 uf +40% −15%; 600 vdcw; JAN type CP70B1DF805X.	Bias power supply filters	3DB8-215
C-21	---	---	---	---	---	(*)			
C-16	(*)	(*)	(*)	(*)	(*)	---	CAPACITOR, fixed: paper; 2 sect; 8.5 uf +20% −10% ea sect; 1000 vdcw.	Exciter power supply filters	3DB8E5
C-17	(*)	(*)	(*)	(*)	(*)	---			
C-22	(*)	(*)	(*)	(*)	---	---	CAPACITOR, fixed: electrolytic; 40 uf +40% −10%; 450 vdcw.	Modulator bias filter	3DB40-7
C-27	(*)	(*)	(*)	(*)	(*)	---	CAPACITOR, fixed: electrolytic; 40 uf +65% −10%; 100 vdcw.	Tubes V-1 and V-2 cathode bias bypass.	3DB40-21
C-18	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, variable: air; plate meshing type; neutralizing; 5.3 uuf max, 3 uuf min.	Power amplifier neutralizing	3D9005VE5
C-12	(*)	(*)	(*)	(*)	(*)	(*)	CAPACITOR, variable: air; plate meshing type; dual sect; 31-151 uuf.	Power amplifier plate tuning	3D9150V-4
	(*)	(*)	(*)	(*)	(*)	(*)	CHART SET: calibration	For tuning up of units	6D10105-9
CH-9	(*)	(*)	(*)	(*)	(*)	(*)	COIL, RF: choke; unshielded	Tube V-8 cathode return r-f choke	3C550
CH-1	(*)	(*)	(*)	(*)	(*)	(*)	COIL, RF: choke; unshielded	CH-1: Tube V-8 grid return r-f choke.	3C363
CH-2	(*)	(*)	(*)	(*)	(*)	(*)		CH-2: Tube V-8 cathode return r-f choke.	
CH-5	(*)	(*)	(*)	(*)	(*)	(*)		CH-5: Tube V-9 plate return r-f choke.	
CH-6	(*)	(*)	(*)	(*)	(*)	(*)		CH-6: Tubes V-10 and V-11 plate return r-f choke.	
CH-7	(*)	(*)	(*)	(*)	(*)	(*)		CH-7: Tubes V-10 and V-11 grid return r-f choke.	
CH-8	(*)	(*)	(*)	(*)	(*)	(*)		CH-8: Tube V-16 grid return choke.	
CH-3	---	---	---	---	---	(*)	COIL, RF: choke	Tube V-8 plate load r-f choke for F model.	3C550-1
CH-4	(*)	(*)	(*)	(*)	(*)	(*)	COIL, RF: choke	CH-4: Tube V-9 grid return r-f choke for A, B, C, and D models. CH-4: Tube V-16 plate return choke for E and F models.	3C308-3
CH-10	(*)	(*)	(*)	(*)	---	---		CH-10: Tube V-16 plate return r-f choke (A, B, C, and D models only).	
CH-3	---	---	---	---	(*)	---		CH-3: Tube V-8 plate load r-f choke for E model.	
PL-1	(*)	(*)	(*)	(*)	---	---	CONNECTOR, receptacle: 6 flat parallel rectangular pol female cont; straight type.	Chassis interconnection connectors	2Z8639
PL-2	(*)	(*)	(*)	(*)	---	---			
PL-4	(*)	(*)	(*)	(*)	---	---			
PL-3	(*)	(*)	(*)	---	---	---			
SO-1	---	---	---	---	(*)	---			
SO-2	---	---	---	---	(*)	---			
SO-4	---	---	---	---	(*)	---			
PL-3	---	---	---	(*)	---	---	CONNECTOR, receptacle: 8 flat parallel rectangular pol female cont; straight type.	Modulator chassis connectors	2Z8678.43
SO-3	---	---	---	---	(*)	---			

2. Identification Table of Parts for Radio Transmitters BC–610–A, –B, –C, –D, –E, and –F—Continued

Ref. symbol	Designation by models A	B	C	D	E	F	Name of part and description	Function of part	Signal Corps stock No.
SO–11	---	---	---	---	(*)	---	CONNECTOR, receptacle: 8 flat pol female cont; straight type.	Upper control panel socket for PL–11 on r-f chassis.	2Z3069–20
SO–5	---	---	---	---	(*)	(*)	CONNECTOR, receptacle: 8 round pol female cont; straight type.	Socket for cable plug from speech amplifier.	2Z8678.13
PL–6,	(*)	(*)	(*)	(*)	---	---	CONNECTOR, receptacle: two wire, half round blade; male cont; straight type; flush base.	A-c power input connector	6Z7588
SO–6	---	---	---	---	(*)	(*)			
PL–1.1	(*)	(*)	(*)	(*)	---	---	CONNECTOR, receptacle: Navy type 491828; 6 flat parallel pol male cont; straight type.	Connectors between modulator chassis and lower control panel.	2Z7116.22
PL–2.1	(*)	(*)	(*)	(*)	---	---			
PL–4.1	(*)	(*)	(*)	(*)	---	---			
PL–3.1	(*)	(*)	(*)	---	---	---			
PL–1	---	---	---	---	(*)	---			
PL–2	---	---	---	---	(*)	---			
PL–4	---	---	---	---	(*)	---			
PL–3.1	---	---	---	(*)	---	---	CONNECTOR, receptacle: 8 flat parallel male blade pol cont; straight type.	Chassis interconnection connectors	2Z7228–1
PL–3	---	---	---	---	(*)	---			
PL–11	---	---	---	---	(*)	---			
PL–7	(*)	(*)	(*)	(*)	---	---	CONNECTOR, receptacle: 12 tubr female cont; straight	Tuning unit sockets	2Z8639–5
PL–8	(*)	(*)	(*)	(*)	---	---			
PL–9	(*)	(*)	(*)	(*)	---	---			
SO–7	---	---	---	---	(*)	(*)			
SO–8	---	---	---	---	(*)	(*)			
SO–9	---	---	---	---	(*)	(*)			
	(*)	(*)	(*)	(*)	(*)	---	CONNECTOR ASSEMBLY, receptacle	Final amplifier tank coil mounting	2Z5594.11
O–12	---	---	---	---	---	(*)			
	(*)	(*)	(*)	(*)	(*)	---	COUPLING, flexible	For switch SW–11	2Z3270–8
	(*)	(*)	(*)	(*)	(*)	---	COUPLING, flexible	For capacitor C–12	2Z3291–3
O–1	---	---	---	---	---	(*)			
I–1	---	---	---	---	---	(*)	DIAL	Amplifier plate tuning	2Z3764.8
	(*)	(*)	(*)	(*)	(*)	---	DIAL	Part of plate tuning	2Z3708–4
	(*)	(*)	(*)	(*)	(*)	---	DIAL: locking disc brake device	Plate tuning lock	2Z3708–5
	(*)	(*)	(*)	(*)	(*)	---	DRIVE, tuning: dial tuning mechanism	Plate tuning	2Z3719–7
FS–3	(*)	(*)	(*)	(*)	(*)	(*)	FUSE, plug: 20 amp	Transformer T–6 primary protection.	3Z2020
FS–1	(*)	(*)	(*)	(*)	(*)	(*)	FUSE, plug: 25 amp	Line fuses	3Z2025
FS–2	(*)	(*)	(*)	(*)	(*)	(*)			
FS–5	(*)	(*)	(*)	(*)	(*)	(*)	FUSE FU–50: 3 amp	Protection for T–1, and speech amplifier power supply primary.	3Z1950
FS–4	(*)	(*)	(*)	(*)	(*)	(*)	FUSE, cartridge: 6 amp	Protects T–1, T–2, T–3, T–4, T–5, T–103, LM–3, RY–1, RY–2, RY–3, and RY–4.	3Z2606.3

E-4 E-5	(*) (*)	(*) (*)	(*) (*)	(*) (*)	(*) (*)	--- ---	HOLDER, fuse: extractor post type; for single 3AG cartridge fuse.	E-4: Holds fuse F-4. E-5: Holds fuse F-5.	3Z3275-1
E-4 E-5	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	HOLDER, fuse: extractor post type; for ¼" x 1¼" and 9/32" x 1¼" fuses.	E-4: Holds fuse F-4. E-5: Holds fuse F-5.	3Z2876-6.1
R-19	(*)	(*)	(*)	(*)	(*)	---	HEATING ELEMENT, electrical: Nichrome wire coil type; 115 v, 600 w, 16 ohms.	Used to reduce primary voltage	2Z5016-4
	(*)	(*)	(*)	(*)	(*)	---	INSULATOR, bushing: round; steatite, grade L-3, white glazed finish; .425" lg x ⅜" OD x 0.173" ID; neck 13/32" x .050" lg; JAN type NS3W4001.	Component mounting	3G3540-01
E-15	---	---	---	---	---	(*)	INSULATOR, bushing: male, round tube w/shoulder; steatite, grade L-4, white glazed; ⅝" lg o/a; body 23/64" OD; shoulder ⅝" max OD x ⅜" h x .156" ID; JAN type NS4W4102.	Component mounting	3G3541-02
E-16	---	---	---	---	---	(*)	INSULATOR, bushing: conical bushing shape; female; steatite, grade L-4, white glazed finish; ⅝" lg o/a; ⅝" diam tapered to ½" OD w/.156" diam axial hole, counterbored ⅜" diam x ¼" d from ⅝" OD end; JAN type NS4W4202.	Component mounting	3G3542-02.2
E-17 E-18	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	INSULATOR, bushing: truncated conical head shape; steatite, grade L-3, white glazed finish; 15/16" lg; 1⅛" large diam x 1" small diam, 23/32" diam x 9/16" lg shank w/.200" diam axial mtg hole; JAN type NS3W4104.	Insulating purposes	3G3541-04
E-19 E-20	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	INSULATOR, bushing: truncated conical shape; steatite, grade L-3, white glazed finish; ¾" lg o/a; 1⅛" large diam x 1" small diam, ¼" ID x 9/16" d w/.200" diam axial mtg hole; JAN type NS3W4204.	Insulating purposes	3G3542-04
	(*)	(*)	(*)	(*)	(*)	---	INSULATOR, standoff: black bakelite; 1" lg o/a; both ends drilled and tapped ⅜" d for #6-32 mach screw; ⅝" diam.	Four mounting choke CH-3	3G1837-32.8
	(*)	(*)	(*)	(*)	(*)	(*)	INSULATOR, feedthru: two conical shape cones; white por, glazed finish; 15/16" h; 1¼" diam at bottom, 13/16" diam at top.	Insulating purposes	3G1050-30
E-24 E-26	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	INSULATOR, feedthru: cup shape female bushing; steatite, grade L-4, white glazed finish; ½" lg o/a; ⅞" OD x ½" ID w/.200" diam thru hole; JAN type NS4W4203.	Insulating purposes	3G3542-03.1
E-23 E-25	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	INSULATOR, feedthru: round male bushing w/extension; steatite, grade L-4, white glazed finish; ⅞" lg o/a; ⅞" OD x .200" ID w/15/32" diam shank, ⅜" lg; JAN type NS4W4103.	Insulating purposes	3G3541-03.1
	(*)	(*)	(*)	(*)	(*)	---	INSULATOR, standoff: conical shape; steatite, grade L-3, white glazed finish; 1" lg o/a; 1" diam one end, ½" diam other end; #8-32 thd hole in ea end ⅜" d; JAN type NS3W2008.	Insulating purposes	3G3520-08.2
	(*)	(*)	(*)	(*)	(*)	---	INSULATOR, standoff: round post shape; steatite, grade L-3, white glazed finish; 1" lg o/a; ½" diam w/1 hole in ea end tapped #8-32 x ⅜" d; JAN type NS3W0208.	Insulating purposes	3G1250-16

2. Identification Table of Parts for Radio Transmitters BC-610-A, -B, -C, -D, -E, and -F—Continued

Ref. symbol	Designation by models: A	B	C	D	E	F	Name of part and description	Function of part	Signal Corps stock No.
E-13	---	---	---	---	---	(*)	INSULATOR, standoff: conical; steatite, grade L-4, white glazed; 1'' lg o/a; one end 1'' diam, other end ½'' diam, w/#8-32 thd hole in ea and ⅜'' d; JAN type NS4W2008.	Insulating purposes	3G3520-08.1
E-14	---	---	---	---	---	(*)			
E-6	---	---	---	---	---	(*)	INSULATOR, standoff: cylindrical; steatite, grade L-4, white glazed; 1'' lg x ½'' diam; #8-32 thd hole in ea end ⅜'' d; JAN type NS4W0208.	Insulating purposes	3G3502-08.1
E-7	---	---	---	---	---	(*)			
E-8	---	---	---	---	---	(*)			
E-9	---	---	---	---	---	(*)			
E-10	---	---	---	---	---	(*)	INSULATOR, standoff: cylindrical pillar shape: steatite, grade L-4, white glazed finish; .500'' lg o/a; ⅜'' diam w/#6-32 hole in ea end 5/32'' d; JAN type NS4W0104.	Insulating purposes	3G3501-04.1
E-11	---	---	---	---	---	(*)			
E-12	---	---	---	---	---	(*)			
E-21	---	---	---	---	---	(*)			
E-22	---	---	---	---	---	(*)			
	(*)	(*)	(*)	(*)	---	---	INSULATOR, standoff: rectangular bar shape; ultra steatite; 4¼'' lg x ⅝'' wd x ¼'' thk; two .204'' diam holes located ¼'' from either end; two .695'' diam holes located 1½'' from either end.	Insulating purposes	3G1100-68.1
	(*)	(*)	(*)	(*)	(*)	---	KNOB: round; black bakelite body; for ¼'' diam shaft; depressed indicating arrow.	Control knob	2Z5821-3
						(*)	KNOB: round; black bakelite body; for ¼'' diam shaft	Control knob	2Z5788-12
						(*)	KNOB: round; black molded phenolic; for ¼'' diam shaft; white filler.	Control knob	2Z5822-5
	(*)	(*)	(*)	(*)	(*)	---	KNOB ASSEMBLY: round; black bakelite; for ¼'' diam shaft; numbered 0-9 CW w/360 deg cir line below numbers.	For filament voltage and modulator bias controls.	2Z5849.10
LM-1	(*)	(*)	(*)	(*)	(*)	---	LAMP LM-27: 6-8 v, .25 amp; miniature bayonet base	LM-1: Final tank tuning dial illumination. LM-2: Tuning compartment illumination.	2Z5927
LM-2	(*)	(*)	(*)	(*)	(*)	(*)			
LM-3	(*)	(*)	(*)	(*)	(*)	(*)	LAMP LM-41: 110 v, 6 w; bulb S-6 clear; candelabra screw base.	LM-3: Filament on-off indicator LM-4: High-voltage on-off indicator.	2Z5941
LM-4	(*)	(*)	(*)	(*)	(*)	(*)			
J-1	---	---	---	---	---	(*)	LAMPHOLDER: miniature bayonet type socket	Holds illuminating lamps	2Z5883-342
E-1	---	---	---	---	---	(*)	LAMPHOLDER: medium screw type	Holds indicating lamps	6Z8357-1.1
E-2	---	---	---	---	---	(*)			
E-3	---	---	---	---	---	(*)			
I-2	(*)	(*)	(*)	(*)	(*)	(*)	LAMPHOLDER ASSEMBLY: candelabra base	Holds lamp bulb	2Z5988-9
I-3	(*)	(*)	(*)	(*)	(*)	(*)	LAMPHOLDER ASSEMBLY: candelabra base	Holds lamp bulb	2Z5988-5
H-12	---	---	---	---	---	(*)	LOCK ASSEMBLY, dial	Dial locking device	2Z6196-7
	(*)	(*)	(*)	(*)	(*)	---	LOCK ASSEMBLY, dial: locking mechanism to prevent tuning dial from rotating.	Plate tuning dial lock	2Z6195.7

M-1	---	---	---	---	---	(*)	METER, ammeter: DC milliammeter; 0-15 ma; JAN type MR36W015DCMA.	Tube V-9 plate, V-10 and V-11 grid and plate, and V-16 grid current indicator.	3F901E5-19
M-1	(*)	(*)	(*)	(*)	---	---	METER, ammeter: DC; 0-100 ma; JAN type MR35W100DCMA.	Tubes V-10 and V-11 grid, and V-16 grid current indicator.	3F910-18
M-1	---	---	---	---	(*)	---	METER, ammeter: DC; 0-15, 0-150, 0-300 ma	Tubes V-9 plate, V-10 and V-11 grid and plate, and V-16 grid current indicator.	3F901E5-14
M-2 M-4	(*) (*)	(*) (*)	(*) (*)	(*) (*)	--- ---	--- ---	METER, ammeter: DC; 0-300 ma; round bakelite flush mtg case; fl 3.5" diam x 0.38" d; body 2.8" diam x 1.66" d; JAN type MR35W300DCMA.	M-2: Tubes V-9 plate and V-10 and V-11 plate current indicator. M-4: Tubes V-3 and V-4 plate current indicator.	3F333
M-2	---	---	---	---	---	(*)	METER, ammeter: DC milliammeter; 0-500 ma; JAN type MR36W500DCMA.	M-2: Tube V-16 plate current indicator.	3F950-61
M-2	---	---	---	---	(*)	---	METER, ammeter: DC; 0-500 ma; JAN type MR35W500DCMA.	Tube V-16 plate current indicators	3F950-31
M-5	(*)	(*)	(*)	(*)	---	---			
M-3	(*)	(*)	(*)	(*)	(*)	---	METER, voltmeter: AC; 0-10 v, 25-125 cyc; JAN type MR34W010ACVV.	Tube V-16 filament voltage indicator.	3F8010-20
M-3	---	---	---	---	---	(*)	METER, voltmeter: AC; 25-125 cyc; 0-10 v; JAN type MR36W010ACVV.	Tube V-16 filament voltage indicator.	3F8010-25
L-2 L-3	--- ---	--- ---	--- ---	--- ---	--- ---	(*) (*)	REACTOR: one sect; 6 hy, 250 ma; 100 ohms DC resistance; HS steel case.	Bias power supply filters	3C573-31
L-1	(*)	(*)	(*)	(*)	(*)	---	REACTOR: single wnd; 6 hy, 250 ma; 90 ohms DC resistance; encl in metal case.	Exciter power supply filter	3C344-21
L-1	---	---	---	---	---	(*)	REACTOR: one sect; 6 hy, +20% −10%; 250 ma; 105 ohms ±10% DC resistance; HS steel case.	Exciter power supply filter	3C573-30
L-2 L-3	(*) (*)	(*) (*)	(*) (*)	(*) (*)	(*) (*)	--- ---	REACTOR: single wnd; 6 hy, ±10%; 250 ma; 125 ohms ±10% DC resistance.	Bias power supply filters	3C560
L-4	(*)	(*)	(*)	(*)	(*)	---	REACTOR: 11 hy ±10%, 500 ma; 50 ohms ±10% DC resistance.	H-v power supply filter choke	3C560-1
L-4	---	---	---	---	---	(*)	REACTOR: one sect; 11 hy, 500 ma; 55 ohms DC resistance; HS steel case.	H-v power supply filter	3C573-29
RY-5	(*)	(*)	(*)	(*)	(*)	---	RELAY, armature: DP; magnetic type; pull-in cur 700-750 ma.	Protects h-v supply from overload	2Z7717.4
RY-4	(*)	(*)	(*)	(*)	(*)	---	RELAY, armature: SPST normally closed; double break; single wnd coil; oper 117 v AC.	Shorts antenna leads together when not transmitting.	2Z7717.3
RY-4	---	---	---	---	---	(*)	RELAY, armature: SPST double break, normally closed; single wnd coil; 117 v AC.	Shorts antenna leads together when not transmitting.	2Z7587-223
RY-3	---	---	---	---	---	(*)	RELAY, armature: DPDT; single wnd coil; 117 v AC	Shorts modulator transformer T-9 secondary and keeps transformer T-6 in h-v position when set is operating "C. W."	2Z7590-188
RY-5	---	---	---	---	---	(*)	RELAY, armature: DPST normally open; single wnd coil; 715 ma ±30 ma.	Protects h-v supply from overload	2Z7588-115
RY-2	(*)	(*)	(*)	(*)	(*)	(*)	RELAY, armature: DPST, 1 pole normally open, 1 pole normally closed; single wnd; 117 v AC.	Resets overload relay RY-5 after overload trips RY-5.	2Z7590-187

2. Identification Table of Parts for Radio Transmitters BC-610-A, -B, -C, -D, -E, and -F—Continued

Ref. symbol	Designation by models						Name of part and description	Function of part	Signal Corps stock No.
	A	B	C	D	E	F			
RY-3	(*)	(*)	(*)	(*)	(*)	---	RELAY, armature: DPDT; single wnd coil	Shorts T-9 secondary and keeps T-6 in h-v position when set is operating "C. W."	2Z7717.2
RY-1	(*)	(*)	(*)	(*)	(*)	(*)	RELAY, armature: DPST normally open; solenoid; 115 v AC.	Applies h-v to primary of T-6	2Z7590-88
R-27	---	---	---	---	---	(*)	RESISTOR, fixed: WW; .1752 ohm ±.50%; ½ w; JAN type RB11BR1752D.	Shunt for M-1 on 300-ma range	3RB1-1752
R-26	---	---	---	---	---	(*)	RESISTOR, fixed: WW; .3700 ohm ±.50%; ½ w; JAN type RB11BR3700D.	Shunts for M-1 on 150-ma ranges	3RB1-5000.2
R-33	---	---	---	---	---	(*)			
R-21	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 51 ohms ±5%; ½ w JAN type RC21BF510J.	Parasitic suppressors for grid circuits of V-10 and V-11, respectively.	3RC21BF510J
R-22	(*)	(*)	(*)	(*)	(*)	(*)			
R-26	(*)	(*)	(*)	(*)	---	---	RESISTOR, fixed: WW; 100 ohms ±5%; 1 w at ambient temp 40° C, max temp 110° C; max body dimen 1 9/32" lg x 9/32" diam; rigid form; ins, resistant to salt water immersion and moisture; two axial wire leads 1½" lg; mts by means of wire leads; JAN type RU4C101J.	Meter M-1 shunts, 100-ma ranges	3RU25614
R-27	(*)	(*)	(*)	(*)	---	---			
R-5	---	---	---	---	(*)	(*)	RESISTOR, fixed: WW; 180 ohms ±5%; 16 w; JAN type RW32G181.	Minimum bias resistor for V-3 and V-4.	3RW19804
R-28	---	---	---	---	---	(*)	RESISTOR, fixed: WW; 470 ohms ±5%; ½ w; body dimen 21/32" max lg x 15/64" max dimen; JAN type RU3C471J.	15-ma shunt for meter M-1	3RU32002
R-24	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: WW; 500 ohms ±5%; 12 w; JAN type RW32G501.	V-9 cathode bias	3RW22508
R-28	---	---	---	---	(*)	---	RESISTOR, fixed: comp; 510 ohms ±5%; ½ w; JAN type RC21BF511J, (500 ohms in original set).	15-ma shunt for meter M-1	3RC21BF511J
R-9	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: WW; 710 ohms ±5%; 16 w; JAN type RW32G711.	R-9: V-16 plate choke shunt	3RW23407
R-20	(*)	(*)	(*)	(*)	(*)	(*)		R-20: V-1 and V-2 cathode bias.	
R-4	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 750 ohms ±5%; 1 w; JAN type RC31BF751J.	Exciter supply filter network	3RC31BF751J
R-8	(*)	(*)	(*)	(*)	---	---	RESISTOR, fixed: WW; 1000 ohms ±5%; 16 w; JAN type RW32G102.	V-16 grid bias	3RW24309
R-8	---	---	---	---	(*)	(*)	RESISTOR, fixed: comp; 4700 ohms ±10%; 2 w; JAN type RC41BF472K.	V-10 and V-11 grid bias	3RC41BF472K
R-2	---	---	(*)	(*)	(*)	(*)	RESISTOR, fixed: WW; 5000 ohms ±5%; 18 w; JAN type RW33F502; (5600 ohms in A thru E models).	V-8 plate voltage stabilizing	3RW28519
R-2	(*)	(*)	---	---	---	---	RESISTOR, fixed: WW; 7500 ohms ±5%; 20 w	V-8 plate voltage stabilizing	3Z6575-65
R-5	(*)	(*)	(*)	(*)	---	---	RESISTOR, fixed: WW; 10,000 ohms ±5%; 20 w	V-9 plate voltage-dropping resistor.	3Z6610-213
R-3	(*)	(*)	(*)	(*)	(*)	---	RESISTOR, fixed: WW; 15,000 ohms ±5%; 20 w	V-8 screen voltage stabilizing.	3Z6615-131

R-8	---	---	---	---	---	(*)	RESISTOR, fixed: WW; 16,000 ohms ±5%; 38 w; JAN type RW35F163.	V-8 screen voltage stabilizing	3RW31506
R-6	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 20,000 ohms ±5%; 2 w; JAN type RC41BF203J.	R-6: V-10 screen voltage dropping.	3RC41BF203J
R-7	(*)	(*)	(*)	(*)	(*)	(*)		R-7: V-11 screen voltage dropping.	
R-16	(*)	(*)	(*)	(*)	(*)	(*)		R-16 and R-17: T-8 secondary loading.	
R-17	(*)	(*)	(*)	(*)	(*)	(*)			
R-28	(*)	(*)	(*)	(*)	---	---	RESISTOR, fixed: WW; 20,000 ohms ±5%; 20 w	V-9 plate voltage dropping	3Z6620-52
R-34	---	---	---	---	(*)	(*)	RESISTOR, fixed: WW; 25,000 ohms ±5%; 78 w; JAN type RW37F253.	V-3 and V-4 grid return	3RW32709
R-1	(*)	(*)	(*)	(*)	(*)	---	RESISTOR, fixed: comp; 30,000 ohms ±5%; ½ w; JAN type RC21BF303J.	V-8 grid bias	3RC21BF303J
R-23	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 33,000 ohms ±10%; 2 w; JAN type RC42BF333K.	V-9 grid bias	3RC40BF333K
R-1	---	---	---	---	---	(*)	RESISTOR, fixed: comp; 33,000 ohms ±10%; 2 w; JAN type RC41BF333K.	V-8 grid bias	3RC41BF333K
R-10	(*)	(*)	(*)	(*)	(*)	---	RESISTOR, fixed: WW; 40,000 ohms ±5%; 20 w	Exciter power supply bleeder	3Z6640-16
R-10	---	---	---	---	---	(*)	RESISTOR, fixed: WW; 40,000 ohms ±5%; 78 w; JAN type RW37F403.	Exciter power supply bleeder	3RW33906
R-25	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 47,000 ohms ±10%; 2 w; JAN type RC41BF473K.	V-9 screen voltage dropping	3RC41BF473K
R-13	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: WW; 75,000 ohms ±5%; 200 w	H-v power supply bleeder	3Z6675-15
R-14	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; JAN type RC21BF104K.	R-14 and R-15: T-7 secondary loading.	3RC21BF104K
R-15	(*)	(*)	(*)	(*)	(*)	(*)			
R-35	---	---	---	---	(*)	(*)		R-35: V-8 cathode parasitic suppressor	
R-11	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, adjustable: WW; 2500 ohms ±10%; 100 w.	Bias supply bleeder	3Z6250-27
R-18	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR. variable (potentiometer): WW; 15 ohms ±10%; 50 w; JAN type RP151FK150KK.	Filament voltage control	3RP3901
R-12	(*)	(*)	(*)	(*)	(*)	(*)	RESISTOR, variable (potentiometer): WW; 500 ohms ±10%; 50 w; JAN type RP151FK501KK.	V-3 and V-4 grid bias voltage control.	3RP6905
R-26	---	---	---	---	(*)	---	SHUNT, meter	R-26 and R-33: Shunts for M-1 on 150-ma ranges.	3F3802-150
R-33	---	---	---	---	(*)	---			
R-27	---	---	---	---	(*)	---	SHUNT, meter	Shunt for M-1 on 300-ma range	3F3802-300
	(*)	(*)	(*)	(*)	(*)	---	SOCKET, tube: 4 cont std; retainer ring mtg	Socket for V-12	2Z8674.8
X-1	---	---	---	---	---	(*)	SOCKET, tube: std 4 prong; isolantite or steatite secured in oval metal mtg.	Socket for tubes V-1, V-2, V-5, and B-12.	2Z8757.3
X-2	---	---	---	---	---	(*)			
X-5	---	---	---	---	---	(*)			
X-12	---	---	---	---	---	(*)			
	(*)	(*)	(*)	(*)	(*)	---	SOCKET, tube: 4 cont; 1 piece saddle mtg	Socket for tubes V-1, V-2, and V-5.	2Z8654.1
X-16	(*)	(*)	(*)	(*)	(*)	(*)	SOCKET, tube: 4 cont bayonet; jumbo type; white por base.	Socket for V-16	2Z8759.3
X-3	(*)	(*)	(*)	(*)	(*)	(*)	SOCKET, tube: UX bayonet, 4 cont; white por glazed base w/brass, nickel pl shell.	Tube sockets for V-3, V-4, V-6, and V-7.	2Z8759.4-1
X-4	(*)	(*)	(*)	(*)	(*)	(*)			
X-6	(*)	(*)	(*)	(*)	(*)	(*)			
X-7	(*)	(*)	(*)	(*)	(*)	(*)			
	(*)	(*)	(*)	(*)	(*)	---	SOCKET, tube: 5 cont, med type; mts in 1$\frac{9}{32}$" chassis cut-out.	Five-contact tube sockets	2Z8659-2

2. Identification Table of Parts for Radio Transmitters BC-610-A, -B, -C, -D, -E, and -F—Continued

Ref. symbol	Designation by models A	B	C	D	E	F	Name of part and description	Function of part	Signal Corps stock No.
X-10	---	---	---	---	---	(*)	SOCKET SO-11: 5 cont, med; above or under chassis wafer mtg.	Sockets for tubes V-10 and V-11	2Z8711
X-11	---	---	---	---	---	(*)			
PL-5	(*)	(*)	(*)	(*)	---	---	SOCKET, tube: octal; 1 piece saddle mtg	Speech amplifier cord plug input	2Z8659-6
X-8	---	---	---	---	---	(*)	SOCKET, tube: octal; metal mtg plate	Sockets for tubes V-8, V-9, V-13, V-14, and V-15.	2Z8678.195
X-9	---	---	---	---	---	(*)			
X-13	---	---	---	---	---	(*)			
X-14	---	---	---	---	---	(*)			
X-15	---	---	---	---	---	(*)			
	(*)	(*)	(*)	(*)	(*)	---	SOCKET SO-137: eight cont octal; retainer ring mtg	Sockets for tubes V-8, V-9, V-13, V-14, and V-15.	2Z8799-137
SW-2	---	---	---	---	---	(*)	SWITCH, interlock: SPST; cont rating 10 amp at 110/220 v AC or DC, interrupting rating 7.5 amp at 110/220 v AC, 5 amp at 125 v DC, 2.5 amp at 250 v DC.	SW-2: Coil unit compartment safety interlock.	3Z9560-7
SW-13	---	---	---	---	---	(*)		SW-13: Tuning unit compartment safety interlock.	
SW-12	(*)	(*)	(*)	(*)	(*)	---	SWITCH, push: SPST	Overload relay reset	3Z9824-274
SW-10	(*)	(*)	(*)	(*)	(*)	---	SWITCH, push: SPST	SW-10: Top cover safety interlock	3Z9812-2
SW-11	(*)	(*)	(*)	---	---	---		SW-11: Final tank coil compartment safety interlock. SW-13: Tuning unit compartment safety interlock.	
SW-13	(*)	(*)	(*)	(*)	(*)	---			
SW-16	---	---	---	(*)	---	---		SW-16: Final tank coil compartment safety interlock.	
SW-2	---	---	---	---	(*)	---		SW-2: Coil unit compartment safety interlock.	
SW-5	(*)	(*)	(*)	(*)	(*)	---		SW-5: Rear cover safety interlock.	
SW-5	---	---	---	---	---	(*)	SWITCH, push: SPST	Rear cover safety interlock	3Z9824-31.21
SW-11.1	(*)	(*)	(*)	(*)	(*)	---	SWITCH, rotary: 3 position, 4 sect, 8 pole	Exciter tuning unit switch wafers	3Z9825-29.3
SW-11.2	(*)	(*)	(*)	(*)	(*)	---			
SW-11.3	(*)	(*)	(*)	(*)	(*)	---			
SW-11.4	(*)	(*)	(*)	(*)	(*)	---			
SW-11.5	(*)	(*)	(*)	(*)	(*)	---			
SW-11.6	(*)	(*)	(*)	(*)	(*)	---			
SW-11	---	---	---	---	---	(*)	SWITCH, rotary: 3 position, 4 sect	Exciter tuning unit selector	3Z9825-62.406
SW-8	---	---	---	---	(*)	(*)	SWITCH, rotary: 4 position, 2 sect	Selector for M-1	3Z9825-29.13
SW-1	(*)	(*)	(*)	(*)	(*)	---	SWITCH, toggle: SPST	SW-1: Filament power switch	3Z9851
SW-4	(*)	(*)	(*)	(*)	(*)	---		SW-4: H-v protection.	
SW-6	(*)	(*)	(*)	(*)	(*)	---		SW-6: Final stage plate power on-off.	
SW-6	---	---	---	---	---	(*)	SWITCH, toggle: SPST; JAN type ST-42A	Final stage plate power on-off	3Z9863-42A
SW-12	---	---	---	---	---	(*)	SWITCH, toggle: SPST; JAN type ST-42B	Overload relay reset	3Z9863-42B
SW-3	(*)	(*)	(*)	(*)	(*)	---	SWITCH, toggle: DPST	Exciter plate power "ON-OFF."	3Z9861-1

SW-1	---	---	---	---	---	(*)	SWITCH, toggle: DPST; JAN type ST-52K	SW-1: Filament on-off	3Z9863-52K
SW-3	---	---	---	---	---	(*)		SW-3: Exciter plate power on-off.	
SW-4	---	---	---	---	---	(*)	SWITCH, toggle: DPDT; JAN type ST-52N	H-v protect switch	3Z9863-52N
SW-8	(*)	(*)	(*)	(*)	---	---	SWITCH, toggle: DPDT; JAN type ST-22N	SW-8: Meter M-1 selector	3Z9849.135
SW-9	(*)	(*)	(*)	(*)	---	---		SW-9: Meter M-2 selector.	
SW-7	(*)	(*)	(*)	(*)	(*)	(*)	SWITCH, toggle: 4PDT	PHONE—C-W switch	3Z9845-11.5
T-7	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, AF: input plate coupling, interstate type; pri to match 500 ohms line to PP2A3 grids (20,000 ohms CT); break-down 2,000 v; fully enclosed tar Bi-wax impr steel case.	Coupling between speech amplifier and tubes V-1 and V-2.	2Z9631.72
T-8	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, AF: driver, plate coupling type; pri CT to match 5,000 ohm PP2A3 plates in class "A," secd 9,000 ohms CT to match PP 100TH grids, class "B"; potted steel case.	V-1 and V-2 plates to V-3 and V-4 grids.	2Z9633.24
T-9	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, AF: modulation type; pri 16,000 ohms CT, secd 8,335 ohms at 250 ma, 7,500 v RMS test; HS, impr and asphalt potted steel case.	Couples V-3 and V-4 to final r-f amplifier h-v circuit.	2Z9634.3
T-7	---	---	---	---	---	(*)	TRANSFORMER, AF: input plate coupling type; pri 500 ohms impedance, secd 20,000 ohms CT; breakdown test 1,500 v RMS; HS steel case.	Coupling between speech amplifier and tubes V-1 and V-2.	2Z9632.505
T-8	---	---	---	---	---	(*)	TRANSFORMER, AF: input plate coupling type; pri 5,000 ohms CT, secd 2,750 ohms CT; breakdown test, pri 1,700 v RMS, sect 1,500 v RMS; HS steel case.	Couples V-1 and V-2 plate circuit to V-3 and V-4 grid circuit.	2Z9632.506
T-9	---	---	---	---	---	(*)	TRANSFORMER, AF: modulation type; pri 21,000 ohms CT, secd 8,000 ohms; 250 ma DC; breakdown test 7,000 v RMS; HS steel case.	Couples V-3 and V-4 output to final r-f amplifier plate circuit.	2Z9634.127
T-6	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, power: plate type; input pri 115 v, 50/60 cyc, single ph, tapped; secd 5,030 v at 500 ma CT or 4,050 v at 250 ma CT; HS steel case.	H-v plate supply to V-6 and V-7.	2Z9612.1
T-5	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, power: plate type; input 115/125 v, 50/60 cyc: 473-0-473 v, 250 ma; HS steel case.	Plate transformer of exciter power supply.	2Z9612.184
T-3	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, power: fil type; input pri 100/115 v, 50/60 cyc; secd 5 v, 16 amp CT; HS steel case.	Filament supply for V-3 and V-4	2Z9611.364
T-2	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, power: fil type; input pri 100/115 v, 50/60 cyc; secd 2.5 v, 10 amp; fully enclosed metal case.	Filament supply for V-6 and V-7	2Z9611.362
T-2	---	---	---	---	---	(*)	TRANSFORMER, power: fil type; input pri 100/115 v, 50/60 cyc, single ph; secd 2.5 v CT, 10 amp; HS steel case.	Filament supply for tubes V-6 and V-7.	2Z9611.513
T-3	---	---	---	---	---	(*)	TRANSFORMER, power: fil type; pri 100/115 v, 50/60 cyc, single ph; secd 5.0 v CT, 12.6 amp; HS steel case.	Filament supply for tubes V-3 and V-4.	2Z9611.510
T-5	---	---	---	---	---	(*)	TRANSFORMER, power: plate type; pri 115-125 v, 50/60 cyc, single ph; secd 880 v CT, 250 ma; HS steel case.	Plate transformer of exciter power supply.	2Z9612.261

2. Identification Table of Parts for Radio Transmitters BC-610-A, -B, -C, -D, -E, and -F—Continued

Ref. symbol	Designation by models						Name of part and description	Function of part	Signal Corps stock No.
	A	B	C	D	E	F			
T-6	---	---	---	---	---	(*)	TRANSFORMER, power: plate type; pri 117 v, 50/60 cyc, single ph; ea w/tap to provide secd of 5760 v CT or 4800 v CT when pri are connected in series; secd 5760 v CT, 321 ma DC or 4800 v CT, 475 ma DC; HS steel case.	H-v plate supply to tubes V-6 and V-7.	2Z9612.262
T-4	---	---	---	---	---	(*)	TRANSFORMER, power: fil type; pri 100/115 v, 50/60 cyc, single ph; secd #1, 5.0 v CT, 10.5 amp; secd #2, 6.3 v CT, 3.5 amp; secd #3, 5.0 v, 3 amp; HS steel case.	Filament supply for tubes V-8 thru V-12, and for tube V-16.	2Z9611.511
T-4	(*)	(*)	(*)	(*)	(*)	(*)	TRANSFORMER, power: fil type; input pri 110/115 v, 50/60 cyc; secd #1, 5 v, 3 amp CT; secd #2, 6.3 v, 3.5 amp, secd #3, 5 v, 10.5 amp CT; HS steel case.	Filament supply for tubes V-8 thru V-12, and for tube V-16.	2Z9611.363
T-1	---	---	---	---	---	(*)	TRANSFORMER, power; fil and plate type; pri 117 v, 50/60 cyc; secd #1, 1000 v CT, 220 ma; secd #2, 2.5 v, 5 amp; secd #3, 5.0 v CT, 3 amp; HS steel case.	Filament supply for tubes V-1, V-2, and V-5 and bias rectifier plate supply.	2Z9613.606
T-1	(*)	(*)	(*)	(*)	(*)	---	TRANSFORMER, power: plate and fil type; input pri 117 v, 50/60 cyc; secd #1, 544-0-544 v, 220 ma; secd #2, 5 v, 3 amp; secd #3, 2.5 v CT, 5 amp; HS steel case.	Filament supply for tubes V-1, V-2, and V-5 and bias rectifier plate supply.	2Z9613.441
L-7A	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-387-D: plate tank; plug-in type; unshielded; pri 32 turns; secd 6½ turns.	2.0- to 3.5-mc final amplifier tank coil.	3C280-387D
L-7B	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-388-C: plant tank; plug-in type; unshielded; pri 24 turns; secd 4½ turns.	3.5- to 4.5-mc final amplifier tank coil.	3C280-388C
L-7C	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-389-C: plate tank; plug-in type; unshielded; pri 18 turns; secd 4½ turns.	4.5- to 5.7-mc final amplifier tank coil.	3C280-389C
L-7D	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-390-C: plate tank; plug-in type; unshielded; pri 14 turns; secd 4½ turns.	5.7- to 8.0-mc final amplifier tank coil.	3C300-390C
L-7E	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-447-B: plate tank; plug-in type; unshielded; pri 10 turns; secd 4½ turns.	8.0- to 11.0-mc final amplifier tank coil.	3C300-447B
L-7F	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-448-B: plate tank; plug-in type; unshielded; pri 8 turns; secd 2½ turns.	11.0- to 14.0-mc final amplifier tank coil.	3C300-448B
L-7G	(*)	(*)	(*)	(*)	(*)	(*)	COIL UNIT C-449-B: plate tank; plug-in type; unshielded; pri 6 turns; secd 1½ turns.	14.0- to 18.0-mc final amplifier tank coil.	3C300-449B
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-47.		2C8047
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-48.		2C8048
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-49.		2C8049
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-50.		2C8050
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-51.		2C8051
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-52.		2C8052
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-53.		2C8053
	(*)	(*)	(*)	(*)	(*)	(*)	TRANSMITTER TUNING UNIT TU-54		2C8054

V-13	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type OD3/VR-150	V-13: Tube V-8 screen voltage regulator.	2J0D3/VR150
V-14	(*)	(*)	(*)	(*)	(*)	(*)		V-14 and V-15: Tube V-8 plate voltage regulators.	
V-15	(*)	(*)	(*)	(*)	(*)	(*)			
V-1	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 2A3	Audio amplifiers	2J2A3
V-2									
V-5	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 5Z3	V-5: Bias supply rectifier	2J5Z3
V-12								V-12: Exciter plate supply rectifier.	
V-9	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 6L6Y	Buffer amplifier and doubler	2J6L6Y
V-8	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 6V6Y	Oscillator	2J6V6Y
V-3	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 100TH	Class B modulators	2J100TH
V-4	(*)	(*)	(*)	(*)	(*)	(*)			
V-16	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 250TH	Final r-f power amplifier	2J250TH
V-10	(*)	(*)	(*)	(*)	(*)	(*)	TUBE, electron: JAN type 807	Intermediate r-f amplifiers	2J807
V-11	(*)	(*)	(*)	(*)	(*)	(*)			
V-6	(*)	(*)	(*)	(*)	(*)	(*)	TUBE electron: JAN type 3B28 (replaces JAN 866A/866).	Gas-filled h-v supply rectifiers	2J3B28
V-7	(*)	(*)	(*)	(*)	(*)	(*)			
							Note. In addition to the foregoing, items shown in the following maintenance list are necessary for maintenance of RADIO TRANSMITTERS BC-610-A, -B, -C, -D, -E, and -F.		
							TRANSMITTER TUNING UNITS TU-47, TU-48, TU-49, TU-50, TU-51, and TU-52. TUNING UNITS TU-53 and TU-54		
							Note. An asterisk (*) indicates models in which the part is used and, by its position, designates the reference symbols by which the item is identified in each model.		

3. Identification Table of Parts for Speech Amplifier BC-614-H

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	AMPLIFIER, AF: Speech Amplifier BC-614-H; .5 w output; freq response ±1 db 200-300 cps; 16½" lg x 9¾" d x 9½" h including shock mount; input 115 v, 60 cps single ph, .04 amp; input impedance 200 ohms and 1 meg; output impedance 500 ohms; metal cabinet; U. S. Army spec #71-1683-A.	Raises microphone output for voice modulation of transmitter.	2C614
E-101	BOARD, terminal: 8 brass, tin pl solder term for mtg 5 resistors; ½" distance between ctr of term; laminated phenolic board, LTS-E5, natural per JAN-P-13; 2¼" lg x 1½" wd x 1/16" thk; mtg holes .161" diam on 1⅞" ctr; B&W part/dwg #S27-533-1C.	Mounts resistors R-116 through R-120	
E-102	BOARD, terminal: 10 brass, tin pl solder term for mtg 5 resistors; ½" distance between ctr of term; laminated phenolic board, LTS-E5, natural per JAN-P-13; 2¾" lg x 1½" wd x 1/16" thk; mtg holes .161" diam on 2⅜" ctr; B&W part/dwg #S27-532-1C.	Mounts resistors R-129 through R-133	

3. Identification Table of Parts for Speech Amplifier BC-614-H—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E-103	BOARD, terminal: 14 brass, tin pl solder term for mtg 7 resistors; ½″ distance between ctr of term; laminated phenolic board, LTS-E5, natural per JAN-P-13; 3½″ lg x 2⅜″ wd x 1/16″ thk; mtg holes .161″ diam on 2⅝″ ctr; B&W part/dwg #S27-534-1C.	Mounts resistors R-115, R-121, and R-124 through R-128.	
E-104	BOARD, terminal: 14 brass, tin pl solder term for mtg 5 resistors and 2 capacitors; ½″ distance between ctr of term; laminated phenolic board, LTS-E5, natural per JAN-P-13; 4¾″ lg x 1½″ wd x 1/16″ thk; mtg holes .161″ diam on 4⅜″ ctr; B&W part/dwg #S27-531-1C.	Mounts resistors R-135, R-136, R-138 through R-140, and capacitors C-117 and C-118.	
E-105	BOARD, terminal: 28 brass, tin pl solder term for mtg 14 resistors; ½″ distance between ctr of term; laminated phenolic board, LTS-E5, natural per JAN-P-13; 7¼″ lg x 1½″ wd x 1/16″ thk; mtg holes .161″ diam on 6⅞″ ctr; B&W part/dwg #S27-530-1C.	Mounts resistors R-101 through R-108, R-110, and R-112 through R-114.	
C-117 C-118 C-122 C-123 C-128	CAPACITOR, fixed: paper; 2000 uuf ±20%; 800 vdcw; JAN type CN30A202H.	C-117: Grid (pin 4) to plate (pin 2) coupling of V-106. C-118: Grid (pin 1) to plate (pin 5) coupling of V-106. C-122: R-f bypass across jack J-101. C-123: R-f bypass across connector SO-101. C-128: Cathode (pin 3) a-f bypass of V-106.	
C-127 C-129 C-130	CAPACITOR, fixed: mica; 4700 uuf ±10% 500 vdcw; JAN type CM35B472K.	C-127: R-f bypass, filament to ground of V-101. C-129: R-f bypass across connector J-102. C-130: R-f filter at input of telephone line.	
C-101 C-102 C-103 C-105 C-106 C-114 C-119 C-121 C-125 C-126	CAPACITOR, fixed: paper; 10,000 uuf ±20%; 600 vdcw; JAN type CN35A103M.	C-101: A-f bypass of 115-volt line input. C-102: Connects plate of V-101 to gain control R-111. C-103: Connects plate of V-102 to grid (pin 1) of V-103. C-105: Connects plate (pin 2) of V-103 to grid (pin 4) of V-104. C-106: Connects plate (pin 5) of V-103 to grid (pin 1) of V-104. C-114: Connects plate of V-105 to primary of T-104. C-119: Connects control R-123 to grid of V-102. C-121: A-f bypass of 115-volt line input. C-125: A-f bypass across meter M-101. C-126: A-f bypass from pin 6 of SO-102 to ground.	

C-116 C-124	CAPACITOR, fixed: paper; 1 sect; .35 uf ±10%; 600 vdcw; HS metal can; 1 15/16" lg x 1" wd x 3/4" h; synthetic oil, "Dykanol G"; 2 solder lug term, 3/8" h, bottom surface of case, spaced 1", phenolic insulation; no internal ground connections; requires two mtg holes w/2 1/8" mtg/c; Dubilier #DYRB6035J.	C-116: Time constant capacitor of limiter rectifier diode load. C-124: Across control circuit of connector SO-101 and J-102, prevents sparking across microphone switch contacts.
C-108 C-109 C-111 C-112 C-113 C-115	CAPACITOR, fixed: electrolytic; 10-10 uf; 450 vdcw; JAN type CE42F100R.	C-108: Input filter capacitor of h-v supply. C-109: Output filter capacitor of h-v supply. C-111: Decoupling filter capacitor for tube V-103. C-112: Decoupling filter capacitor for tube V-102. C-113: Decoupling filter capacitor for tube V-101. C-115: Decoupling filter capacitor for tube V-105.
C-104 C-107	CAPACITOR, fixed: electrolytic; 10 uf; 100 vdcw; JAN type CE63C100H.	C-104: Cathode bypass for V-103. C-107: Cathode bypass for V-104.
C-110 C-120	CAPACITOR, fixed: electrolytic; 50 uf; 25 vdcw; JAN type CE63C500F.	C-110: Filter capacitor for carbon microphone d-c supply. C-120: Filter capacitor for carbon microphone d-c supply.
H-102	CLAMP, tube: vacuum-tube retainer; steel; cadmium plate, cronak dip; 3 bolts used; 1 3/4" diam x 5/8" h o/a; 1 5/16" to 1 7/16" diam; Mallory #VR-3.	Prevents removal, as result of vibration, of V-107 tube from socket.
SO-101	CONNECTOR, female contact: 3 cont, flat, yoke shape, pol by slotted guide; straight type; 5/8" lg x 1 1/8" diam; cylindrical brass body, nickel plate; molded black bakelite; requires 15/16" diam mtg holes; Amphenol #91-PC3F.	Receives Microphone T-50 plug in input circuit.
SO-102	CONNECTOR, female contact: 8 cont, flat, yoke shape, pol by key hole in ctr straight type; 1 1/4" diam x 1 1/8" lg o/a; cylindrical brass body w/cadmium plate; black bakelite insert; mounts in 1 1/4" diam hole, w/1 1/4"-20 thd on mtg end, w/lockwasher and hex nut opposite end 1.387"-20 thread for cable coupling ring; Amphenol #79-PO8F.	Receives Cord CX-141/MRQ-2.
SO-103	CONNECTOR, male contact: 8 cont, round, pol by male key-shaped guide pin in ctr; straight type; 1 1/4" diam x 1 1/8" lg o/a; cylindrical brass body w/cadmium plate; black bakelite insert; mounts in 1 1/4" diam hole, w/1 1/4"-20 thd on mtg end, w/lockwasher and hex nut opposite end 1.387"-20 thread for cable coupling ring; Amphenol #79-PO8M-1.	Receives Cord CD-764 from transmitter.
	DIAL: knob—black bakelite skirt—brass, black enamel; round shape; skirt 1 1/2" diam, knob 1 1/8" diam x 7/8" d; mounts on 1/4" diam shaft w/two #8/32 cup point set screws 90 deg apart; markings read 0 to 9 in counterclockwise direction, 360 deg line below numbers; knob—Midwest MLD #S-308F; skirt—Croname #61-059 B&W #27-47.	Control knobs for input level of dynamic and carbon microphone.
H-101	FASTENER, Dzus: Dzus type; cabinet; steel, cadmium plate w/cronak; 3/4" wd x 1" lg o/a; requires 5/16" diam hole for stud; spring catch requires ctr hole diam of 5/8" with 2 1/8" diam holes on 1" mtg/c; Shakeproof part #SP-W-5-15.	Fastens front panel and chassis assembly to cabinet.

3. Identification Table of Parts for Speech Amplifier BC-614-H—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
J-101	JACK, telephone: Sig C type JK-34-A; 2 cond plug .25" diam; 1¼" lg x 1" wd x ¾" h; J1 contact arrangement; hex mtg nut ⅜"-32; ⅜" mtg hole diam; Sig C dwg #SC-D-2339 and Sig C spec 71-857.	Receives telegraph key	
J-102	JACK, telephone: 3 cond plug .205" diam; 3⅜" lg x ¾" w x ⅜" h; cont arrangement J7; includes 1⅜" hex nut, 1 flat washer, 1 internal tooth lockwasher; ⅜" diam mtg hole; Carter Parts Co. part #X918.	Receives Microphone T-17 plug	
LM-101	LAMP, incandescent: Sig C Lamp LM-27; 6-8 v, .25 amp; T-3, ¼" clear; 1³⁄₁₆" lg; miniature bayonet base; C-2 tungsten fil; burn any position; Mazda #44.	Panel bulb for indicating presence of primary power to speech amplifier.	2Z5927
L-101	LIGHT, indicator: w/lens; ½" diam, red, faceted lens; miniature bayonet base; open frame; steel, cadmium plate; 2" lg x 1" diam; ¹¹⁄₁₆" diam hole required, panel thickness not to exceed ¼"; socket mtd in horizontal position, lamp replaceable from front of panel: thd type jewel; two solder lug term on opposite sides of base of socket; Dialco type #810B-431.	Panel light bracket with socket and lens to hold power on indicator lamp.	
M-101	METER, ammeter: DC; milliamperes; JAN type MR26W300DCMA; U. S. Army spec 71-3159 and JAN-I-6.	Indicates plate and grid current drawn by modulator tubes in transmitter.	
A-101 A-102 A-103 A-104	MOUNT, vibration: square mtg; 24 pounds; 1¹⁄₁₆" h x 2⅜" sq o/a; rubber, plate form, 1½" diam x ⅝" thk; sleeve, steel, hole .257" diam; mtg plate, holder style, square; 4 mtg holes, .196" diam, 1¹⁵⁄₁₆" sq mtg/c; Lord #153PH-24.	Protect speech amplifier from excessive vibration.	
CH-101	REACTOR, filter: smoothing choke; one sect; 29 hy, 25 ma DC; 525 ohms DC; 1500 v RMS; HS metal case; 3¹³⁄₁₆" lg x 2½" wd x 2⅜" d; 4 mtg studs #6-32 x ½" lg on 1¹¹⁄₁₆" x 1¹³⁄₁₆" mtg/c; 2 solder lug term, ceramic/neoprene type, on bottom of case ¾" lg; Chi Trans spec #14567-0; JAN spec JAN-T-27.	Smoothing choke, part of pi filter of h-v power rectifier.	
R-142	RESISTOR, fixed: comp; 51 ohms ±5%; ½ w; JAN type RC20BF510J	Limits d-c current through carbon microphone	
R-104	RESISTOR, fixed: comp; 100 ohms ±10%; ½ w; JAN type RC20BF101K	Part of telephone EE-8 input voltage divider network.	
R-124	RESISTOR, fixed: comp; 330 ohms ±10%; 1 w; JAN type RC20BF331K	Part of carbon microphone d-c current filter network.	
R-115 R-121	RESISTOR, fixed: comp; 470 ohms ±10%; 1 w; JAN type RC30BF471K	R-115: Cathode bias for V-103 R-121: Cathode bias for V-104	
R-136	RESISTOR, fixed: comp; 510 ohms ±5%; ½ w; JAN type RC20BF511J	Cathode bias of sidetone oscillator V-106.	
R-112 R-131	RESISTOR, fixed: comp; 1,000 ohms ±10%; ½ w; JAN type RC20BF102K	R-112: Cathode bias of V-102. R-131: Cathode bias of V-105.	
R-122	RESISTOR, fixed: comp; 2,200 ohms ±10%; ½ w; JAN type RC20BF222K	Cathode bias of V-108.	
R-106 R-139 R-140 R-141	RESISTOR, fixed: comp; 4,700 ohms ±10%; ½ w; JAN type RC20BF472K	R-106: Cathode bias of V-101. R-139: Plate load of V-106 (pin 5). R-140: Plate load of V-106 (pin 2). R-141: Load matching of cathode follower to headset.	

R-146	RESISTOR, fixed: composition; 6,800 ohms ±10%; ½ w; JAN type RC20BF682K.	Part of voltage divider.
R-129	RESISTOR, fixed: comp; 22,000 ohms ±10%; ½ w; JAN type RC20BF223K.	Voltage dropping resistor for plate of V-105.
R-126	RESISTOR, fixed: comp; 22,000 ohms ±10%; 2 w; JAN type RC42BF223K.	H-v dropping.
R-105	RESISTOR, fixed: comp; 27,000 ohms ±5%; ½ w; JAN type RC20BF273J.	Part of telephone EE-8 input voltage divider network.
R-130 R-138	RESISTOR, fixed: comp; 47,000 ohms ±10%; ½ w; JAN type RC20BF473K.	R-130: Plate load resistor of V-105. R-138: Voltage divider for output of sidetone oscillator V-106.
R-127 R-128	RESISTOR, fixed: comp; 47,000 ohms ±10%; 1 w; JAN type RC30BF473K.	R-127: Part of h-v distribution network. R-128: Voltage dropping resistor for V-101.
R-125	RESISTOR, fixed: comp; 75,000 ohms ±5%; 2 w; JAN type RC42BF753J.	Bleeder resistor across h-v to ground.
R-103 R-107 R-113 R-116 R-117	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; JAN type RC20BF104K.	R-103: Part of impedance-matching network in grid circuit of V-101. R-107: Plate load of V-101. R-113: Plate load of V-102. R-116: Plate (pin 5) load of V-103. R-117: Plate (pin 2) load of V-103.
R-108 R-145	RESISTOR, fixed: comp; 220,000 ohms ±10%; ½ w; JAN type RC20BF224K.	R-108: Provides more uniform a-c load for V-101. R-145: Part of voltage divider.
R-110 R-114 R-118 R-119 R-120 R-135	RESISTOR, fixed: comp; 270,000 ohms ±10%; ½ w; JAN type RC20BF274K	R-110: Isolating resistor between T-101 and R-123. R-114: Grid (pin 1) return of V-103. R-118: Grid (pin 4) return of V-104. R-119: Grid (pin 1) return of V-104. R-120: Balancing leg of phase inverter circuit. R-135: Grid (pin 4) return of V-106.
R-109 R-132	RESISTOR, fixed: comp; 560, 000 ohms ±10%; ½ w; JAN type RC20BF564K	R-109: D-c grid return of V-102 to limiter V-105. R-132: Part of time-constant RC filter of limiter rectifier circuit.
R-101	RESISTOR, fixed comp; 1 meg ±10%; ½ w; JAN type RC20BF105K	Grid return of V-101 and part of impedance-matching network in grid circuit of V-101.
R-102	RESISTOR, fixed: comp; 3.3 meg ±5%; ½ w; JAN type RC20BF335J	Grid return and part of impedance-matching network in grid circuit of V-101.
R-133	RESISTOR, fixed: comp; 3.3 meg ±10%; ½ w; JAN type RC20BF335K	Diode load for V-105.
R-137	RESISTOR, variable: comp; 100,000 ohms ±20%; 2 w rating at 70°C; 3 solder lug term; 1-1/16" diam x 9/16" thk w/1/8" shaft; enclosed case; sliding brush type; rounded shaft screwdriver slot, metal; ¼" diam, ⅜" lg; clockwise log taper, resistance at 35%=4000 ohms; 50%=10,000 ohms; 65%=30,000 ohms; cont arm insulated from case, w/o OFF position; ⅜" lg bushing, ⅜" diam, 32 thd per inch, no nonturn device; AB #J4-A-1042, SD-3032; U. S. Army spec 71-3064.	Sidetone volume control.

3. Identification Table of Parts for Speech Amplifier BC-614-H—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R-134	RESISTOR, variable: comp; 500,000 ohms ±20%; 2 w rating at 70°C; 3 solder lug term; 1⅞" diam x ⅝" thk w/⅛" shaft; enclosed case; sliding brush type; rounded shaft, screwdriver slot; metal; ¼" diam, ⅝" lg; clockwise log taper, resistance at 35%=20,000 ohms; 50%=50,000 ohms; 65%=150,000 ohms; cont arm insulated from case, w/o OFF position; ⅜" lg bushing, ⅜" diam, 32 threads per inch; no nonturn device; AB #J4-A-5042; U. S. Army spec 71-3064.	Modulation limiter control.	
R-111 R-123	RESISTOR, variable: comp; 1 meg ±20%; 2 w rating at 70°C; 3 solder lug term; 1⅞" diam x ⅝" thk w/⅜" lg shaft; enclosed case; sliding brush type; rounded metal shaft, ⅜" lg, ¼" diam; clockwise log taper, resistance at 35%=40,000 ohms; 50%=100,000 ohms; 65%=300,000 ohms; cont arm insulated from case, w/o OFF position; ⅜" lg bushing, ⅜" diam, 32 threads per inch; no nonturn device; AB #J4-A-1052, P3048; U. S. Army spec 71-3064.	R-111: Volume control for T-50 microphone input. R-123: Volume control for T-17 microphone input.	
X-101 through X-106 X-108	SOCKET, tube: Navy type #49380S; 8 cont octal; one piece saddle mtg; two ⅛" diam mtg holes on 1½" ctr, 1⅛" diam cutout required for body; round, mica filled bakelite 1¼" wd x ½" thk, excluding term; unmarked, Cinch #T9880-W1.	Tube sockets for V-101 through V-106 and V-108.	
X-107	SOCKET, tube: 4 cont medium; one piece steel plate molded to socket body; two ⅛" diam mtg holes on 1½" mtg/c; round body, mica filled bakelite, 1⅛" diam x ⅜" thk excluding term; unmarked; Amphenol part #M1P4T w/style #4 contacts.	Tube socket for V-107.	
T-102	TRANSFORMER, AF: plate coupling type; push-pull output to line; pri 18,000 ohms impedance, secd 500 ohms impedance, maximum DC current of pri 12 ma; test v=1750 v peak between windings and case; upright shielded case, 3" h x 2⅜" wd x 2⅜" d o/a; 1 w; turns ratio 6:1; 1 db between 150 and 5000 cps; 5 term mounted on base, ceramic/neoprene type; four #6-32 mtg studs on 1⅝" x 1⅝" mtg/c; Chi Trans spec #14570.0; JAN spec JAN-T-27.	Couples push-pull plates of output tube (V-104) to 500-ohm line.	
T-101	TRANSFORMER, AF: input type; high-impedance output microphone transformers; pri impedance=200 ohms, secd impedance=200 ohms; break-down voltage to case 500 v RMS; upright shielded case; 2⅛" h x 2¼" wd x 1⅝" d; turns ratio=1:1; ±1 db between 150 to 5000 cps; 4 term mounted on base, ceramic/neoprene type; 2 holes ⅜" diam on 1⅞" mtg/c; Chi Trans spec #14568-0; JAN spec JAN-T-27.	Couples microphone T-17 to grid of V-102.	
T-104	TRANSFORMER, AF: plate coupling type; plate-to-diode, push-pull winding; pri impedance=10,000 ohms (no DC current thru pri), secd impedance 40,000 ohms, CT; 1250 v peak, test v; upright shielded case; 2⅛" h x 2¼" wd x 1⅝" d; ±1 db between 150 and 5000 cps; electrostatic shield between pri and secd; 5 term mounted on base, ceramic/neoprene type; 2 holes ⅜" diam on 1⅞" mtg/c; Chi Trans spec #14569-1; JAN spec JAN-T-27.	Couples plate of triode section of limiter amplifier V-105 to diode plates of same tube.	

T-103	TRANSFORMER, power: filament and plate type; 115 v, 60 cps, single ph input; 3 output windings; secd #1, 5 v at 2 amp; secd #2, 6.3 v at 3 amp; secd #3, 500 v at 0.025 amp CT, break-down v between windings and to case, 1500 v RMS; potted; HS metal case; 3⅞″ h x 3 3/16″ wd x 2 15/16″ d; 10 term mounted on base; ceramic/neoprene type; four #8/32 mtg studs on 2⅛″ x 2⅜″ mtg/c; Chi Trans spec #14566-1, case style type #MD-3832; JAN spec JAN-T-27	Supplies all filament power and hv to rectifier of power supply.	
V-102 V-108	TUBE, electron: triode; JAN type 6J5	V-102: Second audio amplifier V-108: Sidetone amplifier.	2J6J5
V-103 V-104 V-106	TUBE, electron: JAN type 6SN7GT; dual triode	V-103: Third audio amplifier and phase inverter V-104: Fourth audio amplifier. V-106: Sidetone oscillator.	2J6SN7GT
V-101	TUBE, electron: JAN type 6SQ7; duo-diode high-mu triode	First audio amplifier	2J6SQ7
V-105	TUBE, electron: JAN type 6SR7; duo-diode, low-mu triode	Modulation limiter	2J6SR7
V-107	TUBE, electron: JAN type 80; duo-diode	Rectifier for power supply	2J80

Page 193. Table IX. Add the following table after table IX*b*:

b. 1. Speech Amplifier BC-614-H:

Component	Ref. symbol	Windings or terminals	D-c resistance (in ohms)	Other quantities
Audio transformer	T-101	1 to 2; 3 to 4	15	Impedance, 200 ohms (ac).
			18	Impedance, 200 ohms (ac).
Audio transformer	T-102	1 to 3;	800	Impedance, 18,000 ohms (ac).
		2 to 3; or 1 to 2;	400	Impedance, 9,000 ohms (ac).
		4 to 5	20	Impedance, 500 ohms (ac).
Power transformer	T-103	1 to 2;	15	115 v ac input 5 v at 2 amp.
		3 to 4;	0	6.3 v at 2 amp.
		5 to 7;	0	500 v at 25 ma.
		8 to 10;	1, 000	250 v at 25 ma.
		8 to 9; or 9 to 10	500	
Audio transformer	T-104	2 to 3;	700	Impedance, 10,000 ohms (ac).
		5 to 8;	2, 000	Impedance, 40,000 ohms (ac).
		5 to 6; or 7 to 8	1, 000	Impedance, 20,000 ohms (ac).
Filter choke	CH-101		550	29 hy, 25 ma.

[AG 300.7 (5 Oct 50)]

By order of the Secretary of the Army:

J. LAWTON COLLINS
Chief of Staff, United States Army

Official:
EDWARD F. WITSELL
Major General, USA
The Adjutant General

Distribution:

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For explanation of distribution formula, see SR 310-90-1.

U. S. GOVERNMENT PRINTING OFFICE: 1950

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TM 11-281

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RADIO SETS SCR-399-A AND SCR-499-A

WAR DEPARTMENT • MARCH 1945

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Washington 25, D. C., 31 March 1945

TM 11–281, Radio Sets SCR–399–A and SCR–499–A, is published for the information and guidance of all concerned.

[AG 300.7 (8 Jan 45)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff

OFFICIAL:
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Major General
The Adjutant General

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Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

LIST OF TABLES

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, crowbars, heavy tools.

2. Cut — Use axes, handaxes, machetes.

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

4. Explosives — Use firearms, grenades, TNT.

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 — Crystals, meters, plugs, tubes, tuning controls, capacitors, resistors, sockets, insulators, microphones, headsets, relays, gas engine, and generator.

2. Cut — Cords, wiring, and cables.

3. Burn — Circuit labels, technical manuals, all papers, cords, wiring, cables, capacitors, resistors, and nameplates.

4. Bend — Antenna sections, panels, mounting, and nameplates.

5. Bury or scatter — All of the above pieces after breaking and burning.

DESTROY EVERYTHING

SAFETY NOTICE

Voltages as high as 2,600 volts are used in the operation of this equipment. These voltages are dangerous to life.

Do not change tubes or make adjustments inside the set with the high voltage supply ON.

All panels giving access to voltages above 450 volts are provided with interlocks to shut off the dynamotor when opened. A few service checks must be made inside the set with the high voltage on. When making these checks, always have the immediate presence and assistance of another person capable of rendering aid. Keep one hand in your pocket while making high voltage measurements. This will prevent touching the electrical circuit with more than one part of the body at one time.

Be sure that high-voltage plate circuits are dead before performing preventive maintenance on this equipment. High-voltage capacitors in power supplies must be discharged manually before performing preventive maintenance operations.

Servicing should be done with the vehicular battery circuit open. Shorting this battery circuit will cause a flash and severe burns unless the power is turned off.

TL 15339

Radio-frequency voltages as high as 25,000 volts may develop on the antenna of this radio set. Do not touch the antenna while the set is turned on.

Do not add gasoline to the vehicle fuel tank when the transmitter is on. Radio-frequency voltage may cause a spark resulting in an explosion. Turn off the radio transmitter and KEEP it off until refueling is finished.

Do not add gasoline to the vehicle fuel tank when the transmitter is on. Radio-frequency voltage present on the chassis of the vehicle may cause a spark resulting in an explosion. Turn off the radio transmitter and KEEP it off until refueling is finished.

1. Rescue

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

2. Symptoms

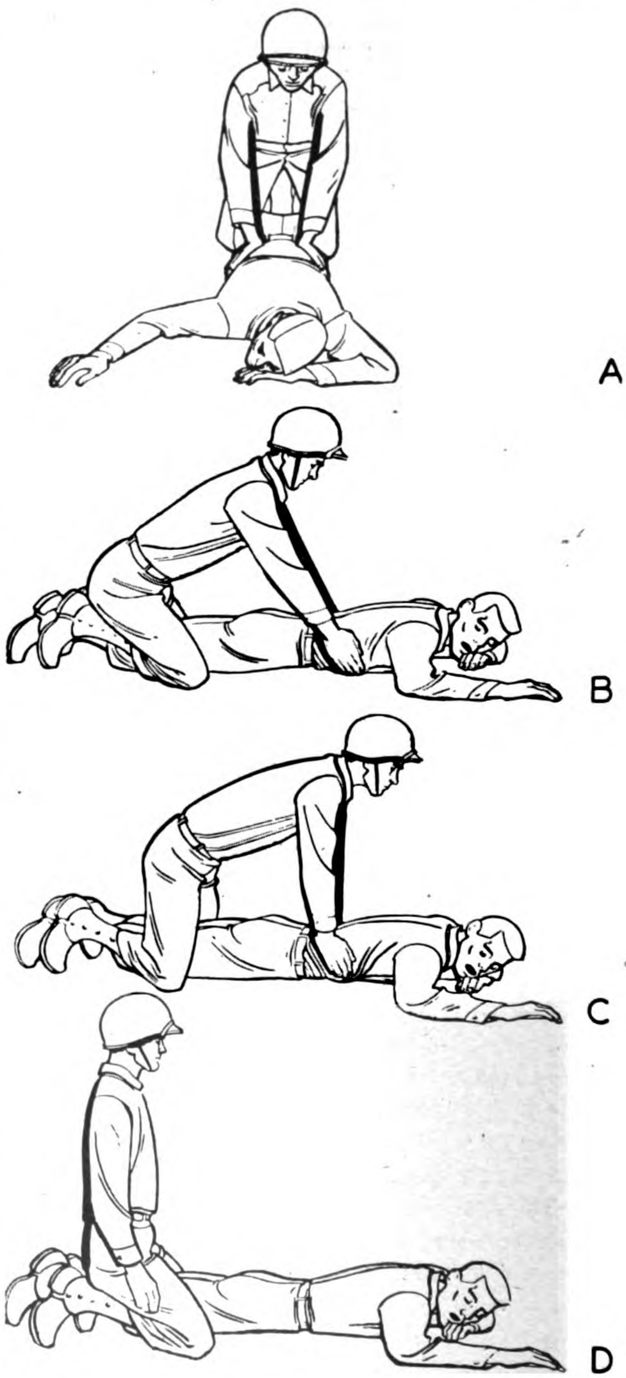
a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breathing center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent, and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

3. Treatment

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only,* remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth to mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the



TL 15338A

hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing, as shown in *A* and *B*.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such a manner that the—

(1) Operator's arms and thighs will be vertical while applying pressure on the small of the victim's back (*C*).

(2) Operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib.

(3) Heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim (*A*).

(4) Operator's elbows are straight and locked.

f. The resuscitation procedure is as follows:

(1) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(2) Swing back, suddenly releasing pressure, and sit on the heels (*D*).

(3) After 2 seconds' rest, swing forward again positioning the hands, and apply pressure for another second (*B* and *C*).

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4 seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing, or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

4. Relieving Operator

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure that he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates to the operator that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

5. Stimulants

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostrils for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

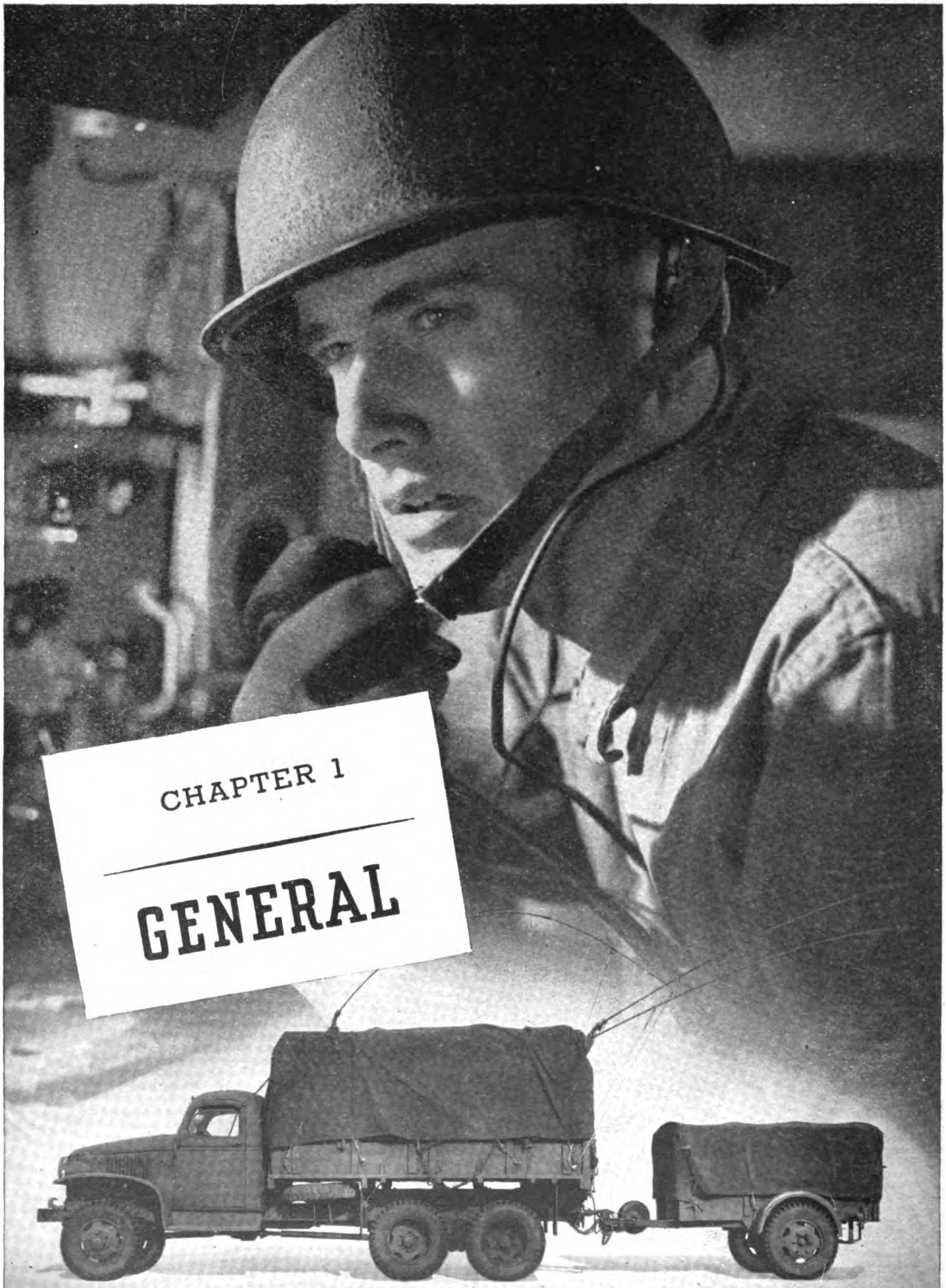
b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. DO NOT GIVE ANY LIQUIDS TO AN UNCONSCIOUS VICTIM.

Cautions: 1. After the victim revives, keep him *lying quietly*. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

2. Keep the victim lying flat on his back, with

his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

3. A resuscitated victim must be watched carefully as he may suddenly stop breathing. **NEVER LEAVE A RESUSCITATED PERSON ALONE UNTIL IT IS *CERTAIN* THAT HE IS FULLY CONSCIOUS AND BREATHING NORMALLY.**


CHAPTER 1
GENERAL

This manual supersedes TM 11-281, 4 September 1943; TB 11-281-1, 13 October 1944, and TB 11-281-2, 25 November 1944.

CHAPTER I

GENERAL

Section I. DESCRIPTION

1. General

a. This manual covers Radio Sets SCR-399-A and SCR-499-A. There are no differences in the operating components and power sources of the two sets, but Radio Set SCR-399-A is usually installed as a mobile station (fig. 1) and Radio Set SCR-499-A is ordinarily set up as a fixed station (fig. 2). To facilitate its use as a mobile station, Radio Set SCR-399-A is shipped with the operating components and the power source installed in Shelter HO-17-A and Trailer K-52-( ), respectively. A shelter and trailer are not provided with Radio Set SCR-499-A, since it is not intended for mobile use. Its components are shipped in 23 boxes from which they can be unpacked and set up as a fixed station at any suitable site.

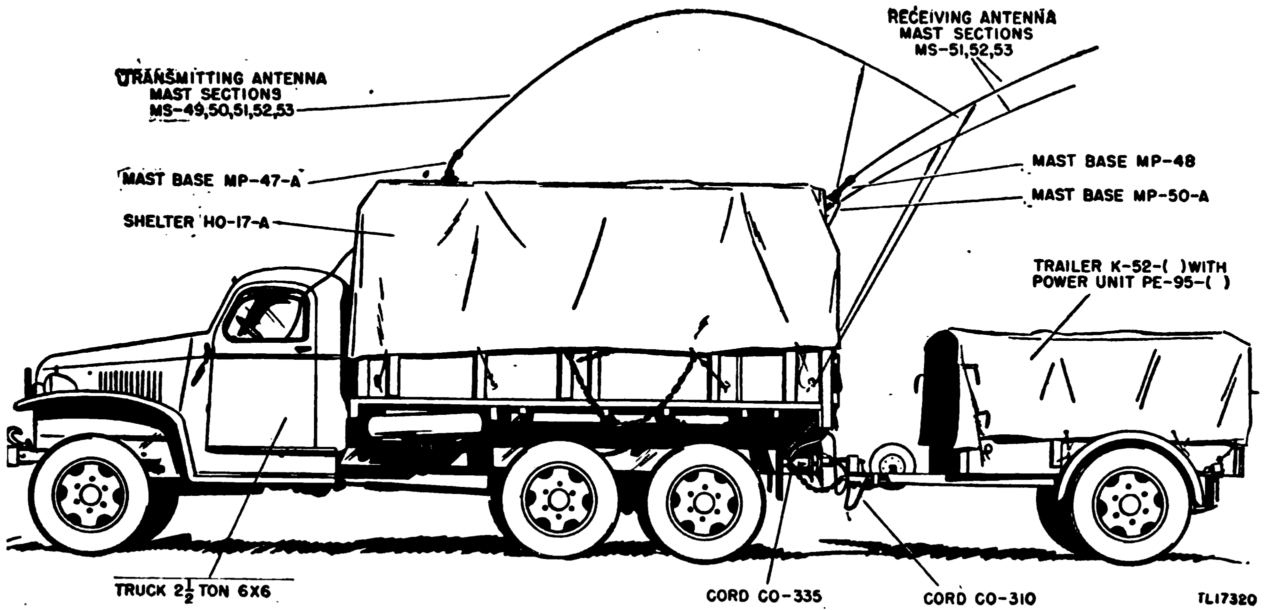


Figure 1. Radio Set SCR-399-A installed as a mobile station.

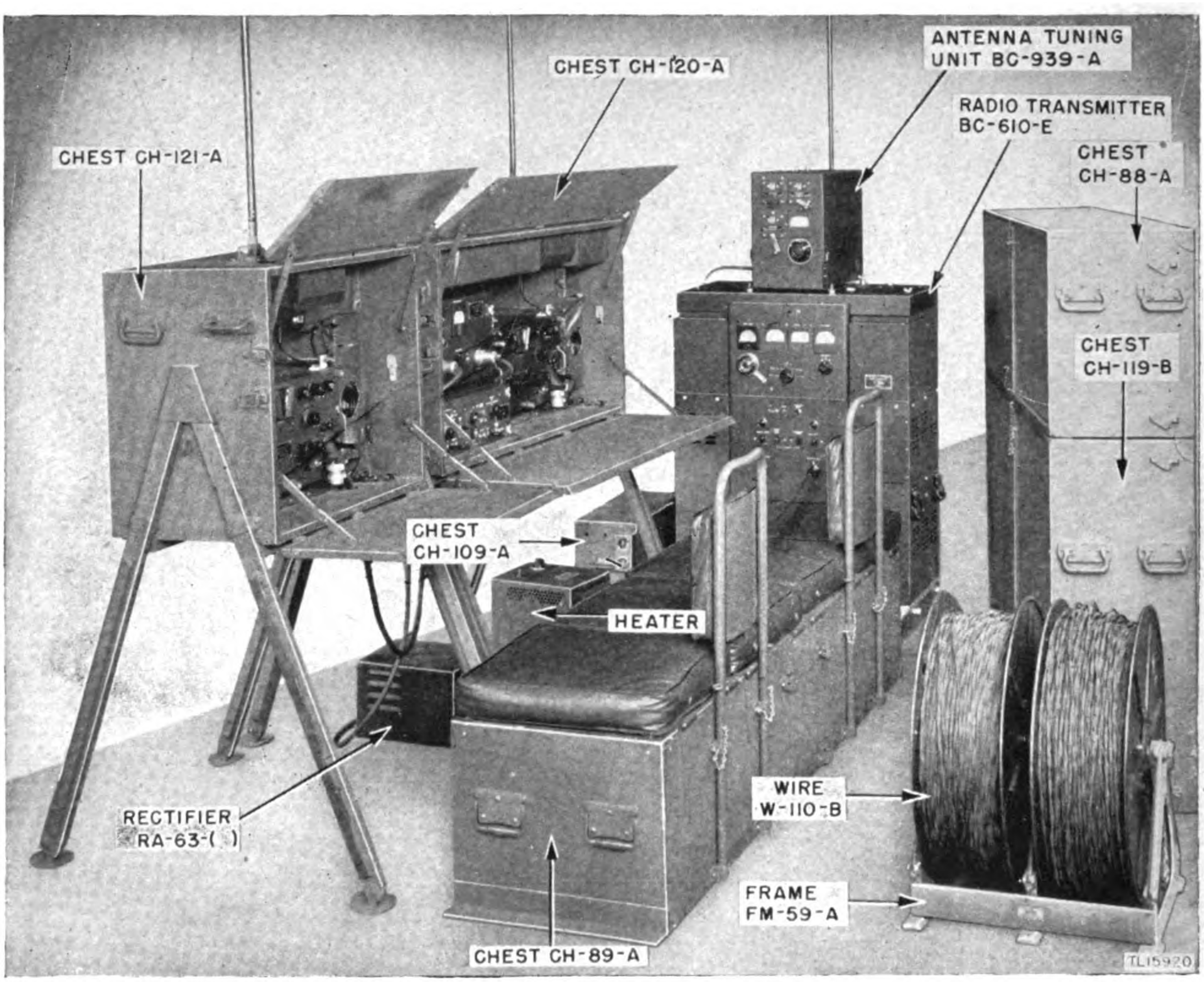


Figure 2. Radio Set SCR-499-A, operating and accessory components arranged as a fixed station.

b. The following Technical Manuals are issued with the radio sets and contain detailed information on the various components as listed below:

TM 11-333, Telephone EE-8-( ).
TM 11-850, Radio Receivers BC-312-( ), BC-314-( ), BC-342-( ), and BC-344-( ).
TM 11-904, Power Unit PE-95-( ).
TM 11-300, Frequency Meter Set SCR-211-( ).
Parts List for Shelter HO-17-A.

c. Trailer K-52-( ) and Power Unit PE-95-( ), used with Radio Set SCR-399-A, are also supplied with Radio Sets SCR-299-C and -D.

d. Official nomenclature followed by ( ) is used in this manual to indicate reference to all models of the item of equipment. Official nomenclature followed by (*) refers to all models included in one Technical Manual. Therefore, Rectifier RA-63-(*) refers to Rectifiers RA-63-A and -C, treated together in this manual.

2. Radio Set SCR-399-A

Radio Set SCR-399-A is a relatively high-power radio communications station. Under all conditions of atmosphere and terrain, the radio set will provide voice or c-w (continuous-wave) communication over a range of more than 100 miles from a stationary position, or while moving at high speed. For mobile use, Shelter HO-17-A should be mounted on a 2½-ton, 6 x 6, cargo truck. (See fig. 1.) Two seats in the truck cab carry the driver and his alternate. In the shelter (fig. 3), two operators may sit at the radio station operating positions. Power Unit PE-95-( ) may be started and stopped by remote control or at the trailer. The transmitting

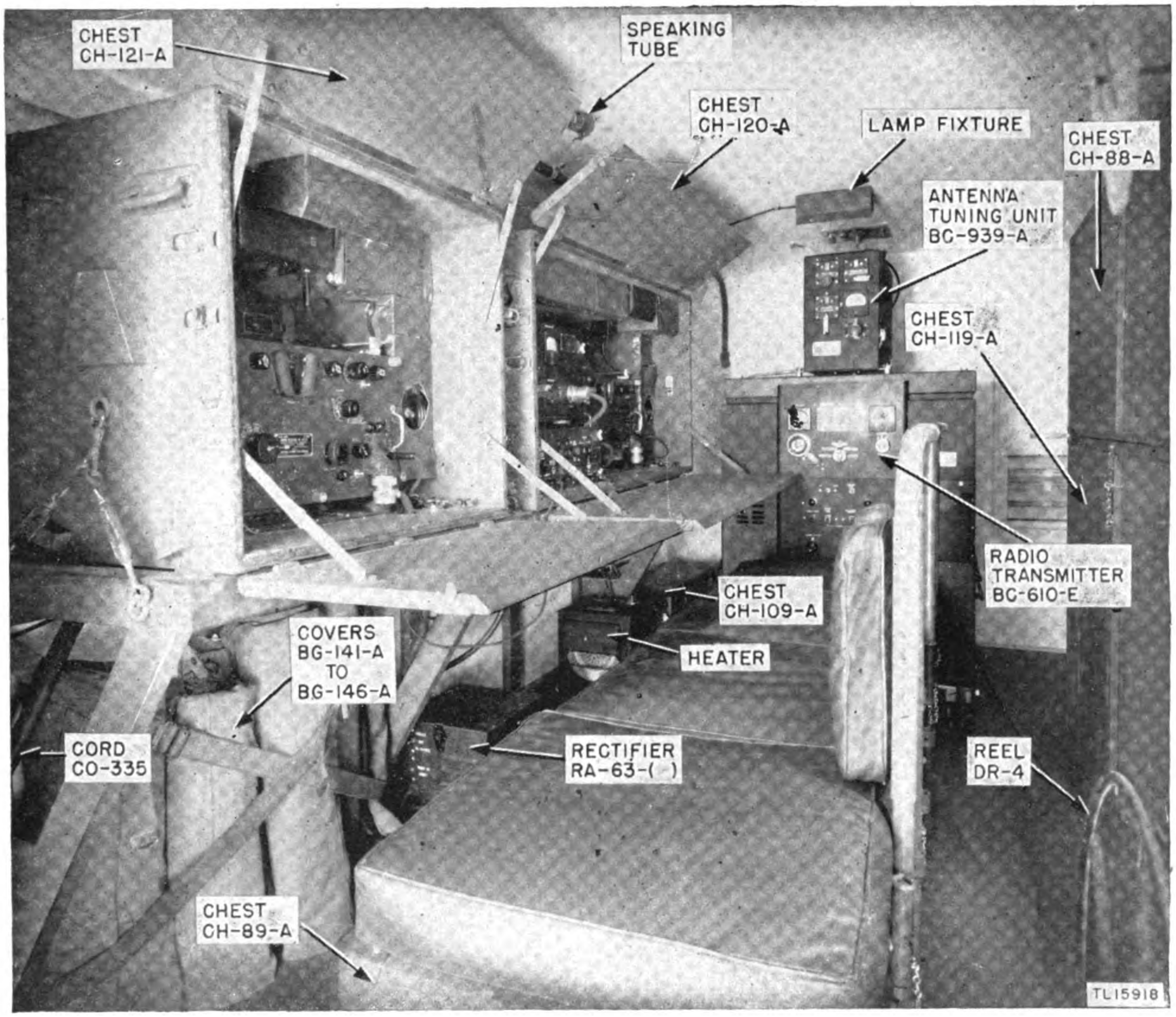


Figure 3. Radio Set SCR–399–A installed in Shelter HO–17–A.

and receiving controls, tuning units, coils, crystals, and spare parts are all within reach of the operating positions. In cold weather, an electric heater maintains moderate temperature within the shelter. In warm weather, the motor-driven heater fan and a ventilating blower provide adequate air circulation. (See fig. 4.) Chest CH–89–A (seat bench) has a 4-inch cushion on each of the four lids covering its spare parts compartments, and provides sleeping quarters for one person. An additional shelter and sleeping quarters can be made with the wooden frame and tarpaulin from the trailer.

3. Radio Set SCR–499–A

The components of Radio Set SCR–499–A are the same as those of Radio Set SCR–399–A, except that a shelter and trailer are not provided. The components can be quickly assembled and set up as a field station in a tent, a shelter, or in the open. The installed radio set can be easily dismantled into a number of component parts, each of which is small enough for air transportation to a new site. Canvas covers are issued to provide protection for components while they are in transit, as well as to protect them if the station is set up in the open.

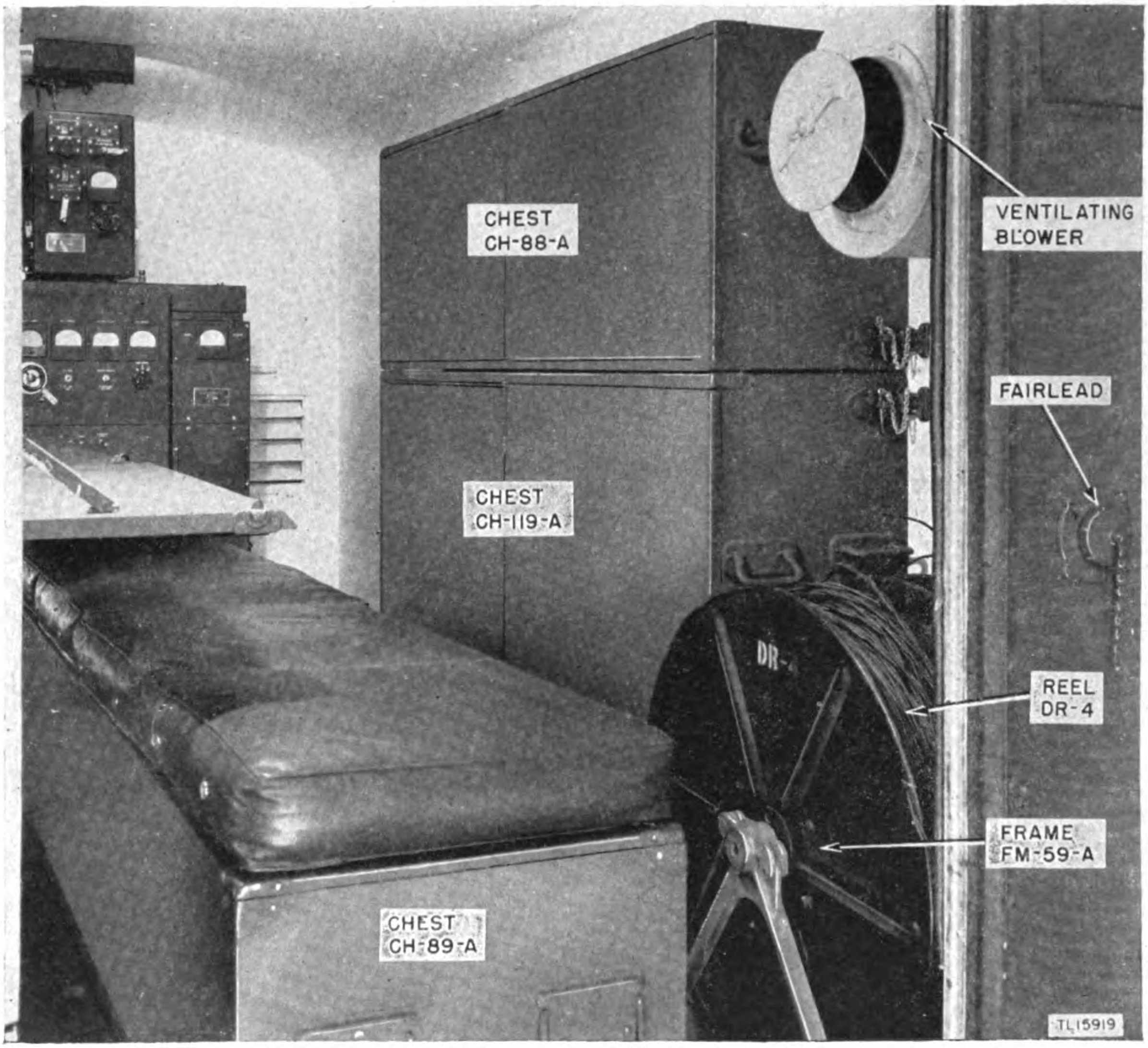


Figure 4. Shelter HO-17-A—interior view of right (or curb) side.

4. Technical Characteristics

a. Radio Transmitter BC-610-E (fig. 5).

Frequency range:[1]	
Three channels (1, 2, and 3)	2 mc to 18 mc
Circuit	master oscillator-power amplifier (mopa)
Types of signals transmitted	c-w and voice
Distance range:[2]	
C-w: Stationary	250 mi
Moving	250 mi
Voice: Stationary	100 mi
Moving	100 mi
Type of modulation	amplitude
Number of tubes	16

[1]Refer to the frequency spectrum chart, figure 6.
[2]Use the best operating frequency for the time of day and season of year.

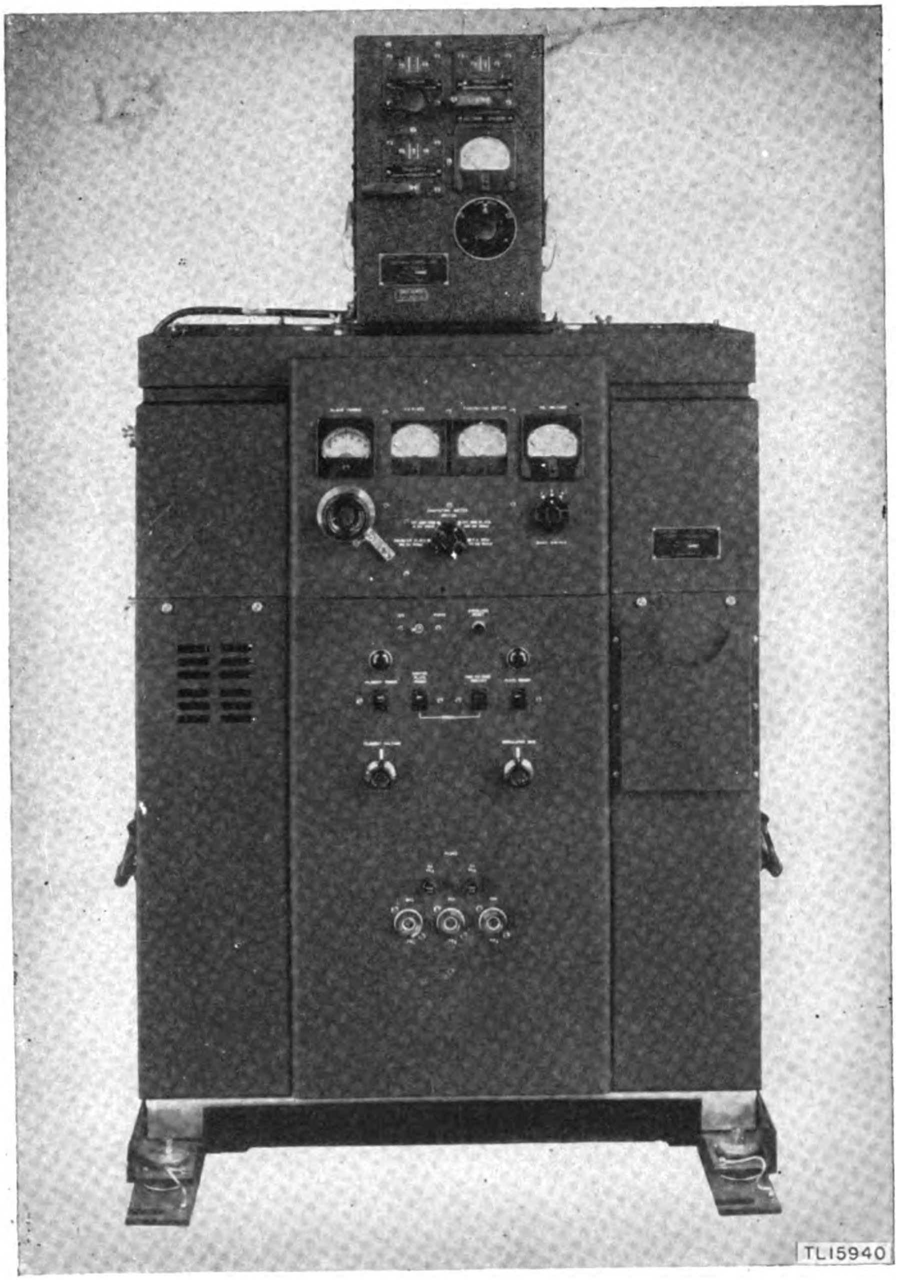


Figure 5. Radio Transmitter BC–610–E with Antenna Tuning Unit BC–939–A in position.

Antennas:

Whip antenna	15 ft long. Consists of Mast Sections MS–49 to MS–53, inclusive
Extended whip antenna	25 ft long. Add 1 or 2 Mast Sections MS–54 to Mast Section MS–53
Straight wire antenna	25-100 ft long
Doublet antenna	kit

Power output:

C-w operation	400 watts (approx)
Voice operation	300 watts (approx)

Power input:	
115-volt, 50/60-cycle ac	1,700-2,000 watts
Power source	PE–95–( ) or commercial
Weight	401 lb

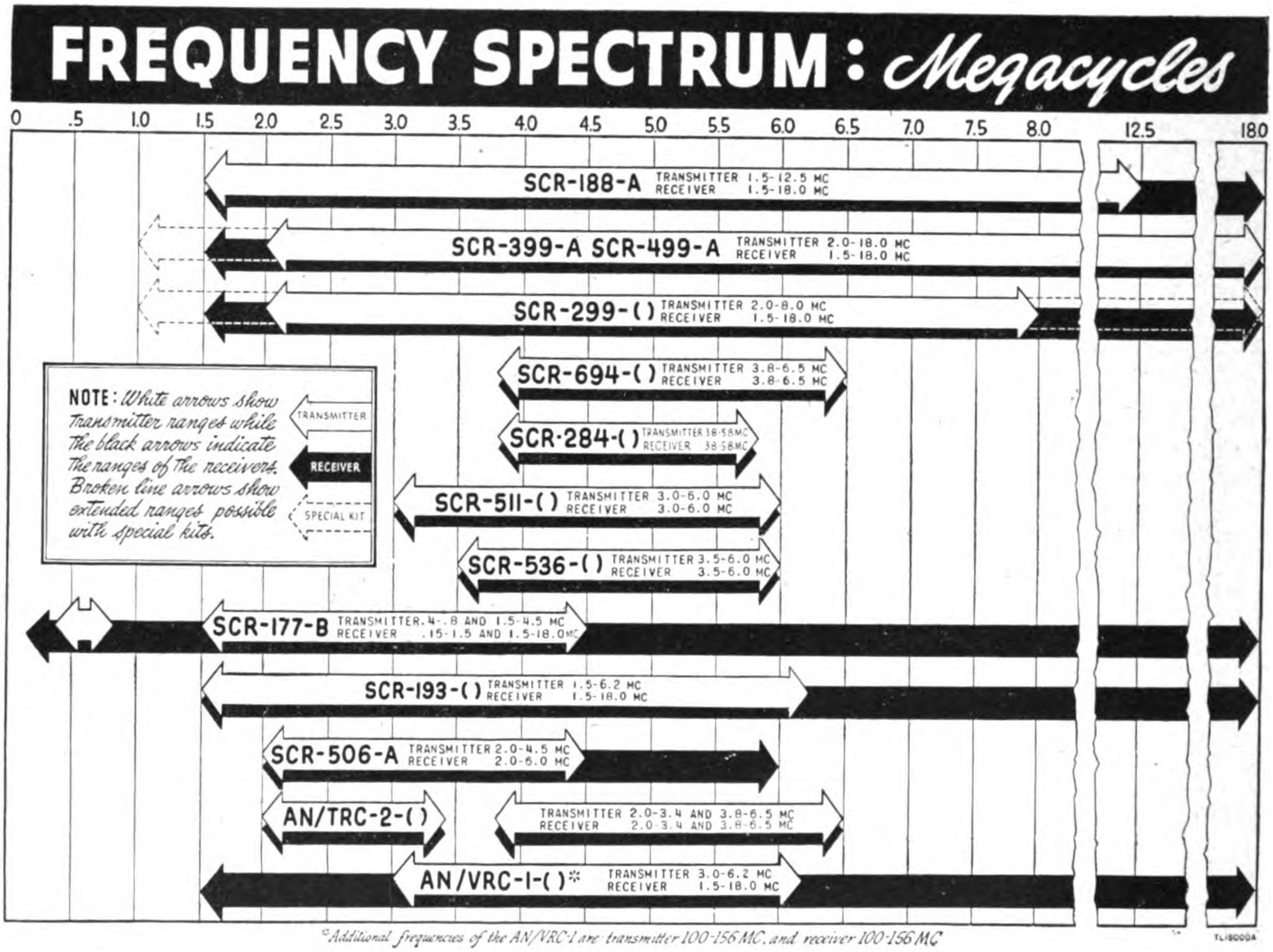


Figure 6. Frequency spectrum chart.

b. RADIO RECEIVERS BC–312–( ) AND BC–342–( ).

Frequency range:	
Band A	1.5 mc to 3 mc
Band B	3 mc to 5 mc
Band C	5 mc to 8 mc
Band D	8 mc to 11 mc
Band E	11 mc to 14 mc
Band F	14 mc to 18 mc
Circuit	superheterodyne
Types of signals which can be received	c-w, tone, and voice
Number of tubes	9
Intermediate frequency	470 kc
Method of calibration	Frequency Meter Set SCR–211–( )
Antenna (whip)	Mast Base MP–48 mounted in Mast Base Bracket MP–50 and Mast Sections MS–51 to MS–53

Power input:	
Radio Receiver BC–312–( )	50-55 watts
Radio Receiver BC–342–( )	70-85 watts
Power source	12-volt battery for Radio Receiver BC–312–( ) 110-volt 50/60 cycle ac for Radio Receiver BC–342–( )
Weight	40-50 lb (each)

5. List of Components and Packaging Data

The following is an alphabetical list of items issued with Radio Sets SCR–399–A and SCR–499–A.

Note. Running spares are for initial issue only and are not to be requisitioned as a kit or group as shown in the list of components.

Radio Set SCR–399–A	*Radio Set SCR–499–A*	*Component*
4	4	Antenna guy assembly (receiver)
2	2	Antenna guy assembly (transmitter)
1	1	Antenna Tuning Unit BC–939–A
1	1	Antenna doublet kit
1	1	Axle RL–27–B
12	12	Battery BA–30; spare
2	2	Battery, storage; 6-volt
2	2	Box BX–19–A
1	1	Box BX–34–B; with crystals
6	0	Bracket for gasoline can
2	2	Brush, high-voltage; for dynamotor of Radio Receiver BC–312–( ); spare
2	2	Brush, low-voltage; for dynamotor of Radio Receiver BC–312–( ); spare
1	1	Bumper clamp (for Cord CO–335)
1	1	Chest CH–88–A (wall)
1	1	Chest CH–89–A (seat bench)
1	1	Chest CH–109–A (12-volt battery)
1	0	Chest CH–112–A
0	1	Chest CH–112–B
1	0	Chest CH–119–A (wall)
0	1	Chest CH–119–B (wall)
1	1	Chest CH–120–A (main operating)
1	1	Chest CH–121–A (auxiliary)
1	1	Cord CX–141/MRQ–2; Junction Box JB–70–A to Speech Amplifier BC–614–E; 3-foot
1	1	Cord CX–143/MRQ–2 (main audio); 55-inch (LS–3 branch 21 inches, BC–342 branch 10 inches)
0	1	Cord CD–201–A; Key J–37 to Junction Box JB–70–A
1	1	Cord CX–140/MRQ–2 (auxiliary audio); 53-inch (BC–312–( ) branch 11 inches)
1	1	Cord CO–313 (a-c extension); 100-foot
1	1	Cord CO–314 (a-c connection); 3-foot
2	2	Cord CO–316 (power and control); 11-foot; 1 in use, 1 spare
1	1	Cord CD–318–A; for Microphone T–30
2	1	Cord CO–335 (power and control); 14-foot; 1 in use, 1 spare (SCR–399–A), no spare (SCR–499–A)
2	2	Cord CD–564 (power); 3-foot; 1 in use, 1 spare
2	2	Cord CD–565 (control and power); 4-foot; 1 in use, 1 spare
2	2	Cord CD–566 (control); 4-foot; 1 in use, 1 spare
4	4	Cord CD–605; for Headset HS–30
1	1	Cord CD–652 (power and control extension); 100-foot
0	1	Cord CD–1117; for Loudspeaker LS–3
1	1	Cord CD–1177 (audio patch); 2-foot
1	1	Cord CD–659 (power); 12-volt battery to receiver; shelter connection; 6-foot

Radio Set SCR–399–A	Radio Set SCR–499–A	Component
1	1	Cord CD–690 (power); 12-volt battery to receiver; field connection; 6-foot
2	2	Cord CD–763 (transmitter power); 4-foot; 1 in use, 1 spare
2	2	Cord CD–764 (transmitter control); 15-foot; 1 in use, 1 spare
1	1	Cover BG–141–A; for Chest CH–89–( )
1	1	Cover BG–142–A; for Chest CH–119–( )
1	1	Cover BG–143–A; for Chest CH–121–( )
1	1	Cover BG–144–A; for Chest CH–88–( )
1	1	Cover BG–145–A; for Chest CH–120–( )
1	1	Cover BG–146–A; for Radio Transmitter BC–610–E and Antenna Tuning Unit BC–939–A
1	1	Counterpoise CP–15–B
2 (sets)	2 (sets)	Crystals in Crystal Holders FT–171–B
6	6	Drums, gasoline; galvanized steel; with handle; capacity 5 gallons
1	1	Frame FM–59–A; for Reels DR–4
1	0	Frame FM–62–A; for spare tire
1	1	Frequency Meter Set SCR–211–( ); with spare tubes and batteries
1	1	Fire extinguisher; Randolph Laboratories model FF–4
6	14	Fuse FU–21–A; for Radio Receivers BC–312–( ) and BC–342–( ); 2 in use, 4 spare (SCR–399–A), 12 spare (SCR–499–A)
4	5	Fuse FU–27; for Radio Receiver BC–342–( ); 1 in use, 3 spare (SCR–399–A), 4 spare (SCR–499–A)
7 (sets)	7 (sets)	Fuses for Radio Transmitter BC–610–E and Speech Amplifier BC–614–E; 1 in use, 6 spare, consisting of— 2—25-ampere fuses 1—20-ampere fuse 1— 5-ampere fuse 1— 3-ampere fuse
7	7	Fuse; 25-ampere; 1 in use, 6 spare (used in Chest CH–109–A)
1	1	Heater, electric; Electromode model AA–15
4	4	Headset HS–30–( ); 2 in use, 2 spare
1	1	Holder for fire extinguisher
1	1	Junction Box JB–60–A
1	1	Junction Box JB–70–A
3	3	Key J–37; 2 in use, 1 spare
1	0	Key J–45
10	7	Lamp; 50-watt; 115-volt; 3 in use, 7 spare for SCR–399–A; 2 in use, 5 spare for SCR–499–A
2	2	Lamp; 50-watt; 12-volt; spare
2	2	Lamp, trouble, emergency; 115-volt; with 25-foot extension cord and 50-watt lamp
1	1	Lamp, trouble, emergency; 12-volt; with 25-foot extension cord and 50-watt lamp
8	8	Lamp LM–27; for radio receivers; 4 spare
2 (sets)		Lamp; for Trailer K–52–( ); spare
1	0	Lamp fixture (shelter)
2	2	Lamp fixture (operating chests)
2	2	Loudspeaker LS–3
2	2	Mast Base MP–47–A; 1 in use, 1 spare
3	3	Mast Base MP–48; 2 in use, 1 spare
0	1	Mast Base Bracket MP–59–A; for Mast Base MP–47–A
3	3	Mast Base Bracket MP–50–A; for Mast Base MP–48; 2 in use, 1 spare
4	4	Mast Section MS–49; 1 in use, 3 spare
4	4	Mast Section MS–50; 1 in use, 3 spare
6	6	Mast Section MS–51; 3 in use, 3 spare
6	6	Mast Section MS–52; 3 in use, 3 spare
6	6	Mast Section MS–53; 3 in use, 3 spare
2	2	Mast Section MS–54
2	2	Microphone T–50; dynamic; 1 in use, 1 spare
1	1	Microphone T–17
1	0	Microphone T–30 (throat)
0	1	Microphone T–45

Radio Set SCR-399-A	Radio Set SCR-499-A	Component
3	3	Nozzle; for gasoline drums
		Parts, spare:
1 (set)	1 (set)	For Radio Transmitter BC-610-E and Speech Amplifier BC-614-E consisting of 33 percent of the number of the following parts used in the radio transmitter and speech amplifier, but not less than 1 each
		Fixed and variable resistors
		Fixed capacitors
		R-f choke coils
1 each	1 each	Every type relay used in Speech Amplifier BC-614-E, Radio Transmitter BC-610-E, and Junction Box JB-70-A
1 each	1 each	Every type switch used, except band switch
20	20	Each ceramic insulator used for the power-amplifier variable capacitor
4	4	Each ceramic insulator used for the power-amplifier coil unit
4	4	Each ceramic spacer used for the power-amplifier coil unit
1 each	1 each	Circuit breaker for Junction Box JB-70-A
7 each	7 each	Every pilot lamp and dial lamp used in Radio Transmitter BC-610-E and Speech Amplifier BC-614-E (For itemized list of resistors, capacitors, and chokes supplied as spares, see the maintenance parts list, par. 198)
1	1	Power Unit PE-95-( ); including tools, 2 batteries (6-volt), and spare parts
1	1	Radio Receiver BC-312-( ); including Mounting FT-162 and 2 Mountings FT-178
1	1	Radio Receiver BC-342-( ); including Mounting FT-162 and 2 Mountings FT-178
1	1	Radio Transmitter BC-610-E; including 24 tuning units, 14 coil units, 2 Capacitors CA-423, and 2 sets tuning charts
1	1	Rectifier RA-63-(*)
2	2	Reels DR-4
1	1	Rope RP-5; 50-foot
1	1	Speech Amplifier BC-614-E
1	0	Shelter HO-17-A (mobile)
1	0	Speaking tube
2	2	Stake GP-8; with 10 feet of copper braid
3	3	Strap ST-19-A
1	0	Table frame; for mounting Chests CH-120-A and CH-121-A in Shelter HO-17-A
3	0	Part List for Shelter HO-17-( )
2	2	TM 11-281; for Radio Sets SCR-399-A and SCR-499-A
2	2	TM 11-904; for Power Unit PE-95-( )
2	2	TM 11-850; for Radio Receivers BC-312-( ) and BC-342-( )
2	2	TM 11-300; for Frequency Meter Set SCR-211-( )
2	2	TM 11-333; for Telephone EE-8-( )
2	2	Telephone EE-8-( )
1	0	Tire and wheel; spare for truck and trailer
1	1	Tool equipment TE-48
1	1	Set tools and repair equipment consisting of—
		1 Analyzer BC-1052-E
		1 can carbon tetrachloride
		1 drill, electric; 110-volt ac; ½-inch
		1 drill, twist; carbon-steel; ⅜-inch
		1 drill, twist; carbon-steel; ½-inch
		2 pair pliers
		1 hammer, claw; 16-ounce
		1 set hardware, assorted
		1 hydrometer; for storage batteries
		2 battery lift strap
		5 pounds solder, rosin-core
		1 can machine oil
		1 Soldering Iron TL-120
		3 rolls tape, friction; ½-inch

Radio Set SCR–399–A	*Radio Set SCR–499–A*	*Component*
		1 roll tape, rubber; ½-inch
		1 Torch TL–130
		2 No. 6–32 Allen head wrench
		2 No. 8–32 Allen head wrench
		2 Allen head wrench for ¼-inch screw
		1 sheet crocus cloth
8	8	Tube VT–65–A (JAN–6C5G); for Radio Receivers BC–312–( ) and BC–342–( ); 4 installed, 4 spare
4	4	Tube VT–66–A (JAN–6F6G); for Radio Receivers BC–312–( ) and BC–342–( ); 2 installed, 2 spare
16	16	Tube VT–86–A (JAN–6K7G); for Radio Receivers BC–312–( ) and BC–342–( ); 8 installed, 8 spare
4	4	Tube VT–87–A (JAN–6L7G); for Radio Receivers BC–312–( ) and BC–342–( ); 2 installed, 2 spare
4	4	Tube VT–88–A (JAN–6R7G); for Radio Receivers BC–312–( ) and BC–342–( ); 2 installed, 2 spare
2	2	Tube VT–97 (JAN–5W4); for Radio Receiver BC–342–( ); 1 installed, 1 spare
6	12	Tube VT–46–A (JAN–866–A/866); for Radio Transmitter BC–610–E; 2 installed, 4 spare (SCR–399–A), 10 spare (SCR–499–A)
4	7	Tube VT–95 (JAN–2A3); for Radio Transmitter BC–610–E; 2 installed, 2 spare (SCR–399–A), 5 spare (SCR–499–A)
6	12	Tube VT–100 (JAN–807); for Radio Transmitter BC–610–E; 2 installed, 4 spare (SCR–399–A), 10 spare (SCR–499–A)
2	4	Tube VT–107 (JAN–6V6); for Radio Transmitter BC–610–E; 1 installed, 1 spare (SCR–399–A), 3 spare (SCR–499–A)
2	4	Tube VT–115 (JAN–6L6); for Radio Transmitter BC–610–E; 1 installed, 1 spare (SCR–399–A), 3 spare (SCR–499–A)
6	10	Tube VT–139 (JAN–OD3/VR–150); for Radio Transmitter BC–610–E; 3 installed, 3 spare (SCR–399–A), 7 spare (SCR–499–A)
5	8	Tube VT–145 (JAN–5Z3); for Radio Transmitter BC–610–E; 2 installed, 3 spare (SCR–399–A), 6 spare (SCR–499–A)
5	8	Tube VT–218 (JAN–100–TH); for Radio Transmitter BC–610–E; 2 installed, 3 spare (SCR–399–A), 6 spare (SCR–499–A)
2	4	Tube VT–220 (JAN–250–TH); for Radio Transmitter BC–610–E; 1 installed, 1 spare (SCR–399–A), 3 spare (SCR–499–A)
2	4	Tube VT–80 (JAN–80); for Speech Amplifier BC–614–E; 1 installed, 1 spare (SCR–399–A), 3 spare (SCR–499–A)
2	3	Tube VT–103 (JAN–6SQ7); for Speech Amplifier BC–614–E; 1 installed, 1 spare (SCR–399–A), 2 spare (SCR–499–A)
2	3	Tube VT–233 (JAN–6SR7); for Speech Amplifier BC–614–E; 1 installed, 1 spare (SCR–399–A), 2 spare (SCR–499–A)
4	7	Tube VT–94 (JAN–6J5); for Speech Amplifier BC–614–E; 2 installed, 2 spare (SCR–399–A), 5 spare (SCR–499–A)
6	10	Tube VT–231 (JAN–6SN7GT); for Speech Amplifier BC–614–E; 3 installed, 3 spare (SCR–399–A), 7 spare (SCR–499–A)
1	1	Typewriter, portable; with telegrapher's keyboard; includes case
1	0	Trailer K–52–( )
1	1	Wire, antenna; 100-foot
1	1	Wire W–110–B (on Reels DR–4); 4,800-foot.

See paragraph 27 for packaging data on Radio Set SCR–399–A and Table II (par. 28) for data on Radio Set SCR–499–A.

6. Major Components

The major components of Radio Set SCR–399–A are furnished installed in a shelter and trailer. Shelter HO–17–A contains the components which comprise the radio station, and should be mounted on a 2½-ton, 6 x 6 cargo truck for mobile use. Trailer K–52–( ) contains Power Unit PE–95–( ). The major components of the set are:

- Radio Transmitter BC–610–E (par. 7)
- Speech Amplifier BC–614–E (par. 8)
- Junction Box JB–70–A (par. 9)
- Radio Receivers BC–342–( ) and BC–312–( ) (par. 10)

Antenna Tuning Unit BC-939-A (par. 11)

Antenna (par. 12)
Power Unit PE-95-( ) (par. 13)

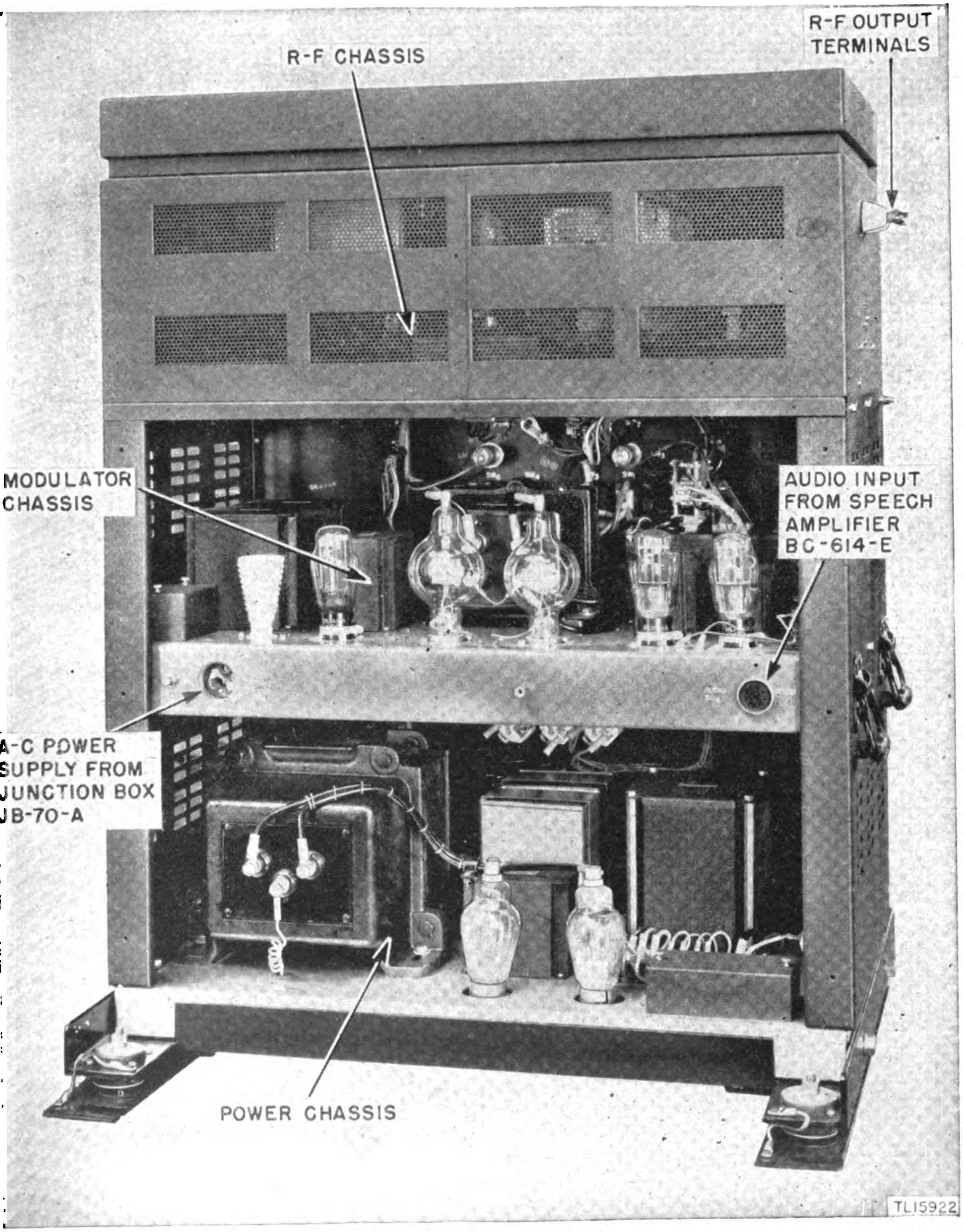


Figure 7. Radio Transmitter BC-610-E chassis assembly—rear view.

7. Radio Transmitter BC–610–E (fig. 7)

a. The transmitter assembly is made up of three chassis. The top chassis is referred to as the r-f (radio-frequency) section and includes all of the r-f components. The center chassis is called the modulator section, since it contains most of the audio and modulator equipment. The bottom chassis includes the high-voltage power-supply and overload relay. It is called the power-supply section. The three chassis are assembled into a sheet steel cabinet with a front panel upon which the external controls and metering instruments are mounted. (See fig. 5.)

b. The transmitter is bolted to the cradle frame shock-mounting base which is anchored to the floor with wrench nuts. The weight of the transmitter is 450 pounds; installed, the over-all weight is approximately 500 pounds.

c. The frequency range of the transmitter is 2 to 18 megacycles. This wide frequency range is covered by means of three sets of plug-in tuning units, eight to a set; two sets of plug-in coil units, seven to a set; and Capacitor CA–423. Each tuning unit and associated coil unit, or coil unit with capacitor, covers a portion of the range. (See table III.) The frequency is controlled by the master oscillator or the crystal oscillator, depending on the position of the M.O.-XTAL switch on the tuning unit. The transmitter can be used for radiotelegraph and radiotelephone communication. At frequencies below 8 megacycles the power output of the transmitter exceeds 400 watts on continuous wave and 300 watts on voice. The power output is somewhat less at higher frequencies. The transmitter will operate satisfactorily with input power of 1,700 to 2,000 watts from a 115-volt, 50/60 cycle a-c (alternating-current) source.

8. Speech Amplifier BC–614–E (fig. 8)

a. The amplifier is shock-mounted to the top

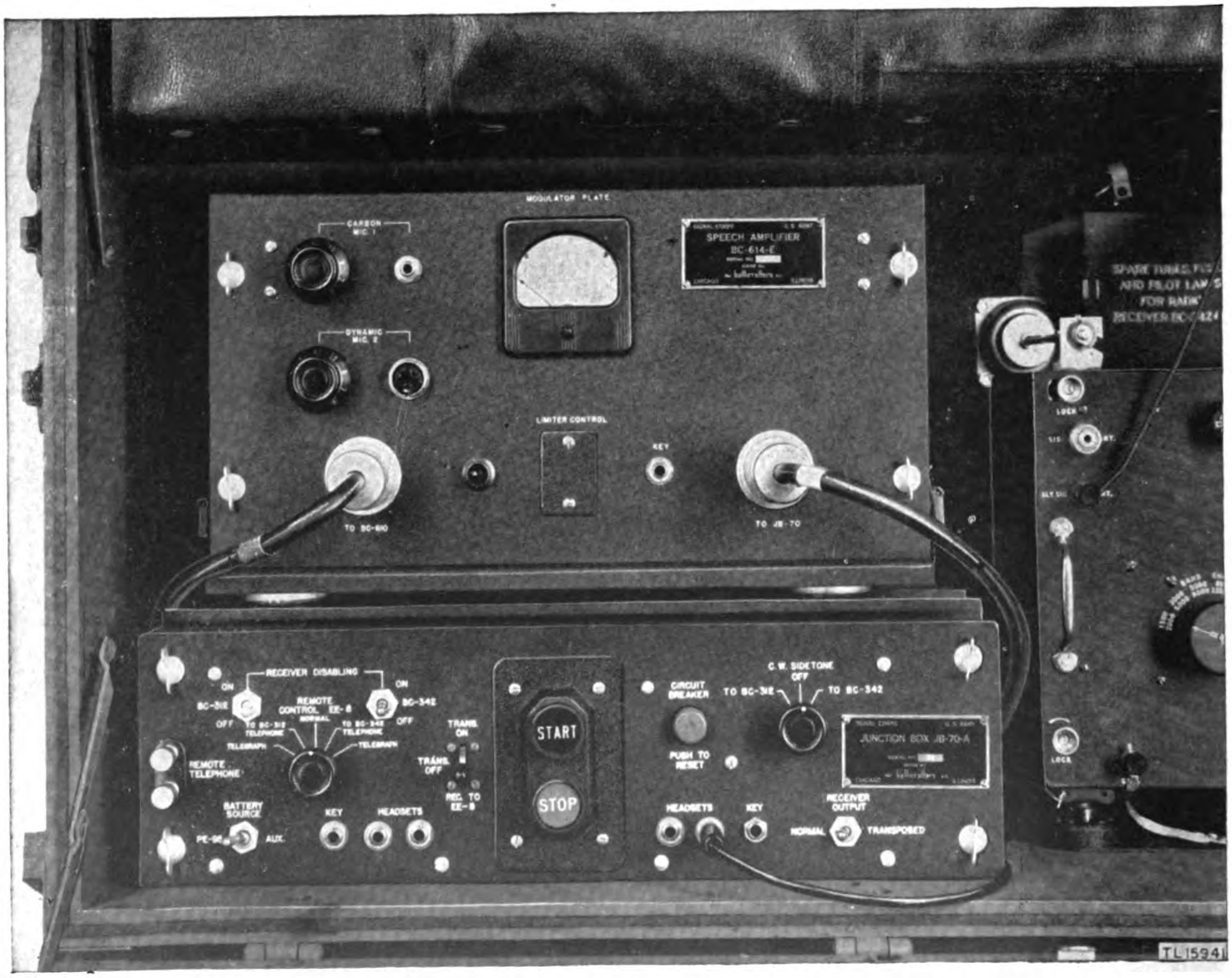


Figure 8. Speech Amplifier BC–614–E and Junction Box JB–70–A in Chest CH–120–A — front view.

of Junction Box JB–70–A in Chest CH–120–A. For convenient removal, four snap fasteners are used to anchor the speech amplifier to its shock-mounting. The weight of the speech amplifier, less shock-mount, is approximately 31 pounds.

b. The speech amplifier raises the microphone output to a level suitable for voice modulation of the transmitter. It also provides sidetone for headset monitoring of c-w transmissions. Speech Amplifier BC–614–E contains its own plate and filament supply unit which draws approximately 40 watts from the 115-volt, 50/60-cycle, a-c source.

9. Junction Box JB–70–A

a. The junction box is a junction point for most of the cords and cables which interconnect the various components. Power and control cords plug into either the bottom (through the bottom of Chest CH–120–A) or the side of the junction box. Key and headset connections are plugged into the jacks on the front panel.

b. Junction Box JB–70–A serves as a control center for the station. The front panel controls (fig. 8) provide for:

(1) Starting or stopping Power Unit PE–95–( ).

(2) Resetting the circuit breaker in the power mains.

(3) Selection of 12-volt battery source.

(4) Control of transmission and reception.

(5) Remote control operation.

(6) Choice of manual or automatic receiver disabling.

(7) Choice of receiver output to headset.

(8) A sidetone signal to monitor transmission during c-w operation.

10. Radio Receivers BC–342–( ) and BC–312–( )

a. Radio Receiver BC–342–( ). Radio Receiver BC–342–( ) is in Chest CH–120–A. It is anchored by Mountings FT–162 and FT–178. This receiver is powered by the 115-volt, 50/60-cycle, a-c source. It is capable of receiving c-w, voice-modulated, or tone-modulated signals over an r-f range of 1.5 to 18 megacycles.

b. Radio Receiver BC–312–( ). Radio Receiver BC–312–( ) is anchored in Chest CH–121–A by Mountings FT–162 and FT–178. It is a d-c (direct-current) receiver with the same receiving characteristics as Radio Receiver BC–342–( ), except that a crystal filter is not included. The battery in Chest CH–109–A or the battery in Power Unit PE–95–( ) may be used as a source of power. For further information on the receivers, consult TM 11–850.

11. Antenna Tuning Unit BC–939–A (fig. 9)

The tuning unit is mounted on top of Radio Transmitter BC–610–E and is fastened securely by four wingnuts. It couples the output of the transmitter to the transmitting antenna. All controls are mounted on the front panel. The unit weighs 48 pounds.

Caution: WHEN THE TRANSMITTER IS IN OPERATION DO NOT TOUCH ANY PART OF THE ANTENNA TUNING UNIT, EXCEPT THE FRONT PANEL CONTROLS.

12. Antenna System

The antenna system consists of a transmitting antenna and two receiving antennas. (See fig. 1.)

a. Transmitting Antenna. Mast Base MP–47–A and Mast Sections MS–49 to MS–53, inclusive, form the transmitting antenna (whip). Mast Base Assembly MP–47–A is mounted through the roof of Shelter HO–17–A and is connected to Antenna Tuning Unit BC–939–A. Mast Section MS–53 is screwed into the mast base to form the lowest section, and Mast Section MS–49 forms the top section of the assembly. For mobile use, the antenna is bent backward (fig. 1) and held in a horizontal position by an insulated guy to the rear of the roof. This provides clearance and keeps the antenna from whipping about while the vehicle is in motion. The snap-catches on the guy permit the release of the antenna to a vertical position to provide more uniform radiation while the set is stationary. When the transmitting antenna is operated vertically, one or two additional Mast Sections MS–54 may be added. A doublet antenna is furnished for operation from a fixed site, since it provides a considerably greater range of communication than the whip antenna. (See par. 123.) A straight wire antenna can be used; 100 feet of wire is issued for this purpose. (See table IV.)

Caution: EXTREMELY DANGEROUS VOLTAGES ARE PRESENT ON THE ANTENNA AND ITS INSULATORS DURING TRANSMISSION. DO NOT TOUCH.

b. Receiving Antenna. Mast Base MP–48, mounted in Mast Base Bracket MP–50–A, and Mast Sections MS–51 to MS–53 make up a re-

Figure 9. Antenna Tuning Unit BC–939–A.

ceiving antenna. Two receiving antennas are used, since each receiver operates from a separate whip antenna. The antennas are mounted on the upper rear corners of Shelter HO–17–A. (See fig. 1.)

13. Power Unit PE–95–( )

Power Unit PE–95–( ) is a complete, self-contained, gasoline-driven generating unit, capable of delivering 5 kilowatts of a-c power (single-phase 60-cycle at 115 volts) for the operation of Radio Set SCR–399–A, Radio Set SCR–499–A, or other equipment. Power Unit PE–95–( ) can be:

a. Installed in Trailer K–52–( ). (See fig. 10.)

b. Operated 100 feet from the truck by using the extension cables provided with the set.

c. Operated 200 feet from the truck by using two extension cables. (Under this condition, the power unit must be started and stopped at the trailer.)

d. Used as a source of power for lights, etc., at a distance of up to 200 feet from the trailer.

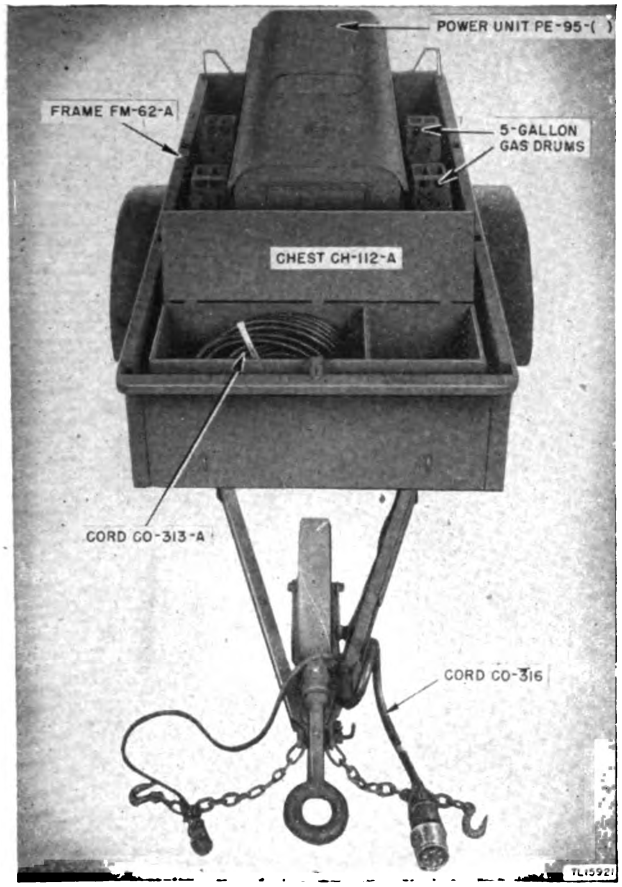


Figure 10. Power Unit PE–95–( ), installed in Trailer K–52–( ).

14. Other Components

The following paragraphs describe the main chests in the radio set and important components other than the major components described above. The chests and additional components are:

- Chest CH–120–A (par. 15)
- Chest CH–121–A (par. 16)
- Chest CH–89–A (par. 17)
- Chest CH–119–A (par. 18)
- Chest CH–88–A (par. 19)
- Frequency Meter Set SCR–211 (par. 20)
- Rectifier RA–63–(*) (par. 21)
- Cordage (par. 22)
- Remote control equipment (par. 23)
- Batteries (par. 24)
- Crystals (par. 25)

15. Chest CH–120–A (Main Operating)

For field use (Radio Set SCR–499–A), Chest CH–120–A is mounted as shown in figure 11. In Radio Set SCR–399–A, the chest is mounted on a frame against the left (or road) side of Shelter HO–17–A and is held in place by a combination of cleats and turnbuckles. (See fig. 3.) All of the necessary radio components (table II) for one operating position are mounted in this chest. Junction Box JB–70–A and Speech Amplifier BC–614–E control transmission and change-over from transmission to reception. Radio Receiver BC–342–( ) and Loudspeaker LS–3 provide for reception. Box BX–19–A contains spare fuses, tubes, and lamps for the receiver. The lower half of the front cover of Chest CH–120–A swings down to form an operating desk large enough for a portable typewriter. Field legs (fig. 11) are strapped to this chest when it is to be set up away from the shelter. The total weight of the chest, including legs and full complement, is 292 pounds.

16. Chest CH–121–A (fig. 12)

The chest is mounted beside Chest CH–120–A in Shelter HO–17–A (fig. 3) and provides a second operating position. When removed from the shelter and set up in the field, Chest CH–121–A becomes a remote operating position from which the transmitter can be modulated over Telephone EE–8–( ), or keyed with Key J–45, through Junction Box JB–60–A (fig. 13). Chest CH–121–A contains Radio Receiver BC–312–( ), Loudspeaker LS–3, Box BX–19–A containing spare parts, and other accessories. A set of field legs is also supplied for this chest. The lower front cover of Chest CH–121–A opens to form a desk top. The total weight of the chest, including legs and full complement, is 157 pounds.

17. Chest CH–89–A

Chest CH–89–A is a combination parts compartment and seat bench. (See fig. 14.) In Shelter HO–17–A, the chest is parallel to the operating chest and fastened to the floor by means of wing bolts. (See fig. 3.) It is 6 feet 8 inches long, 14½ inches high (not including cushions), and 18 inches wide. Fully packed, the chest weighs approximately 300 pounds. Its top is divided into four lids, which can be cushioned to serve as a seat for the operators. The compartment below each lid is subdivided for storage of spare parts, repair equipment, etc., as indicated on the chart attached to the chest. See table I for a typical list of the material packed in Chest CH–89–A. Two movable back rests, together with Straps ST–19–A hooked to Chest CH–89–

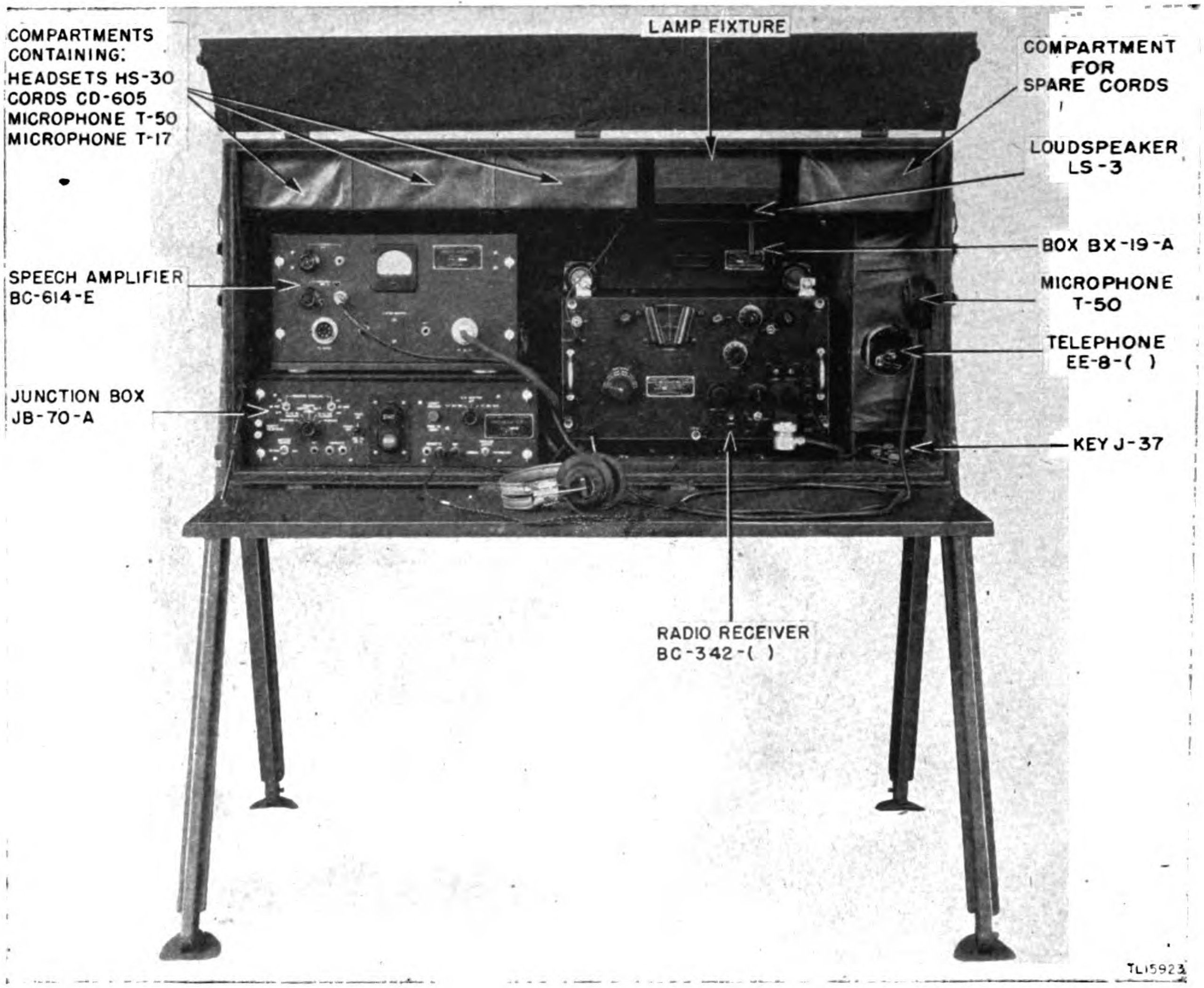


Figure 11. Chest CH–120–A with equipment installed—front view.

A, secure the operator in place when driving on rough roads.

18. Chest CH–119–A (fig. 15)

In Shelter HO–17–A, Chest CH–119–A is placed along the right (curb) wall and is held in position by four trunk clasps. (See fig. 3.) The chest is 55 inches long, 32½ inches high, 12⅝ inches deep and weighs approximately 287 pounds (loaded). Two sliding front panels permit access to the interior compartments in which are stowed the frequency meter, the portable typewriter, box of crystals, Cord CD–652, and tool equipment. Some additional storage space is available for other material. In Radio Set SCR–499–A, the compartment for Cord CD–652 is replaced by compartments for spare tubes, and Chest CH–119–A becomes Chest CH–119–B.

19. Chest CH–88–A (fig. 16)

The chest is mounted inside the shelter and on top of Chest CH–119–A. (See figs. 3 and 4.) It is held to the side of the shelter by four trunk clasps. It is 55 inches long, 18 inches high, and 12⅝ inches deep; fully packed, it weighs approximately 165 pounds. Two sliding front panels permit access to the many compartments in which tuning units and other items are stowed.

20. Frequency Meter Set SCR–211–( )

The frequency meter set is carried in Chest CH–119–A where it is firmly held in place by a strap. (See fig. 15.) It serves as a frequency standard for the radio set, so that the operating frequency of the transmitter and the receivers may be determined accurately in the field. TM 11–300 is supplied with the meter and describes its operation in detail.

21. Rectifier RA-63-(*) (fig. 17)

Rectifier RA-63-(*) is a selenium type of battery charger which is used for charging the 12-volt battery in Chest CH-109-A. The rectifier also furnishes power to operate the keying and disabling relays when Chest CH-109-A is

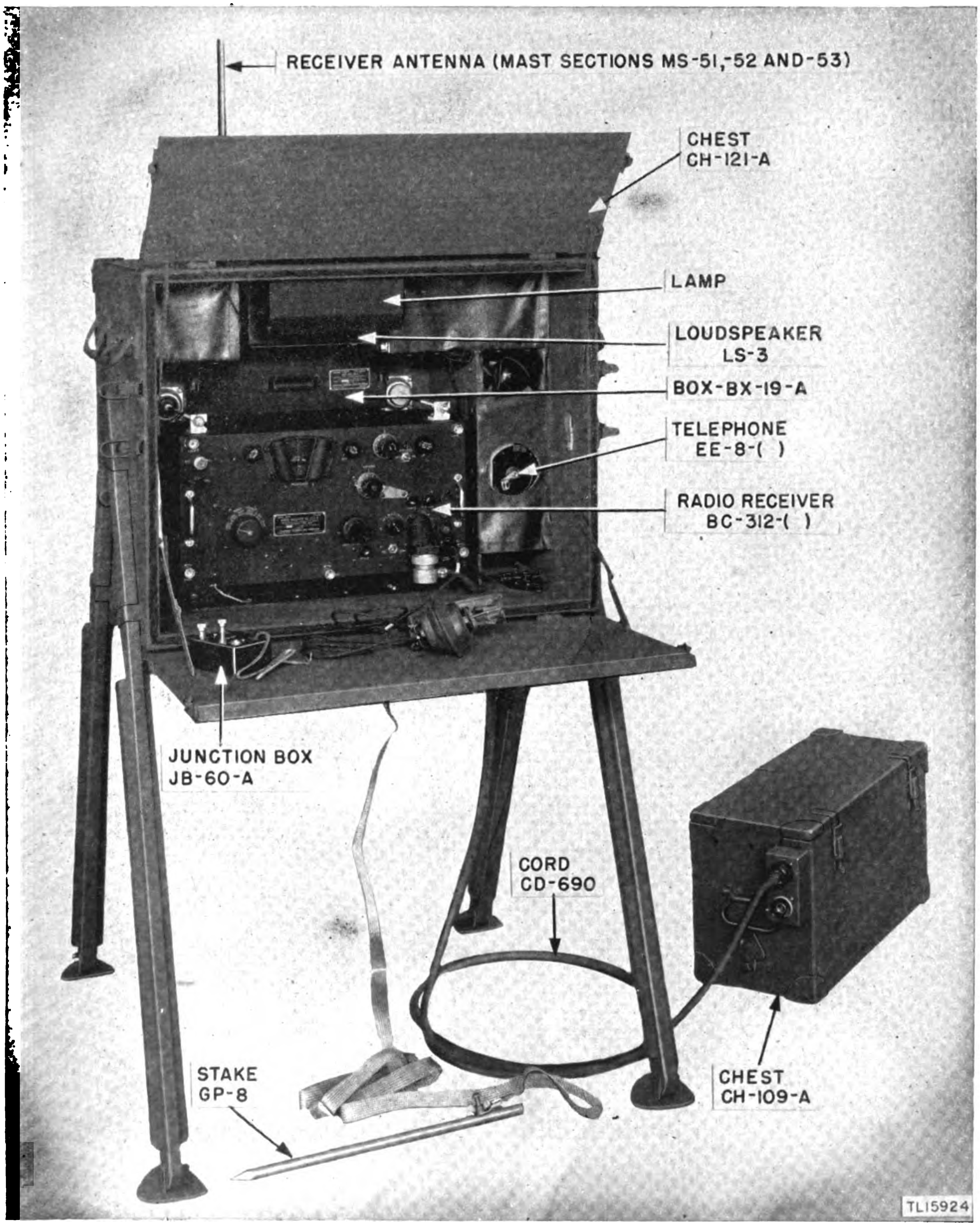


Figure 12. Chests CH-121-A and CH-109-A, as used at a remote position.

removed to a remote position. The rectifier unit is fastened to the floor of the shelter, near the left wall and approximately midway between the two operating chests. (See fig. 3.)

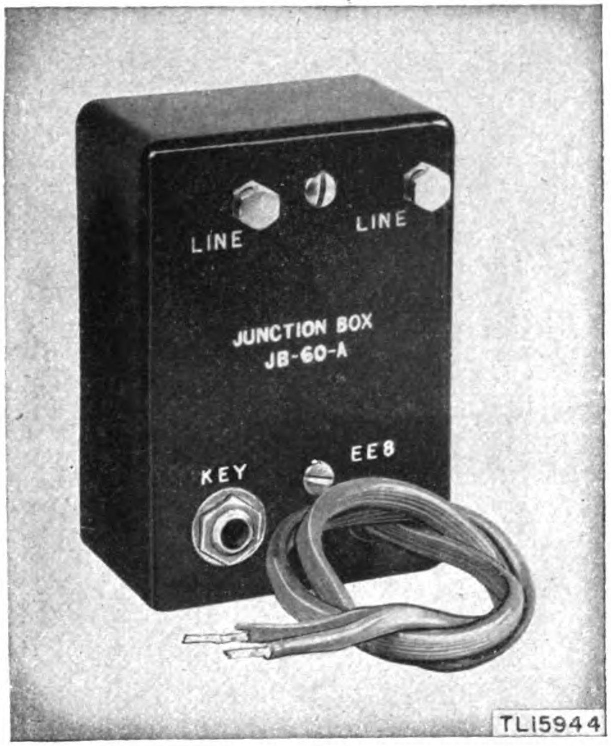


Figure 13. Junction Box JB–60–A.

22. Cordage (fig. 155)

a. Cord CD–564 (power) is a 3-foot power cord connecting Radio Receiver BC–342–( ) with the a-c receptacle in the right side of Junction Box JB–70–A.

b. Cord CD–565 (control and power) is a 4-foot power and control cord connecting Radio Receiver BC–312–( ) with its receptacle in the junction box.

c. Cord CD–566 (control) is a 4-foot control cord connecting Radio Receiver BC–342–( ) with its receptacle in the right side of the junction box.

d. Cord CX–141/MRQ–2 (operating control) is 29 inches long and conducts control circuits between Junction Box JB–70–A and Speech Amplifier BC–614–E. The cord terminates in a plug receptacle on the panel of the speech amplifier and at a terminal strip in the junction box.

e. Cord CX–143/MRQ–2 (main audio) carries the audio output from Radio Receiver BC–342–( ) to switching circuits in Junction Box JB–70–A. This same cord also feeds Loudspeaker LS–3 and Telephone EE–8–( ), both in Chest CH–120–A.

f. Cord CX–140/MRQ–2 (auxiliary audio) carries the audio current from Radio Receiver BC–312–( ) to Junction Box JB–70–A and also feeds Loudspeaker LS–3 in Chest CH–121–A.

g. Cord CD–763 (transmitter power) is 14 feet long. It connects Radio Transmitter BC–610–E with its a-c power receptacle in the junction box.

h. Cord CD–764 (transmitter control) is 15 feet in length. It carries speech and control connections from Speech Amplifier BC–614–E to Radio Transmitter BC–610–E and, in addition, furnishes Speech Amplifier BC–614–E with a-c power. The transmitter end of the cable plugs into the rear modulator apron of the transmitter; the speech-amplifier end plugs into its front panel socket on Speech Amplifier BC–614–E.

i. Cord CO–335 (power and control) is 14 feet long and is used to carry power and control circuits between Junction Box JB–70–A and the shelter outlet to Power Unit PE–95–( ). In mobile operation, the plug end is connected to the bumper bracket underneath the rear of the truck. The cord passes through the hole in the shelter and then through the bottom of Chest CH–120–A. The plug on this end seats in the receptacle inside Junction Box JB–70–A.

j. Cord CD–652 (power and control) is a 100-foot cord for extending all connections between the shelter and trailer. It is equipped with a heavy-duty plug at each end for quick attachment to the system.

k. Cord CO–313 (a-c power) is a 100-foot cord for extending the a-c power connection of the power unit. One end of this cord is provided with a heavy-duty plug which fits the power plug at the tongue of the trailer. The other end of the cord has two lug type terminals from which a-c power can be taken for general use.

l. Cord CD–314 (a-c power) is a 3-foot cord for connecting any outside source of a-c power to Shelter HO–17–A for the operation of the radio set. The cord has a heavy-duty plug on one end for connection to the shelter, and a pair of lug type terminals for attachment to the source of power.

m. Cord CD–659 (12-volt battery cord) is 6 feet long and connects between the outlet receptacle on Junction Box JB–70–A and the plug outlet on Chest CH–109–A.

n. Cord CD–690 (power) is 6 feet long. It is used to connect Radio Receiver BC–312–( ) in

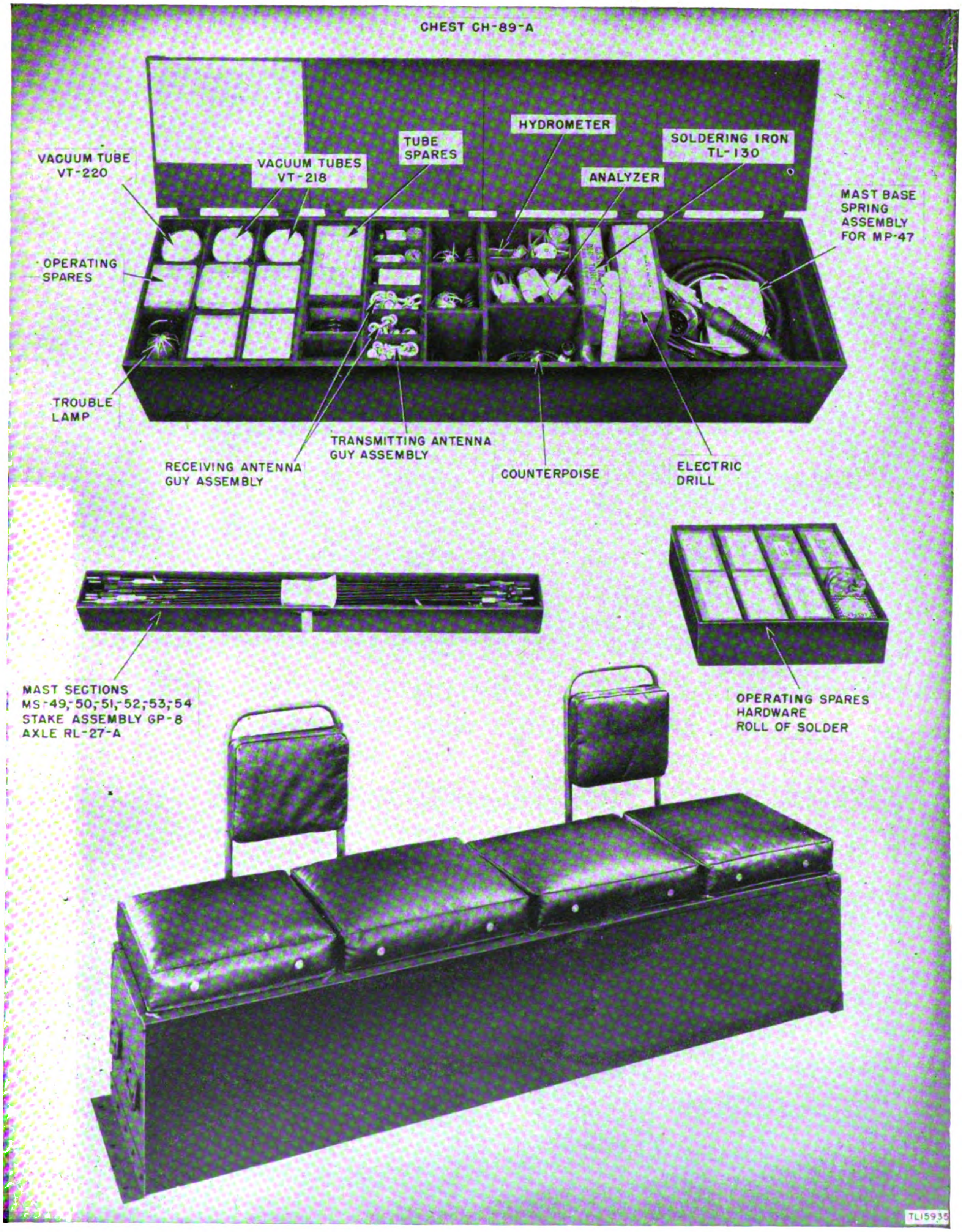


Figure 14. Chest CH-89-A, parts compartments (open) and seat bench (closed).

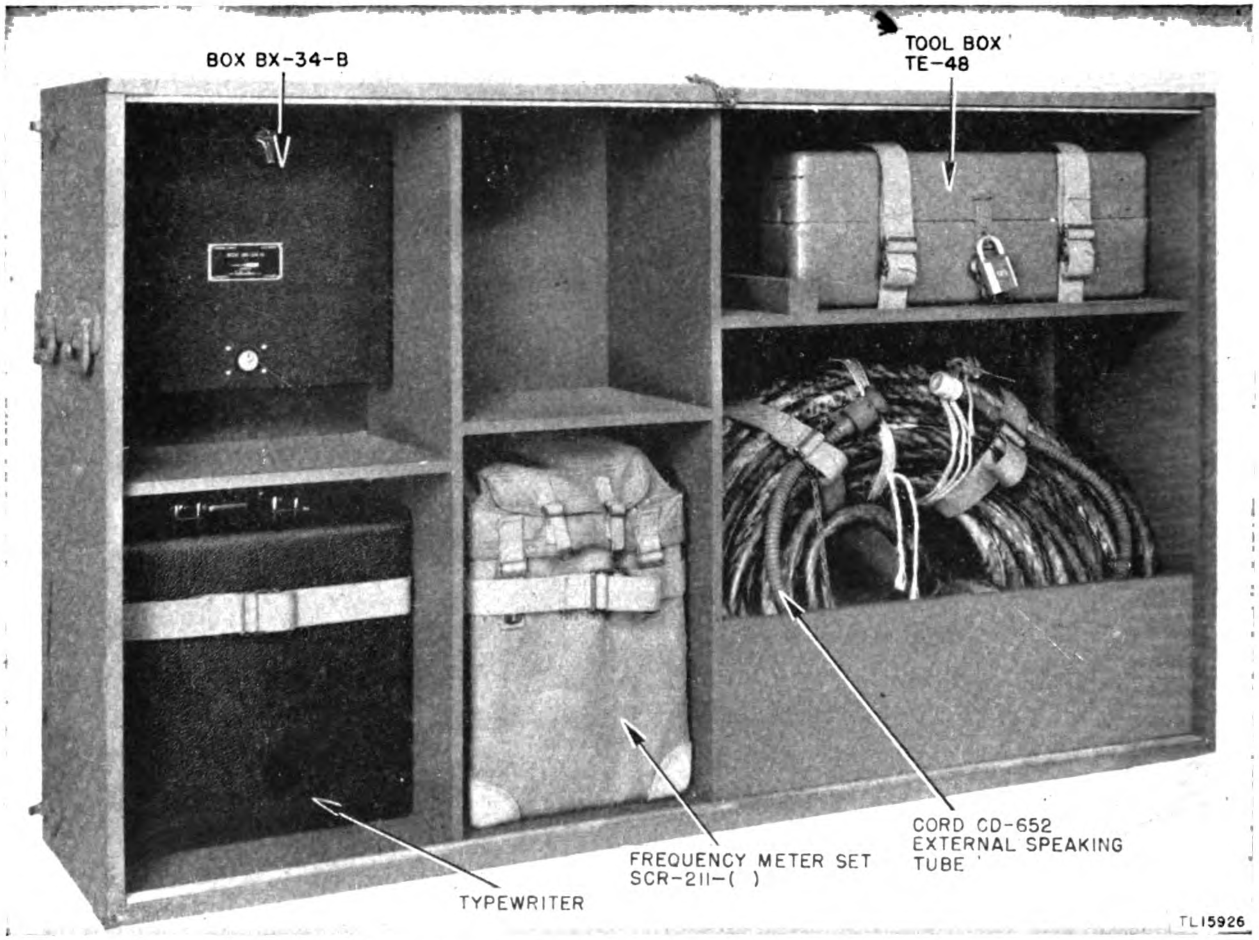


Figure 15. Chest CH-119-A—front panels removed.

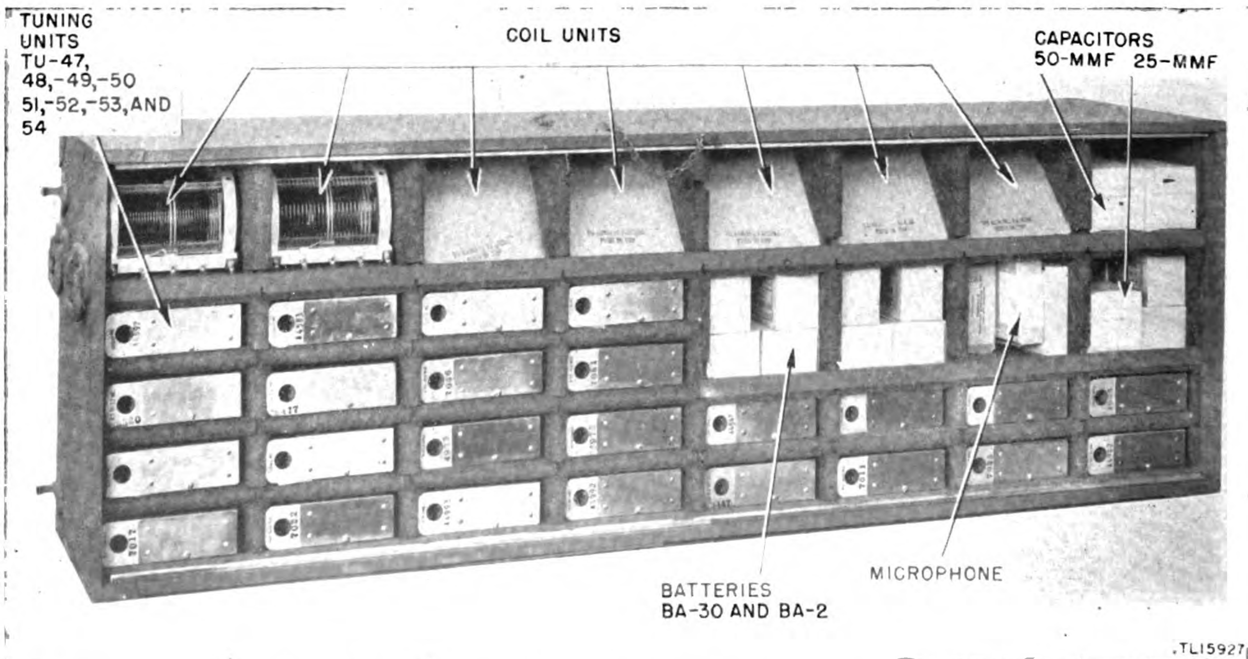


Figure 16. Chest CH-88-A—front panels removed.

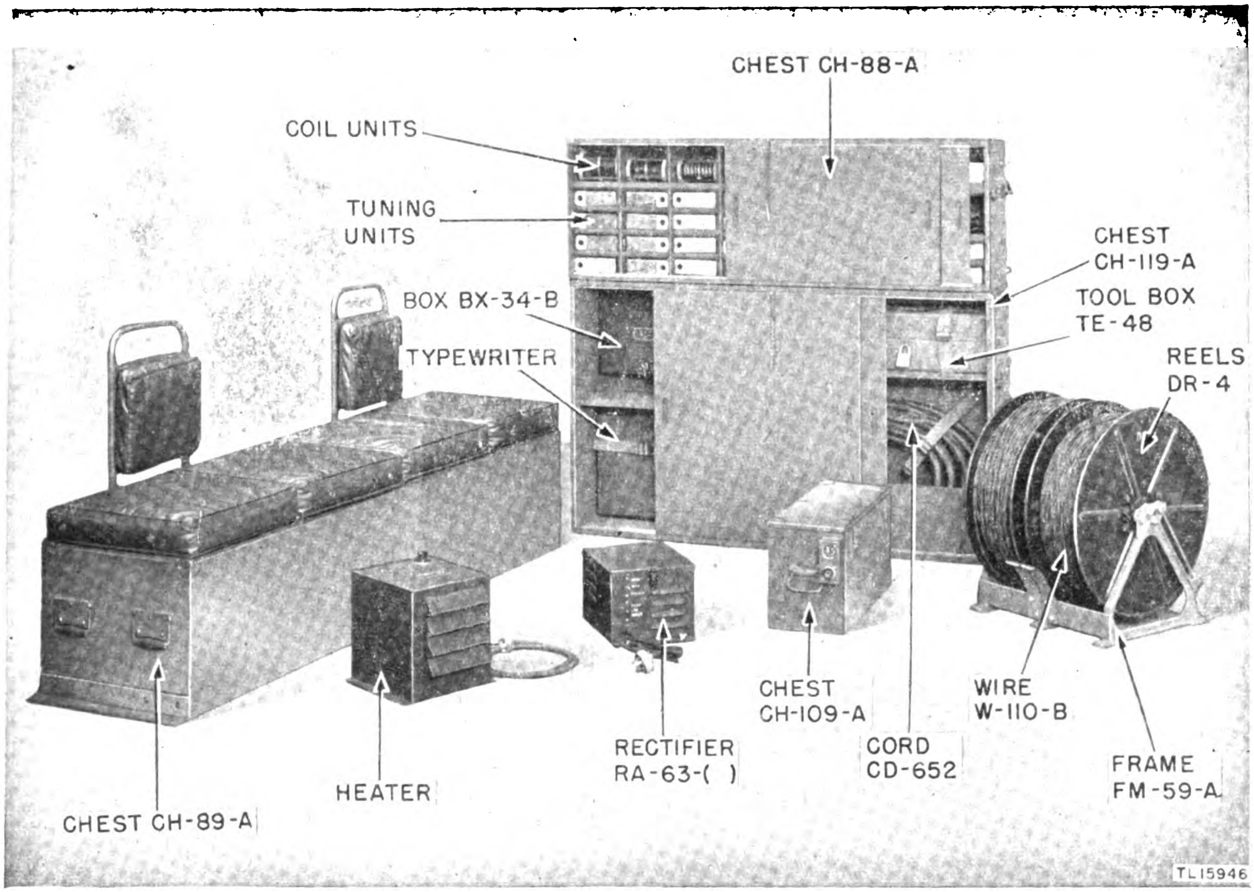


Figure 17. Accessory components of Radio Sets SCR 399–A and SCR–499–A.

Chest CH–121–A to the storage battery in Chest CH–109–A, when both of these units are removed from the radio station.

o. Cord CO–316 (power and control) is a 6-conductor cord, 8.3 feet long. One end connects to the terminal board of the power unit; the other end connects to the power plug under the rear of the truck.

p. Cord CD–201–A is used to connect Key J–37 to Junction Box JB–70–A.

q. Cord CD–1117 is supplied with Loudspeaker LS–3.

23. Remote Control Equipment

a. When connected as directed in section IV, chapter 2, the remote control equipment provides for remote keying and voice modulation of Radio Transmitter BC–610–( ), reception with Radio Receiver BC–312–( ), and communication with the operator at the radio station. The remote operating position may be as much as 1 mile from the set. When receiving and transmitting from a remote position, switching of the remote telephone circuit from transmit to receive must be accomplished at the radio set. Remote keying of c-w transmissions may be effected at the remote position; reception is then provided by using Radio Receiver BC–312–( ), Cord CD–690, and the 12-volt battery (in Chest CH–109–A) at the remote point. (See fig. 13.)

b. The equipment for remote control consists of—

(1) Two Telephones EE–8–( ), one in Chest CH–120–A and one in Chest CH–121–A.

(2) Junction Box JB–60–A, stowed in Chest CH–121–A.

(3) Key J–45, stowed in Chest CH–121–A.

(4) Two Reels DR–4, mounted in Frame FM–59–A. (See fig. 17.)

(5) Wire W–110–B, approximately ½ mile on each Reel DR–4.

(6) Axle RL–27–B, stowed in Chest CH–89–A.

24. Batteries

a. The 12-volt battery in Chest CH–109–A (figs. 2, 3, and 12) consists of two 6-volt storage batteries connected in series. They are interchangeable with the batteries in Power Unit PE–95–( ). The battery output is obtained through a polarized socket mounted on Chest CH–109–A.

b. The batteries in Power Unit PE–95–( ) and those in Chest CH–109–A are exactly alike. In some installations, a switching arrangement is provided to permit the use of either set of batteries for operation of Radio Receiver BC–312–( ).

c. Dry-cell batteries are issued with various components and should be installed in accordance with the instructions in paragraph 35.

25. Crystals

Two sets of crystal holders (36 to the set) are provided in Box BX–34–B (fig. 15), so that the transmitter may be operated at any of the frequencies listed in table V.

Figure 18. Carbon Microphone T–17.

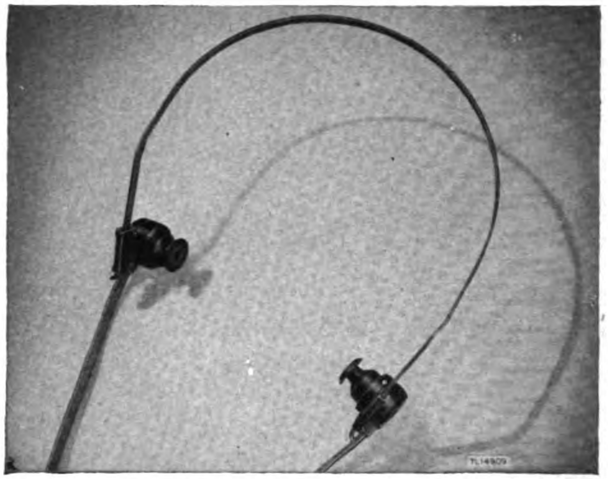


Figure 20. Headset HS–30–( ).

Figure 19. Microphone T–50.

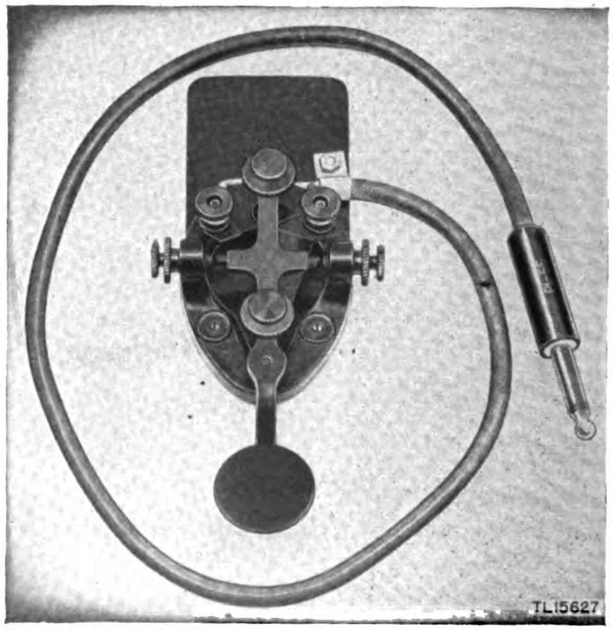


Figure 21. Key J–37.

Section II. INSTALLATION

26. Siting

Note. The following siting information for Radio Set SCR–499–A is also applicable to Radio Set SCR–399–A as a fixed station.

Radio Set SCR–499–A should be set up on a hilltop, elevated ground, or on terrain which is flat over a wide area. A valley or other low ground is to be avoided as much as possible, since the surrounding higher terrain absorbs r-f energy and limits the operating range of the set. Particular care should be taken to avoid a site under or close to steel bridges, underpasses, power lines, and power units, because of the extremely short range possible from any of these sites. If the doublet antenna is used, its directional characteristics should be considered, as explained in paragraph 129.

27. Uncrating, Unpacking, and Checking Radio Set SCR–399–A

a. A shipment of Radio Set SRC–399–A consists of two boxes. One contains Shelter HO–17–A with operating components installed, weighs 7,255 pounds, and is 13′-3″ long, 7′-8″ wide, and 6′-8″ high. The second contains Trailer K–52–( ) with Power Unit PE–95–( ) installed, weighs 4,900 pounds, and is 9′-2″ long, 6′-5″ wide, and 6′-6″ high. Two packing lists are shipped with each box, one attached to the outside and one inside the box. For greatest convenience, the radio set should be uncrated and unpacked as near the operating site as possible. Do not open any box until ready to use its contents.

b. The recommended procedure for uncrating, unpacking, and checking Radio Set SCR–399–A is as follows:

(1) Use nail pullers and pry bars to remove the top of the box containing Shelter HO–17–A. The top must always be removed *first,* so that the sides are free for the next step.

(2) Attach one end of a steel cable or strong rope to the rear of a truck. Fasten a hook to the other end of the cable and catch this hook over the top edge of one side of the shelter box. Use the truck to pull this side from the crate.

(3) Repeat step (2) to remove the other side and the ends of the box. (If a truck is not available, use nail pullers and crowbars.)

(4) Carefully remove the waterproof wrappings from about the shelter.

(5) The openings (windows, doors, etc.) in the shelter are covered with adhesive tape over which a sealing compound has been placed. (See fig. 22.) To remove this protective material, loosen a small section with a sharp object such as a screwdriver or chisel. Grasp the adhesive tape and pull it away from the shelter. The compound will come off with the tape.

(6) Remove the four corner bolts to free the shelter from the crate platform. (See fig. 23.)

Figure 22. Shelter HO–17–A, sealing compound in place.

(7) Enter the shelter and carefully remove the shoring (wooden props) and bags of silica gel.

(8) Remove the straps which hold the separately packaged components (antenna tuning unit, masts, etc.) in position on the floor of the shelter.

(9) Check the contents of each box against the packing list.

(10) Open each chest and check its contents against the chart on the chest. Refer to table I and to the chest lay-out diagram. (See figs. 137 through 145.)

Table I. Chests and contents

Note. This tabulation is general; an itemized list of contents accompanies each chest. See figures 137 through 145 for lay-out and dimensional drawings of the chests.

CHEST CH–88–A (fig. 138)
- 24 Tuning units
- 14 Coil units
- 1 Microphone T–50
- 3 Capacitors
- *1 Carton spare fuses
- Spare pilot lamps

* Complete list of contents in carton

CHEST CH-89-A (fig. 140)
- *8 Cartons operating spares
- *2 Cartons hardware
- 1 Analyzer
- 1 Hydrometer
- Antenna assembly
- Tools
- Cords
- 1 Trouble lamp
- Spare lamp bulbs
- Spare tubes
- 3 Straps ST-19
- 1 Roll solder
- 1 Anticorona ball
- Machine oil
- Carbon tetrachloride

CHEST CH-109 (fig. 141)
- 2 Storage batteries

CHEST CH-112 (fig. 145)
- 1 Cord CD-659, operating
- 1 Cord CO-335, operating
- 1 Cord CO-652, spare
- 1 Cord CO-313, spare

CHEST CH-119 (fig. 143)
- 1 Box BX-34-B, complete with 72 crystals
- 1 Typewriter
- 2 Trouble lamps, 110-volt
- 1 Frequency Meter Set SCR-211
- 1 Tool Box TE-48
- Miscellaneous tubes

CHEST CH-120-A (fig. 146)
- Junction Box JB-70-A
- Speech Amplifier BC-614-E
- Radio Receiver BC-342-( )
- Loudspeaker LS-3
- Lamp fixture
- Headsets HS-30-( )
- Microphone T-50-( )
- Key J-37
- Field Telephone EE-8-( )
- Box BX-19-A, containing spare fuses, tubes, and lamps for receivers

CHEST CH-121-A (fig. 147)
- Radio Receiver BC-312-( )
- Loudspeaker LS-3
- Headsets HS-30-( )
- Spare battery cord
- Field Telephone EE-8-( )
- Lamp fixture
- Box BX-19-A
- Key J-37

* Complete list of contents in carton

(11) The second box (fig. 24) contains Trailer K-52-( ) in which Power Unit PE-95-( ) is installed prior to shipment. With nail pullers and prybars, remove the top of this box.

(12) Remove the four sides of the trailer box.

(13) Remove the waterproof wrapping from about the trailer.

(14) Remove the shoring and straps which hold the trailer to the bottom of the box. (See fig. 25.)

(15) Remove the trailer from the bottom of the box.

(16) Check the contents of the trailer against the packing list.

28. Uncrating, Unpacking, and Checking Radio Set SCR-499-A

a. A shelter and trailer are not supplied with Radio Set SCR-499-A. Its components are shipped in 23 boxes. (See table II.) Two packing lists are shipped with each box; one inside

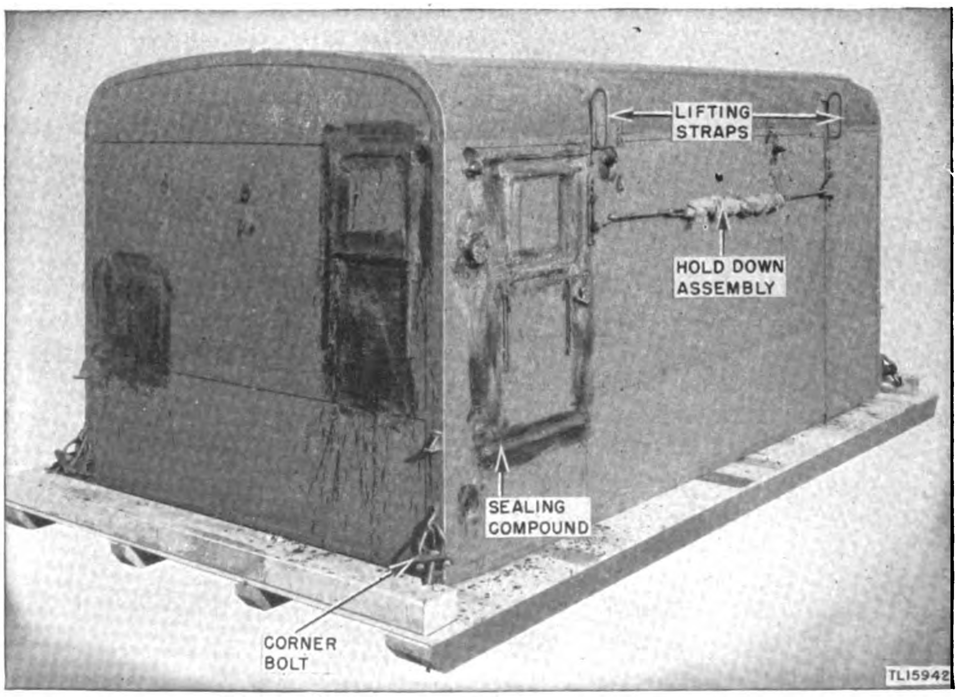


Figure 23. Shelter HO-17-A on shipping crate platform.

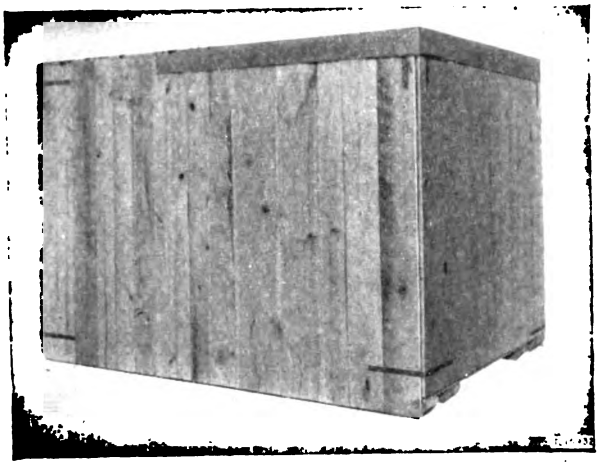


Figure 24. Shipping Box for Trailer K–52–( ) with Power Unit PE–95–( ) installed.

the box and one outside. Do not open any box until its contents are needed for immediate use. For example, if Radio Set SCR–499–A is to be operated on local commercial power, do not open box No. 17 which contains six gasoline cans.

b. The following procedure for uncrating, unpacking, and checking Radio Set SCR–499–A is recommended.

(1) Use nail-pullers and prybars to open each crate.

(2) Remove the outer wrappings and bags of silica gel.

(3) Check the contents of each box against the packing list.

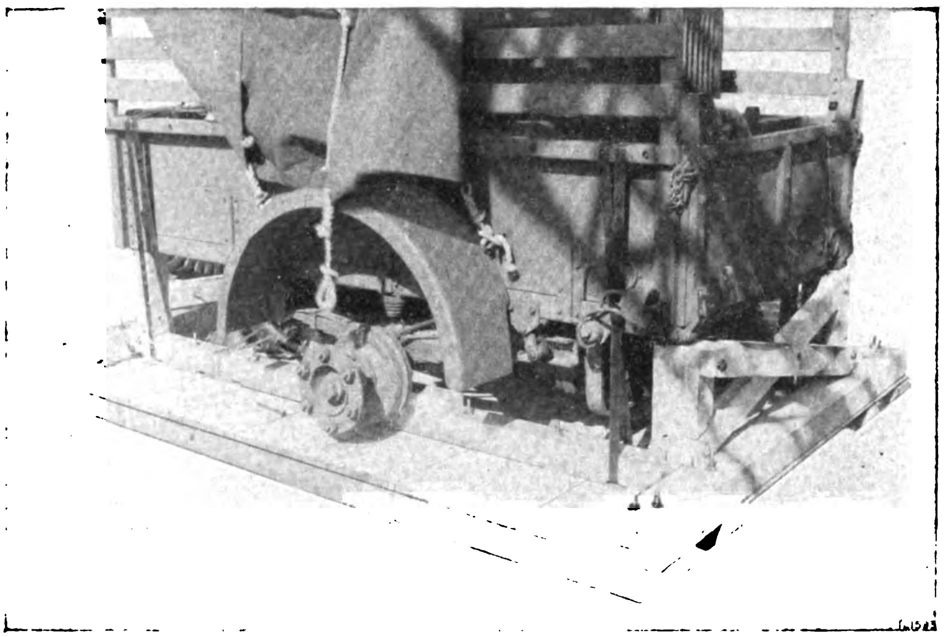


Figure 25. Trailer K–52–( ) with Power Unit PE–95–( ) installed, on shipping crate.

Table II. Typical packing list for radio set SCR-499-A

No. of boxes: 23	Dimensions				Shipping weights		Weight of various items (lb)[2]
Contents	Length (inches)	Width (inches)	Height (inches)	Cubic feet	Gross (lb)	Net (lb)	
BOX NO. 1	38	34	47	35.1	755	497	
1 Transmitter BC-610-E	32 5/8	21 3/8	39 7/8				452
1 Cord CD-763							
1 Cord CD-764							
BOX NO. 2	59	25	35	30.2	560	292	
1 Chest CH-120-A[1]	50 1/2	16 3/4	23 1/4				286
BOX NO. 3	39	23	30	15.5	340	162	
1 Chest CH-121-A[1]	31	16 3/4	23 1/4				155
BOX NO. 4	31	16	21	6	125	48	
1 Antenna Tuning Unit BC-939-A	23 1/2	11 1/4	15 1/4				48
BOX NO. 5	85	23	19	21.4	492	330	
1 Chest CH-89-A[1]	80	18 1/4	14 11/16				300
BOX NO. 6	31	12	14	3	140	101	
1 Chest CH-109-A with:	25 1/2	9 5/8	11 3/8				101
2 6-volt batteries							
BOX NO. 7	49	18	23	11.7	292	196	
1 Chest CH-112-B with:	43 13/64	13 5/8	18 3/16				196
Cords CO-335, CD-659, CD-652, CO-313							
BOX NO. 8	21	19	16	3.7	74	34	
1 Mast Base Bracket MP-59-A							
1 Antenna plate							
10 Fastener assemblies							
Linoleum							
1 Base heater mounting							
1 Base rectifier mounting							
1 Strap							
1 Ground lead assembly							
Copper rope							
1 Concentric lead							
Miscellaneous hardware							
BOX NO. 9	40	18	8	3.3	86	28	
1 Fire extinguisher	13 1/2[3]	4 1/2[4]	18 1/2				17 1/4
1 Holder, for extinguisher							
3 Seat bench backs							
BOX NO. 10	27	15	12	2.8	89	57	
2 Mast Base Brackets MP-50-A							
1 Mast Base MP-47-A							
2 Mast Base MP-48 (assembled)							
BOX NO. 11	31	18	17	5.4	111	42	
1 Electric heater	12 1/2	11 1/2	12				17 1/4
1 Rectifier RA-63-(*)	13 1/2	9 1/2	7 1/2				29 1/4
BOX NO. 12	24	20	17	4.4	75	31	(see box No. 16, Reels DR-4).
1 Frame FM-59							
1 Bumper clamp							
BOX NO. 13	33	25	25	11.8	153	75	
7 Seat bench cushions							
6 Covers (chest and transmitter)							
BOX NO. 14	63	26	19	17.5	343	175	
1 Chest CH-88-A[1]	58	12 3/8	19 1/2				165
BOX NO. 15	63	19	40	27.3	453	236	
1 Chest CH-119-B	57	12 3/4	32 13/16				287
BOX NO. 16	26	17	24	6	229	165	
2 Reels DR-4 (with wire)							190

[1] See table I for list of equipment installed in chest.
[2] Approximate weight of item when set up for use.
[3] Length of nozzle attachment.
[4] Diameter of tank.

Table II. Typical packing list for radio set SCR-499-A (contd)

No. of boxes: 23	Dimensions				Shipping weights		Weight of various items (lb)[2]
Contents	Length (inches)	Width (inches)	Height (inches)	Cubic feet	Gross (lb)	Net (lb)	
BOX NO. 17 6 Gasoline cans (5 gal)	31	22	21	7.8	120	60	
BOX NO. 18 7 Mast Sections MS-44-A 1 Canvas Cover BG-176	70½ (Packed in Roll BG-176)	10¼	6¾	2.6	75	47	47
BOX NO. 19 7 Mast Sections MS-44-A 1 Canvas Cover BG-176	70½ (Packed in Roll BG-176)	10¼	6¾	2.6	75	47	47
BOX NO. 20 7 Mast Sections MS-44-A 1 Canvas Cover BG-176	70½ (Packed in Roll BG-176)	10¼	6¾	2.6	75	47	47
BOX NO. 21 1 Power Unit PE-95-( ) 3 Gas can spouts 1 Cord CO-316 1 Set running spares 2 6-volt batteries	80 67½	35 28¼	48 38½	78	2190	1600	1556
BOX NO. 22 1 Canvas Cover BG-102-A	20¼	18¼	13¼	2.7	97	73	
3 Guy GY-24-A 12 Insulators IN-82-A 18 Stakes GP-2 3 Mast Base MP-19 9 Guy Plate MP-20 6 Guy GY-22-A	(Packed in Bag BG-102-( ))						23
BOX NO. 23 1 Cord CD-1290	20¼	18¼	13¼	2.7	55	31	
Wire W-28, 250 ft 2 Reel RL-29 12 Guy GY-41 1 Steel tape, 100-ft 2 Instruction sheets for doublet antenna kit 1 Bag BG-102-( )	(Packed in Bag BG-102-( ))						31

[2] Approximate weight of item when set up for use.

29. Installation of Radio Set SCR-399-A

a. MOBILE INSTALLATION. If Radio Set SCR-399-A is to be used as a mobile station, Shelter HO-17-A should be installed on a 2½-ton, 6 x 6, cargo truck. (See fig. 1.) The following procedure for setting up the radio set for mobile use is recommended:

(1) Remove the canvas cover, roof bows, and side framing from the truck; drop the tail gate.

(2) With all equipment installed, the shelter weighs about 2¼ tons. If a suitable hoist is available, lift Shelter HO-17-A by its four lifting straps (fig. 23) and place it on the truck body so that the entrance door is toward the rear. If no hoist is available, some other method must be devised for raising the shelter to truck level and sliding it on to the truck. This work is easier if the heavy items of radio equipment are first removed from the shelter, as explained in paragraphs 189 and 190.

(3) Attach the hold-down clamps (two on each side of the shelter) to the truck body sides to hold the shelter firmly in place. If the cargo truck has a wooden body, bolt on the four clamp anchors. (See *Parts List for Shelter HO-17-A*.)

(4) Place Antenna Tuning Unit BC-939-A on top of the transmitter and fasten it in position.

(5) Bolt Mast Base Brackets MP-50-A with Mast Bases MP-48 to the rear of the shelter. (See fig. 26.) Attach the short external lead wire between the mast bases and the lead-in bushings. Bolt Mast Base MP-47-A in place on the roof of the shelter and attach the antenna lead wire between the binding post on the mast base and the binding post at the rear of Antenna Tuning Unit BC-939-A. For information on assembling the antennas, see paragraph 33.

(6) Attach the bumper bracket for Cord CO-335 to the left-hand bumper at the rear of the truck. Do not drill holes in the truck. If the truck body is wooden, chip a small amount of

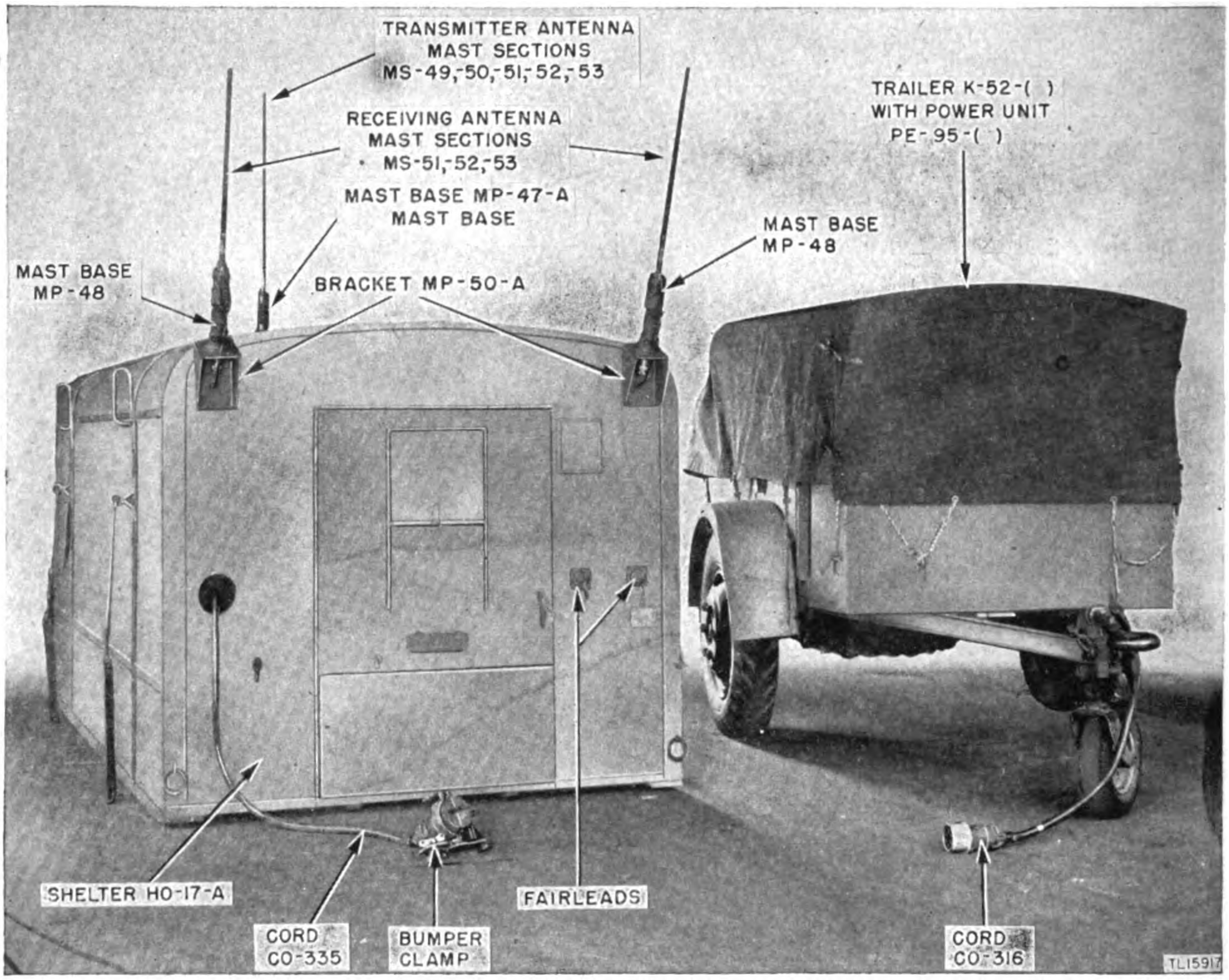


Figure 26. Shelter HO-17-A and Trailer K-52-( ), whip antennas, Cord CO-335, and Cord CO-316 installed.

wood from the floor beam which extends over the bumper. (See fig. 27.)

(7) Extend Cord CO-335 through the hole and clamp in the rear of the shelter. Bring the outer plug down behind the truck body and clamp it into the bumper bracket. (See figs. 26 and 27.)

(8) Attach the flexible section of the speaking tube to the fitting at the front of the shelter, and route the speaking tube into the left-hand truck window. (See fig. 28.) Hook the speaking tube mouthpiece inside the truck cab where it will be convenient to the driver.

(9) Attach one end of the ground strap to the terminal at the front of the shelter. If the truck has a metal body, bolt the other end of the ground strap to the nearest available point. If the truck has a wooden body, run the ground strap to the nearest point on the metal chassis and clamp it securely. (See fig. 28.) Connect an additional ground strap between the stud at the rear of the shelter and the steel frame of the truck.

(10) Couple the trailer to the rear of the truck and plug Cord CO-316 into the receptacle clamped in the bumper bracket.

b. Fixed Installation. If the shelter and trailer are to be used in a fixed location, the truck will not be necessary and may be released for other uses. In this case, the procedure for installation is as follows:

(1) If possible, select a site for the shelter in accordance with the instructions given in paragraph 26. Raise the shelter above the ground and block it in position.

(2) Place the trailer in any convenient position near the shelter. By proper use of the extension cords (par. 56), the trailer may be placed at a distance of up to 200 feet from the shelter.

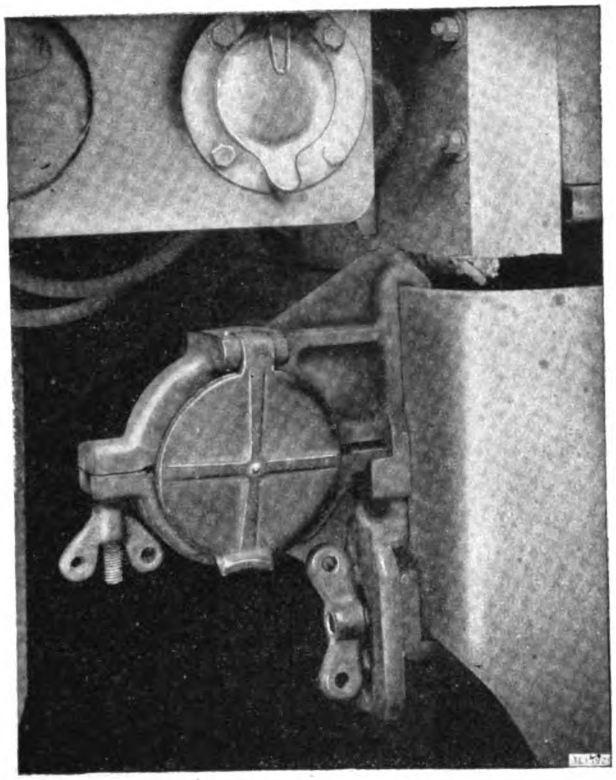


Figure 27. Bumper bracket attached to rear of truck.

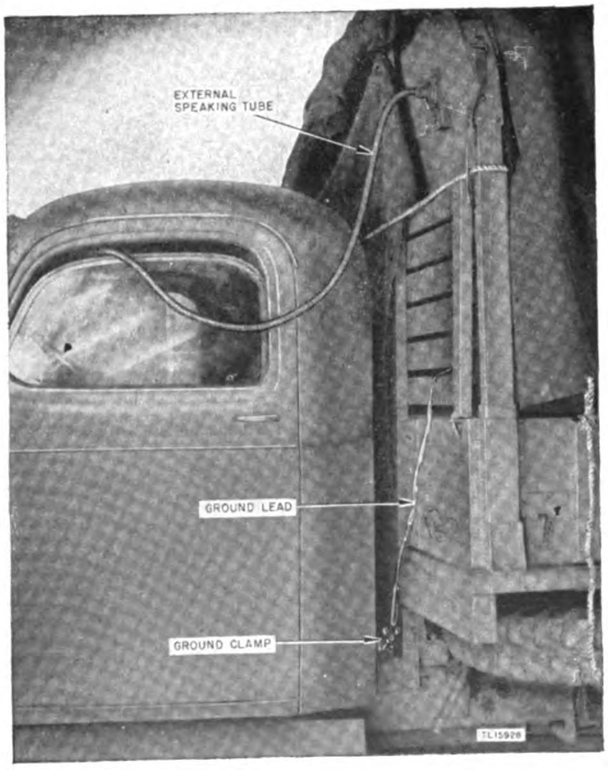


Figure 28. Speaking tube and ground lead from Shelter HO–17–A to truck.

(3) See FM 5–20 and apply camouflage to the shelter and trailer as required.

(4) Follow the instructions given in *a*(4) and (5) above.

(5) Connect Counterpoise CP–15–B to the ground binding post at the front of the shelter. Lay the counterpoise on the ground and fan out the individual conductors.

(6) Bring Cord CO–335 out through the clamp in the rear of the shelter.

(7) Connect Cord CO–316 to Cord CO–335 directly, or through extension cords.

30. Installation of Radio Set SCR–499–A

a. GENERAL. (1) If possible, provide protection from the weather by setting up the equipment in a tent or shed. If Radio Set SCR–499–A is set up in the open, every precaution should be taken to protect the transmitter from rain and dirt. The major components are provided with canvas covers which should be used to protect them from the weather.

(2) Components supplied with Radio Set SCR–499–A are listed in paragraph 5. Use figure 2 as a guide in placing the various components, so that the interconnecting cords will reach from one to the other as required.

b. TRANSMITTER. Set up the transmitter with the antenna tuner fastened in place as shown in figure 5. If the installation is made on bare ground, raise the transmitter above the ground and block it on wooden skids or planks to keep the base dry.

c. TRANSMITTING ANTENNAS. (1) *Long wire antenna.* If a long wire antenna is used, choose the best length for the operating frequency. (See table IV.) Insert an antenna insulator between the outer end of the wire and the rope used to anchor it to a tree or other convenient support. Keep the antenna as high and free of surrounding objects as possible. Attach a lead-in to the antenna binding post on Antenna Tuning Unit BC–939–A.

(2) *Whip antenna.* Mount Mast Base Bracket MP–59–A on the rear of the transmitter by hooking it to the bolts which hold the antenna tuning unit in place. Mount Mast Base MP–47–A in the mast bracket and insert the five-section whip antenna consisting of one each Mast Sections MS–49 to MS–53, inclusive. For detailed instructions on assembling the transmitting whip antenna, see paragraph 33.

(3) *Doublet antenna.* For information on the

installation and use of the doublet antenna, see section II, chapter 4.

d. Other Operating Components. (1) Set up the following components as shown in figure 2:

(*a*) Chest CH–120–A, CH–121–A, and CH–109–A.

(*b*) Rectifier RA–63–(*).

(*c*) Electric heater and blower, if necessary.

(2) Choose a suitable point within reach of the power extension cords provided with the set, and set up Power Unit PE–95–( ) in accordance with the instructions in TM 11–904.

(3) Set the accessory components (Chests CH–89–A, CH–119–B, and CH–88–A) out of the way until the connections and interconnections have been made (par. 32); then place these components convenient to the operating positions, as shown in figure 2.

31. Connections and Interconnections of Radio Set SCR–399–A

When shipped, the operating components of Radio Set SCR–399–A are completely installed, mounted, and interconnected. (See figs. 3 and 4.) Make a general inspection of the equipment and check with the cording diagram (fig. 155) to see that:

a. Power Unit PE–95–( ) is properly connected, both mechanically and electrically, to Shelter HO–17–A.

b. Receiver, speech-amplifier, and transmitter cords are properly plugged into their respective sockets.

c. All wingnuts, wing head bolts, turnbuckles, etc., are tight.

32. Connections and Interconnections of Radio Set SCR–499–A

a. After the components of Radio Set SCR–

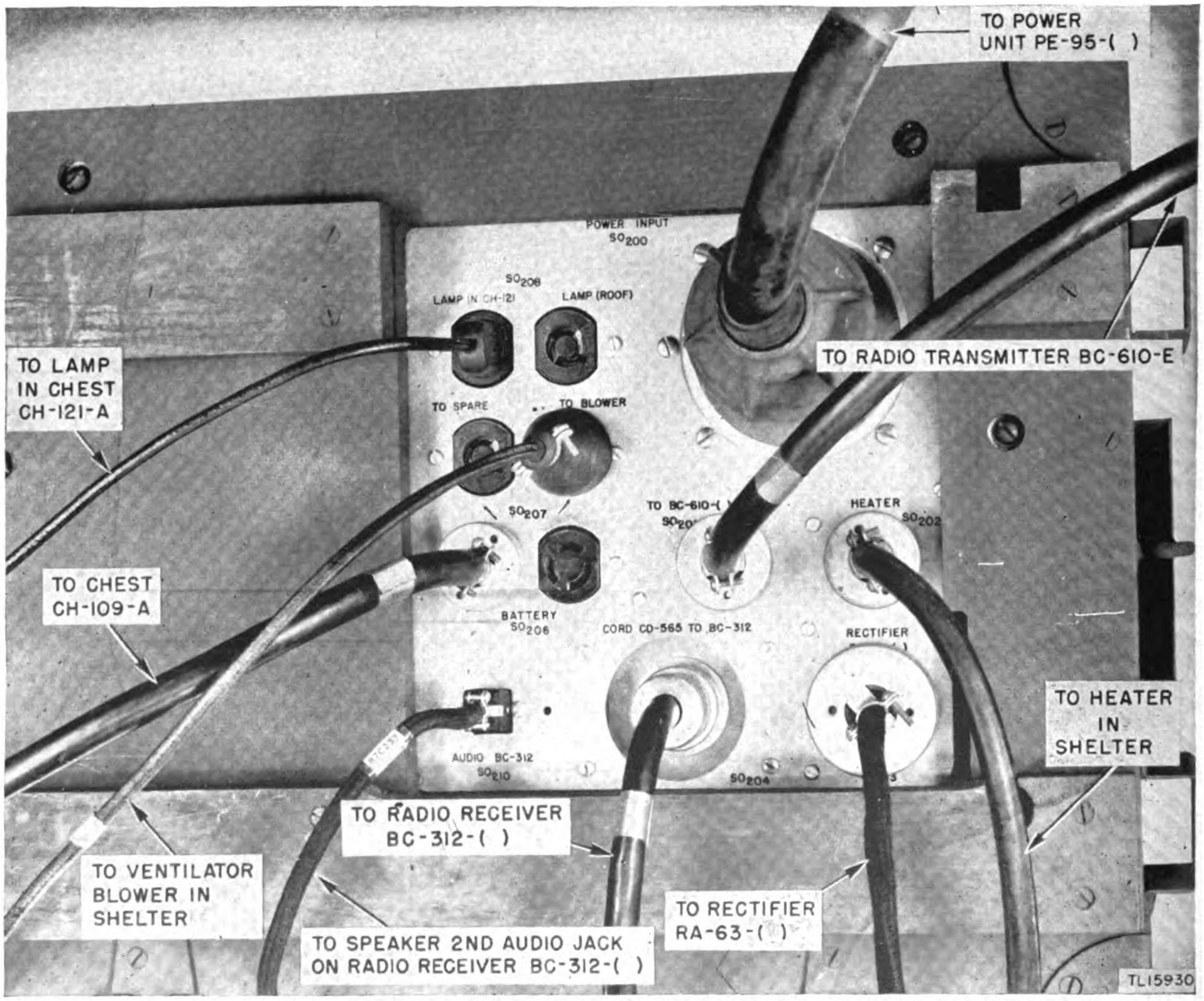


Figure 29. Cord connections through bottom of Chest CH–120–A to bottom of Junction Box JB–70–A.

499–A have been placed in their operating positions, use the cording diagram (fig. 155) and the bottom view of Chest CH–120–A (fig. 29) as guides for connecting:

(1) Cord CD–763 from the transmitter to Junction Box JB–70–A.

(2) Cord CD–764 from the transmitter to Speech Amplifier BC–614–E.

(3) Cord CD–659 from Chest CH–109–A to Junction Box JB–70–A.

(4) Cord CD–565 from Radio Receiver BC–312–( ) to Junction Box JB–70–A.

(5) Cord from Rectifier RA–63–(*) to Junction Box JB–70–A.

(6) Cords from the blower and the heater to Junction Box JB–70–A, if these two items are needed.

(7) Cord CD–564 from Radio Receiver BC–342–( ) to the Junction Box JB–70–A.

(8) Cord CD–566 from Radio Receiver BC–342–( ) to the Junction Box JB–70–A.

(9) Cord CX–140/MRQ–2 (auxiliary audio) from Chest CH–121–A to Junction Box JB–70–A.

(10) Cord CX–141/MRQ–2 from Junction Box JB–70–A to Speech Amplifier BC–614–E.

(11) Cord CX–143/MRQ–2 from Radio Receiver BC–342–( ) to Junction Box JB–70–A.

(12) All key, loudspeaker, and lamp cords, as required.

(13) Cord CO–335 to Junction Box JB–70–A.

(14) Cord CO–316 from Power Unit PE–95–( ) to Cord CO–335, directly or through extension cords, as required.

b. Connect Counterpoise CP–15–B to the ground binding post of the transmitter. Lay the counterpoise on the ground and fan out the individual conductors.

33. Installation of Antennas on Radio Set SCR–399–A

a. Select the following items from Chest CH–89–A. (1) One Mast Section MS–49.

(2) One Mast Section MS–50.

(3) One Mast Section MS–51, to which a metal S-link has been attached (for guying down the transmitter antenna).

(4) Two Mast Sections MS–51.

(5) Three Mast Sections MS–52.

(6) Three Mast Sections MS–53.

(7) Insulated guy ropes for the transmitting antennas.

(8) Two insulated guy ropes for the receiving antennas.

b. Assemble the transmitting antenna (fig. 26) as follows:

(1) Screw Mast Section MS–49 into Mast Section MS–50. Use two pairs of gas pliers to tighten the connection. Tape the joint with ½-inch friction tape.

(2) Repeat this procedure with Mast Sections MS–51, MS–52, and MS–53.

Note. Any mast section with a *lower* number is above that with a *higher* number.

(3) Carry the guy rope and the assembled antenna sections onto the shelter roof, and screw Mast Section MS–53 into Mast Base MP–47–A.

(4) Attach the catches at the rope end of each guy rope to the holes in the corners of Mast Base Brackets MP–50–A.

(5) With hand outstretched at shoulder height, stand at the center of the roof and bend the antenna backwards to a horizontal position.

(6) Hold the antenna down in this position, walk to the rear of the roof, and with the other hand pick up the insulator end of the guy rope and attach it to the S-link on Mast Section MS–51.

c. Assemble the left-hand receiving antenna (fig. 26) as follows:

(1) Screw Mast Section MS–51 into MS–52. Use two pairs of gas pliers to make the connection tight. Tape the joint with ½-inch friction tape.

(2) Screw Mast Section MS–53 into Mast Section MS–52.

(3) Screw Mast Section MS–53 into Mast Base MP–48 on the left rear corner of the shelter.

d. Assemble the right-hand receiving antenna by repeating steps *c*(1) and (2) above. Screw the assembled sections into Mast Base MP–48 on the upper right rear corner of the shelter.

e. Attach guy rope insulators to the receiving antennas. Tie the guy ropes to the rear corners of the truck or shelter.

f. Use these two guy ropes to pull the receiving antennas down when driving in a city or under low obstacles. (See fig. 1.) However, better reception will result with receiving antennas in the vertical position.

g. For information on the use of the doublet antenna, see section II, chapter 4.

34. Installation of Antennas on Radio Set SCR–499–A

a. Assembly and installation of the whip antennas for Radio Set SCR–499–A is the same as for Radio Set SCR–399–A (par. 33), but with the following exceptions:

(1) Mount the assembled transmitting antenna in Mast Base Bracket MP–59–A, which is hooked to the transmitter.

(2) Put the two assembled receiving antennas into their respective antenna receptacles on Chests CH–120–A and CH–121–A. (See fig. 2.)

(3) Use the antennas in their vertical positions.

b. For information on the use of the doublet antenna, see section II, chapter 4.

35. Installation of Dry Batteries

a. Telephones EE–8–( ), Frequency Meter SCR–211–( ), and Analyzer BC–1052–E require dry batteries as listed below:

Component	*Batteries*
Telephone EE–8–( )	2 BA–30
Frequency Meter Set SCR–211–( )	6 BA–2
	4 BA–23
Analyzer BC–1052–E	1 No. 2 dry cell
	2 BA–34 (7½-volt, "C")

b. To install or replace dry batteries, carefully follow the instructions in the technical manual or instruction sheet issued with each component.

36. Placing Storage Batteries in Service

Caution: If electrolyte spills on skin or clothing, wash off immediately with cold water. Apply bicarbonate of soda or ammonia to the affected parts, if available.

a. INSTRUCTIONS. Examine the storage batteries for Chest CH–109–A and Power Unit PE–95–( ). A card attached to each battery gives the manufacturer's instructions for preparing that battery for service. READ THE MANUFACTURER'S INSTRUCTIONS AND FOLLOW THEM CAREFULLY.

b. EXAMPLE. The following is an example of the information which appears on a manufacturer's instruction card:

(1) This battery is of the dry-charged type.

(2) The electrolyte to be used is diluted sulphuric acid having a specific gravity of 1.256 at 80° F. It is packed in a separate container. In tropical climates, use electrolyte having a specific gravity of 1.200, produced by mixing 10 parts of the 1.265 electrolyte with 3 parts of water. Be sure to use distilled water, or other water known to be suitable for use in a lead-acid storage battery.

Caution: Never add the water to the acid.

(3) Remove the vent caps. Remove and destroy the scotch tape which covers the vent holes. Fill each cell with the correct electrolyte to a level ⅜ inch above the tops of the separators. Replace the vent caps and tighten securely.

Caution: Do not put cold electrolyte into a warm battery, or warm electrolyte into a cold battery. Severe damage will result.

(4) If the battery is filled with 1.200 electrolyte for tropical use, stamp the numeral 1 on the lead top connector at the positive cell, for the information of anyone servicing the battery in the future.

(5) Before placing the battery in service, allow it to stand from 4 to 12 hours after filling.

Note. In an emergency, the battery may be placed in service 1 hour after it has been filled with the proper electrolyte. *This is not good practice.*

(6) If possible, give the battery a freshening charge at 6.0 amperes for 16 to 20 hours before placing it in service. It will give satisfactory results without this charge if the battery temperature is above 50° F. If the battery temperature is below 50° F., it *must* be given a freshening charge.

37. Repacking

a. The components of Radio Set SCR–499–A can be quickly disconnected to dismantle the station into a number of relatively small items for transport by aircraft or other suitable conveyance.

b. The circumstances of field transportation differ widely and, therefore, no definite repacking procedure can be given. The following procedure is recommended as a guide for preparing Radio Set SCR–499–A for field transportation.

(1) Set the accessory Chests CH–119–B, CH–89–A, and CH–88–A where they can be repacked conveniently as their original contents are removed from the set.

(2) Remove the seat cushions and backs

from Chest CH–89–A and tie them into a secure and compact bundle.

(3) Disconnect the set cording, keys, lamps, and other small components from the set.

(4) Pack each of these items in the accessory or operating chests as indicated in the contents chart of each chest.

(5) Remove and disassemble the transmitting and receiving antennas.

(6) Pack the antenna mast sections in Chest CH–119–B.

(7) If possible, place protective wrappings about the heater, fire extinguisher, Rectifier RA–63–(*), and other components for which there is no space in the chests. These items are usually handled separately. (See fig. 17.)

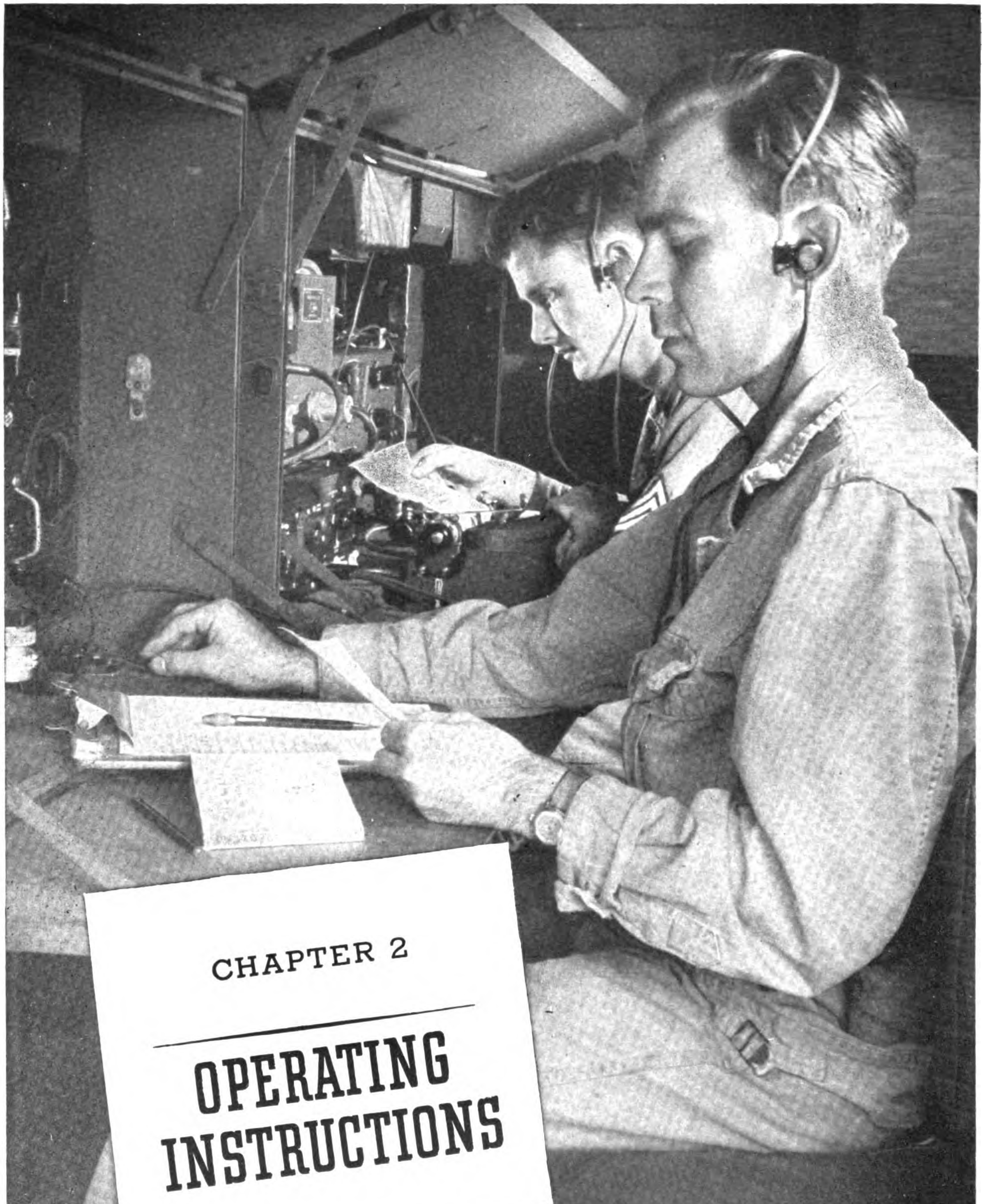
(8) Before closing and locking the chests, stuff any available filler into compartments that require such material to prevent damage to their contents.

(9) Cover the components for which canvas covers are provided.

(10) Repack the doublet antenna components in their original shipping bags.

(11) Carefully store and secure the repacked components in the conveyance being used for transporting the equipment.

Note. For emergency field transportation, Radio Set SCR–399–A can be removed from Shelter HO–17–A. (See pars. 189 and 190.)


CHAPTER 2
OPERATING INSTRUCTIONS
TL 17321

CHAPTER 2

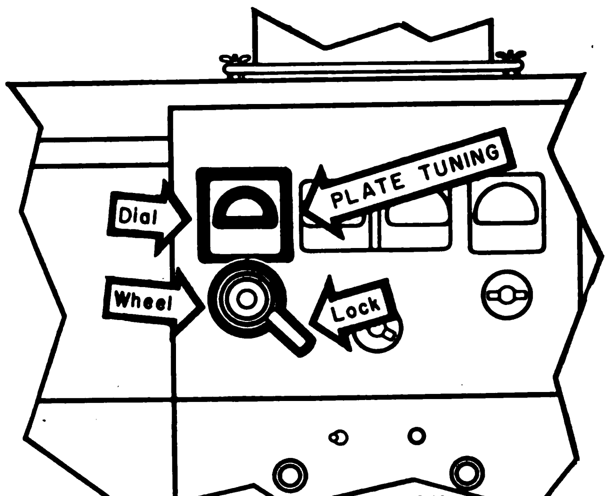
OPERATING INSTRUCTIONS

Note. For information on destroying the equipment to prevent enemy use, see destruction notice at front of manual.

Section I. CONTROLS AND THEIR USE

38. General

The controls of Radio Sets SCR–399–A and SCR–499–A are described in this section. A series of line drawings, keyed to the text, are used to illustrate the controls and to show their location on the equipment.



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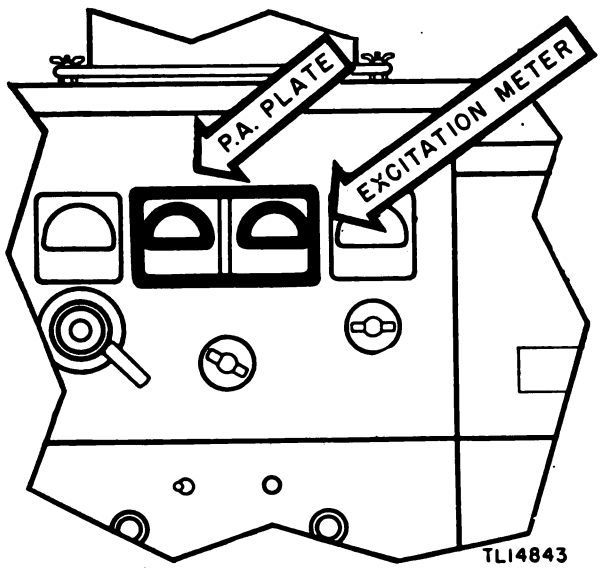
39. Transmitter Controls

a. PLATE TUNING dial is used in conjunction with the TUNING CHARTS to determine an approximate setting for the PLATE TUNING wheel.

b. PLATE TUNING wheel controls the tuning of the p-a (power-amplifier) tank circuit. Its position is registered on the PLATE TUNING dial directly above. The lock holds the PLATE TUNING wheel securely in position.

c. P. A. PLATE meter measures the current in the p-a plate circuit, thus indicating correct tuning of the p-a stage.



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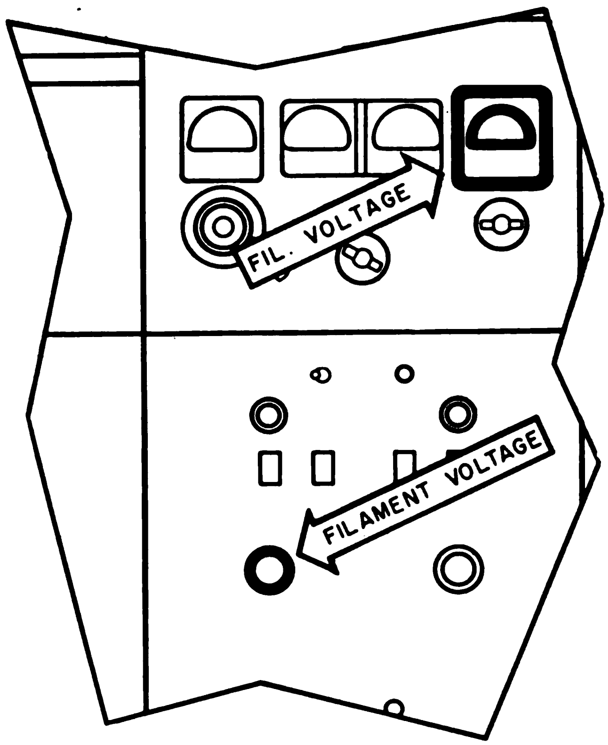

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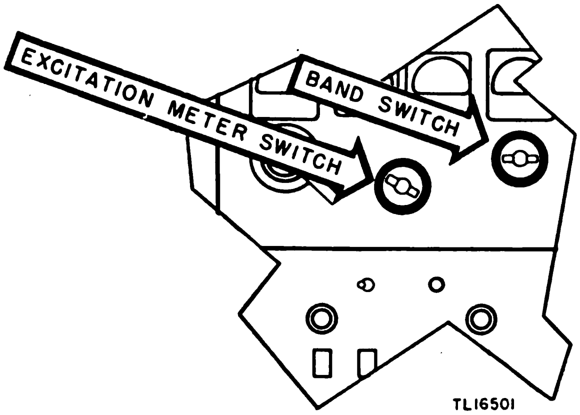
d. EXCITATION METER is a multiple-scale milliammeter which measures the current and thus indicates the degree of resonance in the doubler plate circuit, the i-p-a (intermediate-power-amplifier) grid or plate circuits, or the p-a grid circuit, depending upon the position of the EXCITATION METER SWITCH.



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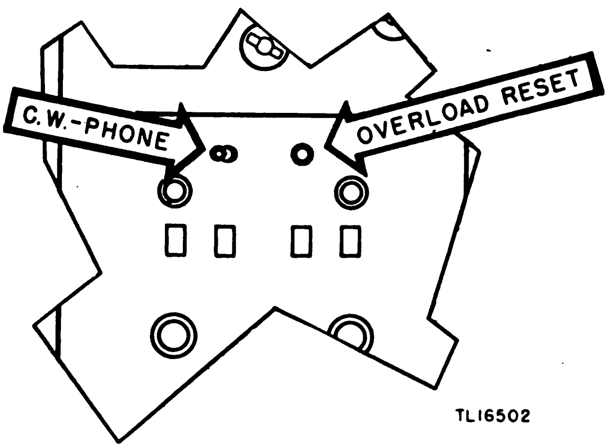
e. FIL. VOLTAGE meter measures the p-a filament voltage which is determined by the setting of the FILAMENT VOLTAGE control knob.

f. EXCITATION METER SWITCH has four positions to place the EXCITATION METER in any one of the following circuits: DOUBLER PLATE, INT. AMP. GRID, INT. AMP. PLATE, or P. A. GRID.

g. BAND SWITCH has three positions to connect any one of three tuning units into the transmitter.



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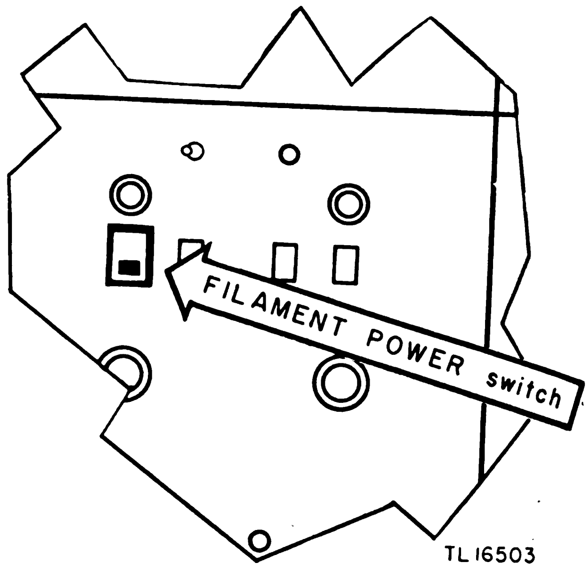
h. C.W.-PHONE switch has two positions, C.W. and PHONE. In the C.W. position, full power is applied to the transmitter and the modulator is thrown out of the transmitter circuit. In the PHONE position, reduced power is applied to the transmitter and the modulator is connected in the transmitter circuit.

i. OVERLOAD RESET switch, a push-button, resets the overload relay when it has been tripped by an overload in the p-a or modulator stage.

j. FILAMENT POWER switch in the ON position applies power to the filaments of all tubes in the transmitter and speech amplifier, and to the speech-amplifier and bias power-supply plate circuits. A green pilot lamp is lighted when this switch is in the ON position.

k. EXCITER PLATE POWER switch has two positions, ON and NORMAL (OFF). In the ON position, this switch applies power to the plate circuits of the oscillator, the buffer-doubler, and the intermediate power amplifier. In the NORMAL position, the plate power is removed from these circuits until the key or the microphone switch is depressed.



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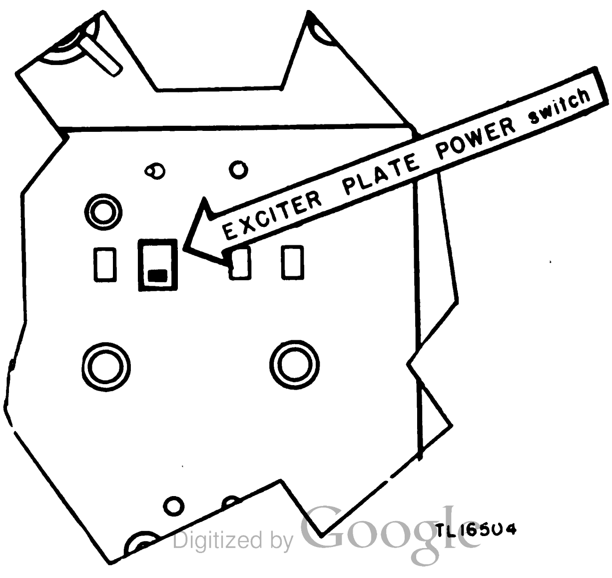
l. HIGH VOLTAGE PROTECT switch has two positions, PROTECT and NORMAL. In the PROTECT position, the transmitter can be operated only with reduced power. Full power can be applied to the transmitter with this switch in the NORMAL position.



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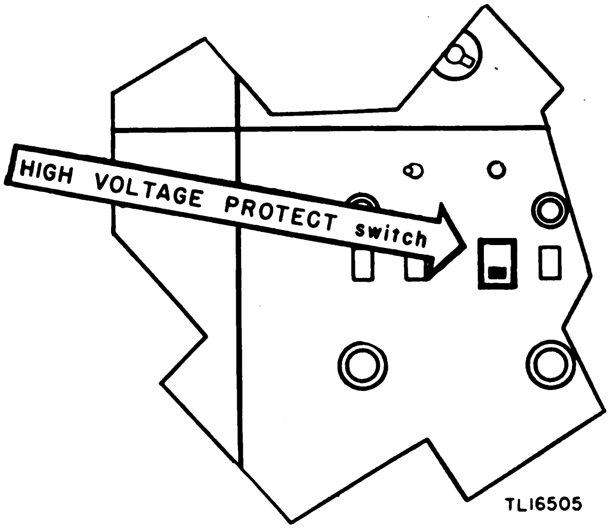
m. PLATE POWER switch is to be used only in emergency or during servicing when the transmitter is away from the other equipment.



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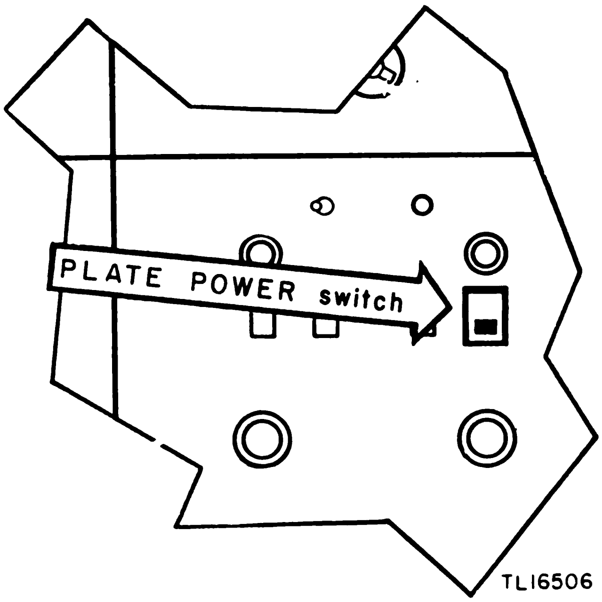
This switch has two positions, ON and OFF. In the ON position, plate power is applied to all tubes in the transmitter which had not been previously turned on by the FILAMENT POWER switch. A red pilot lamp above this switch lights when plate power is applied.

Caution: The receiver disabling circuits are inoperable with this switch in the ON position; do not key the set under this condition.

n. FILAMENT VOLTAGE control adjusts the filament voltage of all tubes in the transmitter except the bias rectifier and the drivers. The circuits are so arranged that a FIL. VOLTAGE reading between 5.0 and 5.3 volts will insure correct filament voltage to all other tubes.



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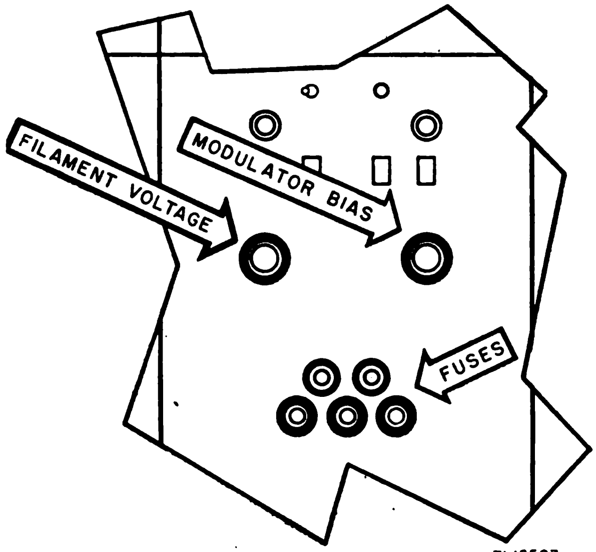

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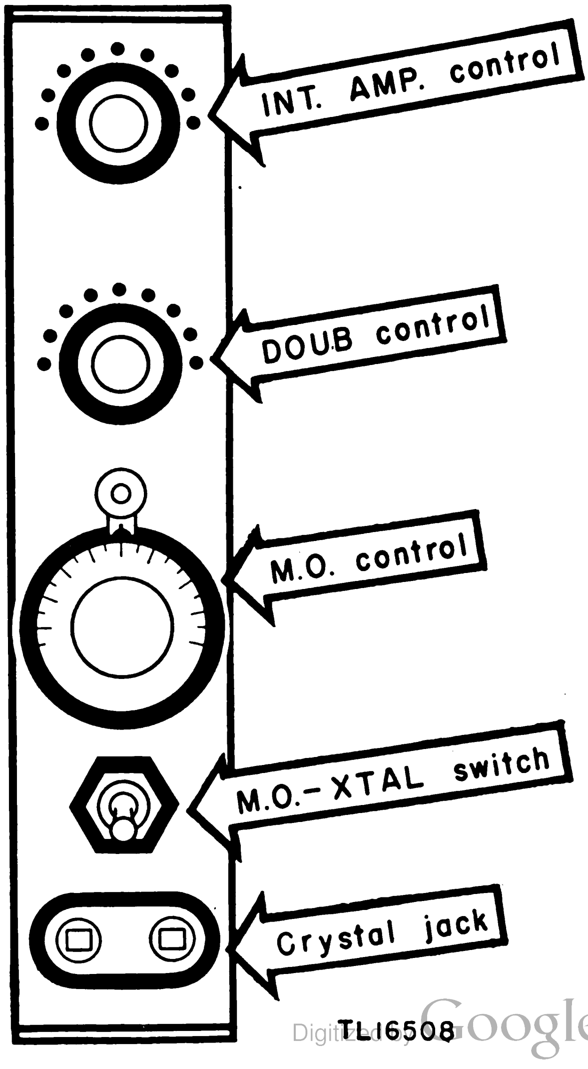
o. MODULATOR BIAS control adjusts the output of the bias rectifier and, therefore, of the modulator tubes.



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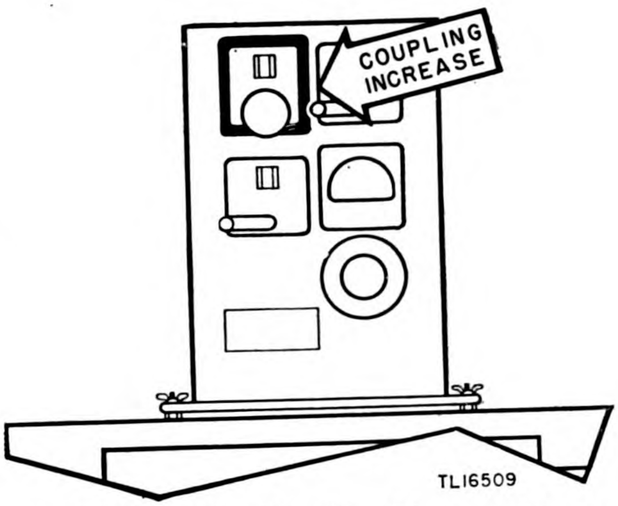


p. FUSES FS_1, FS_2, FS_3, FS_4, and FS_5 are located on the front panel of the transmitter. FUSES FS_1 and FS_2 are line fuses. FUSE FS_3 is in the primary of transformer T_6. FUSE FS_4 protects transformers T_2, T_3, T_4, and T_5; relays RY_1, RY_2, RY_3, and RY_4; and lamp LM_3. FUSE FS_5 protects transformer T_1 and the primary of the speech-amplifier power supply.

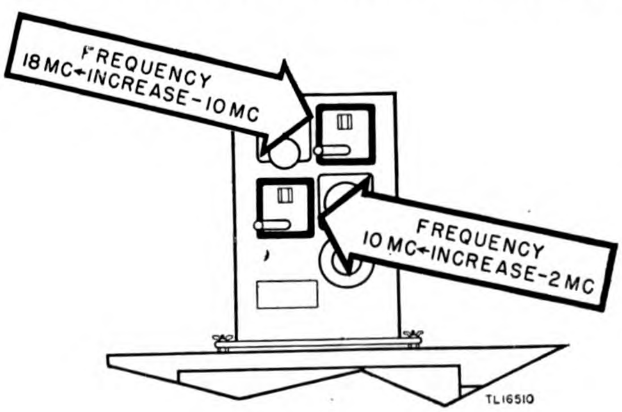
40. Tuning Unit Controls

a. The crystal jack is a two-pin receptacle to accommodate a Crystal Holder FT–171–B containing a crystal within the frequency range of the tuning unit.

b. M.O.-XTAL switch is thrown to the M.O. position for m-o (master-oscillator) operation and to the XTAL position for crystal-controlled operation.

c. M.O. control determines the frequency of the master oscillator. Calibrations on the dial of this control permit it to be set to any frequency within its range through reference to the tuning chart.

d. DOUB control is used to tune the buffer-doubler tank circuit to resonance with the signal from the oscillator. An approximate setting for this control can be obtained from the tuning charts.

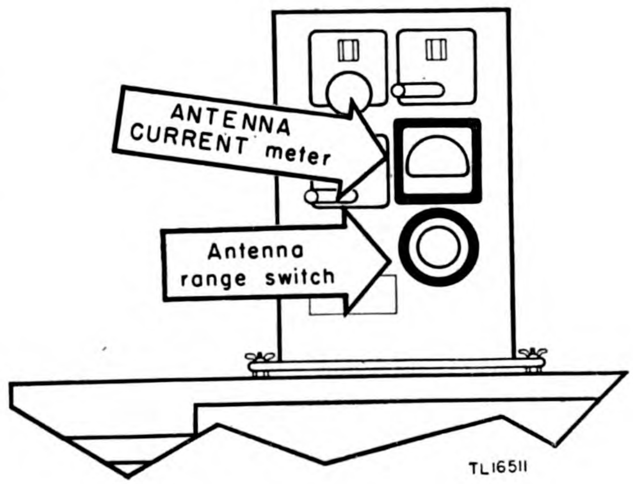


e. INT AMP control is used to tune the i-p-a tank circuit to resonance with the signal from the buffer-doubler. An approximate setting for this control is also found on the tuning charts.

41. Antenna Tuning Unit Controls

a. COUPLING INCREASE control is an antenna-coupling adjustment knob. The setting of this knob is determined from the tuning charts and is read on counters directly above the knob.

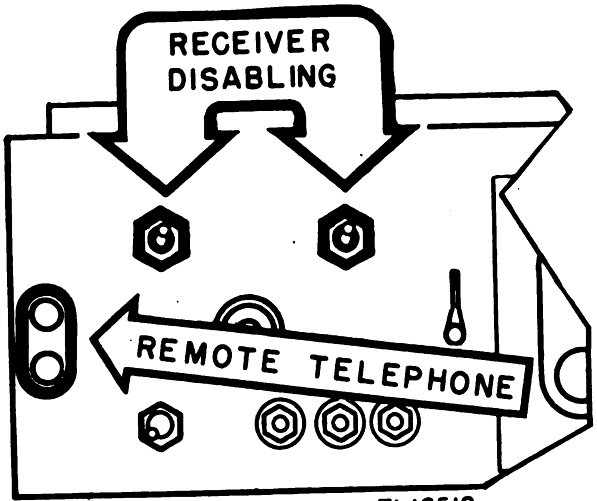
b. FREQUENCY 18MC–INCREASE–10MC control is the high-frequency tuning adjustment for the antenna. It is set approximately by the tuning charts and is read on counters directly above the control.



c. FREQUENCY 10MC–INCREASE–2MC control is the low-frequency tuning adjustment for the antenna. It is set approximately by the tuning charts and is read on counters directly above the control.

d. ANTENNA CURRENT meter, in series with the antenna coupling control, measures the r-f current in the antenna circuit.

e. Antenna range switch is marked 2–10MC LONG WIRE 10–18MC. In the 2–10MC position this switch matches the whip antenna to the low-frequency range of the transmitter. In the LONG WIRE position the antnena is so arranged that the transmitter will work on any frequency within its range into a long-wire antenna. In the 10–18MC position the switch matches the whip antenna to the high-frequency range of the transmitter.



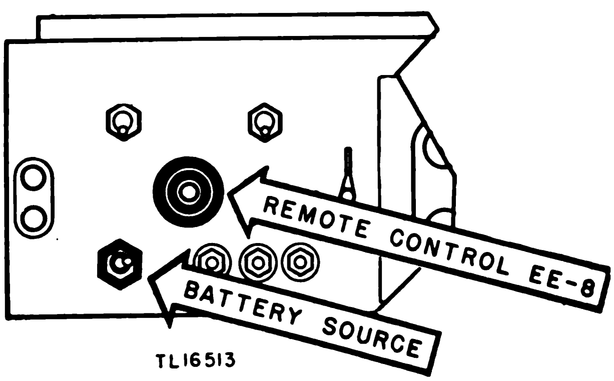
TL16512

42. Junction Box JB–70–A Controls

a. REMOTE TELEPHONE terminals are for the connection of up to a mile of Wire W–110–B from remote Telephone EE–8–( ) or from remote Key J–45.

b. BC–312 RECEIVER DISABLING switch has two positions, marked ON and OFF. With this switch in the ON position, Radio Receiver BC–312–( ) SEND-RECEIVE switch in the SEND position, and the transmitter carrier on, disabling occurs as follows: The disabling short-circuits the receiver input connections to protect the antenna coils, and also short-circuits the loudspeakers to prevent acoustic feedback to the dynamic microphone. In the OFF position no power is applied to the antenna-disabling relay in the receiver, and the loudspeakers are not short-circuited; therefore, the receiver is operative at all times.

c. BC–342 RECEIVER DISABLING switch functions for Radio Receiver BC–342–( ) in the manner described above for Radio Receiver BC–312–( ).



TL16513

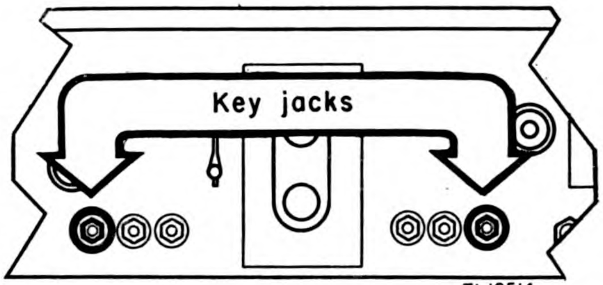
Caution: To avoid burning out the receiver input circuits, leave the RECEIVER DISABLING switches ON at all times. The only exception to this is in the monitoring of a frequency other than the transmitter frequency during transmission, in which case the corresponding RECEIVER DISABLING switch can be turned off. The RECEIVER DISABLING switch is to be turned OFF, however, only when the frequency to be monitored is considerably different from the transmitter frequency, and is not an harmonic of the transmitter frequency; otherwise, damage to the receiver will result.

d. REMOTE CONTROL EE–8 switch is set in the NORMAL position for operation from within the shelter. In the position marked TO BC–312 TELEPHONE, a remote operator can modulate the transmitter from Telephone EE–8–( ) (with main control switch in TRANS. ON position) and will hear the signals being picked up by Radio Receiver BC–312–( ) (with main control switch in REC. TO EE–8 position). In the position marked TO BC–312 TELEGRAPH, a remote operator can key the transmitter from Key J–45 (with main control switch in TRANS. ON position), and will hear the signals being picked up by Radio Receiver BC–312–( ) (with main control switch in REC. TO EE–8 position). The operator can similarly modulate and key the transmitter in the TO BC–342 TELEPHONE and TO BC–342 TELEGRAPH positions, but will hear the signals picked up by Radio Receiver BC–342–( ) when the main control switch is in REC. TO EE–8 position.

Note. If Radio Receiver BC–312–( ) is located at the remote position, the REMOTE CONTROL EE–8 switch should be left in the TO BC–312 TELEPHONE position for remote voice transmission and in the TO BC–312 TELEGRAPH position for remote keying.

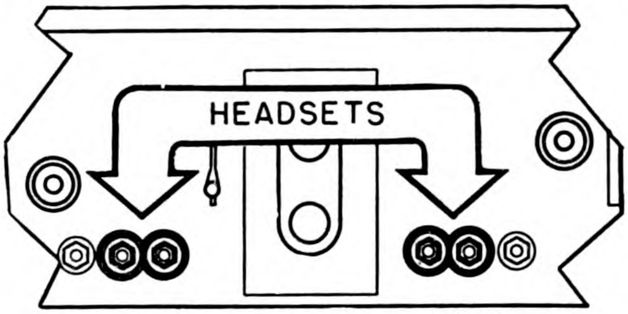
e. BATTERY SOURCE switch at AUX. connects the 12-volt battery in Chest CH–109–A into Radio Receiver BC–312–( ) and into the radio station relay circuits. Some Power Units PE–95–( ) are provided with 12-volt terminals. With Cord CO–316 connected to these terminals, the 12-volt supply may be obtained from the power unit by setting the BATTERY SOURCE switch to PE–95.

f. Two KEY jacks, either of which may be used for keying the transmitter, are located on the front panel.



TL16514

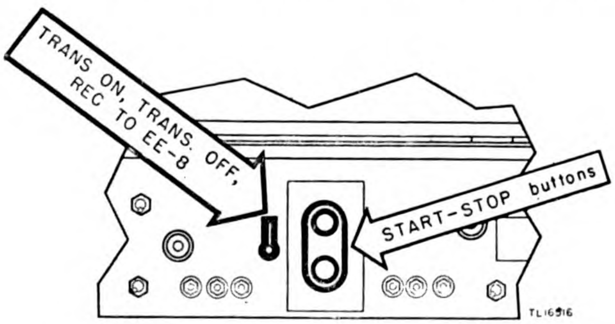
g. Two pairs of jacks marked HEADSETS are so arranged that either the left pair or the right pair may be connected to Radio Receiver



TL16515

BC–342–( ). The alternate pair is connected to Radio Receiver BC–312–( ).

h. The main control switch is marked TRANS. ON, TRANS. OFF, REC. TO EE–8. In the TRANS. ON position, the transmitter may be keyed or modulated from either the operating position or from a remote location. In the



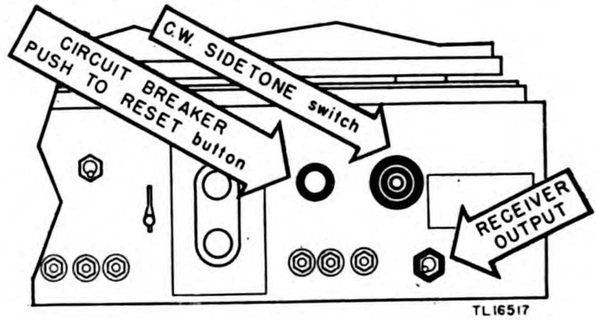
TL16516

TRANS. OFF position, no keying or modulation of the transmitter may occur (except in emergencies when the transmitter PLATE POWER switch is turned ON). In the REC. TO EE–8 position (with the REMOTE CONTROL EE–8 switch other than NORMAL), the remote location can hear the signals being received in the shelter.

i. START-STOP buttons are remote controls for Power Unit PE–95–( ). Pressure on the START button applies current to the starting relay in the power unit, thus starting the engine. Pressure on the STOP button applies current to the stopping relay in the power unit, thus stopping the engine.

Note. In Power Units PE–95–( ) made by Ford, the button must be held down until the engine is started or stopped. In Power Units PE–95–( ) made by Willys, a holding relay performs this function, and once a button is depressed momentarily, it is held in automatically until the function is completed.

j. CIRCUIT BREAKER PUSH TO RESET button is used to return the transmitter a-c line circuit breaker to normal when it has opened through an overload in the transmitter circuit.



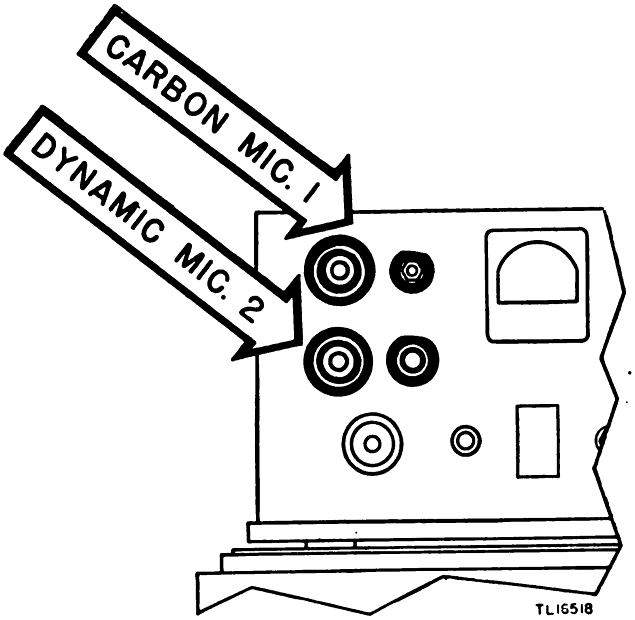
TL16517

k. C.W. SIDETONE switch has three positions, marked TO BC–312, OFF, and TO BC–342. In the TO BC–312 position, sidetone from the transmitter is applied to the HEADSETS jacks on the left side of Junction Box JB–70–A panel and to the loudspeaker in Chest CH–21–A. In the OFF position, no sidetone is applied. In the TO BC–342 position, sidetone from the transmitter is applied to the HEADSETS jacks on the right side of Junction Box JB–70–A panel and to the loudspeaker in Chest CH–120–A. The same sidetone is applied to the remote telephone line in either TELEGRAPH position of REMOTE CONTROL EE–8 switch.

l. RECEIVER OUTPUT switch in the normal position connects the left HEADSETS jacks to Radio Receiver BC–312–( ) and the right HEADSETS jacks to Radio Receiver BC–342–( ). In the TRANSPOSED position the left HEADSETS jacks are connected to Radio Receiver BC–342–( ) and the right HEADSETS jacks are connected to Radio Receiver BC–312–( ).

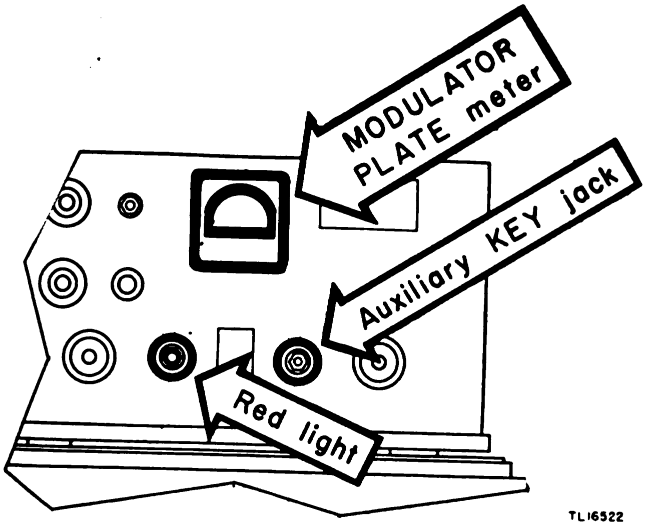
43. Speech Amplifier BC–614–E Controls

a. CARBON MIC. 1 is the panel marking for a gain control and jack for Microphone T–17 or T–30. When using Microphone T–17 or T–30, plug it into the CARBON MIC. 1 jack and adjust the corresponding gain control as described in paragraph 51.



TL16518

b. DYNAMIC MIC. 2 marks the location of the gain control and jack for Microphone T–50. This gain control is also used to control the output of Telephone EE–8–( ) when used in a remote position. The adjustment of the gain for Microphone T–50 and for remote Telephone EE–8–( ) is described in paragraph 51.



TL16522

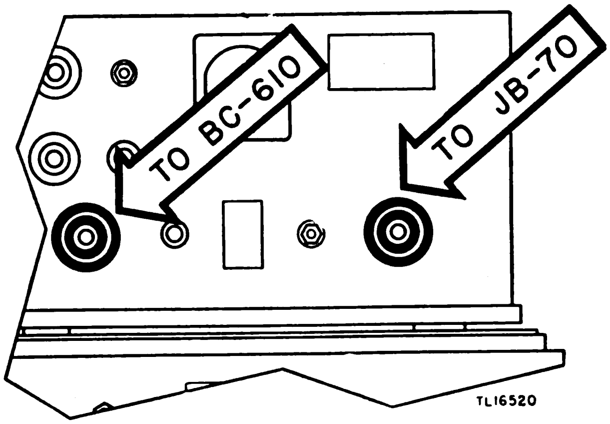
c. MODULATOR PLATE meter indicates the current in the plate circuit of modulator tubes V3 and V4. Its readings are controlled by the adjustment of the MODULATOR BIAS control on the transmitter panel and by adjustment of either microphone gain control on the speech-amplifier panel.

d. A red pilot lamp on the speech-amplifier panel is lighted when the transmitter FILAMENT POWER switch is in the ON position.

e. An auxiliary KEY jack on the speech-amplifier panel makes it possible to key the transmitter in emergencies.

Caution: The receiver disabling circuits are inoperative when this key jack is used. To avoid burning out the receiver input circuits, turn off the receivers during transmission from this key jack, or make sure that they are tuned to a frequency considerably different from the transmitted frequency but not to an harmonic of the transmitted frequency.

f. The eight-pin receptacle marked TO BC-610 is used to connect Cord CD–764 to the transmitter.



TL16520

g. The eight-pin receptacle marked TO JB-70 is used to connect Cord CD–566 to Junction Box JB–70–A.

44. Junction Box JB–60–A Controls

a. LINE terminals are used to connect to Wire W–110–B (up to a mile in length) from the REMOTE terminals on Junction Box JB–70–A.

b. A KEY jack permits remote keying of the transmitter through the connecting field-wire line.

c. A cord marked EE–8 connects Telephone EE–8–( ) into Junction Box JB–60–A. The remote operator is thus able to modulate the transmitter and to hear the signals being received in the shelter.

45. Rectifier RA–63–(*) Controls

a. The rectifier main control switch has three positions marked TRICKLE, OFF, and HI CHARGE. In the TRICKLE position a low voltage is applied to the rectifier and enough charging current is supplied to the battery to offset the load under operating conditions. In the OFF position no charge is applied to the battery. In the HI CHARGE position full voltage is applied to the rectifier with an accompanying high charging rate of the battery.

b. The button marked PUSH TO RESET is used to reset the circuit breaker if it has opened as a result of an overload.

Section II. TUNING

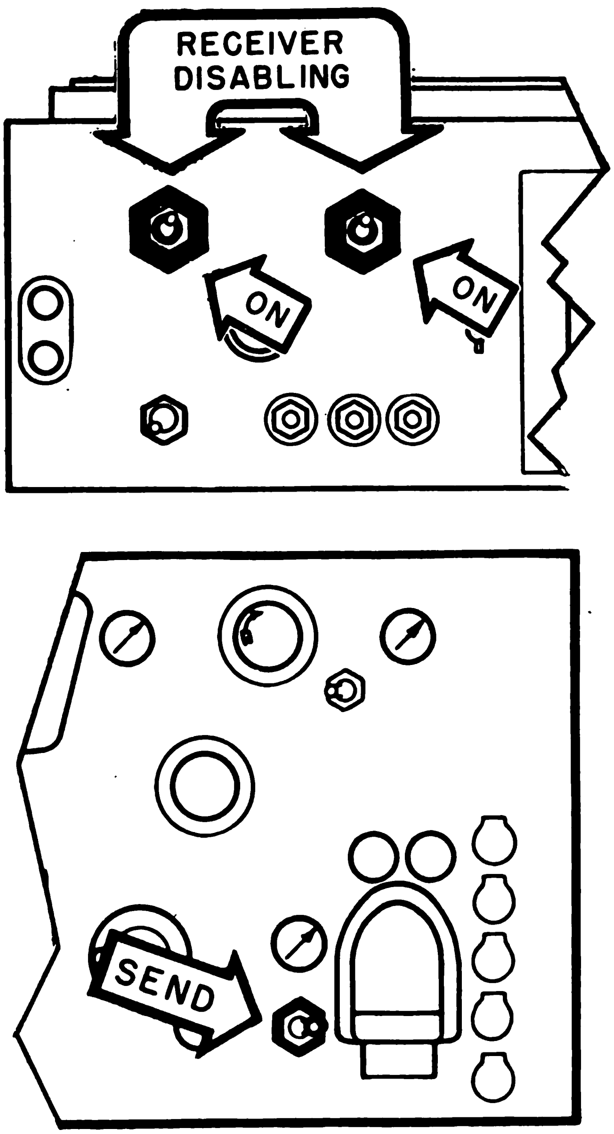
46. Preliminary Steps

a. SAFETY NOTICE. Reread the safety notice in front of book.

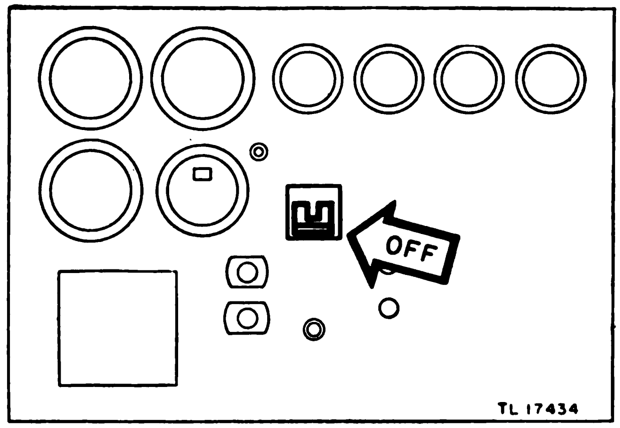
b. RECEIVER DISABLING. (1) Always leave RECEIVER DISABLING switches on Junction Box JB–70–A at ON.

(2) Always leave the SEND–REC. switches on Radio Receivers BC–312–( ) and BC–342–( ) at SEND.

c. GASOLINE TANKS. Never fill gasoline tanks

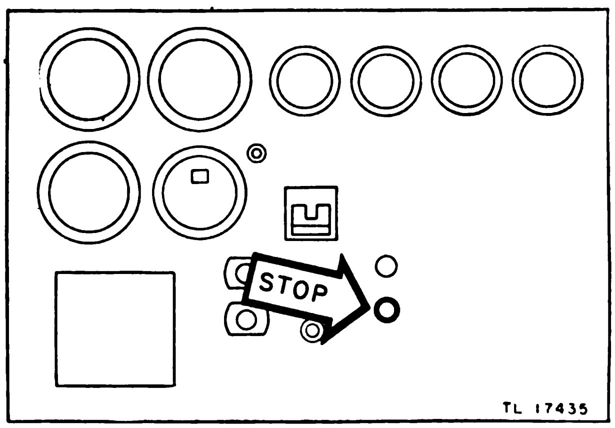


TL 14801



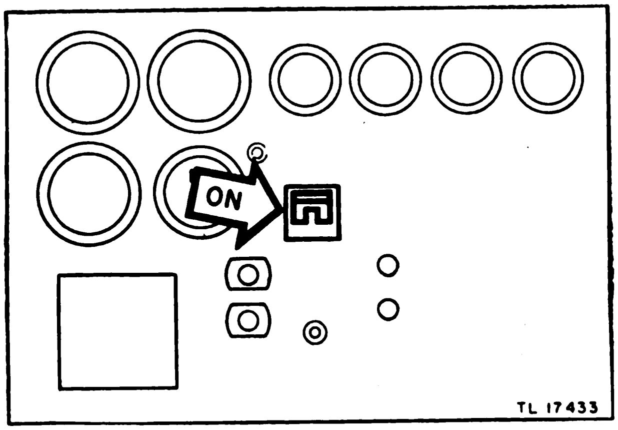
of either truck or trailer when transmitter is in operation.

d. POWER UNIT PE–95–( ). (1) *Start and check the unit.* Turn OFF THE large ON-OFF switch marked CIRCUIT BREAKER (located on the control panel of the power unit). Check the operation and condition of the power unit in accordance with procedure described in TM 11–904.



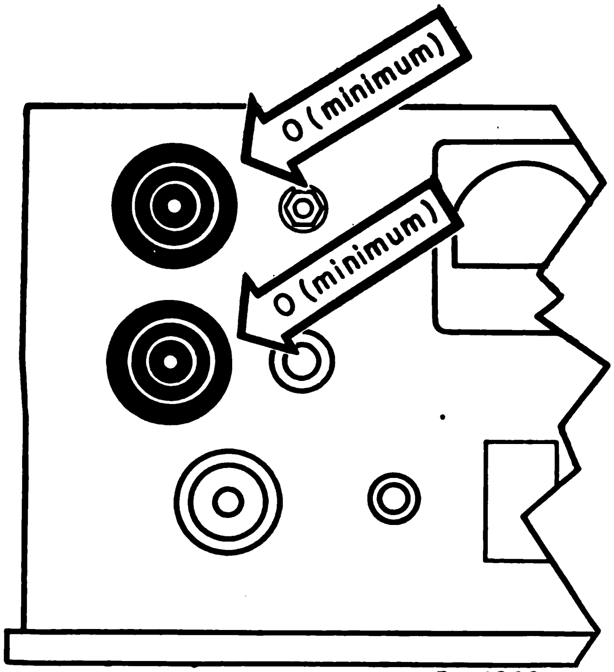
(2) *Stop the unit.* When completely checked, push the STOP button of the START-STOP switch (on the control panel of the power unit) and hold it until the power unit stops.

Note. Some power units are issued which contain a momentary push-to-stop switch which does not have to be held in until the power unit stops. In general, the stop button must be held in on Ford-powered units, while Willys-powered units have the momentary push-to-stop switches.



TL 17433

(3) *Set circuit breaker.* Set the ON-OFF (CIRCUIT BREAKER) switch of the power unit at ON.



TL 14802

e. POSITION OF SWITCHES AND CONTROLS. (1) *Speech Amplifier BC-614-E.* Rotate the gain control knobs of both CARBON MIC. 1 and DYNAMIC MIC. 2 to their extreme counterclockwise positions (minimum gain).

(2) *Junction Box JB-70-A.* (*a*) Set transmitter main control switch at TRANS. OFF.

(*b*) Set C.W. SIDETONE switch at OFF.

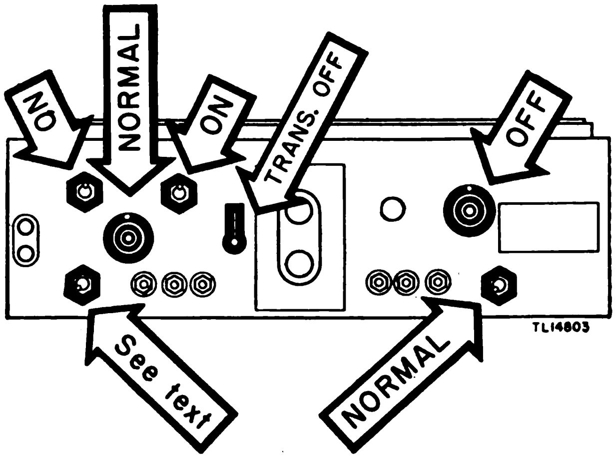
(*c*) Set both receiver disabling switches (marked RECEIVER DISABLING) at ON.

(*d*) Set RECEIVER OUTPUT switch at NORMAL.

(*e*) Set REMOTE CONTROL EE-8 switch at NORMAL.

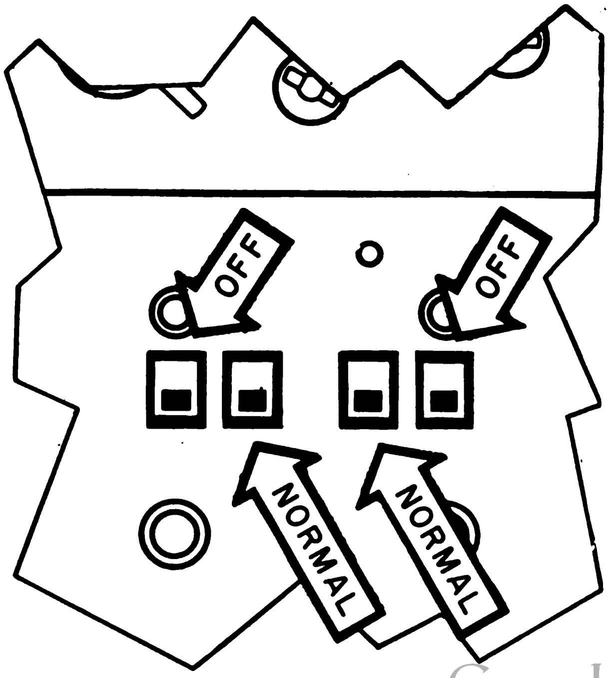
(*f*) BATTERY SOURCE switch.

1. If Power Unit PE-95-( ) is provided with 12-volt terminals and Cord CO-316 is connected to these terminals, set the BATTERY SOURCE switch on Junction Box JB-70-A at PE-95.



TL14803

2. If the 12-volt supply in Chest CH-109-A is to be used, set the BATTERY SOURCE switch at AUX. and set the Rectifier RA-63-(*) switch at TRICKLE. If Radio Receiver BC-312-( ) is to be used, set the rectifier switch at HI CHARGE.



TL14804

Caution: When Radio Receiver BC–312–( ) is to be turned off for more than 1 hour, turn the rectifier switch to TRICKLE.

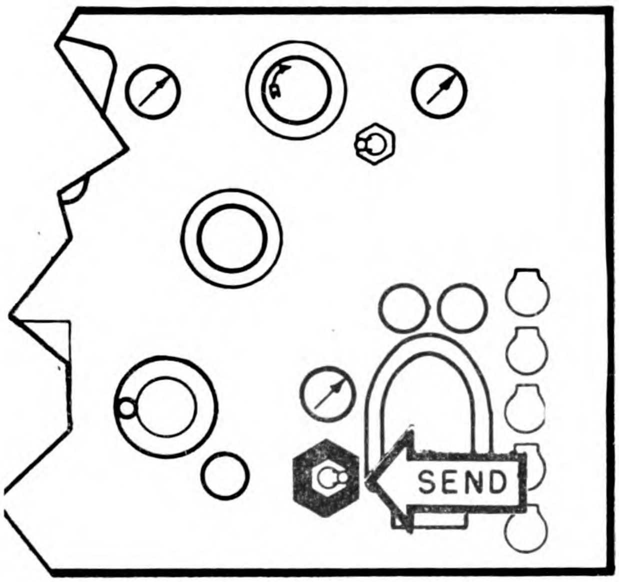
(*g*) See that key plugs are in proper jacks.

(3) *Radio Transmitter BC–610–E.* (*a*) Set FILAMENT POWER switch at OFF.

(*b*) Set PLATE POWER switch at OFF.

(*c*) Set EXCITER PLATE POWER switch at NORMAL (down).

(*d*) Set HIGH VOLTAGE PROTECT switch at NORMAL (down).



TL14805

(4) *Radio Receivers BC–312–( ) and BC–342–( ).* Set SEND–REC. switches at SEND.

Caution: Leave these switches in SEND position at all times.

f. Drying Out the Transmitter. Start Power Unit PE–95–( ) and turn on FILAMENT POWER switch of Radio Transmitter BC–610–E. In damp locations this should be done at least 15 to 30 minutes before turning on the high voltage. The drying process can be accelerated by turning on the heater in the shelter.

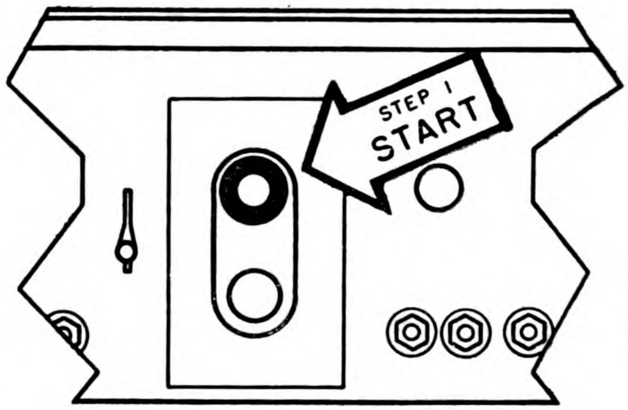
g. Radio Receivers BC–312–( ) and BC–342–( ). (1) Check the operation and condition of Radio Receivers BC–312–( ) and BC–342–( ) as outlined in TM 11–850.

(2) Remove two Headsets HS–30–( ) with Cords CD–605 from Chest CH–120–A. On Junction Box JB–70–A, plug one headset into one of the jacks marked HEADSET located to the left of the START-STOP switch, and plug the other headset into one of the jacks to the right of the START-STOP switch. When the RECEIVER OUTPUT switch is set at NORMAL (par. 421), the left-hand pair of headset jacks is connected to Radio Receiver BC–312–( ) and the right-hand pair of headset jacks is connected to Radio Receiver BC–342–( ).

Note. When no commercial power is available, Power Unit PE–95–( ) must be started before Radio Receiver BC–342–( ) can be checked.

47. Tuning Radio Transmitter BC–610–E for C-W Operation [Master-Oscillator Control]

No matter what mode of operation is intended, always tune the transmitter for c–w operation first. The step-by-step procedure outlined below is illustrated with line drawings. The numbers and letters on these illustrations correspond to the numbers and letters used in the text.



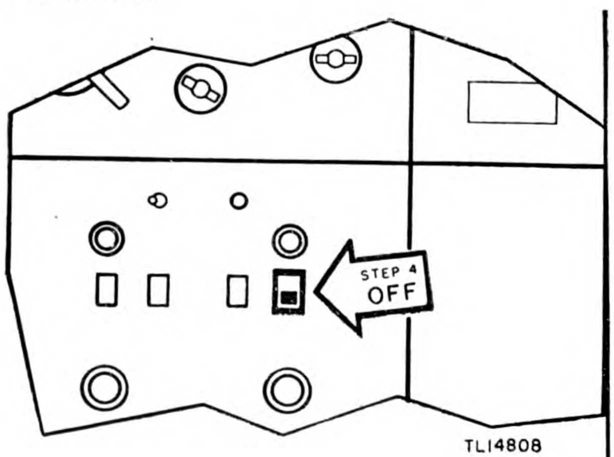
TL14806

STEP 1

Push the START button on Junction Box JB–70–A until Power Unit PE–95–( ) starts and picks up speed.

STEP 2

Turn on the electric lights in Chest CH–120–A, Chest CH–121–A, and in the shelter over the transmitter.



TL14808

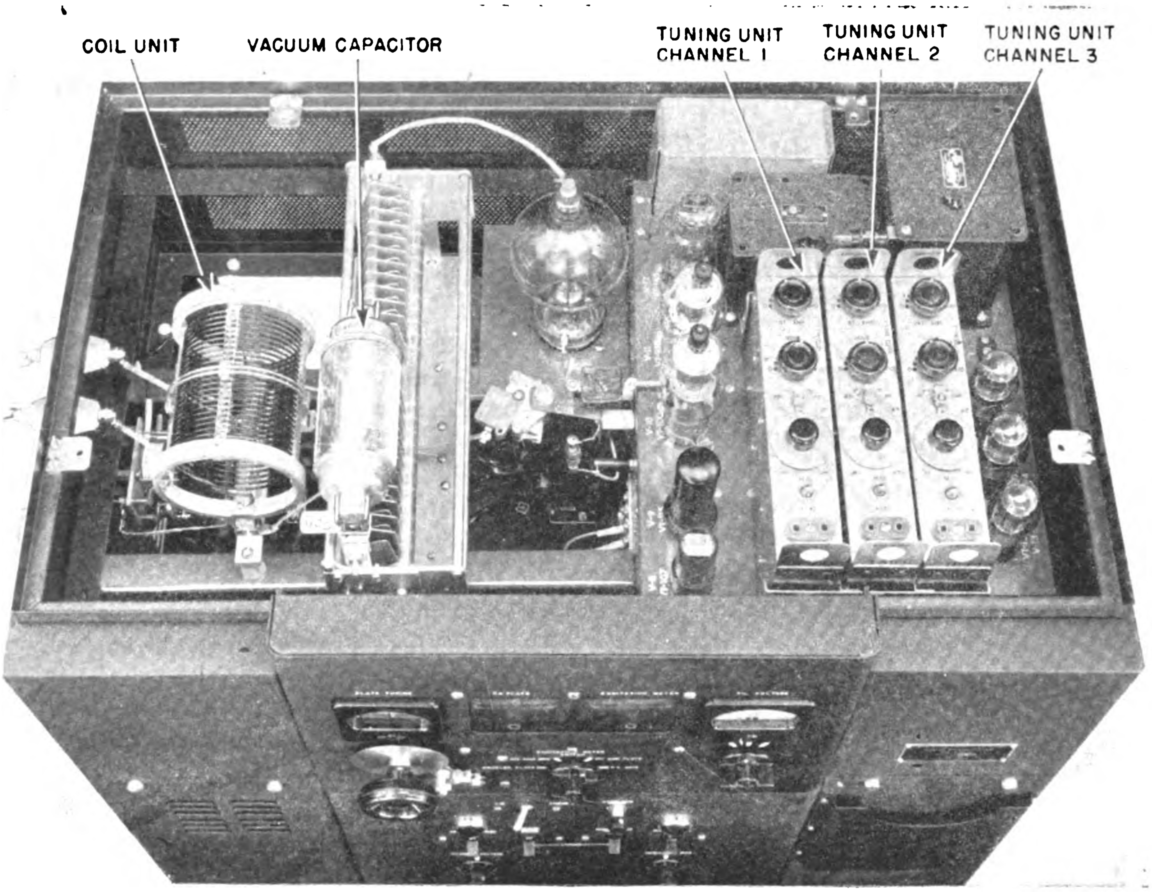
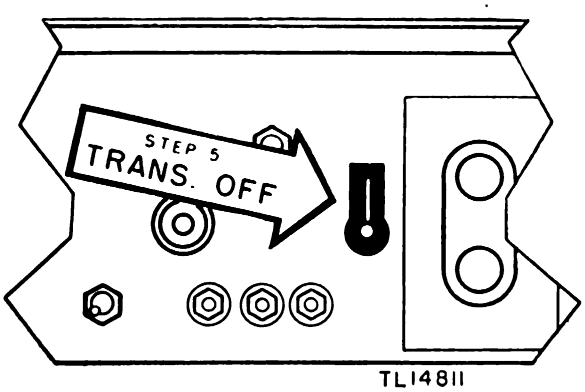


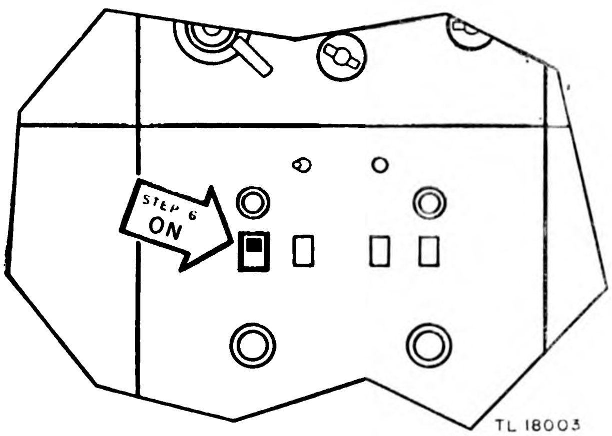
Figure 30. Radio Transmitter BC–610–E, top covers removed.

STEP 3
Turn on the electric heater or the ventilating blower, if either is desired.

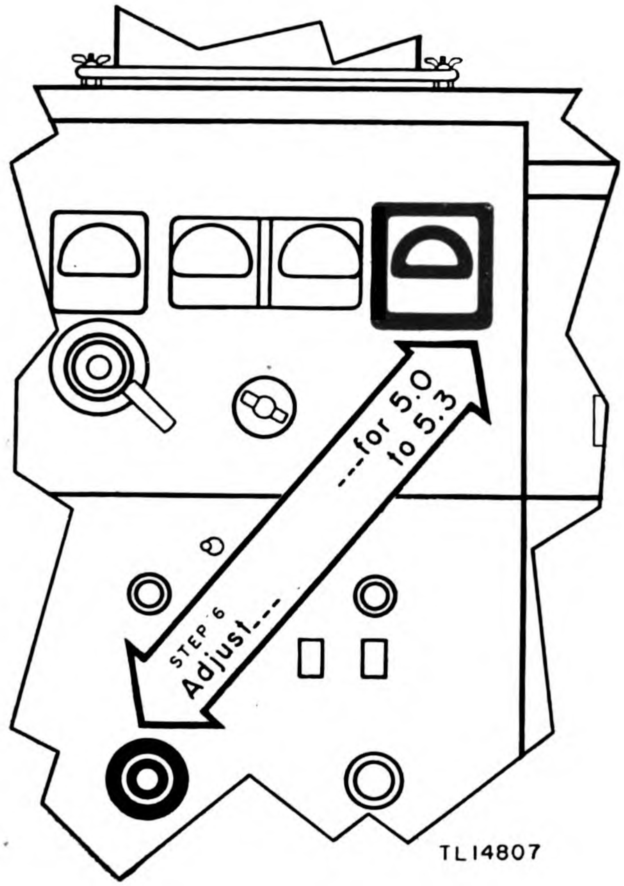
STEP 4
See that the PLATE POWER switch of the transmitter is at OFF and is left there. (See Caution, par. 39*m*.)



STEP 5
Make sure that the transmitter control switch on Junction Box JB–70–A is at TRANS. OFF.



STEP 6
Set the FILAMENT POWER switch of the transmitter at ON. The green pilot lamp and the PLATE TUNING dial should now light. The FIL. VOLTAGE meter should register. (Allow 1 minute for the filaments to come up to the proper operating temperature.) Adjust the FILAMENT VOLTAGE control of the

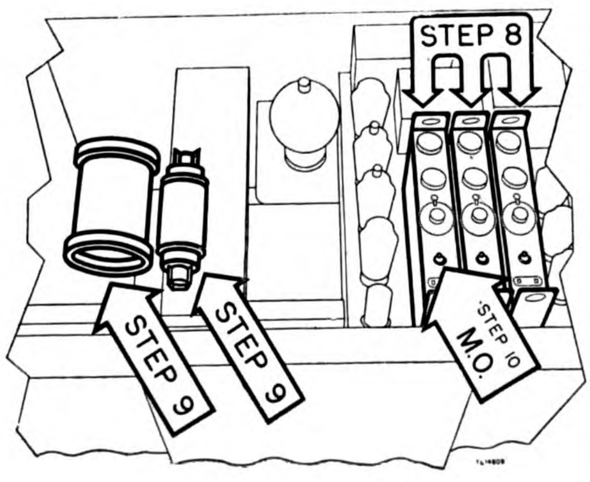


TL14807

transmitter until the FIL. VOLTAGE meter indicates 5.0 to 5.3 volts.

STEP 7

From Chest CH–88–A, select one tuning unit covering the desired frequency range. Tables III and IV list the tuning units and the frequency ranges they cover. Figures 156 through 160 show the tuning charts furnished with the radio sets.



STEP 8

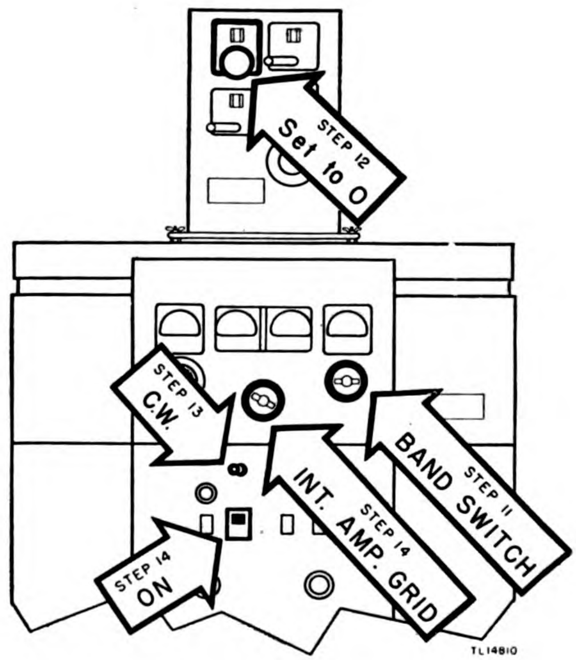
Open the right-hand door in the cover of the transmitter and firmly insert the tuning unit in one of the three available receptacles, marked 1, 2, and 3. (Locate the tuning unit so that the switch marked M.O.–XTAL faces the front panel of the transmitter.)

STEP 9

From Chest CH–88–A, select one coil unit covering the desired frequency. Remove Capacitor CA–423 from Chest CH–88–A, if operation in the 2.0–to 2.5–mc (megacycle) range is desired. Open the left-hand door in the cover of the transmitter and insert the coil unit (and Capacitor CA–423 if required).

STEP 10

Set the M.O.–XTAL switch of the tuning unit at M.O.



TL14810

STEP 11

Set the BAND SWITCH on the front panel of the transmitter at the number which corresponds to the socket in which the tuning unit was placed.

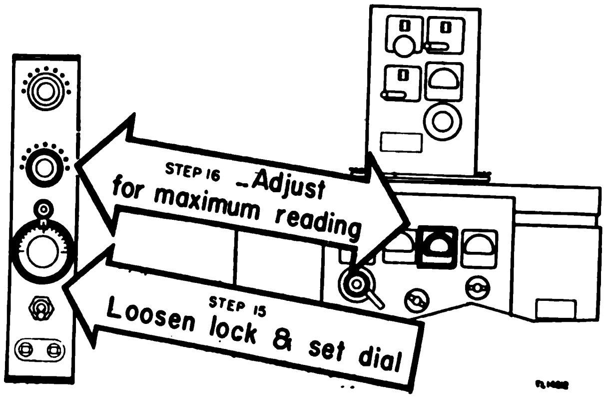
STEP 12

Set the COUPLING control of Antenna Tuning Unit BC–939–A to O.

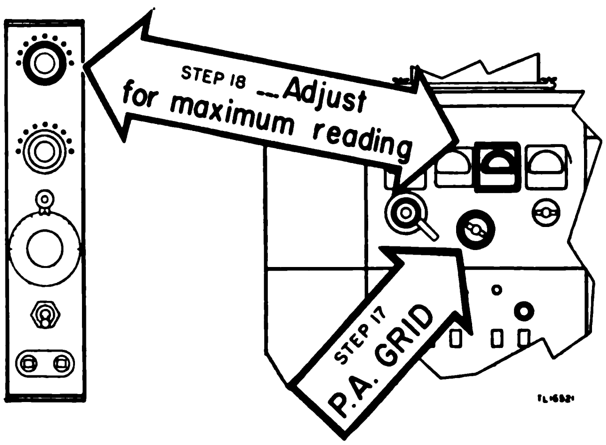
STEP 13

Set the C.W.–PHONE switch of the transmitter at C.W.

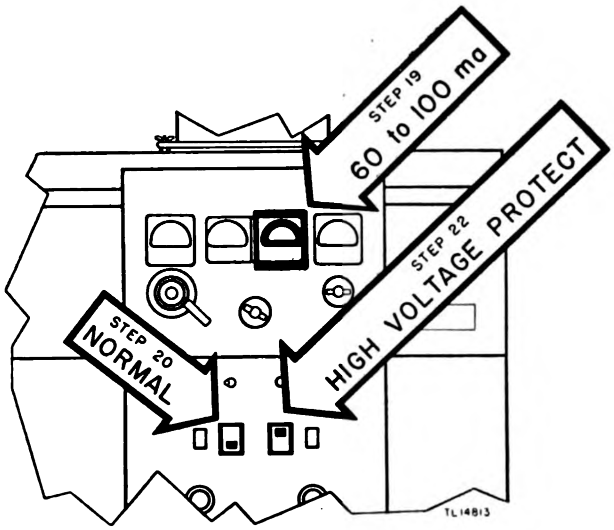
STEP 14
Set the EXCITATION METER SWITCH on the front panel of the transmitter at INT. AMP. GRID. Set the EXCITER PLATE POWER switch of the transmitter at ON.



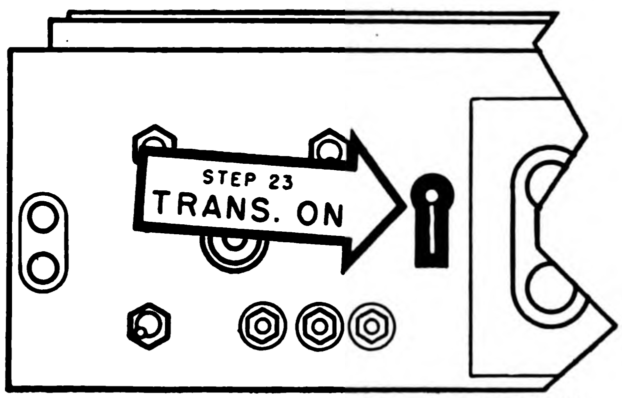
STEP 15
Loosen the thumbscrew lock on the M.O. dial of the tuning unit. Set the M.O. dial to the desired frequency as indicated by the tuning chart of Radio Transmitter BC–610–E which pertains to the tuning unit in use. For greater accuracy use Frequency Meter Set SCR–211–( ). (See TM 11–300.) Tighten the dial lock.
STEP 16
Adjust the center knob of the tuning unit (marked DOUB) for maximum reading as indicated on the EXCITATION METER.



STEP 17
Set the EXCITATION METER SWITCH on the front panel of the transmitter at P.A. GRID.
STEP 18
Adjust the INT. AMP. knob of the tuning unit for maximum reading as indicated on the EXCITATION METER.



STEP 19
Repeat steps 16 and 18 until the maximum possible deflection is obtained on the EXCITATION METER. The EXCITATION METER should indicate between 60 and 100 ma (milliamperes).
STEP 20
Set the EXCITER PLATE POWER switch at NORMAL (off).
STEP 21
Make certain that both doors in the top cover of the transmitter are firmly closed upon the interlock switches; otherwise plate power cannot be applied.
STEP 22
Set the HIGH VOLTAGE PROTECT switch at HIGH VOLTAGE PROTECT. Always do this before tuning the final amplifier or the antenna tuning unit.



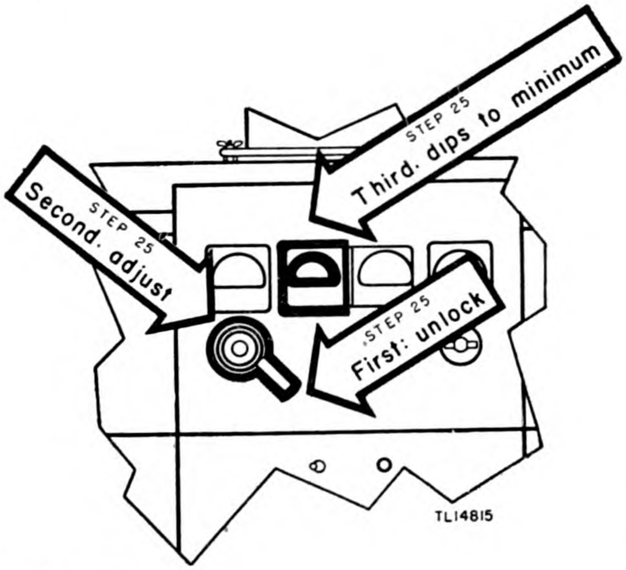
TL14814

STEP 23

Set the transmitter control switch on Junction Box JB–70–A at TRANS. ON. The red pilot lamp on the transmitter should now light.

STEP 24

Press and hold down Key J–37 while making subsequent tuning adjustments. The P.A. PLATE meter should indicate a flow of current in the circuit. The quantity of current will depend upon the setting of the PLATE TUNING dial.



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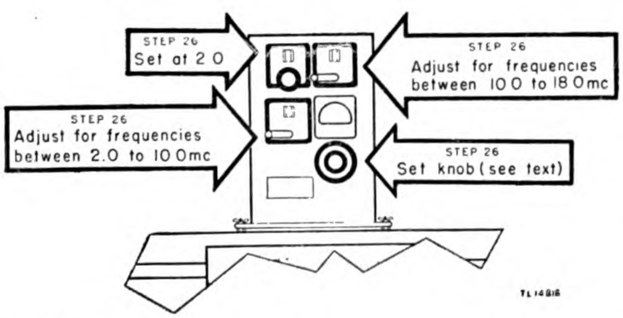
STEP 25

Unlock the PLATE TUNING dial by pushing down on the small knurled knob and adjust the wheel until the P.A. PLATE meter dips to a minimum reading. ONCE THIS ADJUSTMENT IS MADE, DO NOT CHANGE IT UNTIL THE TRANSMITTER IS TO BE TUNED ON A NEW FREQUENCY. Lock the PLATE TUNING dial by pushing the lock lever to the right.



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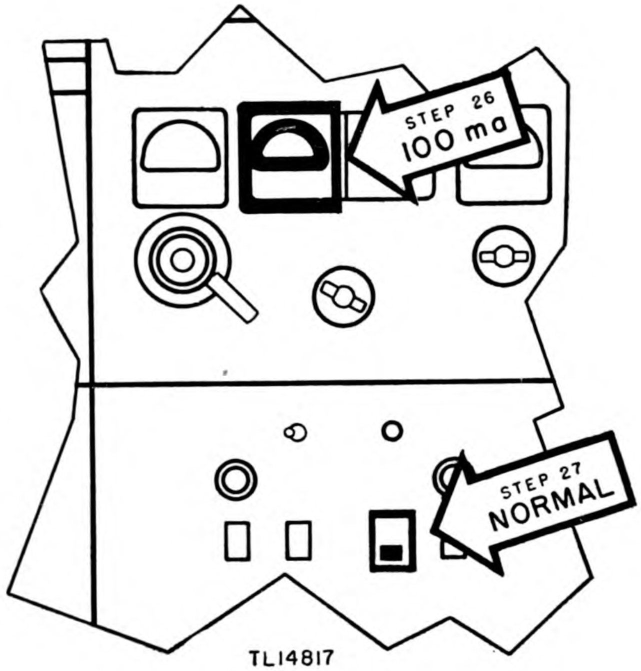
STEP 26

On Antenna Tuning Unit BC–939–A, set the range switch knob at 2–10MC if operating below 10 mc, or at 10–18MC if operating above



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10 mc. If a long wire antenna is used, set the knob at LONG WIRE. Set COUPLING INCREASE control at about 2.0. From the tuning chart, determine the approximate setting of antenna tuning inductor for the selected frequency. Turn antenna tuning inductor crank to approach this setting and watch for an indication of rising plate current on the P.A. PLATE meter on the transmitter.

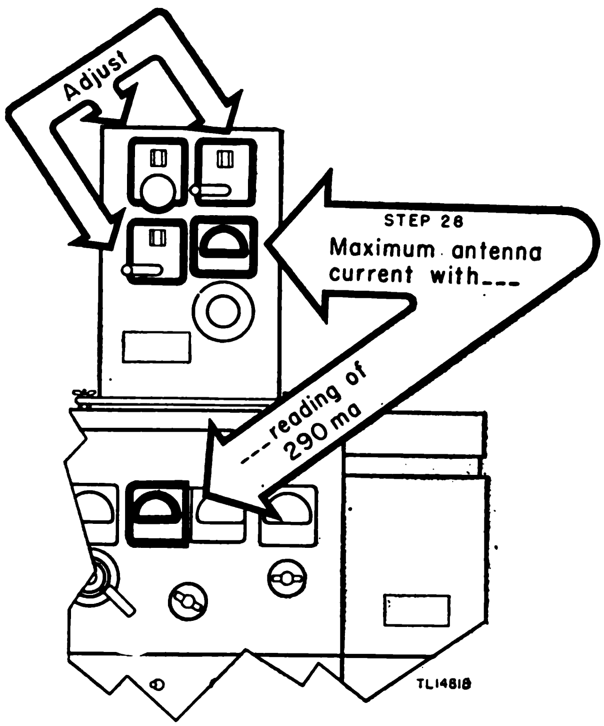
Note. If the operating frequency is in the range of 2 to 10 mc, use the crank marked FREQUENCY 10MC–INCREASE–2MC. If the operating frequency is in the range of 10 to 18 mc, use the crank marked FREQUENCY 18MC–INCREASE–10MC. When the antenna range switch is set at LONG WIRE, use the crank marked FREQUENCY 10MC–INCREASE–2MC. It will be found that fewer turns of the loading coil will be necessary when a long wire antenna is used instead of a whip antenna.

Adjust the proper crank for maximum indication of the P.A. PLATE meter. Either increase or decrease the degree of coupling with the COUPLING INCREASE knob of the antenna tuning unit to keep the P.A. PLATE meter reading at 100 ma. The ANTENNA CURRENT meter will now give some indication of antenna current.

STEP 27

Throw the HIGH VOLTAGE PROTECT switch of the transmitter to NORMAL. Press Key J–37. The P.A. PLATE meter of the transmitter and the ANTENNA CURRENT meter of the antenna tuning unit will now indicate substantially higher readings.

STEP 28
Alternately adjust the COUPLING INCREASE control and the tuning inductor crank until the maximum antenna current occurs when the P.A. PLATE meter reads 290 ma.

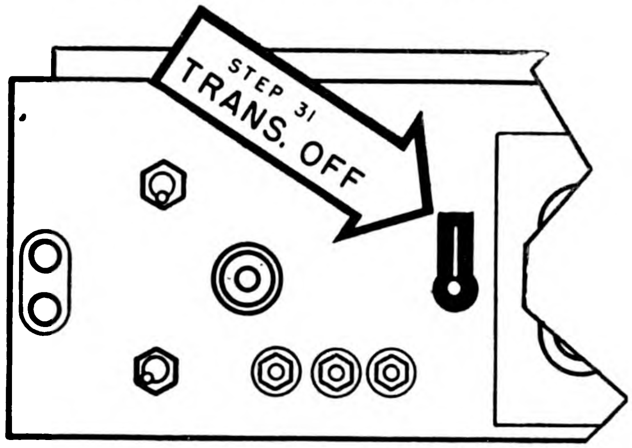


Caution: NEVER EXCEED A P.A. PLATE METER READING OF 300 MA on c–w operation. It is permissible to reduce coupling until plate current is as low as 200 ma, if satisfactory c–w communication is still maintained. Do not readjust the PLATE TUNING dial after it is once adjusted for the frequency on which operation is to take place.

STEP 29
Release Key J–37. With the opening of the key, the EXCITATION, P.A. PLATE, and ANTENNA CURRENT meters should return to zero.

STEP 30
Press Key J–37 and check the FIL. VOLTAGE meter. If necessary reset the FILAMENT VOLTAGE knob until this meter reads 5.0 to 5.3 volts; then release the key. This completes the tuning procedure, and the transmitter is ready for c–w operation. Keying of the transmitter may be checked by depressing the key and noting the meter indications. Data on meter readings will be found in the equipment performance check list. (See par. 66.)

STEP 31
If c–w transmission is not desired at the moment, throw the transmitter control switch on the junction box to TRANS. OFF.



Note. To turn off the transmitter completely, set the FILAMENT POWER switch on Radio Transmitter BC–610–E at OFF.

Table III. Tuning components

Component	Frequency Range (mc)
Tuning Unit	
TU–47	2.0 to 2.5
TU–48	2.5 to 3.2
TU–49	3.2 to 4.0
TU–50	4.0 to 5.0
TU–51	5.0 to 6.35
TU–52	6.35 to 8.0
TU–53	8.0 to 12.0
TU–54	12.0 to 18.0
Coil Unit	
C–387–B (with Capacitor CA–423)	2.0 to 2.5
C–387–B	2.5 to 3.5
C–388–A	3.5 to 4.5
C–389–A	4.5 to 5.7
C–390–A	5.7 to 8.0
C–447	8.0 to 11.0
C–448	11.0 to 14.0
C–449	14.0 to 18.0

Table IV. Tuning ranges for long wire antennas when used with Antenna Tuning Unit BC–939–A

Antenna lengths (ft.)	Useful frequency range (mc)
25	2 to 10; 15 to 18
35	2 to 6; 11 to 18
45	2 to 4; 10 to 18
65	2 to 3; 9 to 18

48. Tuning Radio Transmitter BC–610–E for C-W Operation [Crystal Control]

STEP 1
Perform all operations in steps 1 through 9 and 11 through 13 in paragraph 47, then proceed as follows:

STEP 2
Set the tuning unit M.O.–XTAL switch at XTAL. Insert into XTAL jack Crystal Holder

FT–171–B with a crystal of proper frequency as listed in table V.

Note. At frequencies between 2 and 4 mc, the transmitter output frequency is the same as the crystal frequency and a circuit controlled by the DOUB. knob functions as a buffer stage. At frequencies between 4 and 12 mc, this stage acts as a doubler; hence the output frequency is twice that of the crystal. For example, a crystal with a frequency of 2,200 kc (kilocycles) may be used with Tuning Unit TU–47 to produce the same frequency in the transmitter output or it may be used with Tuning Unit TU–50 to operate the transmitter on 4,400 kc. At frequencies between 12 and 18 mc this stage quadruples the crystal frequency. For example, a 4,000-kc crystal will produce a transmitter output frequency of 16,000 kc.

STEP 3

Set the EXCITATION METER SWITCH on the transmitter at INT. AMP. GRID. Set the EXCITER PLATE POWER switch on the transmitter at ON.

STEP 4

Perform all operations listed in steps 16 through 30, paragraph 47.

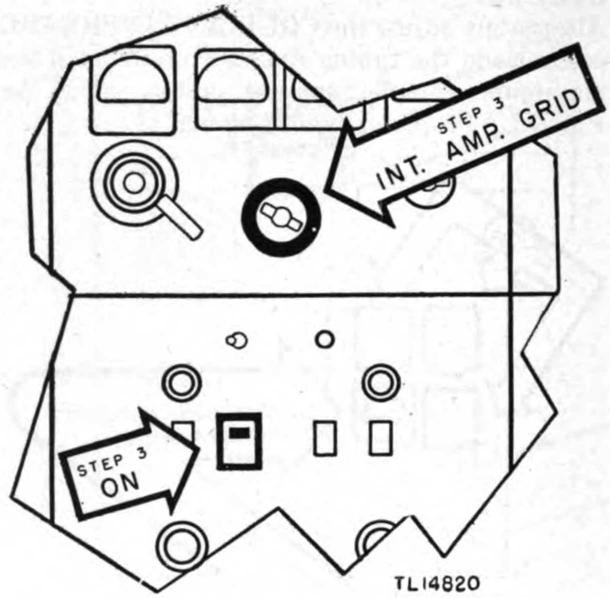


Table V. Crystals and operating frequencies

Note. Radio Sets SCR–399–A and SCR–499–A include two sets of Crystal Holders FT–171–B whose crystals have the following operating frequencies. For convenience, a third column is included to show the additional operating frequencies which may be obtained by use of different tuning units. Two groups of crystals are shown, only one of which is supplied with each set.

GROUP 1

Crystal frequency (kc)	Operating frequency (kc)	Tuning Unit	Additional possible operating frequencies (kc)	Tuning Unit
2,030	2,030	TU–47	4,060	TU–50
2,220	2,220	TU–47	4,440	TU–50
2,258	2,258	TU–47	4,516	TU–50
2,300	2,300	TU–47	4,600	TU–50
2,360	2,360	TU–47	4,720	TU–50
2,390	2,390	TU–47	4,780	TU–50
3,510	3,510	TU–49	7,020	TU–52
3,520	3,520	TU–49	7,040	TU–52
3,550	3,550	TU–49	7,100	TU–52
3,570	3,570	TU–49	7,140	TU–52
3,580	3,580	TU–49	7,160	TU–52
3,945	3,945	TU–49	7,890	TU–52
3,955	3,955	TU–49	7,910	TU–52
2,045	4,090	TU–50	2,045	TU–47
2,065	4,130	TU–50	2,065	TU–47
2,105	4,210	TU–50	2,105	TU–47
2,105	4,210	TU–50	2,105	TU–47
2,125	4,250	TU–50	2,125	TU–47
2,145	4,290	TU–50	2,145	TU–47
2,155	4,310	TU–50	2,155	TU–47
2,260	4,520	TU–50	2,260	TU–47
2,282.5	4,565	TU–50	2,282.5	TU–47
2,290	4,580	TU–50	2,290	TU–47
2,305	4,610	TU–50	2,305	TU–47
2,320	4,640	TU–50	2,320	TU–47
2,415	4,830	TU–50	2,415	TU–47
2,435	4,870	TU–50	2,435	TU–47
2,442.5	4,885	TU–50	2,442.5	TU–47
2,532.5	5,065	TU–51	2,532.5	TU–48
2,545	5,090	TU–51	2,545	TU–48
2,557.5	5,115	TU–51	2,557.5	TU–48
3,202.5	6,405	TU–52	3,202.5	TU–49
3,215	6,430	TU–52	3,215	TU–49
3,237.5	6,475	TU–52	3,237.5	TU–49
3,250	6,500	TU–52	3,250	TU–49
3,322.5	6,645	TU–52	3,322.5	TU–49

GROUP 2

Crystal frequency (kc)	Operating frequency (kc)	Tuning Unit	Additional possible operating frequencies (kc)	Tuning Unit
2,030	2,030	TU–47	4,060	TU–50
2,052.5	2,052.5	TU–47	4,105	TU–50
2,085	2,085	TU–47	4,170	TU–50
2,117.5	2,117.5	TU–47	4,235	TU–50
2,160	2,160	TU–47	4,320	TU–50
2,200	2,200	TU–47	4,400	TU–50
2,217.5	2,217.5	TU–47	4,435	TU–50
2,390	2,390	TU–47	4,780	TU–50
2,415	2,415	TU–47	4,830	TU–50
2,436	2,436	TU–47	4,872	TU–50
2,532.5	2,532.5	TU–48	5,065	TU–51
2,647.5	2,647.5	TU–48	5,295	TU–51
2,772	2,772	TU–48	5,544	TU–51
2,980	2,980	TU–48	5,960	TU–51
3,000	3,000	TU–48	6,000	TU–51
3,035	3,035	TU–48	6,070	TU–51
3,100	3,100	TU–48	6,200	TU–51
3,120	3,120	TU–48	6,240	TU–51
3,150	3,150	TU–48	6,300	TU–51
3,155	3,155	TU–48	6,310	TU–51
3,232.5	3,232.5	TU–49	6,465	TU–52
3,265	3,265	TU–49	6,530	TU–52
3,322.5	3,322.5	TU–49	6,645	TU–52
3,417.5	3,417.5	TU–49	6,835	TU–52
3,475	3,475	TU–49	6,950	TU–52
3,588	3,588	TU–49	7,170	TU–52
3,665	3,665	TU–49	7,330	TU–52
3,725	3,725	TU–49	7,450	TU–52
3,785	3,785	TU–49	7,570	TU–52
3,792.5	3,792.5	TU–49	7,585	TU–52
3,850	3,850	TU–49	7,700	TU–52
3,865	3,865	TU–49	7,730	TU–52
3,905	3,905	TU–49	7,810	TU–52
3,935	3,935	TU–49	7,870	TU–52
3,995	3,995	TU–49	7,990	TU–52
3,997.5	3,997.5	TU–49	7,995	TU–52

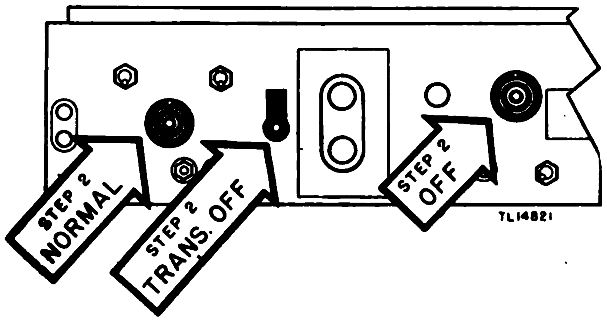
Note. Although no crystals are included for frequencies above 8 mc, the following examples show typical crystal and operating frequencies in this range.

Crystal frequency (kc)	Operating frequency (kc)	Tuning Unit
4,500	9,000	TU-53
5,500	11,000	TU-53
3,500	14,000	TU-54
4,500	18,000	TU-54

49. Tuning Radio Transmitter BC–610–E for Voice Operation

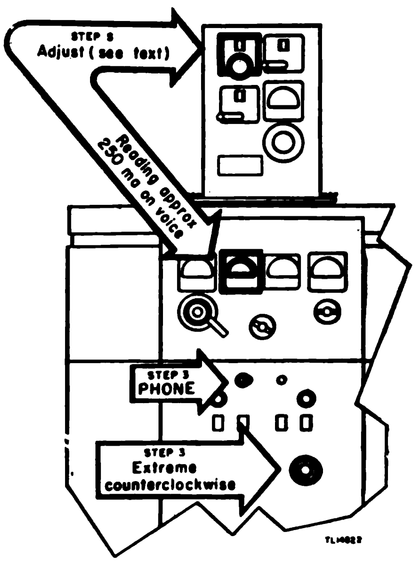
STEP 1

Perform all operations in paragraph 47 or 48 (depending upon whether the operation is to be m-o controlled or crystal controlled), then proceed as follows:



STEP 2

On Junction Box JB–70–A set the transmitter control switch at TRANS. OFF. Set REMOTE CONTROL EE–8 switch at NORMAL. Set C.W. SIDETONE at OFF.



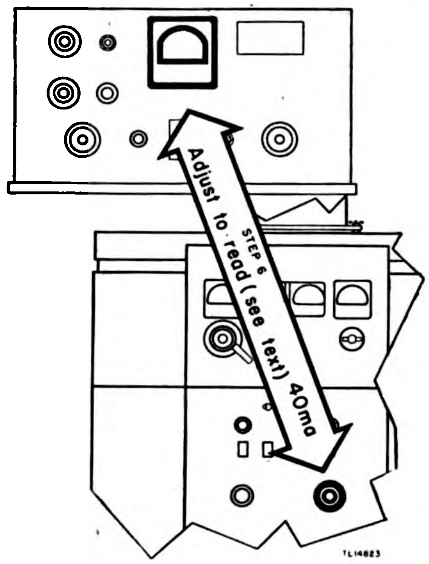
STEP 3

Set the MODULATOR BIAS control on transmitter to the extreme counterclockwise position. (This increases the bias so that the MODULATOR PLATE meter, located on Speech Amplifier BC–614–E, will not indicate until further adjustments have been made.) Set the C.W.-PHONE switch at PHONE.

Caution: Never throw this switch while the final amplifier is turned on.

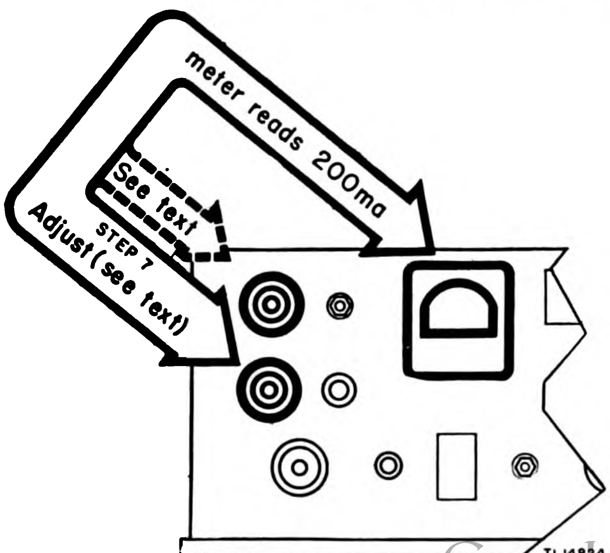
STEP 4

Remove Microphone T–50 from its mount in Chest CH–120–A and connect it to the receptacle marked DYNAMIC MIC. 2 located on the speech-amplifier panel.



STEP 5

Press the switch on the microphone and note that this puts the transmitter carrier on the air. The P.A. PLATE meter should read approximately 250 ma, which is the normal plate current for voice operation. If the transmitter



has been tuned to 290 ma on c-w operation, the plate current will be 250 ma when switched to voice because the C.W.-PHONE switch automatically reduces the final amplifier plate voltage. If the P.A. PLATE meter reads more than 260 ma, the COUPLING INCREASE control on the antenna tuning unit should be adjusted until the plate current is reduced to the proper value.

STEP 6

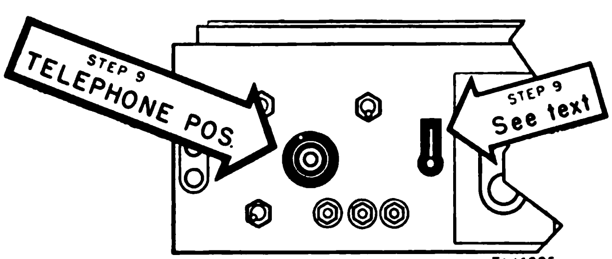
Hold the microphone in the left hand, press the microphone switch, and with the right hand adjust the MODULATOR BIAS control on the transmitter until the MODULATOR PLATE meter on Speech Amplifier BC-614-E indicates 40 ma. Release the microphone switch.

STEP 7

Hold the microphone in the normal speaking position (position varies with voice characteristics, from 2 to 6 inches from mouth), press the microphone switch, and speak into the microphone. While pressing the switch and talking into the microphone, adjust the gain control (marked DYNAMIC MIC. 2) until the MODULATOR PLATE meter indicates approximately 200 ma on voice peaks. If the pointer swings higher than 200 ma on extreme voice peaks, reduce the gain control to prevent exceeding 200 ma. (This figure represents 100 percent modulation when the transmitter is fully loaded.) The same procedure applies to the use of carbon Microphone T-17. Only one gain control should be open (turned away from the O position) at a time, however.

STEP 8

Release the microphone switch, taking the transmitter off the air. Voice transmission can now be accomplished by pressing the microphone switch and speaking into the microphone.



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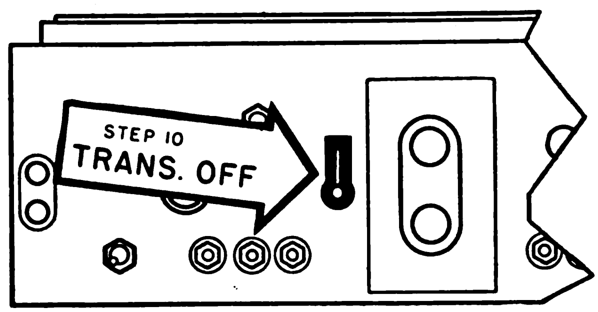
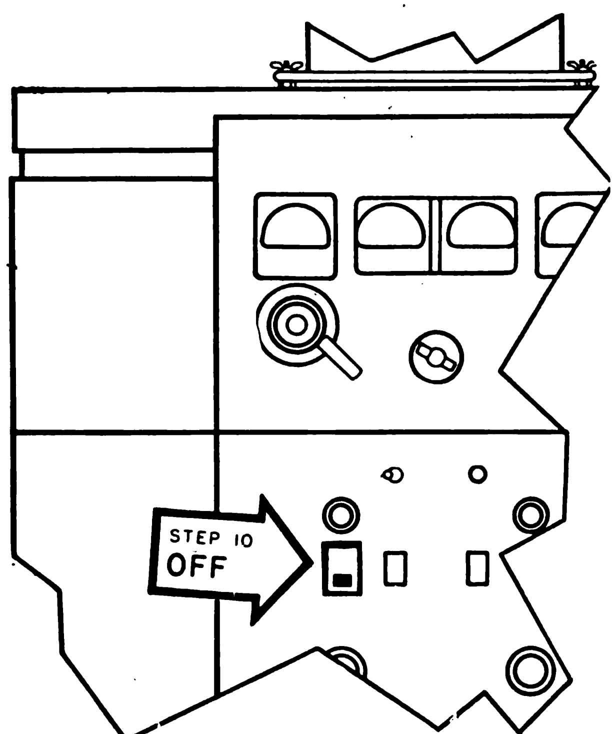
STEP 9

When REMOTE CONTROL EE-8 switch is in either TELEPHONE position, voice transmission can be obtained without pressing the microphone switch. When using this method, set the transmitter control switch at TRANS. ON during transmission periods and to TRANS. OFF to terminate transmission. This procedure is not recommended for general practice.

STEP 10

To turn transmitter off completely, set the transmitter control switch on Junction Box JB-70-A at TRANS. OFF and set FILAMENT POWER switch on the transmitter at OFF.





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Section III. NORMAL OPERATION

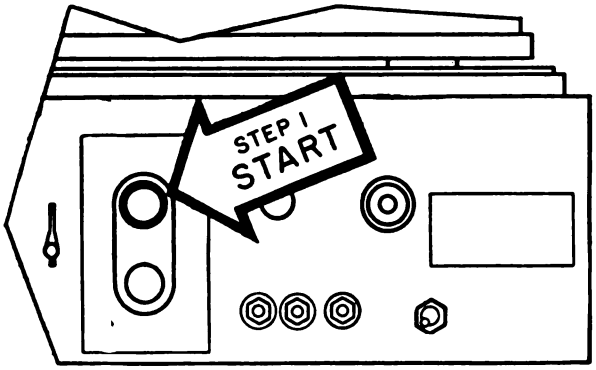
Caution: Before attempting operation of the equipment, read paragraphs 38 through 46. When thoroughly familiar with their contents, proceed with the operation of the set.

50. C-W Operation

To operate the transmitter on continuous wave, perform the following steps:

STEP 1

Push START button on Junction Box JB–70–A until Power Unit PE–95 starts and picks up speed.



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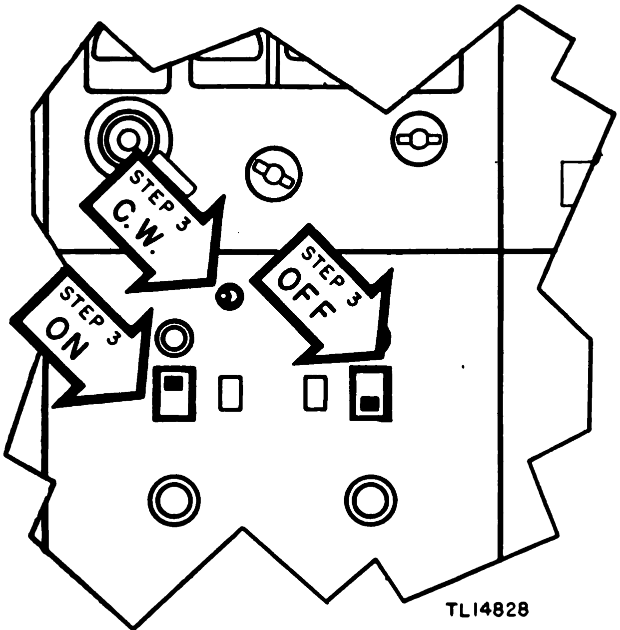
STEP 2

Turn on the electric lights in Chest CH–120–A, Chest CH–121–A, and in the shelter over the transmitter.



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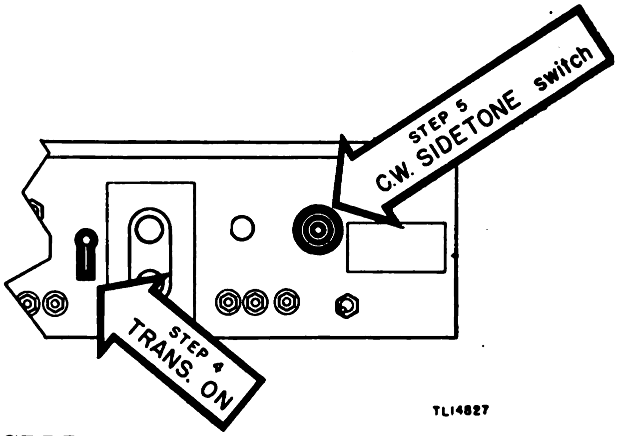
STEP 3

See that the PLATE POWER switch of the transmitter is OFF. Set FILAMENT POWER switch of the transmitter at ON and wait 1 minute for the filaments to reach operating temperature. See the transmitter C.W.-PHONE switch at C.W.



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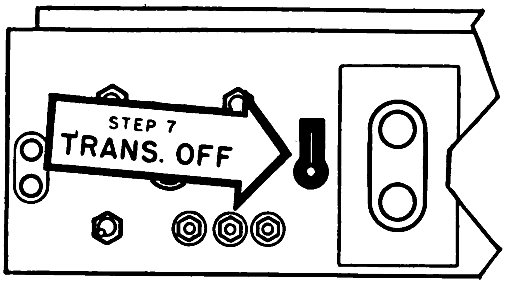
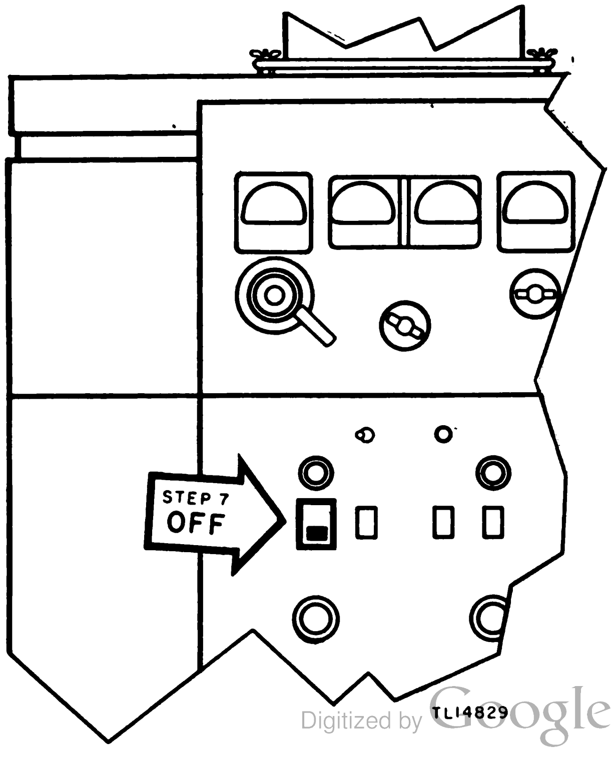
STEP 4

Set the transmitter control switch on Junction Box JB–70–A at TRANS. ON.





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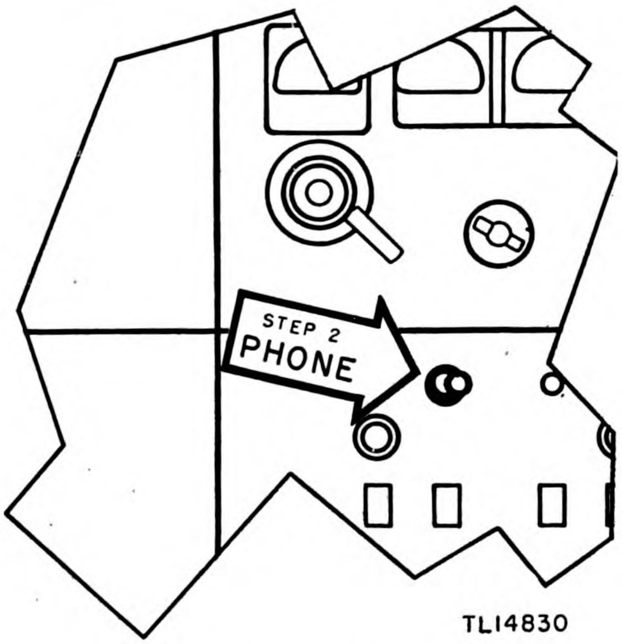
STEP 5
Set the C.W. SIDETONE switch in the position corresponding to the receiver being used.
STEP 6
Use Key J–37 to send any desired messages. In addition to Keys J–37 located in the operating chests, Key J–45 may be used to key the transmitter at the auxiliary KEY jack located on the front of the speech-amplifier panel. Keying of the transmitter at the auxiliary key jack will be necessary if the source of 12-volt d-c power fails, since the auxiliary jack is the only direct connection to the cathode circuit of the transmitter oscillator.



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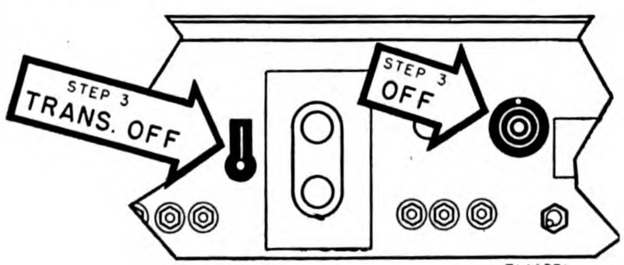
Caution: Relay RY_{200} does not function with this method of keying; therefore, automatic receiver disabling cannot occur. See paragraph 43 before using this jack.
STEP 7
To turn the transmitter off completely, set the transmitter control switch on Junction Box JB–70–A at TRANS. OFF, and set the FILAMENT POWER switch on the transmitter at OFF.



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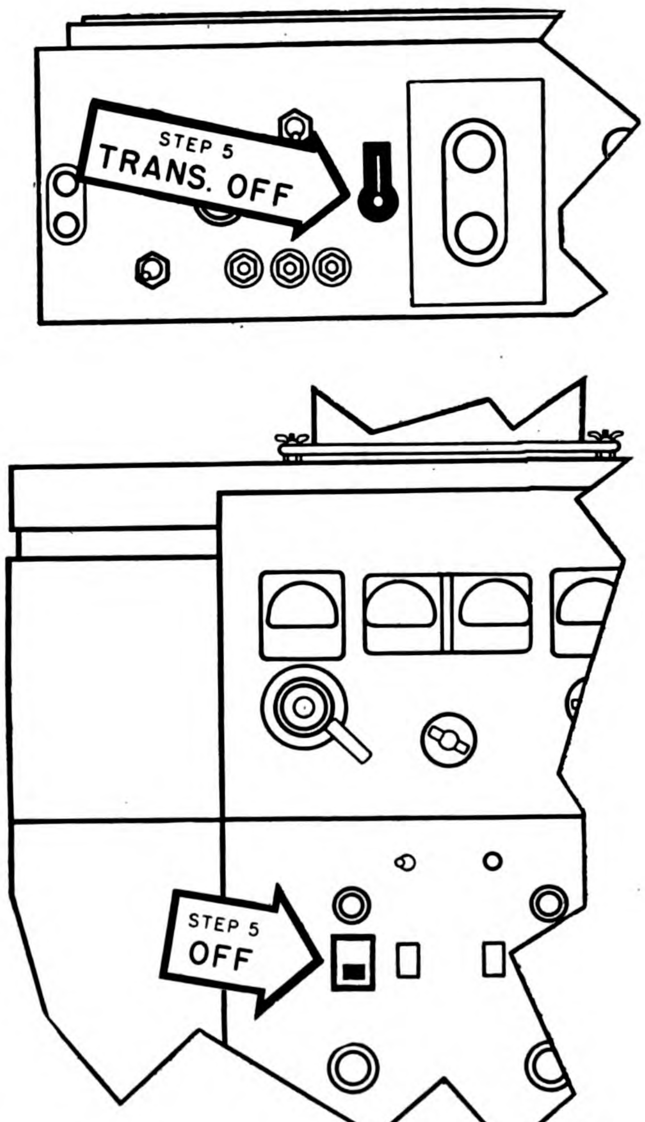
51. Voice Operation

To operate the transmitter on voice, perform the following steps:
STEP 1
Perform all operations in steps 1 through 3, paragraph 50.
STEP 2
Set the transmitter control switch on Junction Box JB–70–A at TRANS. OFF, and the C.W. SIDETONE switch at OFF.
STEP 3
Set the C.W.-PHONE switch of the transmitter at PHONE.
STEP 4
Press the microphone switch on Microphone T–50, and speak into the microphone to modu-



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late the transmitter. There are three additional ways of modulating the transmitter, using:

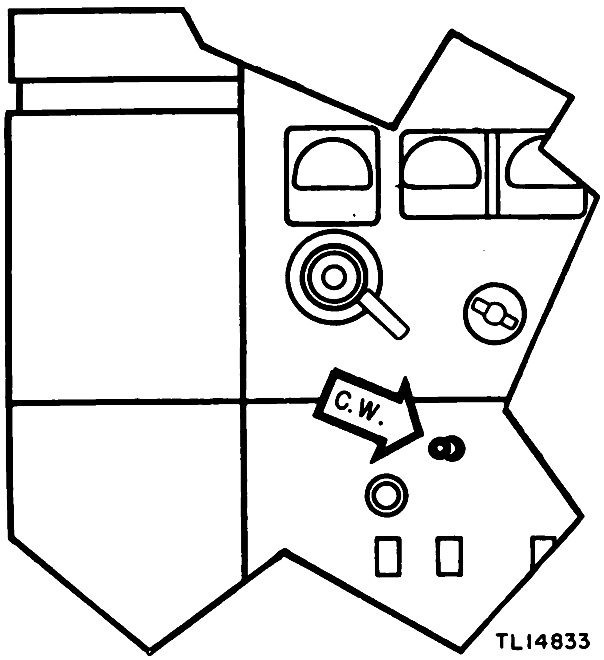
a. Microphone T–30–( ) (throat), if a gas mask must be worn. Insert the plug on the end of the microphone into the jack on Cord CD–318, and plug the other end of Cord CD–318 into the CARBON MIC. 1 jack on the speech-amplifier panel. The adjacent gain knob will control the input level. The microphone switch will operate the transmitter.

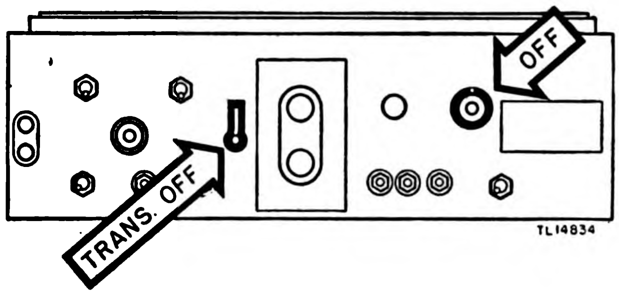
b. Microphone T–17, plugged into the CARBON MIC. 1 jack on the speech-amplifier panel. The adjacent gain control will control the input level, and the switch on the microphone will control the transmitter.

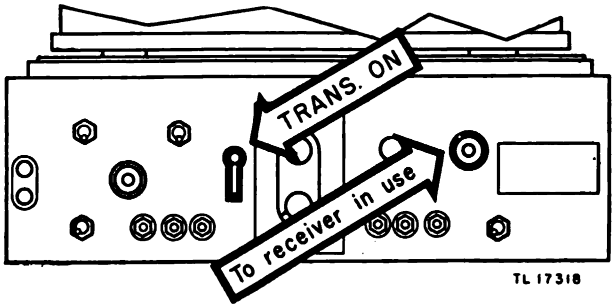
c. Handset TS–9–( ) of Telephone EE–8–( ), connected to Junction Box JB–70–A. This handset is stored in the right-hand compartment in Chest CH–120–A. When the transmitter control switch on the junction box is set at TRANS. ON, with REMOTE CONTROL EE–8 switch in either TELEPHONE position, and the microphone switch on the telephone handset is pressed, it is possible to modulate the transmitter. The gain control marked DYNAMIC MIC. 2 provides adjustment of the input level from the handset. In this case, the microphone switch does not control the transmitter, but connects battery current to the microphone. Throwing the transmitter control switch down to REC. TO EE–8 connects the output of one receiver to the earpiece of the handset. The receiver to be used is selected by throwing the junction box REMOTE CONTROL EE–8 switch to the TO BC–312 TELEPHONE or to the TO BC–342 TELEPHONE position.

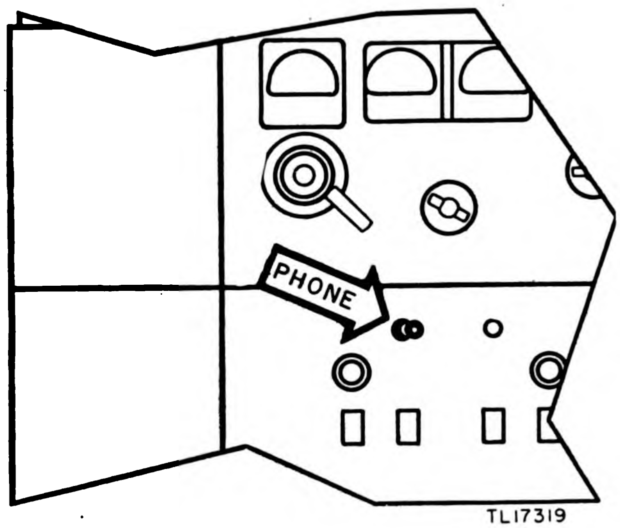
STEP 5

To turn off the transmitter completely, set the transmitter control switch on Junction Box JB–70–A at TRANS. OFF, and set the transmitter FILAMENT POWER switch at OFF.





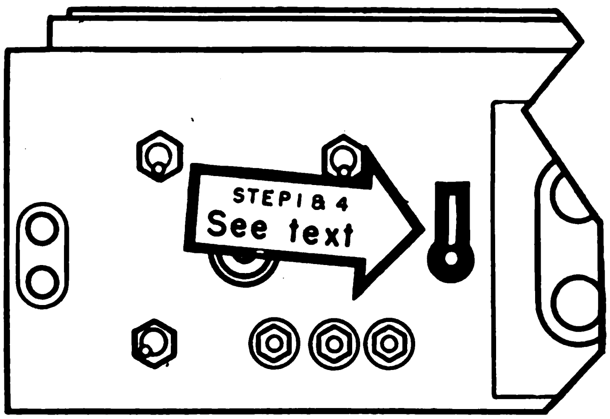




52. Changing Type of Emission

a. Changing from Voice to Continuous Wave. After the transmitter has been operated on voice it can be immediately switched to c-w operation by setting the C.W.-PHONE switch at C.W., setting the C.W. SIDETONE switch to the position corresponding to the receiver in use, and setting the transmitter control switch to TRANS. ON.

b. Changing from Continuous Wave to Voice. After the transmitter has been operated



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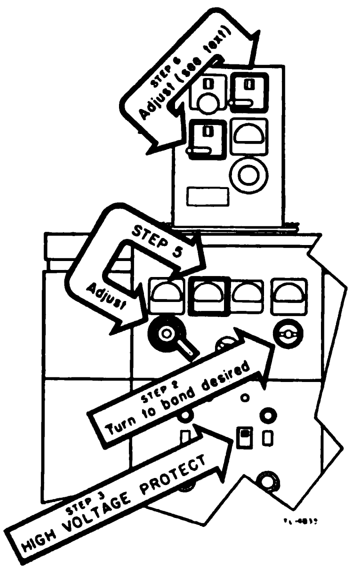
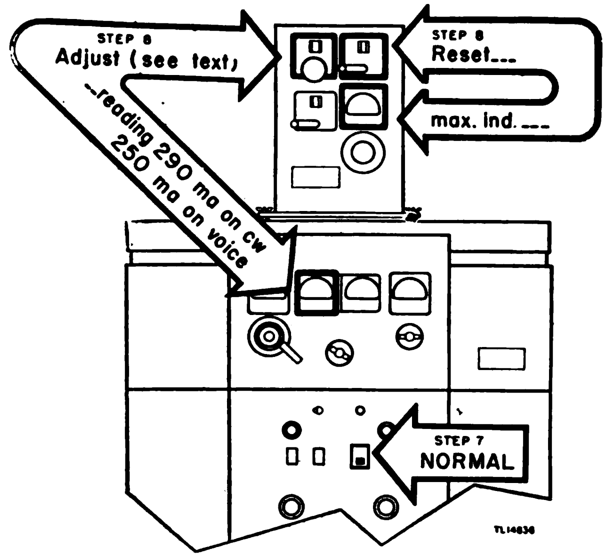
on continuous wave, it can be switched immediately to voice by resetting the transmitter control switch at TRANS. OFF, setting the C.W. SIDETONE switch at OFF, and then setting the C.W.-PHONE switch at PHONE.

53. Changing Frequency

a. Case 1. Provision is made in the transmitter for simultaneously accommodating three





tuning units, each of which may be instantly selected by the BAND SWITCH. Each tuning unit may be tuned to a separate frequency and left plugged in ready for use when needed. Since there are three sets of tuning units, it is possible to install three tuning units of the same range which would be covered by one coil unit. With each unit pretuned to a different frequency within the range, change of transmitting frequency is accomplished as follows:

STEP 1
Set the transmitter control switch at TRANS. OFF if operating on continuous wave. Release the microphone switch if operating on voice.

STEP 2
Reset the BAND SWITCH to the desired channel number.

STEP 3
Set the HIGH VOLTAGE PROTECT switch at HIGH VOLTAGE PROTECT.

STEP 4
Set the transmitter control switch to TRANS. ON and close the key if operating on continuous wave. Leave the transmitter control switch at TRANS. OFF and press the microphone switch if operating on voice.

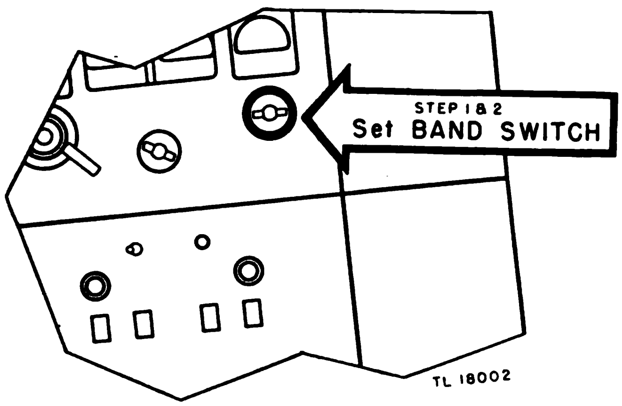
STEP 5
Slightly retune the PLATE TUNING dial for a dip in the P.A. PLATE meter.

STEP 6
Adjust the proper antenna tuning inductor crank for a rise in indication of the P.A. PLATE meter.

STEP 7
Throw the HIGH VOLTAGE PROTECT switch to NORMAL.

STEP 8
Adjust the COUPLING INCREASE control of the antenna tuning unit until the P.A. PLATE meter reads 290 ma (on continuous wave) or 250 ma (on voice). Reset the tuning inductor crank for maximum indication of the ANTENNA CURRENT METER.

Note. When the difference in frequency is small, only steps 1, 2, and 4 may be necessary, though disregarding the other steps is not recommended.



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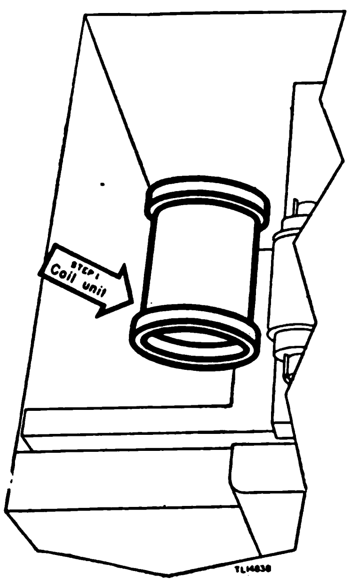
b. CASE 2. When the three tuning units plugged into the transmitter cover two or more different frequency ranges, it is necessary to proceed as follows:



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STEP 1
Before moving the BAND SWITCH to the desired channel number, open the cover door over the coil unit and determine whether the frequency range of the coil unit is correct. If not, remove it and replace it in Chest CH–88–A.

STEP 2
Set the BAND SWITCH to the desired channel number.

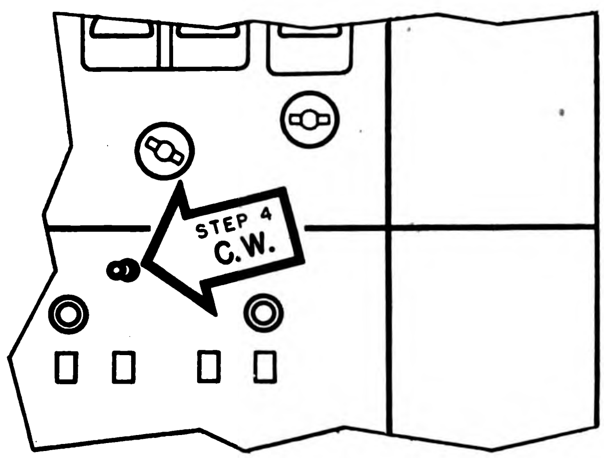
STEP 3
Install a coil unit of the proper frequency.

STEP 4
Close the cover doors. Set the C.W.-PHONE switch of the transmitter at C.W.

STEP 5
Since the tuning unit has been tuned previously, for c-w operation it will be necessary to tune only the final and antenna circuits as outlined in steps 22 through 31 in paragraph 47. If voice operation is required, throw the C.W.-PHONE switch to PHONE at the completion of step 31, paragraph 47.

54. Presetting Tuning Units

Tuning units may be tuned one after another for m-o operation by following steps 5 through



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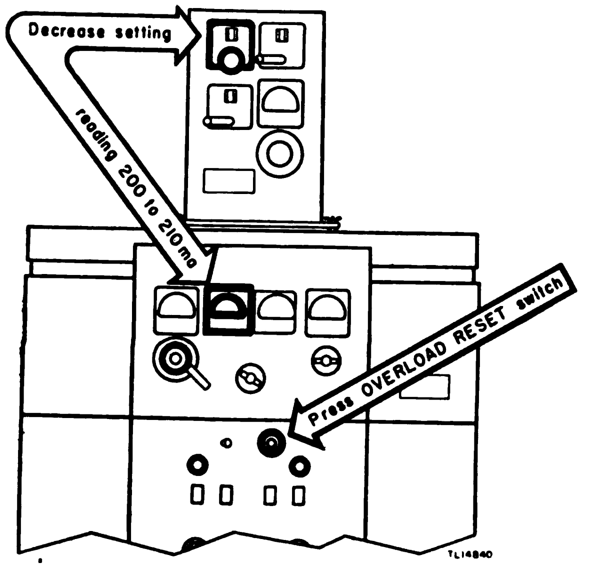
20, paragraph 47, or for crystal-controlled operation by following steps 1 through 4, paragraph 48.

55. Additional Operating Instructions

a. WHEN STATION IS IN MOTION. Speak into the microphone with the lips almost touching it so as to exclude unwanted noises. To avoid overmodulation, readjust the gain control on the speech amplifier. Use of Microphone T–30 (throat) is also recommended for reducing the effect of external noise.

b. DURING TRANSMISSION ON CRITICAL FREQUENCY. The frequency range of 2 to 2.5 mc is critical in damp weather and at high altitudes because extreme voice peaks may cause flashovers. These trip the overload relay which momentarily interrupts communication until the relay is reset. If this should happen, do one of the following:

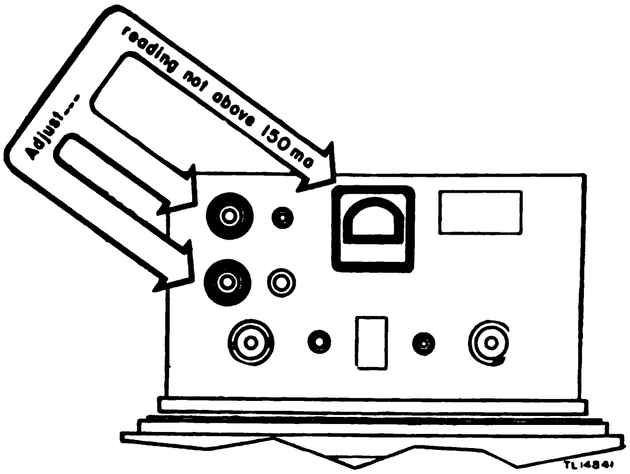


(1) Switch to a more favorable operating frequency.

(2) Stop the truck and transmit from a fixed position after unguying the antenna and inserting one or two Mast Sections MS–54 to provide added height.

(3) Use an auxiliary transmitting antenna.

(4) Decrease the setting of the COUPLING INCREASE control on the antenna tuning unit until the P.A. PLATE meter reads 200 to 210



ma. DO NOT REDUCE BELOW 200 MA. Under this condition less modulation is required; therefore the gain control should be adjusted so that voice peaks do not cause swings above 150 ma on the MODULATOR PLATE meter.

c. OVERLOAD RESET SWITCH. If the high-voltage circuits are overloaded (by excessive plate current plus heavy modulation), the overload relay will trip and shut off the plate power. In this case, press the OVERLOAD RESET switch on the front panel of the transmitter and proceed with the transmission. If the overload persists, check tuning adjustments and meter readings.

Section IV. REMOTE CONTROL OPERATION

Note. The description of remote control operation and power source operation for Radio Set SCR–399–A is given below. These instructions will apply equally to Radio Set SCR–499–A if references to the truck are deleted.

56. Connection of Remote Stations

A complete description of the equipment and facilities provided for remote control will be found in paragraphs 16 and 23. Follow the steps below in connecting the remote control equipment.

STEP 1

Remove the unconnected Telephone EE–8–( ) from its mounting compartment in Chest CH–121–A. Before leaving the truck, make sure the telephone batteries are in good condition and the screw switch is set to LB.

STEP 2

Remove Junction Box JB–60–A and Key J–45 from Chest CH–121–A.

STEP 3

Remove Axle RL–27–B from Chest CH–89–A

for use with either or both Reels DR–4 which should be dismounted, as required, from Frame FM–59–A.

STEP 4
Carry Telephone EE–8–( ), Junction Box JB–60–A, and Key J–45 to the point where remote control is to be established.

STEP 5
Connect the cord of Junction Box JB–60–A at terminals L_1 and L_2 of Telephone EE–8–( ).

STEP 6
Insert the plug on the cord from Key J–45 into the jack on Junction Box JB–60–A.

STEP 7
Using Wire W–110–B from Reel DR–4, run the line between the remote station and the radio station in the truck. (If less than one full reel of wire is used, do not cut the wire, but pull out the inner end from the center of the reel.) In some cases it will be more convenient to leave reels of wire in Frame FM–59–A and pay out the wire through the fairleads in the back of the shelter.

STEP 8
Connect the two leads of one end of the line to the two line terminals on Junction Box JB–60–A.

STEP 9
Connect the leads at the other end of the line to terminals marked REMOTE TELEPHONE outside Junction Box JB–70–A. The telephone at the remote station is not connected to the telephone in the truck. Communication between these two points may be established by operating Telephone EE–8–( ) in accordance with instructions contained in TM 11–333.

57. Remote Voice Operation

a. The remote station operator may now request the radio operator at the truck to turn on the radio transmitter for voice operation and to adjust the speech-amplifier gain so that the remote station can properly modulate the transmitter. This is accomplished by following the procedure outlined in step 7, paragraph 49, and in step 4, paragraph 51. It should be noted that both telephones are on the same circuit and accordingly both share the same facilities. Therefore, the radio operator may switch in the output of either receiver so it may be heard at the remote station.

b. Since the transmitter cannot be operated by pressing the microphone switch when using a telephone line, the remote operator should signal the radio station operator when end of transmission is desired. The radio station operator can throw the transmitter control switch to obtain reception or shut down the station, as required.

58. Remote C-W Operation

a. If remote keying of c-w transmission is desired, the radio station operator should be instructed to place the transmitter in c-w operation and to set the REMOTE CONTROL EE–8 switch on Junction Box JB–70–A to either TELEGRAPH position. Then Key J–45 at the remote location can be used to key the transmitter.

b. Remote keying of the transmitter in two-way communication or net operation may be accomplished without the assistance of a radio station operator if there is an independent means of reception at the remote station.

59. Remote Receiver Operation

When necessary, Chest CH–121–A with Radio Receiver BC–312–( ) may be removed from the truck to a remote point for operation. This is accomplished as follows:

STEP 1
Disconnect the antenna lead from the fitting at the top of the chest.

STEP 2
Disconnect the key cord and the main audio cord between Chest CH–121–A and Junction Box JB–70–A.

STEP 3
Disconnect Plug PL–114 of Cord CD–565 from Socket SO–94 on the receiver.

STEP 4
Disconnect the ground strap from the terminal under Chest CH–121–A.

STEP 5
After removing safety wires from wingnuts, loosen the turnbuckles holding Chest CH–121–A to the table frame in Shelter HO–17–A.

STEP 6
Remove Chest CH–121–A from the shelter.

STEP 7
Remove Chest CH–109–A (12-volt battery) after pulling out the plug of Cord CH–659.
STEP 8
Remove the four legs from the top of Chest CH–120–A and one each Mast Sections MS–51, MS–52, and MS–53 from Chest CH–89–A.
STEP 9
Move the two chests, the legs, the mast sections, and Cover BG–143–A to the desired location.
STEP 10
Set up Chest CH–121–A on its legs. (See fig. 13.)
STEP 11
Remove Cord CD–690 from Chest CH–121–A and connect it between Chest CH–109–A and the receiver.
STEP 12
Screw the mast sections together and into the fitting in the top of Chest CH–121–A.
STEP 13
Remove the headset from Chest CH–121–A and plug it into the PHONES jack on Radio Receiver BC–312–( ). The receiver is now ready for operation.
STEP 14
If the radio station is to be operated with Chest CH–109–A removed as described above, turn the switch on Rectifier RA–63–(*) to FULL CHARGE to furnish 12-volt power for relays.

Section V. POWER SOURCE OPERATION

60. Operation from Commercial Power Source

Operation from a 117-volt, 50/60-cycle, single-phase, a-c commercial source may be effected as follows:

a. Plug one end of Cord CD–652 into the power plug at the rear of the truck and plug Cord CD–314 into the other end of the power plug.

b. Connect the leads from the other end of Cord CD–314 directly to the source of power.

61. Operation of Trailer 100 Feet From Truck

a. Disconnect the trailer power Cord CO–316 from Cord CO–335 at the bumper clamp underneath the rear of the truck. (See fig. 27.) Also disconnect the cable which delivers power to the running lights on the trailer.

b. Unhitch the trailer from the truck.

c. Drive the truck to any point up to 100 feet from the trailer.

d. Remove Cord CD–652 from Chest CH–119–A.

e. Insert one end into the plug in the bumper bracket of the truck, then insert the other end into the plug on the power cord of the trailer. Operation may now proceed normally with remote control of the power unit from the transmitter location.

62. Operation of Trailer 200 Feet From Truck

a. Proceed as in paragraph 61*a* and *b*, but drive the truck to any point within 200 feet of the trailer.

b. Remove Cord CD–652 from Chest CH–119–A, Cord CO–314 from the seat bench, and Cord CO–313 from Chest CH–112–A in the trailer.

c. Insert one end of Cord CD–652 into the power plug at the rear of the truck. Insert the plug of Cord CO–314 into the other end of this cord.

d. Twist the leads of Cord CO–314 around the terminals of Cord CO–313 and tape up these connections.

e. Insert the plug of Cord CO–313 into the power plug at the trailer. Operation of the power unit at distances greater than 100 feet is an emergency measure, and is not ordinarily used. Therefore it will be necessary to start or stop Power Unit PE–95–( ) at the trailer instead of at the transmitter location.

63. Use of Power Unit PE–95–( ) to supply power to Auxiliary Equipment

a. If the radio set is not in use, power may be supplied at distances up to 200 feet from Power Unit PE–95–( ) as follows:

(1) Remove the plug of the trailer power cord from the plug at the rear of the truck.

(2) Connect one end of Cord CD–652 to the trailer power cord.

(3) Plug Cord CO–313 into the other end of Cord CD–652. Connect the load to the terminals at the end of Cord CO–313 and start the power unit.

b. If Radio Set SCR–399–A or SCR–499–A must be used while the auxiliary power is being generated, proceed as follows:

(1) Leave the trailer connected and hitched to the truck.

(2) Connect the terminals of Cord CO–313 to the a-c terminals on the power panel of Power Unit PE–95–( ).

(3) Plug Cord CO–314 into the other end of Cord CO–313.

(4) Connect the bare ends of Cord CO–314 to the load. With the radio set and the heater in operation, this additional load should not exceed 1 kilowatt. If the heater is not being used, the total external load may be 2.5 kilowatts. Before operating in this manner, check the rated capacity of the power unit.

64. Operation of Low-voltage Power Supply System

a. The 12-volt battery system is used to furnish power for Radio Receiver BC–312–( ), as well as for operating the keying relay and the disabling relays.

b. With the BATTERY SOURCE switch on Junction Box JB–70–A at AUX. (par. 42*e*), the 12-volt supply is obtained from the 12-volt battery in Chest CH–109–A.

c. Rectifier RA–63–(*) charges the battery in Chest CH–109–A. When using this battery, turn the switch on the rectifier to TRICKLE. If the battery is low, set the switch on the rectifier at HI CHARGE.

d. Keep the battery fully charged at all times. Do not let the level of the electrolyte fall so low that the plates become uncovered. Check the state of charge of the battery with the hydrometer provided.

e. Some Power Units PE–95–( ) are provided with 12-volt terminals. With Cord CO–316 connected to these terminals, the 12-volt supply may be obtained from the power unit by setting the battery switch on Junction Box JB–70–A to PE–95.

f. With Chest CH–121–A and Chest CH–109–A removed from the shelter as described in paragraph 59, the 12-volt supply for the radio station relays is obtained from Rectifier RA–63–(*) with its switch set at HI CHARGE.

Section VI. EQUIPMENT PERFORMANCE CHECK LIST

65. Purpose and Use

a. GENERAL. The equipment performance check list (par. 66) will help the operator determine whether Radio Set SCR–399–A or SCR–499–A is functioning properly. The check list gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures that the operator can take. Items 1 to 28 are checked before starting, items 29 to 34 when starting, items 35 to 44 during operation, and items 45 to 49 when stopping. Items 35 to 44 on this check list should be checked at least once during a normal operating period or at least four times a day during continuous operation.

b. ACTION OR CONDITION. For some items the information given in the action or condition column consists of the settings of various switches and controls under which the item is to be checked. For other items it represents an action that must be taken in order to check the normal indication given in the normal indication column.

c. NORMAL INDICATIONS. The normal indications listed include the visible and audible signs that the operator will perceive when he checks the items. In the case of meter readings, the allowable tolerances of the readings are given. When a meter reads between the limits specified, operation can be considered satisfactory. A meter reading outside the limits given is a sign of impending trouble. If the indications are not normal, the operator should apply the recommended corrective measures.

d. CORRECTIVE MEASURES. The corrective measures listed are those that the operator can make without turning the equipment in for repairs. A reference to part five in the table indicates that the correction of the trouble cannot be effected during operation and that trouble shooting by an experienced repairman is called for. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

e. ITEMS 1 TO 34. Items 1 to 34 should be checked each time the equipment is put into operation.

f. ITEMS 35 TO 38. Items 35 to 38 show correct meter readings when the transmitter is properly tuned and in operation.

g. ITEMS 39 TO 44. These items represent general operating characteristics of the radio set. The operator must become familiar with the characteristics of the set during normal operation; he must use that knowledge as a basis for recognizing changes in audible and visible indications, such as relay clicks, sidetone, flicking of the meter needles, etc., when the set is not operating properly. By becoming familiar with the operation of the receiver, the operator will know the normal position of the VOL control. This will aid in determining the sensitivity and amplification of the receiver.

h. ITEMS 45 TO 49. Items 45 to 49 are checked whenever the station is taken out of operation. Any abnormal indications at this time are probably caused by trouble in the set and should be corrected before the next expected period of operation.

66. Check List

a. POWER UNIT PE–95–( )

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	CIRCUIT BREAKER ON-OFF switch. (Main power switch if commercial power source is used)	Set at ON		

b. JUNCTION BOX JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	2	Transmitter control switch	Set at TRANS. OFF		
	3	C.W. SIDETONE switch	Set at OFF for voice transmission. Set at TO BC–312 or TO BC–342 for c-w transmission		
	4	REMOTE CONTROL EE–8 switch	*a.* Set at NORMAL unless remote control operation of transmitter is desired *b.* Set at TO BC–312 TELEPHONE or TO BC–342 TELEPHONE for remote voice operation *c.* Set to proper TELEGRAPH position for remote c-w operation		
	5	Keys J–37	Keys plugged in KEY jacks		
	6	BATTERY SOURCE switch	*a.* Set at PE–95 if 12-volt supply of Power Unit PE–95–( ) is used *b.* Set at AUX. if 12-volt supply in Chest CH–109–A is used		
	7	RECEIVER OUTPUT switch	Set at NORMAL		
	8	Headsets HS–30–( )	Headsets plugged into proper HEADSETS jacks (one on either side of START-STOP switch)		
	9	RECEIVER DISABLING switches	Set both switches at ON		
	10	RECEIVER OUTPUT switch	Set at NORMAL unless headsets are to be transposed		

66. Check List (Cont'd)

c. RECTIFIER RA–63–(*)

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	11	Main control switch	If 12-volt battery in chest is used, set switch at TRICKLE		

d. RADIO RECEIVERS BC–312–( ) AND BC–342–( )

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	12	SEND-REC. switches	Set both switches at SEND		
	13	BAND CHANGE switches	Set to correct band		
	14	FAST TUNING control	Set to approximate frequency required		
	15	C.W.–OSC. switch	*a.* Set at ON for c-w reception		

e. RADIO TRANSMITTER BC–610–E

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	16	FILAMENT POWER switch	Set at OFF (down)		
	17	PLATE POWER switch	Set at OFF (down)		
	13	EXCITER PLATE POWER switch	Set at NORMAL (down)		
	19	HIGH VOLTAGE PROTECT switch	Set at NORMAL (down)		
	20	C.W.–PHONE switch	Set at C.W. or PHONE, as desired		
	21	Tuning units	Check selection of proper tuning unit		
	22	BAND SWITCH	Set to channel corresponding to desired tuning unit		
	23	Coil unit	Check selection of proper coil unit for frequency desired		
	24	M.O.–XTAL switch of tuning unit	*a.* Set switch at M.O. for master-oscillator control *b.* Set switch at XTAL for crystal-frequency control. Check selection of proper crystal holder for frequency desired		
	25	PLATE TUNING wheel	Has been set to proper reading		

66. Check List (Cont'd)

f. Antenna Tuning Unit BC–939–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	26	Antenna range switch	Set to desired band		
	27	COUPLING INCREASE knob	Has been set to desired position		
	28	FREQUENCY crank	Crank for band being used has been set to desired position		

g. Junction Box JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	29	START button	Push START button to control Power Unit PE–95–( )	Power Unit PE–95–( ) starts Normal line voltage (110–125 volts) indicated on A.C. VOLTAGE meter on Power Unit PE–95–( ) panel	*a.* Check Cords CO–335 and CO–316 *b.* Check for discharged battery in Power Unit PE–95–( )
	30	Electric lights	Turn on electric lights in Chest CH–120–A, in Chest CH–121–A, and in shelter over transmitter	Lamps light up	Change lamps Check associated cords and plugs

h. Radio Transmitter BC–610–E

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	31	FILAMENT POWER switch	Set switch at ON. (Wait 1 minute for filaments to reach operating temperature. Wait 30 minutes if transmitter is damp)	*a.* Green pilot lamp and PLATE TUNING dial on transmitter light	*a.* If only one lamp lights, replace the other lamp. If both lamps are out, check Fuses FS_1, 2, 4, and Cord CD–763. Check that V_{13}, V_{14}, and V_{15} are firmly seated in their sockets
				b. Red pilot lamp on Speech Amplifier BC–614–E lights	*b.* Replace lamp if lamps in *a* above light
				c. FIL. VOLTAGE meter reads 5 to 5.3 volts	*c.* Adjust FILAMENT VOLTAGE control

i. Junction Box JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	32	Transmitter control switch	*a.* For c-w transmission, set at TRANS. ON	*a.* Red pilot lamp on transmitter lights. Plate power relay RY_1 clicks	*a.* If the relay clicks but the red pilot does not light, check fuse FS_3. (See ch. 5)
			b. For voice transmission, set at TRANS. OFF	*b.* Red pilot lamp is out	*b.* See chapter 5

66. Check List (Cont'd)

j. RADIO RECEIVERS BC–312–( ) AND BC–342–( )

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	33	OFF-M.V.C.-A.V.C. switch	Turn to M.V.C. or A.V.C. position. (If Radio Receiver BC–312–( ) is used, set Rectifier RA–63–(*) switch at HI CHARGE)	Dial lights unless dial light switch is provided. If Radio Receiver BC–312–( ) is used, the dynamotor starts	Check panel fuses. Check Cords CD–565 and CD–566 and associated plugs
	34	VOL control	Rotate clockwise	Signal or noise is heard.	See TM 11–850

k. RADIO TRANSMITTER BC–610–E

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	35	EXCITATION METER SWITCH	Key J–37 held closed or microphone press-to-talk switch operated. EXCITATION METER SWITCH set to— *a.* DOUBLER PLATE *b.* INT. AMP. GRID. *c.* INT. AMP. PLATE. *d.* P.A. GRID.	 *a.* 25 to 45 ma. *b.* 1 to 8 ma. *c.* 125 to 175 ma. *d.* 60 to 100 ma.	*a.* If the meter does not indicate in any position, check— (1) The installation and tuning of the tuning unit (2) The setting of the BAND SWITCH (3) The position of the M.O.-XTAL switch on the tuning unit *b.* If the meter readings are improper, retune the transmitter, replace V_8, V_9, V_{10}, or V_{11} if necessary
	36	P.A. PLATE meter	*a.* Voice operation; microphone press-to-talk switch operated *b.* C-w operation; Key J–37 closed	*a.* 200 to 260 ma. *b.* 200 to 300 ma.	Retune transmitter. Check coil unit L_7. Operate OVERLOAD RELAY. Check antenna coupling. Replace V_6, V_7, or V_{16} if necessary. (See ch. 5)

l. ANTENNA TUNING UNIT BC–939–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	37	ANTENNA CURRENT meter	Key J–37 held closed or microphone press-to-talk switch operated. Operating frequency is— *a.* 2 to 8 meg. *b.* 8 to 12 meg. *c.* 12 to 18 meg.	ANTENNA CURRENT meter reads: *a.* 7 to 14 amp. *b.* 5 to 12 amp. *c.* 2½ to 10 amp.	Check control settings, tuning, coupling, and antenna range switch. (See ch. 5)

66. Check List (Cont'd)

m. Speech Amplifier BC–614–E

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	38	MODULATOR PLATE meter	Microphone press-to-talk switch operated and— *a.* With no modulation *b.* With modulation	MODULATOR PLATE meter reads— *a.* 35 to 50 ma. *b.* 200 ma on voice peaks	*a.* Check fuse FS_5 and adjustment of MODULATOR BIAS control *b.* Check gain control of CARBON MIC. 1 or DYNAMIC MIC. 2, tube V_5, and fuse FS_5. (See ch. 5)

n. Junction Box JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	39	Key J–37 (c-w operation)	Key operated	Sidetone is heard. Relays in junction box and receiver click. P.A. PLATE, EXCITATION, and ANTENNA CURRENT meter needles flick. The receivers are disabled.	Check key cord, plug, and jack. (See ch. 5)
	40	Microphone (voice operation)	Press-to-talk switch operated	Meters indicate as in items 35 to 38. Receivers are disabled	Check microphone cord, Amphenol plug and receptacle

o. Receivers BC–312–( ) and BC–342–( )

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	41	VOL control	Control rotated clockwise	Increased output is heard in the headset or loudspeaker	Tighten setscrew. See TM 11–850
	42	Headset or loudspeaker	Set operating normally. Plug inserted completely	Signal is heard	Check plug and cable connections. Tune receiver
	43	ALIGN INPUT control	When rotated	Response varies	See TM 11–850
	44	CRYSTAL PHASING control (when provided)	When rotated	Response varies	See TM 11–850

p. Junction Box JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	45	Transmitter control switch	Set to TRANS. OFF	Red pilot lamp goes out	See chapter 5

66. Check List (Cont'd)

q. Radio Transmitter BC–610–E

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	46	FILAMENT POWER switch	Set to OFF	*a.* Green pilot lamp and PLATE TUNING dial lamp go out *b.* Pilot lamp on Speech Amplifier BC–614–E goes out *c.* No voltage indication on FIL. VOLTAGE meter	See chapter 5

r. Receivers BC–312–( ) and BC–342–( )

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	47	OFF–M.V.C.–A.V.C. switch	Turn to OFF position	Receiver turned off	See TM 11–850

s. Junction Box JB–70–A

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	48	STOP button	Push red STOP button	Power Unit PE–95–( ) stops	See chapter 5

t. Rectifier RA–63–(*)

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	49	Main control switch	Set at OFF. Check the battery with the hydrometer	1.265 specific gravity at 70° F	Recharge the battery with Rectifier RA–63–(*). Add distilled or battery-approved water to the battery if insufficient liquid is present to obtain a reading on the hydrometer


CHAPTER 3
PREVENTIVE MAINTENANCE
TL17322

CHAPTER 3

PREVENTIVE MAINTENANCE

Section I. PREVENTIVE MAINTENANCE TECHNIQUES

67. Meaning of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment, when turned off, to eliminate major break-downs and unwanted interruptions in service, and to keep the equipment operating at top efficiency. To understand what is meant by preventive maintenance it is necessary to distinguish between preventive maintenance, trouble shooting, and repair. The prime function of preventive maintenance is to *prevent* break-downs and therefore the need for repair. On the other hand, the prime function of trouble shooting is to locate *existing* defects making repairs possible. The importance of preventive maintenance cannot be overemphasized. The entire system of radio communication depends on each set's being *on the air* when it is needed and also upon its *operating efficiency*. It is vitally important that radio operators and repairmen maintain their radio sets properly.

Note. The operations in sections I and II are considered first and second echelon (organization operators and repairmen) maintenance. Some operations in sections III and V are considered higher echelon maintenance.

68. Description of Maintenance Techniques

a. GENERAL. Most of the electrical parts in Radio Sets SCR–399–A and SCR–499–A require routine preventive maintenance. Those requiring maintenance differ in the amount and kind required. Because hit-or-miss maintenance techniques cannot be applied, definite and specific instructions are needed. This section of the manual contains these specific instructions and serves as a guide for personnel assigned to perform the six basic maintenance operations, namely: FEEL, INSPECT, TIGHTEN, CLEAN, ADJUST and LUBRICATE. Throughout this manual the lettering system for the six operations will be as follows:

F—Feel	C—Clean
I—Inspect	A—Adjust
T—Tighten	L—Lubricate

The first two operations establish the need for the other four. The selection of operations is based on a general knowledge of field needs. For example, the dust encountered on dirt roads during cross-country travel filters into the equipment no matter how much care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat) excessive dampness, snow, and ice tend to cause corrosion of exposed surfaces and parts. Without frequent inspections and the necessary performance of tightening, cleaning, and lubricating operations, the equipment will become undependable, and subject to break-down when the equipment is most needed.

b. FEEL. The feel operation is used most often to check rotating machinery, such as blower motors, drive motors, etc., and to determine whether electrical connections, bushings, etc., are overheated. Feeling indicates the need for lubrication or the existence of similar types of defects requiring correction. The maintenance man must become familiar with the normal operating temperatures of motors, etc., in order to recognize signs of overheating.

Note. It is important that the feel operation be performed as soon as possible after shut-down and always before any other maintenance is done.

c. INSPECT. Inspection is the most important operation in the preventive maintenance program. A careless observer will overlook the evidences of minor troubles. Although these defects may not interfere with the performance of the equipment, valuable time and effort can be saved if they are corrected before they lead to major break-downs. Make every effort to become thoroughly familiar with the indications of normal functioning, in order to be able to recognize the signs of a defective set. Inspection consists of carefully observing all parts of the equipment, noticing their color, placement, state of cleanliness, etc. Inspect for the following conditions:

(1) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating

compounds; and oxidation of metal contact surfaces.

(2) Placement, by observing that all leads and cables are in their original positions.

(3) Cleanliness, by carefully examining all recesses in the units for accumulation of dust, especially between connecting terminals. Parts, connections, and joints should be free of dust, corrosion, and other foreign matter. In tropical and high-humidity locations, look for fungus growth and mildew.

(4) Tightness, by testing any connection or mounting which appears to be loose.

d. TIGHTEN, CLEAN, AND ADJUST. These operations are self-explanatory. Specific procedures to be followed when performing them are given wherever necessary throughout this section.

Caution: Screws, bolts, and nuts should be tightened carefully. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.
Whenever a loose connection is tightened, it should be moistureproofed and fungiproofed again by applying the varnish with a small brush. See section V for details of moistureproofing and fungiproofing.

e. LUBRICATE. Lubrication refers to the application of grease or oil to the bearings of motors or other rotating shafts. It may also mean the application of a light oil to door hinges or other sliding surfaces on the equipment.

69. Recommended Lubricants

The following table lists the lubricating material necessary in servicing the equipment:

Approved Symbol	Standard nomenclature	Specification No.
OE 30	Oil, Engine, SAE 30	U. S. Army 2–104B
OE 10	Oil, Engine, SAE 10	U. S. Army 2–104B
PS	Oil, Lubricating, Preservative, Special	U. S. Army 2–120
GL	Grease, Lubricating, Special Ordnance	AXS–637
SD	Solvent, Dry-cleaning	Federal P–S–661a

70. Vacuum Tubes

Note. Avoid doing work on the tubes immediately after shut-down. Severe burns may result from contact with the envelopes of hot tubes.

a. INSPECT (I). (1) Inspect glass and metal tube envelopes, tube caps, and tube connector clips for accumulation of dirt and for corrosion. Tubes with loose plate caps, grid caps, or envelopes should be replaced if possible.

(2) Examine the spring clips that make contact with the grid caps for corrosion and for loss of tension. Check the condition of the wires soldered to the spring clips. The wires should be free from frayed insulation and broken strands.

(3) Inspect the firmness of tubes in their sockets. Make the inspection by pressing the tubes down in the sockets and testing them in that position; *not* by partially withdrawing the tubes and jiggling them from side to side. Movement of a tube tends to weaken the pins in the base and unnecessarily spread the contacts in the socket. It is desirable to inspect the sockets of the tubes at the time the tubes are removed.

(4) When it is necessary to remove a tube from its socket, especially if it is a high-power tube, great care must be used. Never jar a warm tube. Connections to the grid caps and plate caps must always be removed.

b. TIGHTEN (T). Tighten all loose connections to the tube sockets or to the tubes. If the connections are dirty or corroded, clean before tightening. When tightening locknuts that hold the sockets to the insulated bushings, do not apply excessive pressure. Too much pressure will crack the bushings.

c. CLEAN (C). (1) Clean the tubes only if inspection shows cleaning to be necessary. Tubes operated at high voltages and with exposed plate and grid connections must be kept free of dirt and dust because of possible leakage between grid and plate terminals. Tubes operating at low voltages and not having exposed grid and plate caps do not require frequent cleaning. However, do not permit dirt to accumulate on low-voltage tubes.

(2) Remove dust and dirt from the glass or metal envelopes with a clean, lint-free, dry cloth. If proper care is exercised, the grid and plate caps may be cleaned with a piece of #0000 sandpaper. Wrap the paper around the cap and *gently* run along the surface. Excessive pres-

sure is not needed; do not grip the cap tightly. Wipe with a clean dry cloth.

(3) When tube sockets are cleaned and the contacts are accessible, fine sandpaper may be used to remove corrosion, oxidation, and dirt.

d. ADJUST (A). Adjust loose tube connector clips. Do not flatten tube connector clips during adjustment. Flattened clips do not make adequate contact with the surface of the tube cap. If the clip is made of thin metal, it can be adjusted by gently compressing it with the fingers. If it is made of heavy-gauge metal, suitable pressure can be applied with a pair of long-nose pliers.

71. Capacitors

a. INSPECT (I). (1) Inspect the terminals of large fixed capacitors for corrosion, loose connections, cracks, and breakage. Carefully inspect the mountings to discover loose mounting screws, studs, or brackets. Examine the leads for poor insulation, for cracks, and for evidences of decay. Cut away frayed strands on the insulation. If the wire is exposed, wrap it with friction tape.

(2) Inspect the case of each large fixed capacitor for leaks, bulges, and discoloration.

(3) Inspect the plates of variable capacitors for dirt, dust, or lint. Examine the movable set of plates for signs of damage or misalignment that would cause them to touch the fixed plates during tuning. Rotate the movable plates, using the panel tuning control, and thus check for operation of the capacitor.

b. TIGHTEN (T). Tighten loose terminals, mountings, and connections on the capacitors. Do not break the bushing or damage the gasket.

c. CLEAN (C). (1) Clean the cases of fixed capacitors, the insulating bushings, and connections that are dirty or corroded. The capacitor cases and bushings can usually be cleaned with a dry cloth, but if the deposit of dirt is hard to remove, moisten the cloth in a dry-cleaning solvent.

(2) Clean the plates of variable capacitors with a small brush, removing all dust and lint.

72. Resistors

a. INSPECT (I). Inspect the coating of the vitreous-enameled resistors for signs of cracks and chipping, especially at the ends. Examine the bodies of all types of resistors for blistering, discoloration, and other indications of overheating. Inspect leads and all other connections for corrosion, dirt, dust, looseness, and broken strands in the connecting wires. Check the security of all mountings. Do not attempt to move resistors with pigtail connections, because there is danger of breaking the connections at the point where they enter the body of the resistor. Such defects cannot be repaired.

b. TIGHTEN (T). Tighten resistor connections and mountings whenever they are found loose. If a resistor is allowed to remain loose, vibration may break the connection or damage the body.

c. CLEAN (C). (1) Clean all carbon resistors with a small brush.

(2) Vitreous-enameled resistors must be kept clean to avoid leakage between the terminals. They are ordinarily wiped with a clean dry cloth. However, if the dirt deposit is unusually hard to remove, use a dry-cleaning solvent.

(3) Resistors with discolored bodies cannot be cleaned. Discoloration indicates that there has been overloading and overheating at some time prior to the inspection. The discoloration is probably due to circuit trouble which requires analysis and correction. Trouble-shooting procedures are described in chapter 5.

73. Fuses

a. INSPECT (I). Inspect the fuse caps for evidence of burning. Any evidence of burning indicates that the fuse contact is not tight. Examine the fuses and holders for signs of corrosion, dirt, loose connections, and loss of spring clip tension.

b. CLEAN (C). Clean fuse ends and fuse clips with #0000 sandpaper; then wipe them with a clean cloth. If the fuse clips are burned and pitted, use a fine file to dress the clips properly, and finish with emery cloth to leave a smooth surface. Be sure to remove all traces of emery dust because emery dust is a good conductor of electricity and may cause short circuits.

c. TIGHTEN (T). Tighten all loose wire connections to the fuses. Make certain that all connections are clean before tightening.

d. ADJUST (A). Adjust the spring tension on the fuse clips if necessary. Use a pair of long-nose pliers for this operation. Do not flatten the clip while adjusting because a flattened clip makes poor contact.

74. Bushings and Insulators

a. DESCRIPTION. (1) Insulated bushings are used in the high-voltage and r-f circuits. They are constructed of ceramic material with a glazed surface. Because an insulator is no better than its surface, deposits of foreign substances on the surface will materially reduce the insulation value of the bushing. Therefore, it is very important that all bushings used in the high-voltage circuits be inspected frequently.

(2) Insulator bushings are used as supports for high-voltage tube sockets, for high-voltage terminals of capacitors, and for tank coils. They are used as mountings for resistors in high-voltage circuits and as supports for panels which mount other parts. The condition of insulator bushings that are used solely as panel supports is not critical, but the condition of bushings used as high-voltage insulators is extremely important.

b. INSPECT (I). Inspect the physical condition of the insulator bushings. They should be clean and free from cracks or chips. It is possible for a highly glazed insulator to develop fine-line surface cracks where moisture and dust will accumulate and eventually form a leakage for a high-voltage flash-over. Consequently, the surface of the bushings must be inspected to detect such cracks. As a rule, the bushings are held in position with nuts screwed onto the threaded conductors. These bushings can be replaced very easily by unscrewing the nuts. If replacement is not possible because of a shortage of supplies, frequently clean the defective bushing thoroughly with dry-cleaning solvent. Sometimes it is difficult to see dust on a glazed surface. A satisfactory check can be made by sliding a clean finger across the bushing.

c. TIGHTEN (T). The procedure to be used in tightening loose bushings is self-evident. However, one precaution must be observed. *Do not force the nuts or screws down too tight.* Excessive pressure exerted on the bushings will cause damage. If the threads on bushing stud bolts are found stripped so that they cannot be tightened, replace the entire bushing.

d. CLEAN (C). Insulating bushings are easily cleaned. Never use abrasive materials because the glazed finish will be destroyed. A clean cloth is usually satisfactory. If deposits of grime or dirt on the surface of a bushing are hard to remove, use dry-cleaning solvent. After the surface has been cleaned with a solvent, it should be carefully polished with a clean dry cloth. Otherwise, a thin film of the solvent will be left which will impair the effectiveness of the bushing as a high-voltage insulator.

75. Relays

a. GENERAL. Relays normally require very little attention. Extreme care should be used during all operations of preventive maintenance; otherwise, these same operations may result in trouble that would not have existed if the relay had not been tampered with.

b. INSPECT (I). Inspect the mechanical action of the relays to make certain that when the moving and stationary contacts come together they make positive contact and are directly in line with each other. Inspect the contacts for dust that may result in poor contact or arcing. Do not mistake the brown stain often found on silver contacts for corrosion. This brown stain is silver oxide and is a good conductor.

c. TIGHTEN (T). Tighten all loose connections and mounting screws, but do not apply enough force to damage the screw or to break the parts it holds.

d. CLEAN (C). Brush the exterior of the relay with a soft brush to remove dust. If inspection shows that the contacts require cleaning, clean them with a strip of white paper placed between the contacts. Close the contacts on the paper just enough to grip the paper snugly, and draw the paper between the contacts. Dry-cleaning solvent may be used on the paper if corrosion is present or if dirt deposits are not readily removed with the dry paper. If the contacts are burned or pitted, they may be dressed down with a fine file followed with a burnishing tool and crocus cloth.

e. ADJUST (A). Adjust the contacts of the relays *only* if they do not close evenly and securely. Too frequent adjustment of the relays usually results in equipment failure.

76. Switches

a. INSPECT (I). (1) Inspect the mechanical action of each switch and, while doing so, look for signs of dirt or corrosion on all exposed elements. In some cases, examine the elements of the switch visually; in others, check the action of the switch by flipping the control knob or toggle, or press the switch button and note the freedom of movement and the amount of spring tension.

(2) Examine the ganged multiple-section switches to see whether they are properly lubricated and whether the contacts are clean. The inspection is visual. Do not pry the leaves of the switch apart. The rotary members should make good contact with the stationary members; and as the former slides into the latter, a spreading of the stationary contact leaves should be noticeable. The switch action should be free. The wiping action of the contacts usually removes any dirt at the point of contact.

b. CLEAN (C). With a small brush, clean dust and dirt from all switches. Be very careful while brushing around exposed contacts.

c. LUBRICATE (L). If necessary, lubricate the bearing surfaces of the multiple-section switches (such as the BAND SWITCH on Radio Transmitter BC–610–E and the antenna band switch on Antenna Tuning Unit BC–939–A). Apply only a thin film of special lubricating preservation oil (PS). Do not permit excess oil to run down onto wires or other parts.

77. Coils

a. INSPECT (I). Inspect all coils for dirt, poor connections, and damaged insulation. The coil forms supporting the transmitter coils should be inspected for cracks in the insulation and loose joints in the insulation supporting the coil windings. Examine the pins of the plug-in coils for damaged or defective pins. See that the pins maintain the necessary spring action to insure good contact in the pin sockets.

b. TIGHTEN (T). Tighten all loose connections on coils, after first making certain that the connection is free of dirt or corrosion. Recement loose joints in the insulation supporting the coil windings. Tighten the nuts supporting the pins in plug-in coils, if the pins are found to be loose. Do not exert excessive pressure while tightening these nuts; excessive pressure will crack the supporting insulator.

c. CLEAN (C). Clean the coil form and coil with a soft brush. Remember that the ceramic coil form is actually performing the function of a high-voltage insulator, hence the same preventive maintenance applies to the coil form as to high-voltage insulators and bushings.

78. Rheostats and Potentiometers

a. INSPECT (I). Inspect all rheostats and potentiometers for cleanliness and mechanical action. Potentiometers which are protected with dust covers should be inspected externally only. Do not remove the dust covers. Look for loose connections and loose mounting nuts. Examine the sliding arm of exposed rheostats and potentiometers for firm contact with the resistance element. Look for corrosion on the contact of the sliding arm.

b. TIGHTEN (T). Tighten any loose connections or mounting nuts.

c. CLEAN (C). Use a soft brush to clean dust and dirt from the exposed resistance elements and sliding arms. Use crocus cloth to remove corrosion from the contact surface of exposed, wire-wound resistance elements, and from the contact surface of the sliding arm of exposed rheostats and potentiometers.

d. ADJUST (A). If inspection reveals that the sliding arm is not making adequate contact with the resistance element, increase the spring tension. Any adjustment to the spring tension should be made with extreme caution to avoid damaging the control.

79. Terminal Blocks

a. INSPECT (I). Inspect the terminal blocks for cracks, breakage, dirt, and loose connections or mounting screws.

b. TIGHTEN (T). Tighten loose screws, lugs, and mounting bolts. When tightening screws, be sure to select a screw driver of correct size. Do not exert too much pressure.

c. CLEAN (C). Remove all dust and dirt from the terminal blocks with a small brush. Remove corrosion from connections with #0000 sandpaper.

80. Multiple Connectors

a. INSPECT (I). Inspect the exterior of all multiple connectors, male and female, for dust, dirt, corrosion, or damaged pins. Look for traces of moisture on the insulated portion of the connector. Inspect the interior of the connectors for loose connections and broken strands of wire to the various pins. Loose strands should be soldered in place. If the insulation on each wire connected to the pins does not extend entirely to the pin, wrap the bare wire with friction tape to prevent short circuits.

b. CLEAN (C). Remove all dust and dirt from the exterior and interior of the connectors. Wipe the moisture out with a clean dry cloth. In tropical areas, the insulated portion of the connector will mold rapidly if moisture is not removed at frequent intervals. Light mold may be removed by wiping with a clean dry cloth. If mold is excessive, use a cloth dampened with dry-cleaning solvent. Use #0000 sandpaper for removing corrosion from metal parts of the connector.

81. Cords and Cables

a. INSPECT (I). Inspect the cables for cracked or deteriorated insulation, frayed or cut insulation at the connecting and supporting points, and improper placement which puts the cables or connections under strain. Watch for kinks which will damage the wires within the cable. Examine for oil or grease on the rubber insulation. Oil or grease causes rapid deterioration of rubber.

b. TIGHTEN (T). Tighten loose cable clamps, coupling rings, and cable connections.

c. CLEAN (C). Remove all dust, dirt, oil, grease, and foreign matter from all cables and cords. Dirt often hides defects in the cable insulation. These hidden defects may result in equipment failure.

82. Meters

a. INSPECT (I). Inspect the connections for loose, dirty, or corroded connections. Look for cracked meter glass. Inspect for loose meter mounting screws.

b. TIGHTEN (T). Tighten all loose connections to the meter. Make certain that connections are clean before they are tightened. Tighten the meter mounting screws if necessary.

c. CLEAN (C). Clean the entire exterior of the meter with a clean dry cloth. Clean corrodded connections with #0000 sandpaper.

d. ADJUST (A). Meters normally register zero when the equipment is turned off. Occasionally a meter will become out of adjustment and require adjustment. Before adjusting, however, a test should be made to determine whether the meter has acquired a charge of static electricity as a result of cleaning the meter glass with a dry cloth. Such a static charge will cause a meter movement to register above (or below) zero reading with the equipment shut off. To test the meter for static charge, dampen the fingers of one hand and place the little finger firmly on a screw head or other metal part of the component to place the body at a chassis ground potential. Brush the dampened thumb slowly across the face of the meter glass. The static charge should drain off, releasing the meter movement so that the meter will register zero. In some cases this discharge is not effected, but the meter needle deflection will vary during the time that the thumb is brushed over the glass if a static charge is present. In this case, allow the meter to remain idle for 5 minutes to allow a natural drain. If the meter movement is not affected in any way by the above test, no static charge is present. To adjust the movement, use a small thin-blade screw driver in the adjustment screw in the lower edge of the meter face. Rotate the screw to the right or left as required to bring the needle to zero.

83. Pilot Lamps

a. INSPECT (I). Inspect the pilot lamp assembly for loose lamps, loose mounting screws, and loose, dirty, or corroded connections. If a pilot lamp is found with a loose glass envelope, replace the lamp.

b. TIGHTEN (T). Tighten loose mounting screws and resolder loose connections. If the connections are dirty or corroded, clean before soldering. Tighten loose lamps in their sockets.

84. Jacks

a. INSPECT (I). Although jacks require very little attention, inspect them periodically for cleanliness and tightness. Insert the proper plug in the jack and note the action of the jack. Contact to the plug should be secure.

b. TIGHTEN (T). Tighten the mounting nut or screws on all jacks, if they are found to be loose.

c. CLEAN (C). Clean the jacks thoroughly with a stiff brush. If the contacts on the jacks are corroded, clean them with crocus cloth.

d. ADJUST (A). Adjust the spring contact of the jacks *only* if inspection shows that the jacks are not making firm contact with the plugs. Bend the spring contact with a pair of long-nose pliers. Check the action of the jack with a plug after each adjustment.

85. Dynamotors and Motors

a. INSPECT (I). Inspect for dust and dirt around the commutator and brushes. Inspect the brushes for wear and signs of arcing. Check the tension of the brush springs. Look for poor connections at the brushes as well as at the plug.

b. FEEL (F). Feel the bearings as soon as possible after shut-down of the equipment, to determine whether the bearings are running hot. Become accustomed to the amount of heat to expect at the bearings under normal conditions.

c. TIGHTEN (T). Tighten the mounting bolts securing the dynamotor or motor. Tighten any loose connections at the brushes or plugs.

d. CLEAN (C). Use a dry clean cloth to remove dust and dirt from the exterior of all dynamotors and motors. If heavy dirt deposits are not readily removed, use dry-cleaning solvent on a clean cloth. Use an air stream from an air compressor to blow the dust out of the interior of motors if dry compressed air is available. Use a soft brush to remove the dust if dry compressed air is not available.

e. LUBRICATE (L). Lubricate the ventilating fan air-control plate screw sparingly with oil. Lubricate the ventilating fan motor bearings and the heater fan motor bearings with oil as follows:

(1) *Temperatures above +32° F.* Use engine oil SAE 30 (OE 30).

(2) *Temperatures from +32° F., to 0° F.* Use engine oil SAE 10 (OE 10).

(3) *Temperatures below 0° F.* Use special preservative lubricating oil (PS).

86. Cabinets, Chassis, and Mountings

a. INSPECT (I). Inspect all cabinets and chests for cleanliness. Examine all chassis and mountings for loose screws, dirt, and corrosion or rust. Check all panels for loose knobs.

b. TIGHTEN (T). Tighten all loose mounting screws, loose chassis screws and bolts, and all loose knobs or handles. Tighten all wingnuts and turnbuckles which secure the various components to their mountings or the mountings to the shelter.

c. CLEAN (C). Wipe all dust and dirt from the exterior and interior of the cabinets and chests. Brush out the dust and dirt from the chassis and mountings. Use dry-cleaning solvent on a clean cloth to remove stubborn accumulations of dirt. Use #0000 sandpaper to remove corrosion and rust. Cover all bare spots on metal surfaces with touch-up paint.

d. LUBRICATE (L). Lubricate the hinges on chests, the threads on turnbuckles, and the threads on wingnuts with a light oil (special preservative lubricating oil (PS)).

87. Headsets, Microphones, Keys, and Loudspeakers

a. INSPECT (I). Inspect all external surfaces for dirt and corrosion. See that all cord connections are tight and that plugs and jacks fit together properly. Inspect the key for proper operation.

b. CLEAN (C). Wipe the dust and dirt from all external surfaces with a clean dry cloth. Use crocus cloth for removing corrosion from the connecting plugs.

c. LUBRICATE (L). Lubricate all key bearings with light oil (special preservative lubricating oil (PS)), if needed.

88. Couplings and Control Shafts

a. INSPECT (I). Inspect couplings and control shafts for tightness and cleanliness. If the setscrews securing the couplings and control shafts are loose, the switches or capacitors connected to the shafts will not rotate through the correct arc, and inaccuracy will result.

b. TIGHTEN (T). Tighten all setscrews securing the couplings and control shafts.

c. LUBRICATE (L). Lubricate bearings of capacitor shafts (front and rear) and tuning-control shaft bearings with 1 or 2 drops of oil. For temperatures above 0° F., use engine oil SAE 10 (OE 10). For temperatures below 0° F., use special preservative lubricating oil (PS). Lubricate the following points on Antenna Tuning Unit BC–939–A with special lubricating grease (GL):

(1) Antenna high-frequency loading coil contact roller shaft.

(2) Antenna coupling adjustment coil contact roller shaft.

(3) Antenna coupling adjustment control bevel pinions.

(4) Antenna high-frequency tuning control bevel pinions.

(5) Antenna low-frequency tuning control bevel pinions.

89. Gears

a. INSPECT (I). Inspect the teeth of the gears on the tuning-capacitor drive mechanism for cleanliness and freedom of operation.

b. CLEAN (C). Remove all dust and dirt with a small brush. If dirt accumulation is great, use a brush dipped in dry-cleaning solvent.

90. Antennas

a. INSPECT (I). Inspect antenna mast sections for cleanliness and tightness of joints. Examine antenna insulators for cracks, chips, and dirt. Examine antenna lead-in wires for poor connection, kinks, frayed insulation, and dirty connections.

b. TIGHTEN (T). Tighten all mounting bolts supporting the antenna mounting bracket. Tighten loose antenna mast sections.

c. CLEAN (C). Wipe all dust and dirt from the antenna mast sections and insulators with a clean dry cloth. If dirt accumulations are difficult to remove, use dry-cleaning solvent on the cloth. If dry-cleaning solvent is used as a cleaning agent, wipe the antenna insulators with a clean dry cloth. Use #0000 sandpaper to remove corrosion from antenna connections. Use #0000 sandpaper to remove corrosion or rust spots on the antenna mast sections. Cover any bare metal spots with touch-up paint.

91. Reels

a. INSPECT (I). Inspect reels for dirt, rust, and corrosion. Check to see that the reel operates freely.

b. CLEAN (C). Remove all dirt from reels with a stiff brush. If rust or corrosion is present, use #0000 sandpaper to remove these spots. Repaint, if necessary, with touch-up paint.

c. LUBRICATE (L). Lubricate the bearings of the fixed handle of reel hand Axle RL–27, by applying lubricant liberally at the opening between the shaft and the inner end of the handle. To lubricate the handle bearings and lock, remove the handle, clean the lock and flush out the bearings, then relubricate. Clean dirt from the handle shaft before replacing the handle. The correct lubricants to use are:

(1) *Temperatures above +32° F.* Use engine oil SAE 30 (OE 30).

(2) *Temperatures from +32° F., to 0° F.* Use engine oil SAE 10 (OE 10).

(3) *Temperatures below 0° F.* Use special preservative lubricating oil (PS).

Section II. ITEMIZED PREVENTIVE MAINTENANCE

92. General

For ease and efficiency of performance, it is suggested that preventive maintenance on Radio Sets SCR–399–A and SCR–499–A be broken down into operations that can be performed at different time intervals. In this section the preventive maintenance work to be performed on the radio set at specified time intervals is broken down into units of work called items. The general techniques involved and the application of the FITCAL operations in performing preventive maintenance on individual parts are discussed in section I. These general instructions are not repeated in this section. When performing preventive maintenance, see section I if more information is required for the following items. All work is to be performed with the power removed from the equipment. After preventive maintenance has been performed, the equipment should be put into operation and checked for satisfactory performance. (See check list, par. 66.)

93. Common Materials Needed

The following materials will be needed in performing preventive maintenance:

- Common hand tools (TE–41 or equivalent)
- Clean cloth
- #0000 sandpaper
- Crocus cloth
- Fine file or relay burnishing tool
- Dry-cleaning solvent (SD)
- Small soft brush
- Small stiff brush
- Small inspection mirror

Note. Leaded gasoline will not be recommended as a cleaning fluid for any purpose. Dry-cleaning solvent (SD), a cleaning fluid, is available through established supply channels. Oil, Fuel, Diesel, U. S. Army Specification 2–102B, may be used for cleaning purposes when dry-cleaning solvent is not at hand. Since unleaded gasoline is available only in limited quantities, and only in certain locations, it should be used for cleaning purposes only when no other agent is suitable. Carbon tetrachloride, or fire-extinguishing liquid (carbon tetrachloride base), may be used if necessary, *but only on contact parts of electronic equipment.*

94. Item I. Exterior of Radio Sets SCR–399–A and SCR–499–A

OPERATIONS

I T C L	Cabinets and mountings
I T C	Control knobs
I T	Pilot lamps

REMARKS: Maintenance operations in item 1 do not require the removal of the chassis from their cabinets. Pilot lamp connections inside the cabinets will be handled with items 7 and 9.

95. Item 2. Headsets, Microphones, Keys, and Loudspeakers

OPERATIONS

I C	Headsets
I C	Microphones
I C L	Keys
I C	Loudspeakers

REMARKS: Check connecting cords for breaks under the insulation. Adjust keys after performing preventive maintenance.

96. Item 3. Cords, Cables, and Connectors

OPERATIONS

I T C	Cords and cables
I T C	Multiple connectors

REMARKS: Perform operations on external surfaces only for multiple connectors. Internal operations will be handled with items 6, 9, and 10.

97. Item 4. Antennas

OPERATIONS

I T C	Antenna mast sections
I C	Antenna insulator
I T C	Mounting bracket
I T C	Antenna lead-in

REMARKS: When equipment is used in vehicles, check the tie-down ropes and insulators for security.

98. Item 5. Accessories

OPERATIONS

I C L	Reels
I C	Shelter HO–17–A
I T C L	Chests

REMARKS: Keep all cords and cables off the floor. The shelter must be kept clean and orderly. Keep instruction books in their proper compartment when not in use.

99. Item 6. Interior of Radio Sets SCR–399–A and SCR–499–A

OPERATIONS

I T C	Chassis of each main component
I T L	Couplings and control shafts
I C	Gears
I T C	Multiple connectors

REMARKS: Disassemble multiple connectors and check for poor connections, frayed insulation, and broken strands of wire. Do not attempt to remove individual pins within the connector.

100. Item 7. Radio Transmitter BC–610–E

OPERATIONS

I T C A	Vacuum tubes
I T C	Capacitors
I T C	Resistors
I T C A	Fuses
I T C	Bushings and insulators
I T C A	Relays
I C L	Switches
I T C	Coils
I T C A	Rheostats and potentiometers
I T C	Terminal blocks
I T C A	Meters
I T	Pilot lamps

REMARKS: Test the transmitter after performing preventive maintenance to be sure that all circuits are correct.

101. Item 8. Antenna Tuning Unit BC–939–A

OPERATIONS

I T C	Capacitors
I T C	Coils
I T C	Bushings and insulators
I C L	Switches
I C	Gears
I T L	Couplings and control shafts

REMARKS: Test for performance after completing preventive maintenance.

102. Item 9. Speech Amplifier BC–614–E

OPERATIONS

I T C A	Vacuum tubes
I T C	Capacitors
I T C	Resistors
I T C	Bushings and insulators
I T C A	Potentiometers
I T C	Terminal blocks
I T C A	Meter
I T	Pilot lamp
I T C A	Jacks
I T C	Multiple connectors

103. Item 10. Junction Box JB–70–A

OPERATIONS

I T C	Capacitors
I T C	Resistors
I T C	Terminal blocks
I T C A	Jacks
I C L	Switches
I T C	Multiple connectors

REMARKS: Use great care when handling the junction box when the chassis is out of its cabinet. The socket insulators break easily if the chassis is not handled properly.

104. Item 11. Rectifier RA–63–(*)

OPERATIONS

I T C A	Relay
I T C	Terminal block
I C L	Switch

REMARKS: Wipe dust, dirt, and moisture from the rectifier unit with a clean dry cloth. Tighten the mounting screws.

105. Item 12. Heating and Ventilating System

OPERATIONS

F I T C L	Motors
I C	Switches

REMARKS: Examine the heating element for loose or corroded connections. Clean dust from the heating coil with a soft brush. Do not allow any inflammable material to come in contact with the heating coil.

106. Item 13. Auxiliary Batteries

OPERATIONS

I C	Storage batteries
I C T	Battery connections

REMARKS: Test the specific gravity of the storage batteries in accordance with TM 11-430.

107. Preventive Maintenance Check List

a. GENERAL. The following check list is a summary of the preventive maintenance to be performed on Radio Sets SCR–399–A and SCR–499–A. Some items require preventive maintenance more frequently than others. For this reason the check list divides the preventive maintenance items into daily, weekly, and monthly tasks. This recommended frequency of operation may be varied at the discretion of the commanding officer. Similarly, the check list indicates the echelon most fitted to perform the various tasks. The echelon performing any given item may be changed at the discretion of the commanding officer.

b. CHECK LIST

Item No.	Operations	Item	When performed: Before operation	After operation	Daily	Weekly	Monthly	Echelon
1	I T C L	Exterior of Radio Sets SCR–399–A and SCR–499–A		X	X			1st
2	I C L	Headsets, microphones, keys, and loudspeakers		X	X			1st
3	I T C	Cords, cables, and connectors	X		X			1st
4	I T C	Antennas	X		X			1st
5	I T C L	Accessories		X		X		1st
6	I T C L	Interior of Radio Sets SCR–399–A and SCR–499–A				X		2d
7	I T C A L	Radio Transmitter BC–610–E				X		2d
8	I T C L	Antenna Tuning Unit BC–939–A				X		2d
9	I T C A	Speech Amplifier BC–614–E				X		2d
10	I T C A L	Junction Box JB–70–A				X		2d
11	I T C A L	Rectifier RA–63–(*)					X	2d
12	F I T C L	Heating and ventilating system					X	2d
13	I T C	Auxiliary batteries		X	X			1st

F	I	T	C	A	L
Feel	Inspect	Tighten	Clean	Adjust	Lubricate

Section III. LUBRICATION

Note. Lubrication orders are not required for Radio Sets SCR–399–A and SCR–499–A. All lubrication instructions on the equipment are included in section I.

Section IV. SPECIAL TOOLS

108. Relay and Commutator Tools

A number of items in preventive maintenance require work of a special and somewhat delicate nature. These include cleaning silver-plated relay contacts, removing pitted surfaces from contacts, polishing and dressing commutators and slip-rings, and dressing motor and generator brushes. To do the work properly, special supplies and a few specially constructed tools are needed. Most of the required materials are furnished with the radio set, but a few must be improvised.

109. Construction of Special Relay and Commutator Tools

Crocus-cloth, canvas, and sandpaper sticks are constructed in the following manner:

a. Obtain one length of wood (or suitable substitute) 1/32 inch thick, 3/8 inch wide, and 3¾ inches long; and three lengths of wood (or suitable substitute) ¼ inch thick, 1 inch wide, and 8 inches long. Cut two pieces of crocus cloth, one piece 1 inch wide and 2½ inches long, and the other 1 inch wide and 5¼ inches long. Cut one piece of #0000 sandpaper and one piece of canvas, each 1 inch wide and 5¼ inches long.

b. Cement the small piece of crocus cloth to the small stick, as shown in figure 31 (A). Note that both sides of the stick are covered. Place the stick in the vise until the cement hardens. The pieces of crocus cloth which extend over the edge of the stick may be cut off with a knife. The finished product is shown in figure 31 (A).

c. The long, narrow pieces of crocus cloth, sandpaper, and canvas are cemented to the three long sticks, as shown in figure 31 (B). Note that in this case, the fold is over one end of the stick rather than over the side. Again the vise should be used to hold the cover material flat on the stick until the cement has hardened. This finished product is shown in figure 31 (B).

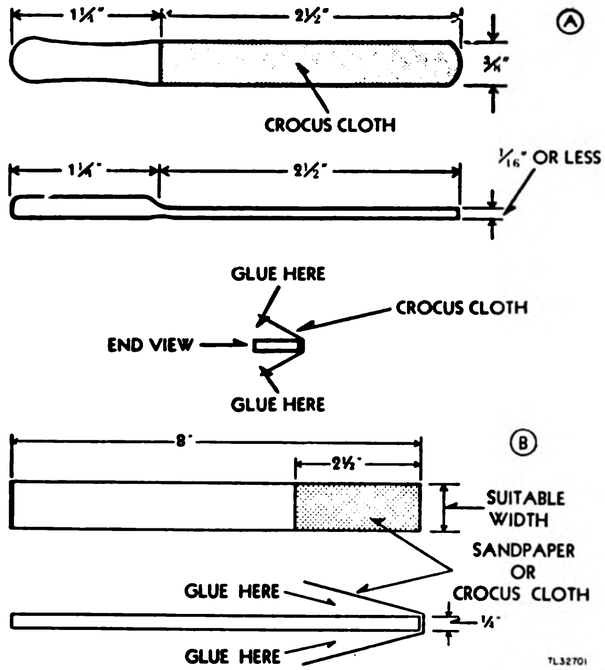


Figure 31. Relay and commutator tools, method of construction.

110. Safety Shorting Stick and Jumper Wires

It will be necessary for the maintenance personnel to construct a safety shorting stick and several jumper wires. The suggested method of construction is as follows:

a. Secure a dry piece of wood or some other material which is a good electrical insulator. It should be about 15 inches long and about 1 inch square. The latter dimension is not very important. Securely fasten a piece of copper or brass rod (or thin tubing) to one end of the stick in such a manner that the rod extends 12 inches beyond the end of the stick. The free end of the rod should be bent in the form of a small hook. Solder a piece of heavy flexible hook-up wire about 18 inches long to the metal rod at the point where it is fastened to the stick. Attach a heavy clip to the free end of the wire.

b. The jumper wires are made from heavy flexible wire, about 18 inches long, with heavy clips attached to each end. These are intended for use as shorting links across high-voltage capacitors in components that are being repaired or cleaned.

Section V. MOISTUREPROOFING AND FUNGIPROOFING

111. 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:

a. Resistors, capacitors, coils, chokes, transformer windings, etc., fail.

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

c. Hook-up wire and cable insulation breakdown. Fungus growth accelerates deterioration.

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

e. Moisture provides leakage paths between battery terminals.

112. Treatment

A moistureproofing and fungiproofing 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. See TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment.

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

113. Step-by-Step Instructions for Treating Radio Transmitter BC–610–E

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

b. DISASSEMBLY. (1) Remove seven screws holding cover plate to back of the set; remove plate.

(2) Tilt the set forward, or place it on its face. Be careful not to rest it on any of the projecting dials or knobs on the front panel.

(3) Remove resistor R_{19} from its socket. This resistor is not to be treated.

(4) Remove Tubes VT–218 from sockets V_3 and V_4. These tubes are not to be treated.

(5) Remove capacitor C_{28} from its contact clips. This capacitor is not to be treated.

(6) Remove antenna coil unit. Antenna coils are not to be treated.

(7) Remove crystals from tuning units. Do not treat crystals.

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

c. MASKING. Cover the following components with masking tape as shown in figures 32, 33, 34, 35, and 36.

(1) Interlock switch SW_5, item A, figure 32.

(2) Contacts on socket SO_6, item B, figure 32.

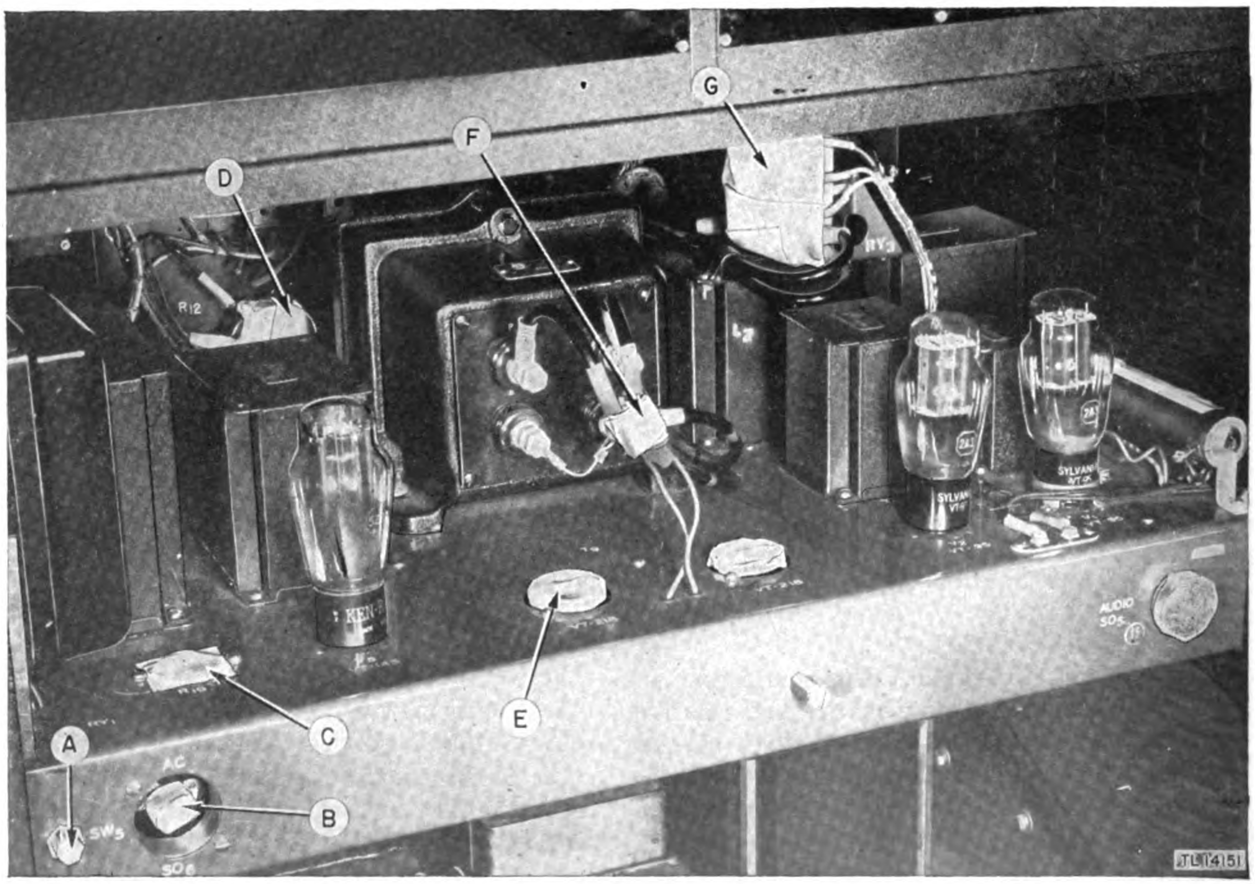


Figure 32. Radio Transmitter BC–610–E—rear interior view of chassis, showing method of masking.

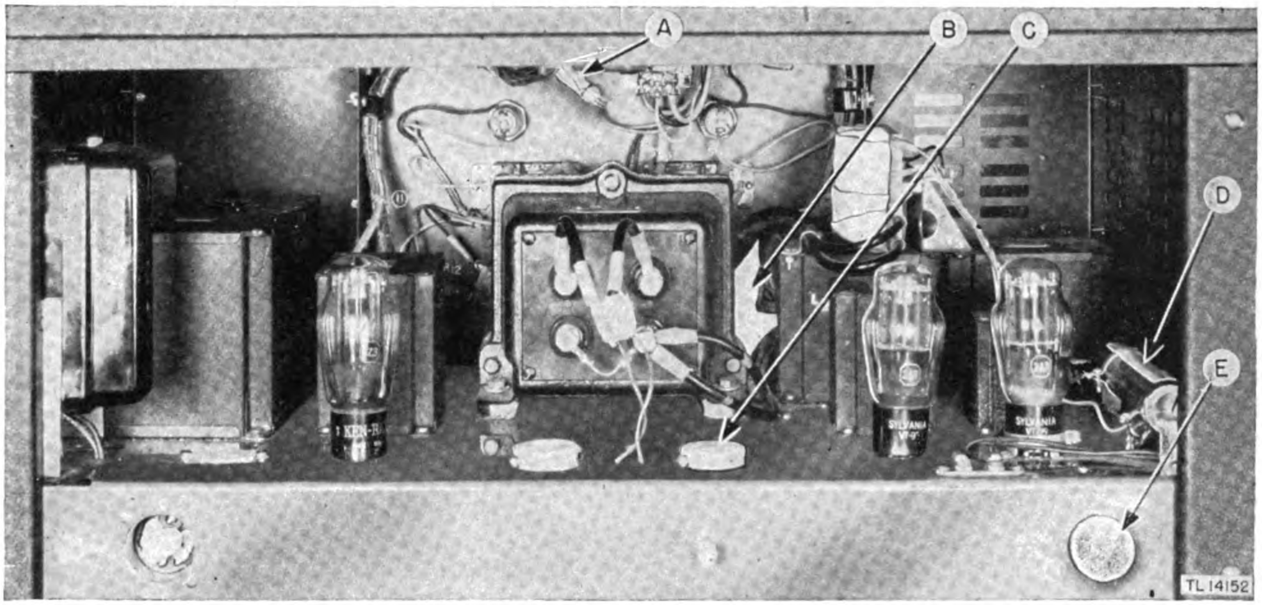


Figure 33. Radio Transmitter BC–610–E—rear interior view of chassis, showing method of masking.

(3) Socket of resistor R_{19}, item C, figure 32.
(4) Variable resistor R_{12}, item D, figure 32.
(5) Tube socket V_4, item E, figure 32.
(6) Contacts on four leads to Tubes VT–218, item F, figure 32.
(7) Relay RY_3, item G, figure 32.
(8) Contacts of push-button switch SW_{12}, item A, figure 33.
(9) Variable resistor R_{18}, item B, figure 33.
(10) Tube socket V_3, item C, figure 33.
(11) Sliding contact area of variable resistor R_{11}, item D, figure 33.
(12) Audio socket SO_5, item E, figure 33.
(13) Wafers of BAND CHANGE switch, item A, figure 34.
(14) EXCITATION METER switch SW_8, item B, figure 34.
(15) Underside of jacks which receive antenna coil, item C, figure 34.
(16) Relay RY_4, item D, figure 34.

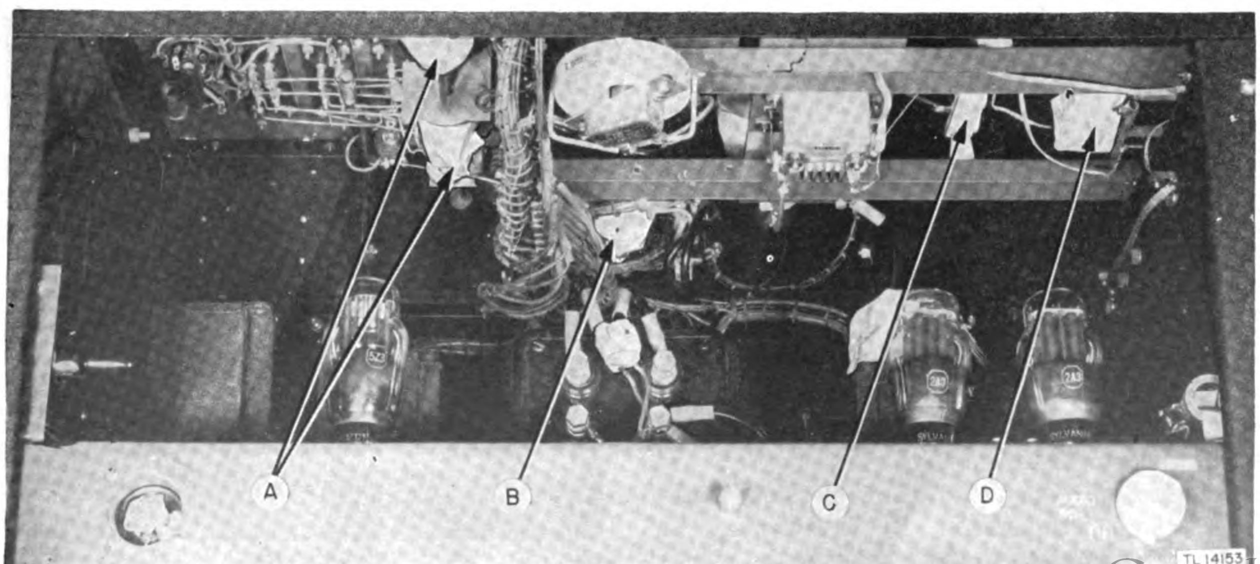


Figure 34. Radio Transmitter BC–610–E—bottom interior view of r-f chassis, showing method of masking.

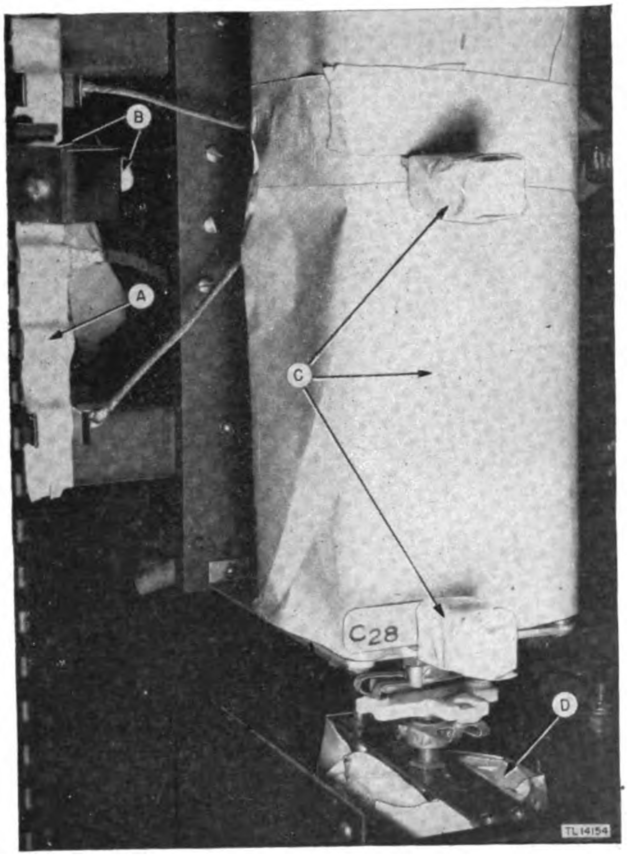


Figure 35. Radio Transmitter BC–610–E—top interior view of r–f chassis, showing method of masking.

(17) Jacks which receive antenna coil, item A, figure 35.

(18) Interlock switch, item B, figure 35.

(19) Plates of variable capacitor C_{12} and clip contacts of capacitor C_{28}, item C, figure 35.

(20) Drive gears of capacitor C_{12}, item D, figure 35.

(21) Interlock switch, item A, figure 36.

(22) Tuning unit crystal sockets, item B, figure 36.

d. DRYING. (1) Place the transmitter in a baking oven, and bake approximately 2 to 3 hours at 160° F.

Caution: Do not exceed 160° F. If wax should begin to melt in any of the components, decrease the temperature and increase the baking time approximately 1 hour for each decrease of 10° F., in temperature.

(2) If a suitable oven for drying is not available, Radio Transmitter BC-610-E may be dried by using a truck as a bake oven, by means of infrared lamps, or in an emergency, by use of a number of electric lamps placed inside the cabinet. It is recommended that treatment be carried out immediately after a long period of operation.

e. VARNISHING. (1) Spray three coats of moistureproofing and fungiproofing varnish (Lacquer, Fungus-resistant, Spec. No. 71-2202 (Stock No. 6G1005.3), or equal) on all components of all three chassis on the transmitter rack, allowing a 15- to 20-minute drying period after each coat.

(2) Using a brush, apply the varnish to those components not reached by the spray. Make sure that all components are adequately protected by varnish.

f. REASSEMBLY. (1) After the varnish is dry, remove the masking tape from all components.

(2) Reassemble by following instructions for disassembly in reverse order.

(3) Test the operation of the transmitter.

g. MARKING. Mark the transmitter with "MFP" and the date of treatment.

Example: MFP—27 September 1944.

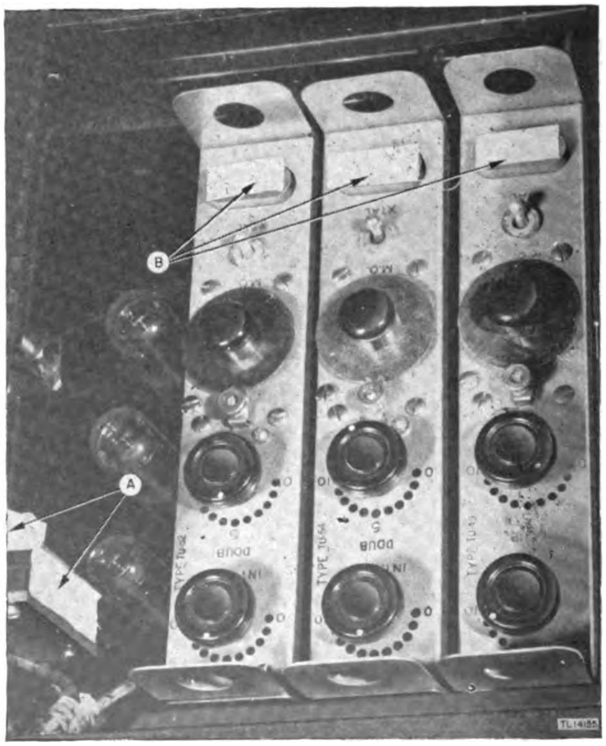


Figure 36. Radio Transmitter BC–610–E—top interior view of exciter stages, showing method of masking.

114. Step-by-Step Instructions for Treating Speech Amplifier BC–614–E

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

b. DISASSEMBLY. (1) Loosen four fasteners and remove speech amplifier from its case.

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

c. MASKING. Cover the following components with masking tape as shown in figures 37 and 38.

(1) Socket SO_{103} on front panel, item A, figure 37.

(2) Two microphone jacks on front panel, item B, figure 37.

(3) KEY jack on front panel, item C, figure 37.

(4) Socket SO_{102} on front panel, item D, figure 37.

(5) Lamp socket LM_{101}, item A, figure 38.

(6) Key jack J_{101}, item B, figure 38.

(7) Contacts of jacks J_{102} (not shown in illustration. *d.* DRYING. Place the speech amplifier in a baking oven and bake approximately 2 to 3 hours at 160° F.

Caution: Do not exceed 160° F. If wax should begin to melt in any of the components, decrease the temperature and increase the baking time approximately 1 hour for each decrease of 10° F., in temperature.

e. VARNISHING. (1) Spray three coats of moistureproofing and fungiproofing varnish (Lacquer, Fungus-resistant, Spec. No. 71–2202 (Stock No. 6G1005.3), or equal) on all components, allowing a 15- to 20-minute drying period after each coat.

(2) Using a brush, apply the varnish to those components not reached by the spray. Make sure that all components are adequately protected by varnish.

f. REASSEMBLY. (1) After the varnish is dry, remove the masking tape from all components.

(2) Reassemble by following the instructions for disassembly in reverse order.

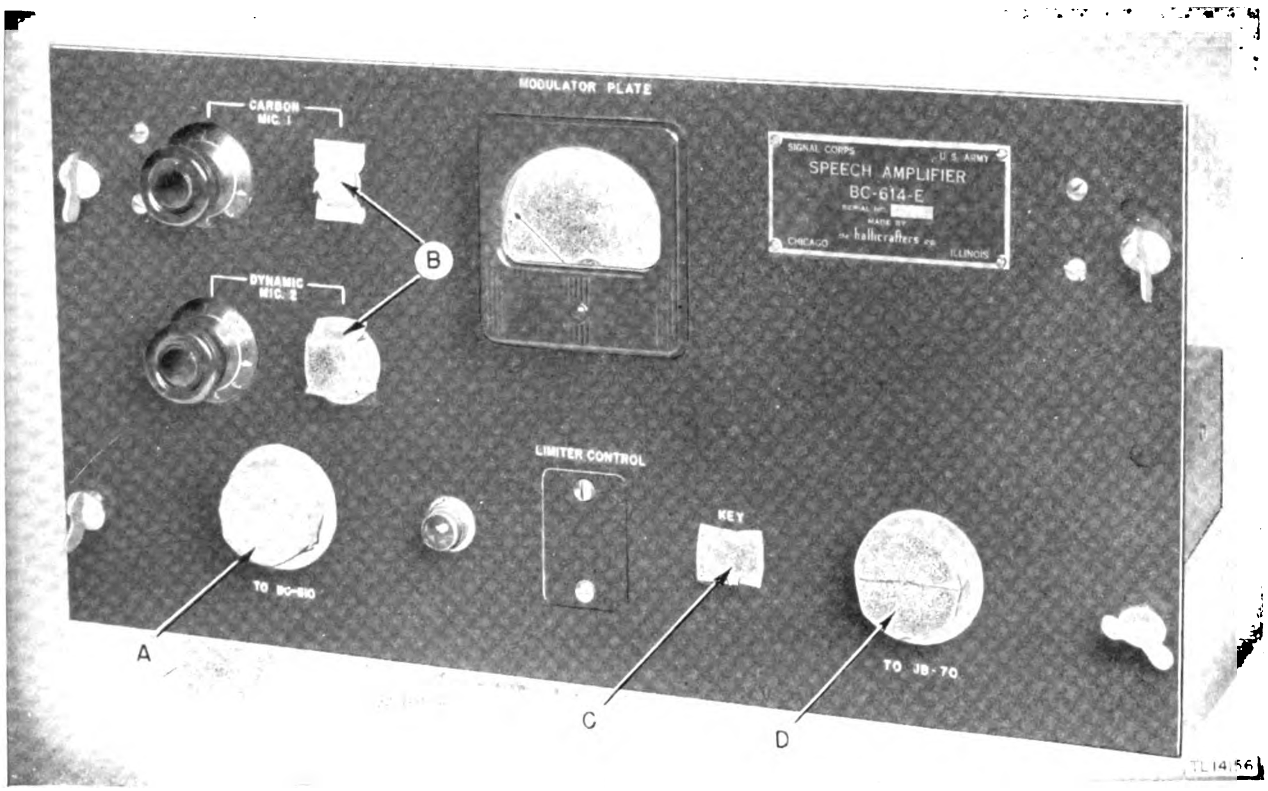


Figure 37. Speech Amplifier BC–614–E—front panel, showing method of masking.

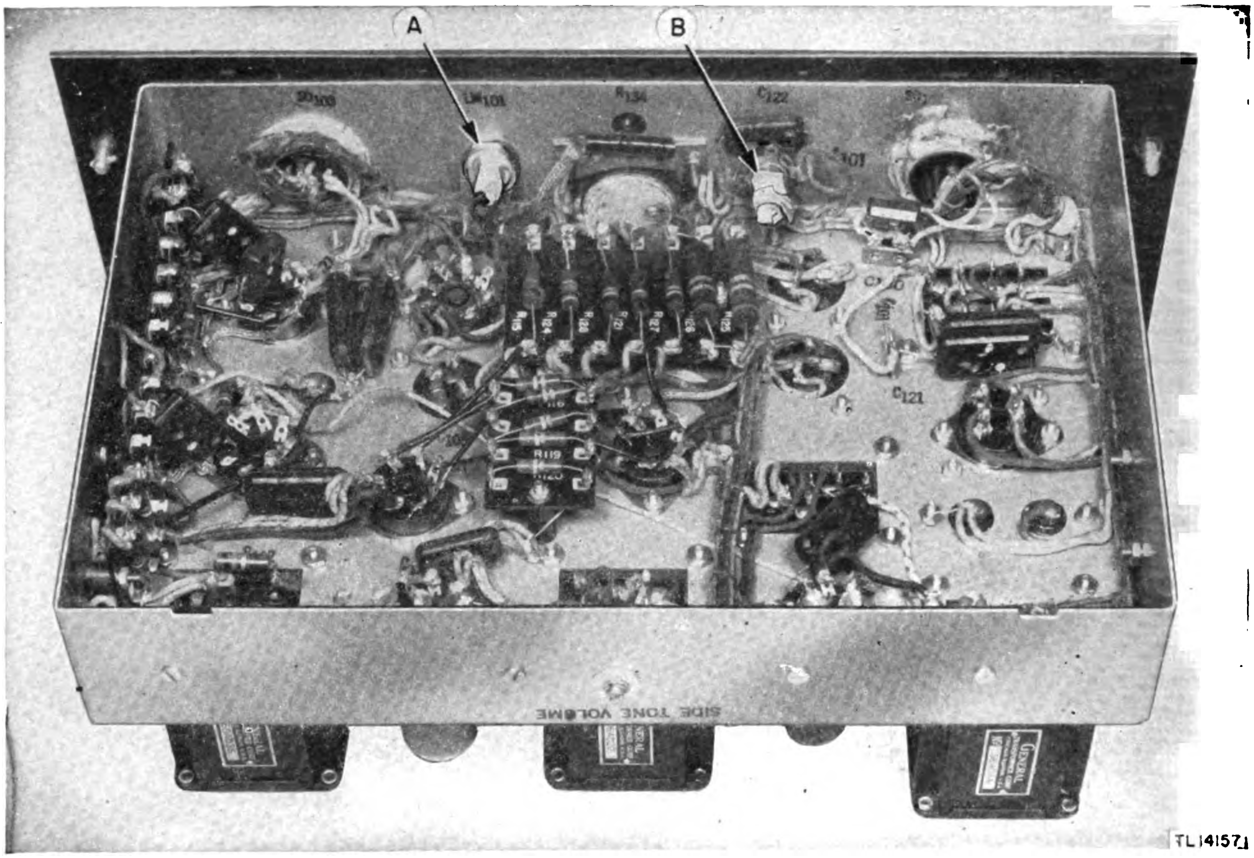


Figure 38. Speech Amplifier BC–614–E—bottom interior view of chassis, showing method of masking.

(3) Test the operations of the speech amplifier.

g. MARKING. Mark the speech amplifier with "MFP" and the date of treatment.

Example: MFP—27 September 1944.

115. Step-by-Step Instructions for Treating Junction Box JB–70–A

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

b. DISASSEMBLY. (1) Loosen four fasteners and remove junction box from its case. Disconnect the four wires attached to the terminal strip on the inside rear of the junction box.

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

c. MASKING. Cover the following components with masking tape as shown in figures 39 and 40.

(1) Holes in case of receiver output switch SW_{204}, item A, figure 39.

(2) Contacts of wafer switch SW_{205}, item B, figure 39.

(3) Three jacks J_{201}, J_{204}, and J_{205}, item C, figure 39.

(4) Contacts of push-button switch SW_{206}, item D, figure 39.

(5) Contacts of transmitter receiver switch SW_{203}, item E, figure 39.

(6) Three jacks J_{200}, J_{202}, and J_{203}, item F, figure 39.

(7) Holes in case of receiver disabling switch SW_{201}, item G, figure 39.

(8) Contacts of wafer selector switch SW_{202}, item H, figure 39.

(9) Holes in case of receiver disabling switch SW_{200}, item I, figure 39.

(10) Socket SO_{205} on side of chassis, item A, figure 40.

(11) Socket SO_{209} on side of chassis, item B, figure 40.

(12) Six jacks on front panel, item C, figure 40.

(13) Twelve sockets on bottom of chassis, item D, figure 40.

(14) Two terminal posts on front panel, item E, figure 40.

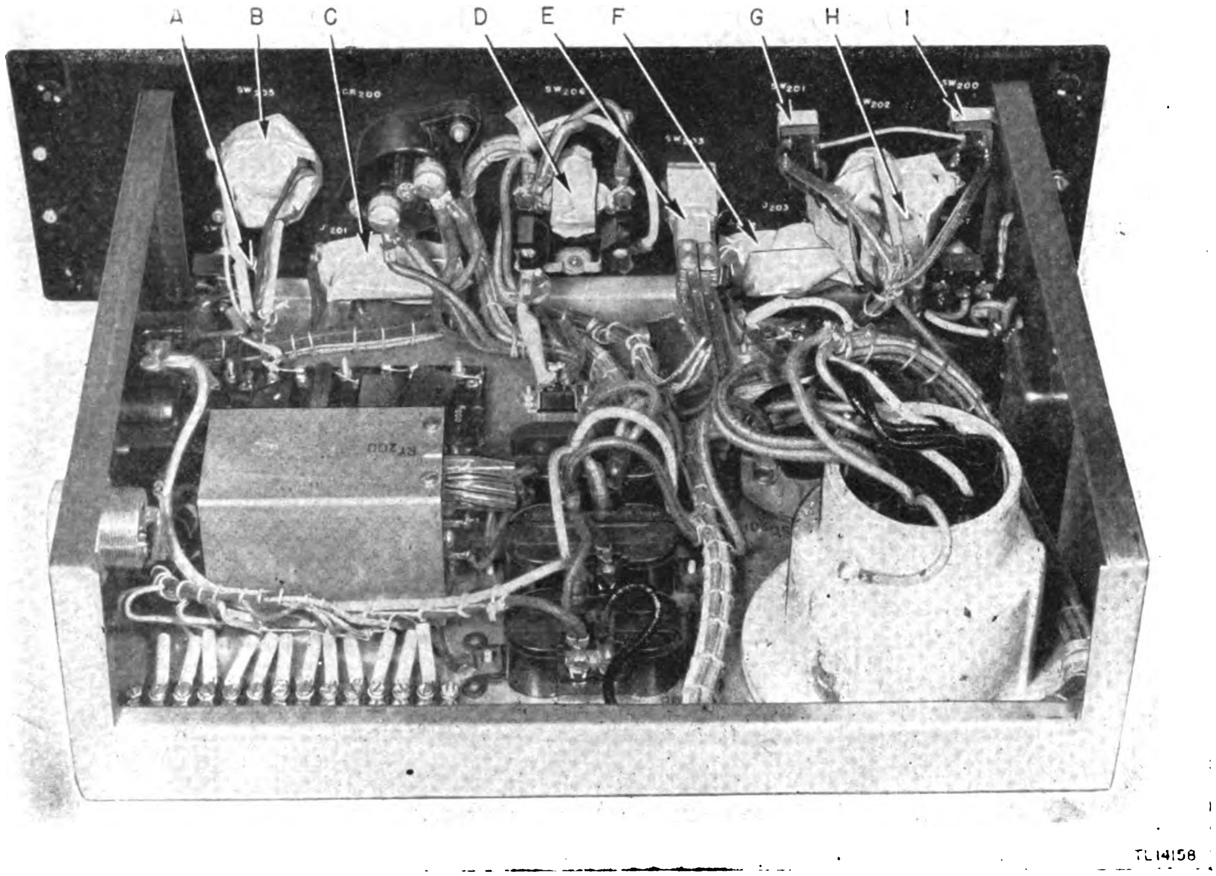


Figure 39. Junction Box JB-70-A—top interior view of chassis, showing method of masking.

d. DRYING. Place the junction box in a baking oven and bake approximately 2 to 3 hours at 160° F.

Caution: Do not exceed 160° F. If wax should begin to melt in any of the components, decrease the temperature and increase the baking time approximately 1 hour for each decrease of 10° F., in temperature.

e. VARNISHING. (1) Spray three coats of moistureproofing and fungiproofing varnish (Lacquer, Fungus-resistant, Spec. No. 71-2202 (Stock No. 6G1005.3), or equal) on all components, allowing a 15- to 20-minute drying period after each coat.

(2) Using a brush, apply the varnish to those components not reached by the spray. Make sure that all components are adequately protected by varnish.

f. REASSEMBLY (1) After the varnish is dry, remove the masking tape from all components.

(2) Reassemble by following the instructions for disassembly in reverse order.

(3) Test the operation of the junction box.

g. MARKING. Mark the junction box with "MFP" and the date of the treatment.

Example: MFP—27 September 1944.

116. Instructions for Treating Radio Receivers BC–312–( ) and BC–342–( )

For instructions for moistureproofing and fungiproofing Radio Receivers BC–312–( ) and BC–342–( ) see C 1, TM 11-850.

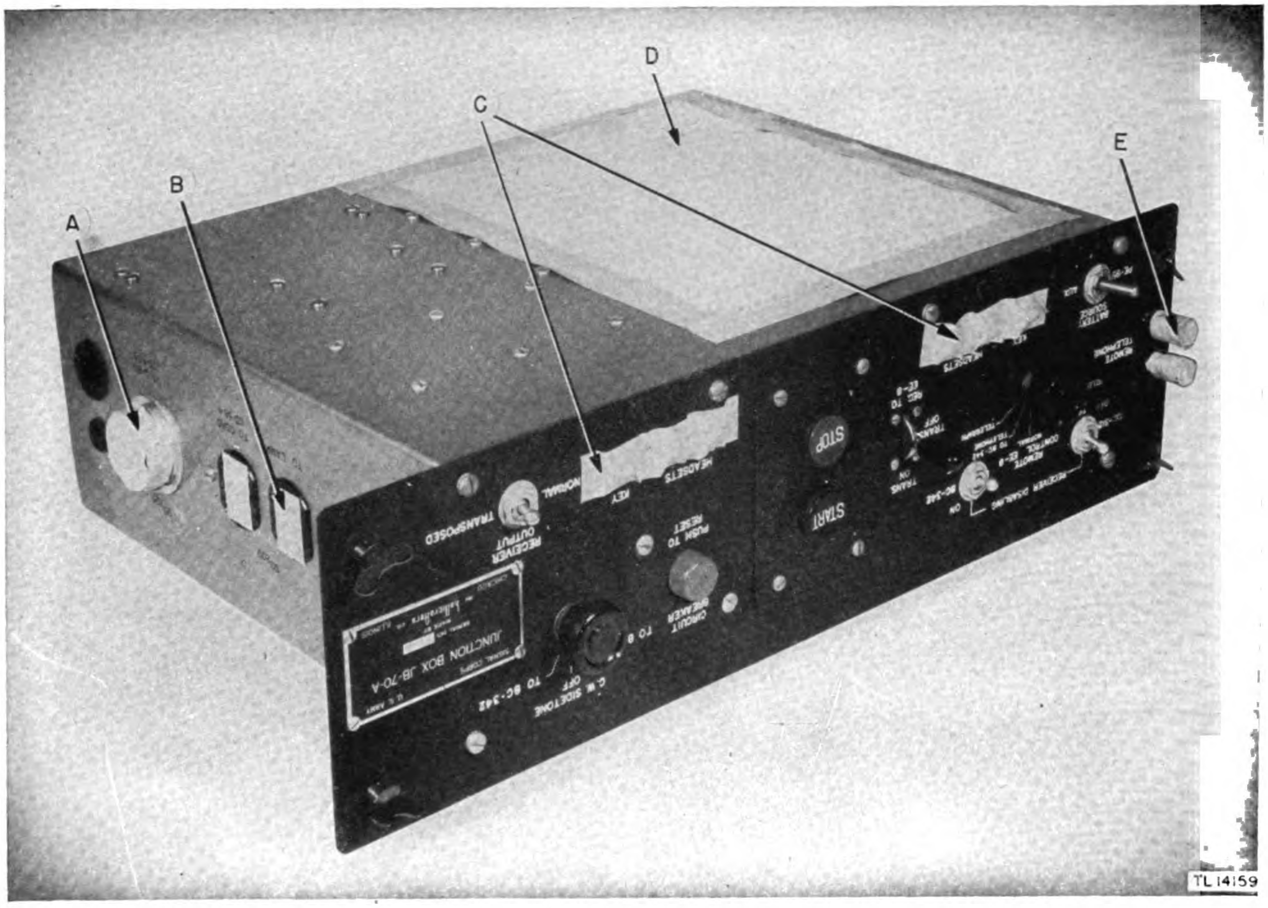
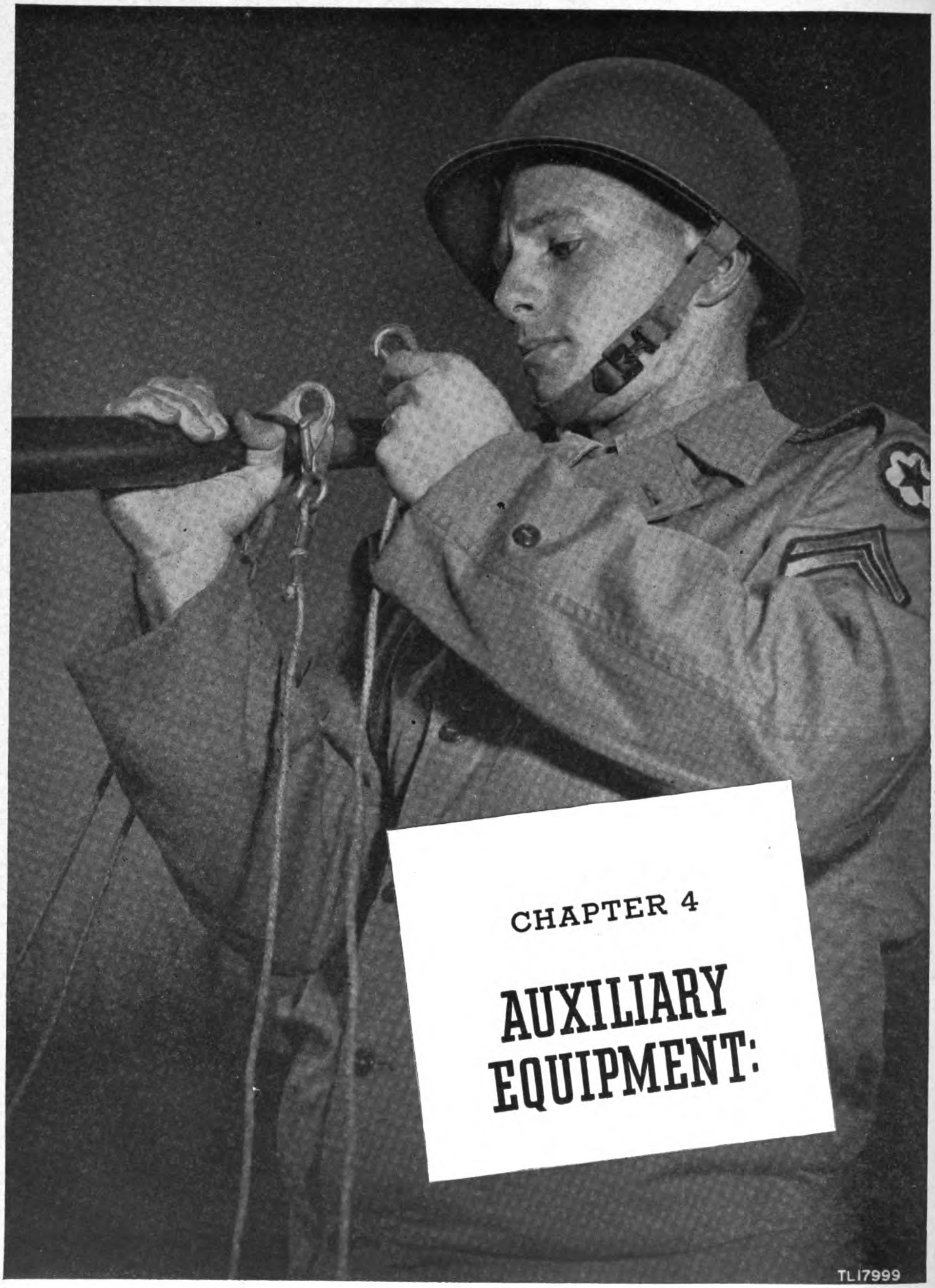


Figure 40. Junction Box JB–70–A—bottom view of chassis and front panel, showing method of masking.



CHAPTER 4

AUXILIARY EQUIPMENT:

CHAPTER 4

AUXILIARY EQUIPMENT

Section I. FREQUENCY CONVERSION KIT MC–509

117. Description

a. Frequency Conversion Kit MC–509 is used to extend the transmitter frequency range of Radio Sets SCR–399–A and SCR–499–A to cover the additional range of 1.0 to 2.0 mc.

b. The component parts of Frequency Conversion Kit MC–509 are:

- 1 Chest CH–251
- 3 Tuning Units TU–61 (range 1.5 to 2.0 mc)
- 3 Tuning Units TU–62 (range 1.0 to 1.5 mc)
- 2 Coil Units C–454 (range 1.5 to 2.0 mc)
- 2 Coil Units C–455 (range 1.0 to 1.5 mc)
- 2 vacuum capacitors, 100–mmf
- 2 vacuum capacitors, 50–mmf
- 1 Antenna AN–168, long wire
- 7 Mast Sections MS–44
- 1 Mast Base MP–19
- 2 Guy Plates MP–20
- 6 Stakes GP–2
- 1 Guy GY–24–A (halyard)
- 4 Guys GY–22–A (2 in use, 2 spares)
- 1 Roll BG–176, antenna
- 1 Bag BG–102–( ) antenna accessories
- 1 Wire W–128, 2-foot
- 1 bag of hardware, including:
  - 1 lug, solder (with ¼-inch hole)
  - 1 lug, solder (with 8–32 machine-screw hole)
  - 1 screw, machine, 8–32 x 1⅛ inches long
  - 1 lockwasher, 8–32
  - 1 nut, hexagonal, 8–32

118. Installation on Antenna Tuning Unit BC–939–A

Antenna Tuning Unit BC–939–A may be modified by the use of Frequency Conversion Kit MC–509 to allow operation of Radio Sets SCR–399–A and SCR–499–A on frequencies from 1.0 to 2.0 mc. To install, refer to figure 41 and proceed as follows:

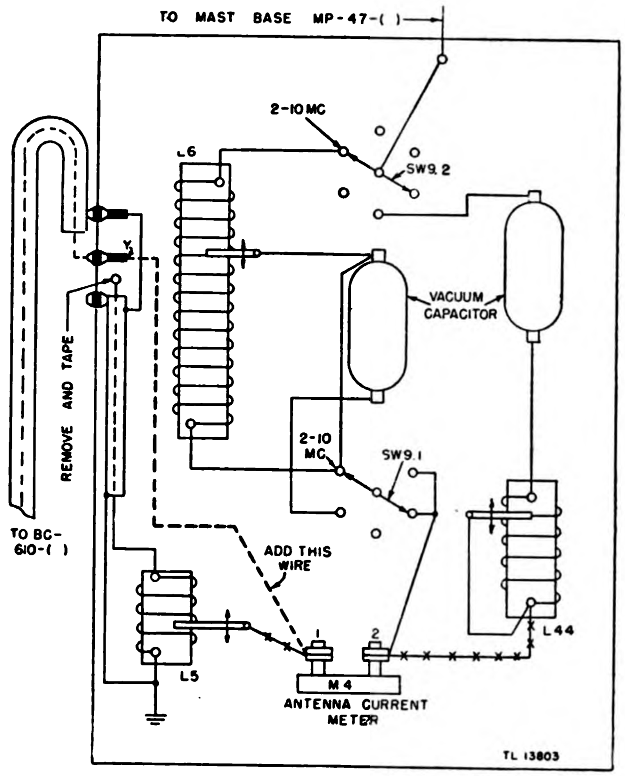


Figure 41. Modification of Antenna Tuning Unit BC–939–A.

a. Open the coaxial line *inside* Antenna Tuning Unit BC–939–A by removing the center conductor of the coaxial line from point *Y*. Bend this wire away from the insulator, and tape. Attach one end of a 17-inch length of Wire W–128 to point *Y*.

b. Remove the lead running from coupling coil L_5 to the ANTENNA CURRENT meter M_4 at terminal 1.

c. Attach the free end of the 17-inch length of Wire W–128 to the ANTENNA CURRENT Meter M_4 at terminal 1.

d. Remove the lead from the high-frequency inductor coil L_{44} to the ANTENNA CURRENT meter M_4 at terminal 2. Do not remove the other lead on this same post which runs to a contact of switch $SW_{9,1}$.

e. Place the antenna range switch of Antenna Tuning Unit BC–939–A in the 2–10MC position.

119. Erection and Installation of Antenna Mast

The choice of location for the erection of the antenna is largely dependent upon tactical considerations. (See par. 26.) For best operating results, select a location away from power lines, tall trees, or other obstructions. However, necessity for cover will not always permit selection of the best location. In any case, use the best compromise between cover and a clear antenna.

a. Refer to the table of approximate dial settings (table VI) and determine whether to use the 125-foot or the 75-foot antenna. Add

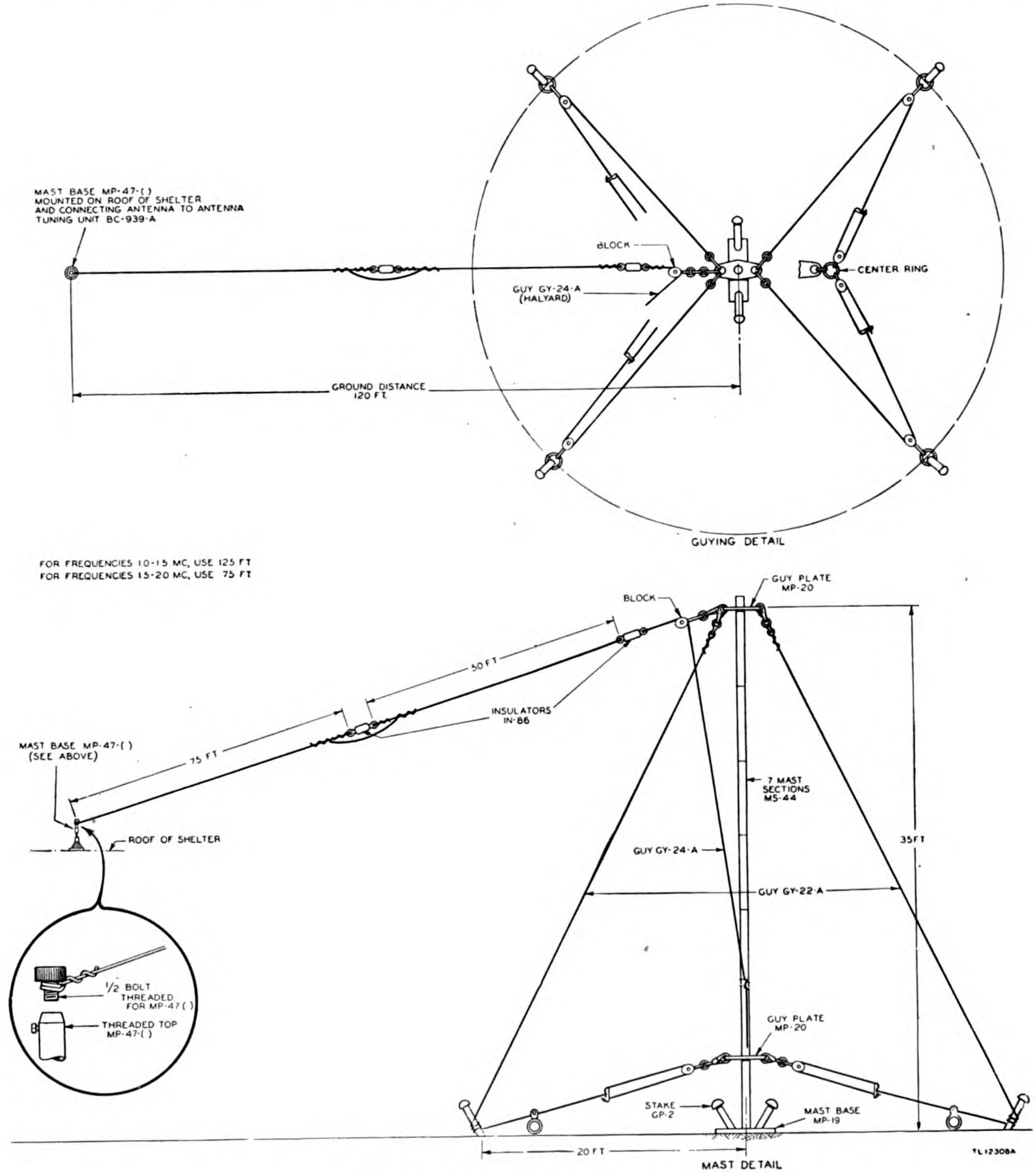


Figure 42. Installation of antenna.

a few feet to this length when locating the mast.

b. Erect the mast as directed in paragraph 125*d*(2) through (7), (9), (10), and (11). However, since 1 Guy Plate MP-20 and 4 Guys GY-41-A are not used in this installation, note the following exceptions:

(1) In paragraph 125*d*(2) omit 4 Guys GY-41-A, and use only two Guy Plates MP-20 instead of three.

(2) In paragraph 125*d*(5) omit reference to Guy Plate MP-20 at the junction of the fourth and fifth sections.

c. All necessary items for installation of the antenna mast are provided in Frequency Conversion Kit MC-509. If the ½-inch screw originally supplied in Mast Base MP-47-A is no longer available, use Mast Section MS-53.

120. Modification of Radio Transmitter BC-610-E

a. Unsolder one end of the 700-ohm, 20-watt resistor R_9 which is located adjacent to r-f choke CH_4 on the under side of the p-a tank capacitor bakelite mounting panel.

Caution: Failure to do so before operating the transmitter may result in damage to the 700-ohm resistor R_9 and r-f choke CH_4.

b. To operate on the higher frequency, resolder the open connection of resistor R_9.

121. Operation of Radio Sets SCR-399-A and SCR-499-A in Frequency Range of 1.0 to 2.0 MC.

To operate Radio Sets SCR-399-A and SCR-499-A in the frequency range of 1.0 to 2.0 mc, proceed as follows:

a. From the table of approximate dial settings (table VI), determine the correct antenna length for the selected frequency. If a 125-foot antenna is required, connect a short jumper wire around the insulator separating the 75-foot and the 50-foot lengths of antenna wire. (See fig. 42.) If a 75-foot antenna is required, omit this jumper wire.

b. From the table of approximate dial settings (table VI), determine the correct tuning unit, coil unit, and p-a fixed vacuum capacitor to be used for the desired frequency. Install these units in the radio transmitter.

c. The exciter stages are tuned by the M.O., DOUB, and INT AMP controls on the tuning units. See paragraph 47 for procedure to be followed in tuning the exciter stages.

d. To tune the final amplifier stage and adjust the antenna circuit with the p-a amplifier, proceed as follows:

Table VI. Approximate dial settings using antenna tuning unit BC-939-A

Frequency (mc)	Tuning unit				Transmitter			Antenna tuning crank 2-10MC	Antenna length (ft)
	Tuning Unit	M.O.	DOUB	INT AMP	Coil Unit	PLATE TUNING dial	Vacuum capacitor (mmf)		
1.0	TU-62	4	3.3	1.5	C-455	33	100	13	125
1.1	TU-62	34	4.7	3.0	C-455	78	100	20	125
1.2	TU-62	54	6.2	5.0	C-455	37	50	28.8	125
1.3	TU-62	69	7.4	6.9	C-455	63	50	33.6	125
1.4	TU-62	80	8.5	7.8	C-455	86	50	38.3	125
1.5	TU-62	90	10.0	9.0	C-455	20	0	44.2	125
1.5	TU-61	12	3.2	2.2	C-454	54	50	26	75
1.6	TU-61	32	4.6	4.3	C-454	74	50	29.7	75
1.7	TU-61	49	5.7	5.2	C-454	9	0	33.2	75
1.8	TU-61	63	6.7	6.2	C-454	22	0	36.3	75
1.9	TU-61	75	7.3	7.1	C-454	33	0	39.6	75
2.0	TU-61	85	8.2	8.0	C-454	42	0	42.1	75

(1) Refer to the table of approximate dial settings (table VI) for approximate setting of the PLATE TUNING dial and the 2-10MC antenna tuning crank on Antenna Tuning Unit BC-939-A.

(2) Throw the HIGH VOLTAGE PROTECT switch to HIGH VOLTAGE PROTECT.

Caution: Be sure that plate power is turned off when making coupling adjustments.

(3) Set the movable coupling link located in the tank coil (Coil Unit C-454 or C-455) at minimum coupling. Minimum coupling is obtained when the movable coil is at right angles to the tank coil.

(4) Set the transmitter control switch on the Junction Box JB-70-A to the TRANS. ON position.

(5) Place the antenna range switch of An-

tenna Tuning Unit BC–939–A in the 2–10MC position.

(6) Depress the sending key and adjust the PLATE TUNING dial until the P.A. PLATE meter dips to minimum.

Note. P–a tuning may differ by several divisions from the tuning charts when a vacuum capacitor is inserted across the p–a tank capacitor because of the production tolerances in manufacture of these capacitors. Precautions should be taken to see that the p–a plate current is at the minimum dip when tuning the PLATE TUNING wheel.

(7) Turn the 2–10MC antenna tuning crank to the approximate position indicated in table VI for the desired frequency. As this setting is approached, observe the P.A. PLATE meter for a rising plate current indication. Adjust the crank for maximum current as indicated by the P.A. PLATE meter.

(8) If the current indicated on the P.A. PLATE meter exceeds 110 ma, the coupling is too close and should be decreased. If the meter indicates less than 110 mc, the coupling should be increased. After the coupling has been reset, readjust the PLATE TUNING dial for minimum reading of the PLATE CURRENT meter.

(9) Repeat the steps in (6), (7), and (8) above until maximum antenna current is obtained.

Note. Keep in mind the 110–ma maximum allowable P.A. PLATE meter reading.

(10) Throw the HIGH VOLTAGE PROTECT switch to NORMAL. The P.A. PLATE meter should read approximately 290 ma.

(11) Carefully repeat the steps in (6), (7), and (8) above with the HIGH VOLTAGE PROTECT switch in the NORMAL position, and adjust for a reading of 290 ma on the P.A. PLATE meter. The transmitter is now ready for c-w operation. For voice operation proceed as above and then refer to paragraph 49.

122. Theory of Equipment

a. GENERAL. To extend the frequency range of Radio Transmitter BC–610–E from 2.0 to 1.0 mc, three factors are involved:

(1) A means must be provided for tuning the oscillator, buffer-doubler, and i-p-a stages over the range of 2.0 to 1.0 mc.

(2) The p-a tank circuit must be provided with increased inductance and capacitance to tune over the required frequency range.

(3) The antenna must operate efficiently on frequencies from 1.0 to 2.0 mc, and a means must be provided for coupling the antenna to p-a tank circuit.

(4) The function of the electrical components of Frequency Conversion Kit MC–509, which make possible the extended frequency range of Radio Transmitter BC–610–E, is discussed in *b*, *c*, and *d* below.

b. TUNING UNITS TU–61 AND TU–62. The tuning circuits for the oscillator, buffer-doubler, and i-p-a stages of the transmitter are included in plug-in tuning units. Tuning Unit TU–61 covers a frequency range of 2.0 to 1.5 mc, and Tuning Unit TU–62 covers a frequency range of 1.5 to 1.0 mc. The electrical parts of these tuning units perform the same functions as the electrical parts of Tuning Units TU–47 to TU–54. See chapter 5 for the functioning of these parts.

c. COIL UNIT C–454 OR C–455 AND VACUUM CAPACITORS. The p-a plate circuit of the transmitter is tuned over a frequency range of 1.0 to 2.0 mc by the use of a proper combination of Coil Unit C–454 or C–455 and vacuum capacitors of 50 mmf (micromicrofarads) or 100 mmf respectively. (See table VI.) Coil Units C–454 and C–455 are provided with variable coupling links. By varying the position of the coupling link relative to the p-a tank coil, the operator can secure the required plate power input when loading the transmitter with the antenna.

d. ANTENNA SYSTEM. To secure efficient operation of the transmitter on frequencies from 1.0 to 2.0 mc, a long wire antenna is used. The antenna operates as a grounded quarter-wave antenna. For frequencies from 1.0 to 1.5 mc the physical length of the antenna is 125 feet, and for frequencies from 1.5 to 2.0 mc the physical length is 75 feet. Electrically, these antennas are much shorter than a quarter-wavelength; therefore, tuning the antenna to resonance at the operating frequency requires the use of a variable series inductance. By making a slight wiring change in Antenna Tuning Unit BC–939–A, coil L_6 is connected in series with the antenna and the variable coupling link of the p-a tank coil. Figure 43 is a schematic diagram of the p-a plate circuit and Antenna Tuning Unit BC–939–A, after the tuning unit wiring has been changed. The antenna, being shorter than a quarter-wavelength, represents a highly capacitive load to the transmitter. However, the antenna can be tuned to resonance at the operating frequency by the proper adjustment of coil L_6. When the antenna is tuned to resonance, maximum r-f current is indicated by ANTENNA CURRENT meter M_4 and the antenna presents a purely resistive load to the transmitter. The radiation resistance at the base of a quarter-wave grounded antenna is approximately 36 ohms. The purpose of the variable coupling link of the p-a tank coil is to reflect this resistance into the p-a plate circuit. The magnitude of the reflected resistance depends on the amount of mutual reactance existing between the variable coupling link and the p-a tank coil. The effect of the reflected resistance is to reduce the Q of the p-a tank circuit, and consequently, the impedance of the p-a plate circuit. When the impedance in the p-a plate circuit is lowered, the p-a tube draws more plate current. The correct setting of the variable coupling link is that setting which allows the p-a tube to draw the recommended d-c plate current.

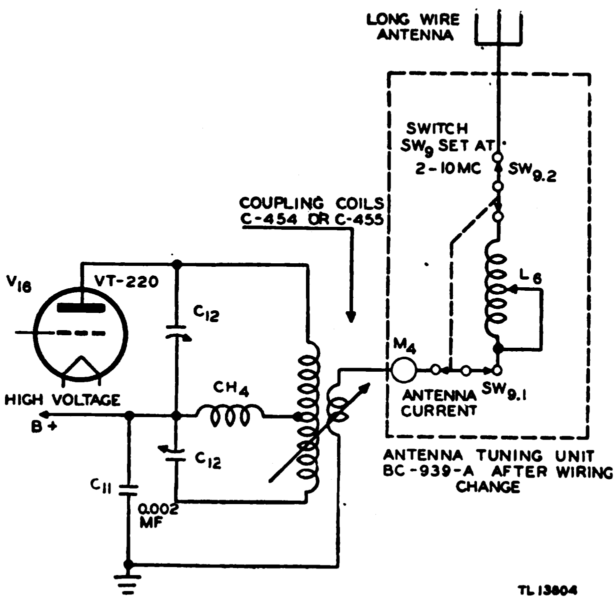


Figure 43. P-a plate circuit and Antenna Tuning Unit BC–939–A—schematic diagram.

Section II. DOUBLET ANTENNA

123. Purpose

The doublet antenna is furnished for operation from a fixed location. It is used to extend the transmitting range of Radio Transmitter BC–610–E several hundred miles. Use of the doublet antenna will increase the range of communication many times over the range obtained with the whip antenna.

124. Description

a. The doublet antenna consists of a half-wave doublet antenna (cut to operating frequency by the operators of the radio set) which is fed by means of a coaxial cable. One end of the coaxial cable is connected to the center of the antenna and the other end is coupled to Radio Transmitter BC–610–E by means of a variable link coil which is part of the transmitter tank coil. Cord CD–1290 is a coaxial cable, 50 feet long, with a connector on each end. The antenna is supported by three masts, each made up of Mast Sections MS–44–A. The masts may be improvised from other materials, if necessary.

b. A list of components contained in the doublet antenna kit follows. There are two *quantity* columns. The first *quantity* column indicates the number of items required for an installation where masts must be used. The second *quantity* column indicates the number of items required for the antenna and coupling system when other means of supporting the antenna are used.

Note. In later models the components making up the doublet antenna set are issued as part of Radio Sets SCR–399–A and SCR–499–A.

c. The coil units are contained in a package prepared for oversea shipment. Mast Sections MS–44–A are packed in the three canvas Rolls BG–176, seven mast sections to each roll. All of the guys, guy plates, mast bases, and stakes are packed in one Bag BG–102–( ). The remaining items, which are required for the antenna system only (column 3), are packed in the other Bag BG–102–( ).

d. As soon as circumstances will permit, Radio Sets SCR–399–A and SCR–499–A will be delivered with the variable link coupling tank coils listed above instead of with fixed link coupling tank coils. When the doublet antenna kit is issued for use with such sets, either the coils will be omitted from the kit or, if issued, should be returned to stock.

125. Location and Erection of Mast

a. The choice of location for the erection of the antenna is largely dependent upon tactical considerations. If possible, a location away from power lines, tall trees, or other obstructions should be selected for best operating results. Consideration of cover will not always permit selection of the best location. In any case, use the best compromise between cover and a clear antenna. The radio set and the antenna must be so located that the cable assembly will reach from the top of the center mast to the transmitter output.

Table VII. List of components in doublet antenna kit

Article	Quantity	
	Complete doublet kit	Antenna system only
Roll BG–176	3	
Bag BG–102–( )	2	1
Mast Section MS–44–A	21	
Mast Base MP–19	3	
Guy Plate MP–20	9	
Guy GY–22–A	6	
Guy GY–41	12	
Guy GY–24–A	3	3
Insulator IN–86–A	12	12
Stake GP–2	18	
Reel RL–29	2	2
Steel tape (100-foot)	1	1
Wire W–28	250 ft	250 ft
Cord CD–1290 (50 ft)	1[1]	1[1]
Coil Unit C–387–D	1[2]	1[2]
Coil Unit C–388–C	1[2]	1[2]
Coil Unit C–389–C	1[2]	1[2]
Coil Unit C–390–C	1[2]	1[2]
Coil Unit C–447–B	1[2]	1[2]
Coil Unit C–448–B	1[2]	1[2]
Coil Unit C–449–B	1[2]	1[2]

[1] This cord is so designed that if additional distance between the doublet antenna and the radio set is required, several sections may be joined together until the desired length is obtained.

[2] See *d* below.

b. The doublet antenna radiates strongest in a direction at right angles (90°) to the plane of its wire. Remember this, as well as the location of the station with which communication is desired, when selecting the position of the masts.

c. Three masts are used to support the antenna; the center mast is used to support the weight of the coaxial-cable feeder line.

d. Erect the masts and install the antenna in accordance with the following procedure:

(1) Cut the antenna wire for the lowest operating frequency to be used. This may be obtained from the formula:

$$\text{Antenna length in feet} = \frac{468}{F(mc)}$$

($F(mc)$ is the lowest operating frequency in megacycles.) The frequency vs length curve (fig. 44) can be used to obtain the approximate antenna length. To obtain the distance separating the outer masts, add 6 or 8 feet to the length determined above. The third antenna mast is erected at the midpoint, in line with the two outer masts. See figure 46 for the general layout to be followed.

(2) Select the following parts from the kit for one mast:

- 7 Mast Sections MS–44–A
- 6 Stakes GP–2
- 3 Guy Plates MP–20
- 1 Mast Base MP–19
- 2 Guys GY–22–A
- 1 Guy GY–24–A (antenna halyard)
- 4 Guys GY–41

(3) At the point selected for one of the outer masts, stake Mast Base MP–19 to the ground with two Stakes GP–2. Use the hammer supplied with the radio set.

(4) Using a radius of 20 feet from Mast Base MP–19, drive in the remaining four Stakes GP–2, 90° apart from one another and at an angle of 45° with the antenna wire. (See fig. 45.)

Note. When measuring off distances on the ground to determine the position of the stakes, a mast section may be used conveniently since its over-all length is 5½ feet (5 feet NOT INCLUDING the 6-inch ferrule (smaller diameter portion)) at one end.

(5) Assemble the seven Mast Sections MS–44–A with one Guy Plate MP–20 at the top of the mast, another at the junction of the fourth and fifth sections, and the remaining guy plate at the junction of the first and second sections.

(6) Slip the bottom mast section over the mast base.

(7) To one hole in Guy Plate MP–20 at the top of the mast, attach the two ends of Guy GY–22–A and the block of Guy GY–24–A (halyard) by means of the snap hooks. (See fig. 45.) To the hole in the opposite end of the top guy plate, attach the two ends of the remaining Guy GY–22–A. Place all of the rings with block attached (not the center ring) over the corresponding Stake GP–2.

(8) To Guy Plate MP–20 at the junction of the fourth and fifth sections near the center of the mast, attach one end of each of the 4 Guys GY–41–A, using two snap hooks in each of the two holes. Since these guys are not used in raising the mast, temporarily tie the loose ends near the bottom of the mast to avoid tangling when the mast is raised.

(9) Guy GY–24–A is used as a halyard to raise and lower the antenna wire. Make sure that this guy will be on the antenna side of the mast after erection. Secure both ends of this guy to a point near the bottom of the mast to

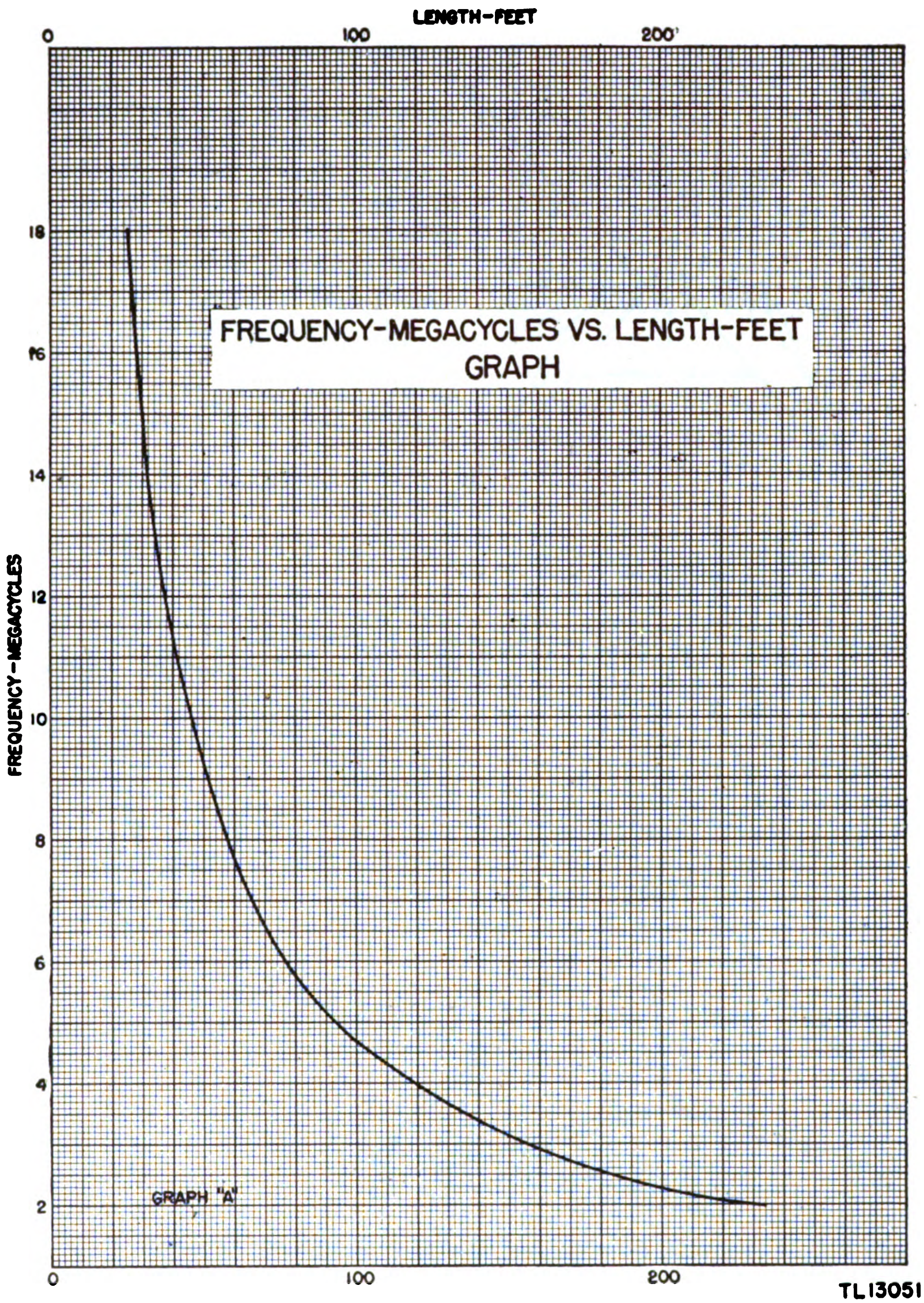


Figure 44. Frequency vs length curve.

keep it out of the way while the mast is being raised, and also to prevent either end from accidentally getting out of reach.

(10) The mast can now easily be raised. One man grasps the center ring of Guy GY–22–A and walks toward the base of the mast. (See fig. 46(A).) Another man assists in the erection procedure by lifting the mast from the ground in a manner similar to that used in raising a ladder. At the same time, a man guides the bottom of the mast onto Mast Base MP–19 until the mast is halfway erect, then quickly grasps the center ring of the remaining Guy GY–22–A (fig. 46(B)) and makes the necessary adjustment on the length of the guy when the mast is erect. When the mast has been brought into a

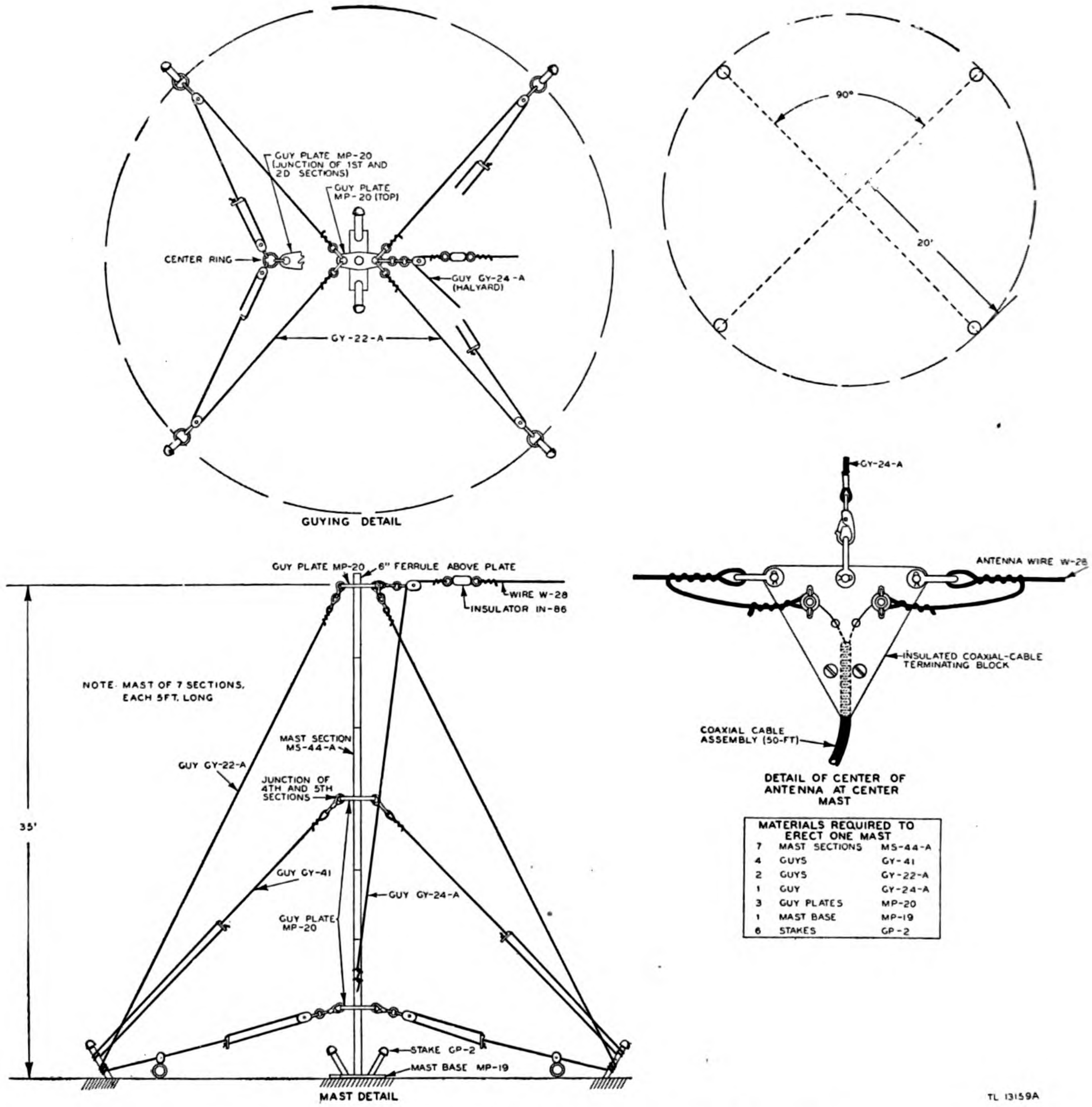


Figure 45. Details of one mast and coaxial-cable connector.

vertical position, adjust both Guys GY–22–A until the mast is plumb.

(11) Untie the loose ends of the four Guys GY–41–A, attach them to their respective stakes, and tighten them firmly to prevent any tendency of the mast to bow.

(12) After the masts are erected, the blocks will not be needed until the mast is to be lowered. Lift off the rings and attached blocks that are secured to the stakes one at a time, and loop the guy rope two or three times around the guy stake. (See fig. 45.) This is done to prevent antenna masts from bowing or bending.

(13) Erect the other two masts in the same manner.

(14) Select the following parts from the kit: Wire W–28, coaxial-cable Cord CD–1290 (50-foot), and Insulators IN–86–A.

(15) Determine the length of the antenna in accordance with the formula given in (1) above, and cut the required length of Wire W–28. If operation on more than one frequency is

planned, cut the antenna for the lowest frequency.

(16) Attach one Insulator IN–86–A to each end of the antenna.

(17) Cut the antenna wire at the exact center and join it to the coaxial-cable insulating terminating block at one end of Cord CD–1290. (See fig. 45.) One end of the halyard (Guy GY–24–A) must be made fast to the coaxial-cable terminating block as shown in the same figure, in order to support the weight of both the antenna and the coaxial cable.

(18) Fasten the Guy GY–24–A halyards on the two end masts to their respective antenna insulators, and raise the antenna into position.

126. Installation in Radio Transmitter BC–610–E

a. Make the following changes in the wiring of Radio Transmitter BC–610–E:

(1) Disconnect the coaxial-cable link between. Radio Transmitter BC–610–E and Antenna Tuning Unit BC–939–A from the outside terminals of the feed-through insulators on the left side of the transmitter cabinet.

(2) Connect the other end of coaxial-cable Cord CD–1290 from the doublet antenna to the feed-through insulators by means of the connector on the end of the coaxial-cable assembly (Cord CD–1290).

b. To place the radio set in operation, proceed as follows:

Caution: NEVER MAKE THE FOLLOWING ADJUSTMENTS WHILE THE PLATE POWER IS ON. TURN OFF THE PLATE POWER, MAKE THE NECESSARY ADJUSTMENTS, AND THEN TURN THE POWER BACK ON. FOLLOW THIS PROCEDURE UNTIL THE ADJUSTMENTS ARE COMPLETED. DO NOT RELY UPON THE INTERLOCK SWITCHES FOR PROTECTION.

(1) Select the new coupling coil unit with the variable link coil whose frequency range includes the frequency for which the doublet antenna was cut. Plug the coil into the jack bar in the transmitter.

Note. Variable link coil units are supplied in a package prepared for oversea shipment. They should be unpacked and placed in Chest CH–88 in the location formerly occupied by the fixed-link transmitter tank coils, originally supplied with the equipment. The fixed link coils should be stored elsewhere or returned to depot stock when so authorized.

(2) Rotate the link coil so that the purple mark on the link coil is next to the similar mark on the primary (fixed) winding. Then rotate the link coil, in a clockwise direction, until its axis is at an angle of 90° with the axis of the primary winding. This is a position of minimum coupling. (See fig. 48.)

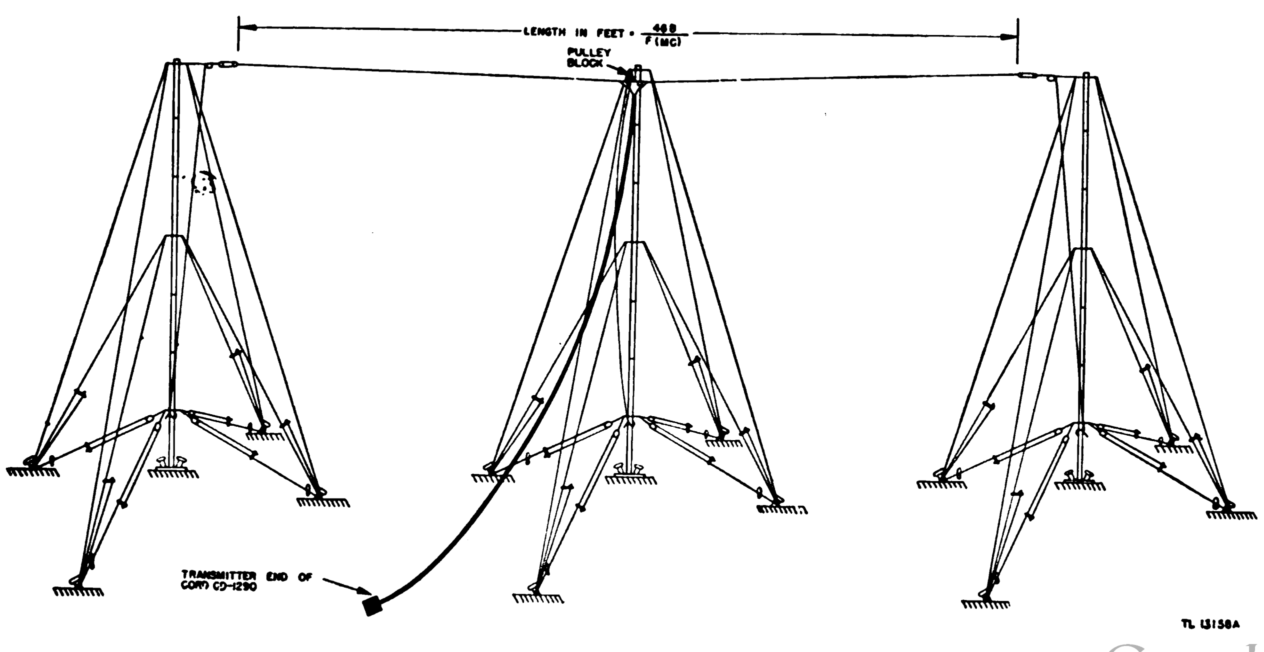


Figure 46. Installation details.

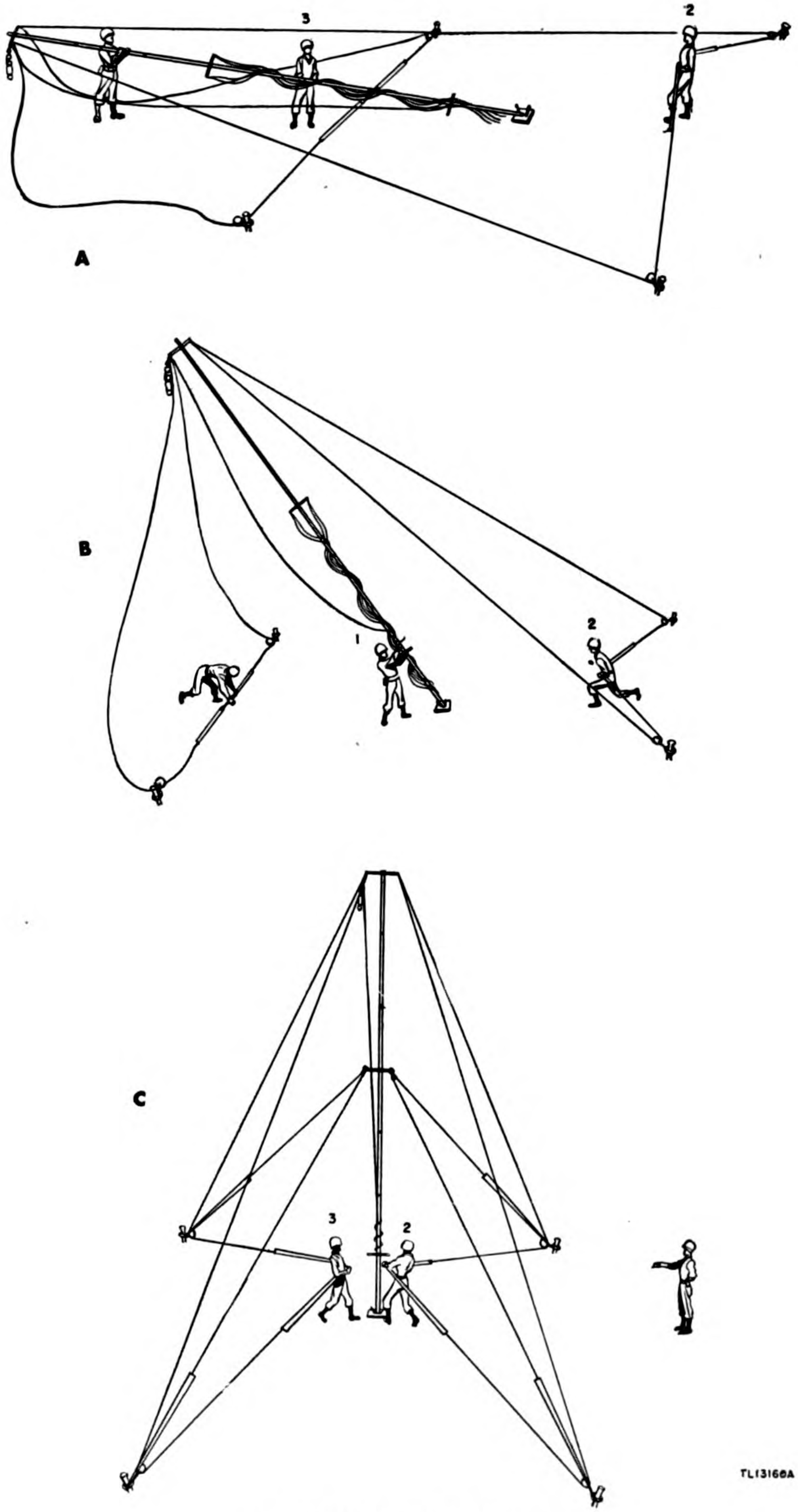


Figure 47. Erection of masts.

(3) Tune up the transmitter in the usual manner with the HIGH VOLTAGE PROTECT switch in the HIGH VOLTAGE PROTECT position. Resonate the final-amplifier plate tank circuit by turning the PLATE TUNING wheel for a minimum reading of plate current, as indicated by the P.A. PLATE meter.

(4) Turn off the plate power and open the left-hand cover of the transmitter in order to gain access to the final tank coil. Increase the coupling of the coils by rotating the link coil in a counterclockwise direction, until its axis is at an angle of about 45° with the axis of the tank coil. Close the transmitter cover, turn the plate power on, and retune the PLATE TUNING wheel for minimum plate current. The value of plate current indicated by the P.A. PLATE meter should show an increase over the value shown when the transmitter was tuned with the variable link coil in the minimum coupling position. The position of the link coil must be adjusted so that the value of plate current indicated at resonance (minimum plate current) is 100 ma with the HIGH VOLTAGE PROTECT switch in the HIGH VOLTAGE PROTECT position.

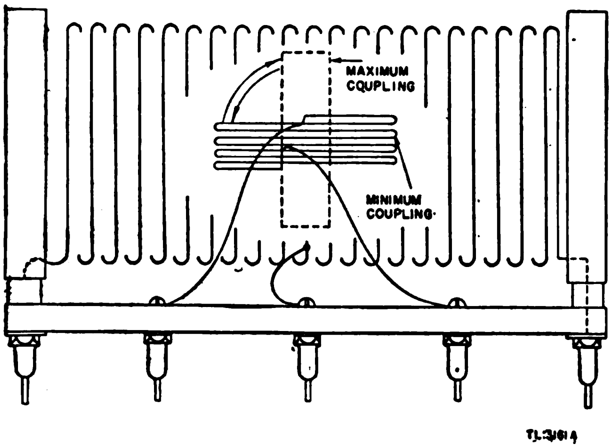


Figure 48. Method of adjusting coupling.

Note. Always remember to retune the final plate tank circuit to resonance (minimum plate current) after making each coupling readjustment of the variable link coil.

(5) Place the HIGH VOLTAGE PROTECT switch in the NORMAL position, and turn the transmitter on. The reading on the P.A. PLATE meter should be from 290 to 300 ma. If the value of plate current differs materially from these figures, turn the transmitter off and readjust the coupling of the link coil. A value of plate current greater than 300 ma requires a reduction in coupling; a value of plate current less than 290 ma requires an increase in coupling.

c. To change the frequency of operation, proceed as follows:

(1) Plug in the new coil unit whose frequency range includes the desired operating frequency.

(2) If the antenna has been cut for the lowest frequency of operation as outlined in *b*(1) above, it will be necessary to shorten the antenna for the new frequency. Lower the antenna, determine the proper length for the new frequency, and cut the antenna at points of equal distance from the center of the antenna for the new length. Insert an Insulator IN-86-A at both points where the antenna was cut. Hoist the antenna back into position and tune the transmitter for operation on the new frequency in accordance with the instructions given in *b* above. For example, if the original length of the antenna was 234 feet (2 mc) and it is desired to operate on 4 mc, it will be necessary to reduce the length of the antenna to 117 feet, or 58.5 feet each side of center. When it is desired to go back to the lower frequency, place a wire jumper across the insulators inserted for operation at the higher frequency. The antenna may be divided into a number of sections to permit operation on different frequencies. Use jumpers across the insulators between the section if necessary.

Note. The doublet antenna works best at the frequency for which it was cut. It can be operated without serious loss of efficiency, however, over a band extending to approximately 100 kc (kilocycles) each side of the frequency for which it was designed.

127. Maintenance

a. To insure proper operation of the doublet antenna system, routine checks of the electrical connections should be made from time to time.

(1) Check the connections from the coaxial-cable assembly to the center of the antenna.

(2) Check the connections from the coaxial-cable feeder line to the feed-through insulators on the side of Radio Transmitter BC-610-E.

(3) Check the condition and connections of the coaxial cable assembly (Cord CD-1290) and the coil units.

(4) Check the condition of the coaxial-cable insulating terminating block at the antenna. It is imperative that no moisture get into this connector. Moisture will seriously impair its operation.

b. Check the tension on Guys GY–22–A and GY–41 daily. Usually it will be found that the guy ropes will shrink during the night and stretch during the day. Sufficient slack must be allowed to permit normal shrinking during damp periods in order to prevent undue strain on the guys. Examine the guy stakes daily to make sure that they are seated firmly in the ground.

128. Differences in Coil Units

a. The following tabulation illustrates the difference between the new coil units that are a part of this kit and those previously supplied with the transmitter:

Frequency range (in mc)	New coil units		Coil units previously supplied
	Coil Unit	No. of turns on link coils	
2.0 to 3.5	C–387–D	6.5	C–387–B
3.5 to 4.5	C–388–C	4.5	C–388–A
4.5 to 5.7	C–389–C	4.5	C–389–A
5.7 to 8.0	C–390–C	4.5	C–390–A
8.0 to 11.0	C–447–B	4.5	C–447
11.0 to 14.0	C–448–B	2.5	C–448
14.0 to 18.0	C–449–B	1.5	C–449

b. The new coil units will also operate equally well into Antenna Tuning Unit BC–939–A when connected to a 15-foot whip antenna. Note that the tuning charts may be slightly in error with respect to the listed dial setting of the plate tuning control. The error may vary somewhat depending on operating frequency and ground conditions. The tuning charts will serve, however, to locate the proper dial settings approximately. The final plate tank circuit must be tuned to resonance at all times, as pointed out in paragraph 47.

c. When the new coil units are used with Antenna Tuning Unit BC–939–A, the link coil should be set for maximum coupling. Maximum coupling is indicated when the plane of the link coil winding is parallel to the plane of the primary winding, and when the purple mark on the link coil is next to the identical mark on the primary winding.

129. Theory of Equipment

a. GENERAL. When Radio Transmitter BC–610–E is used with a doublet antenna, no antenna tuning unit is required because the antenna is cut to resonate at the operating frequency and represents, electrically, one-half wavelength. Theoretically, the radiation resistance at the center of a half-wave antenna in free space is 73 ohms. The actual value of radiation resistance of a practical antenna may be above or below 73 ohms, depending on the height of the antenna above ground and the nature of surrounding objects. However, power can be fed to the antenna by means of any length of untuned transmission line which has a characteristic impedance of approximately 70 ohms. (See fig. 49).

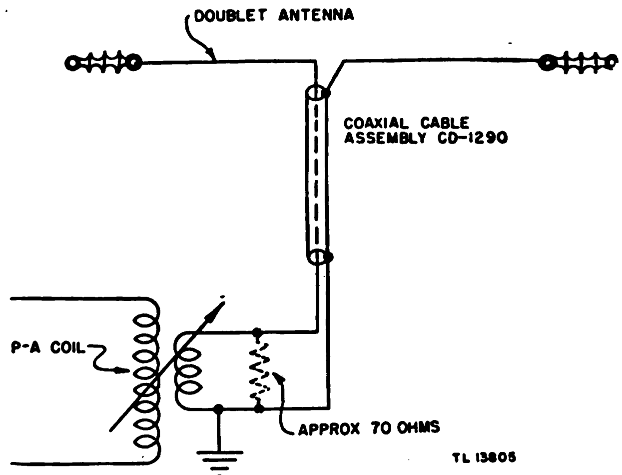
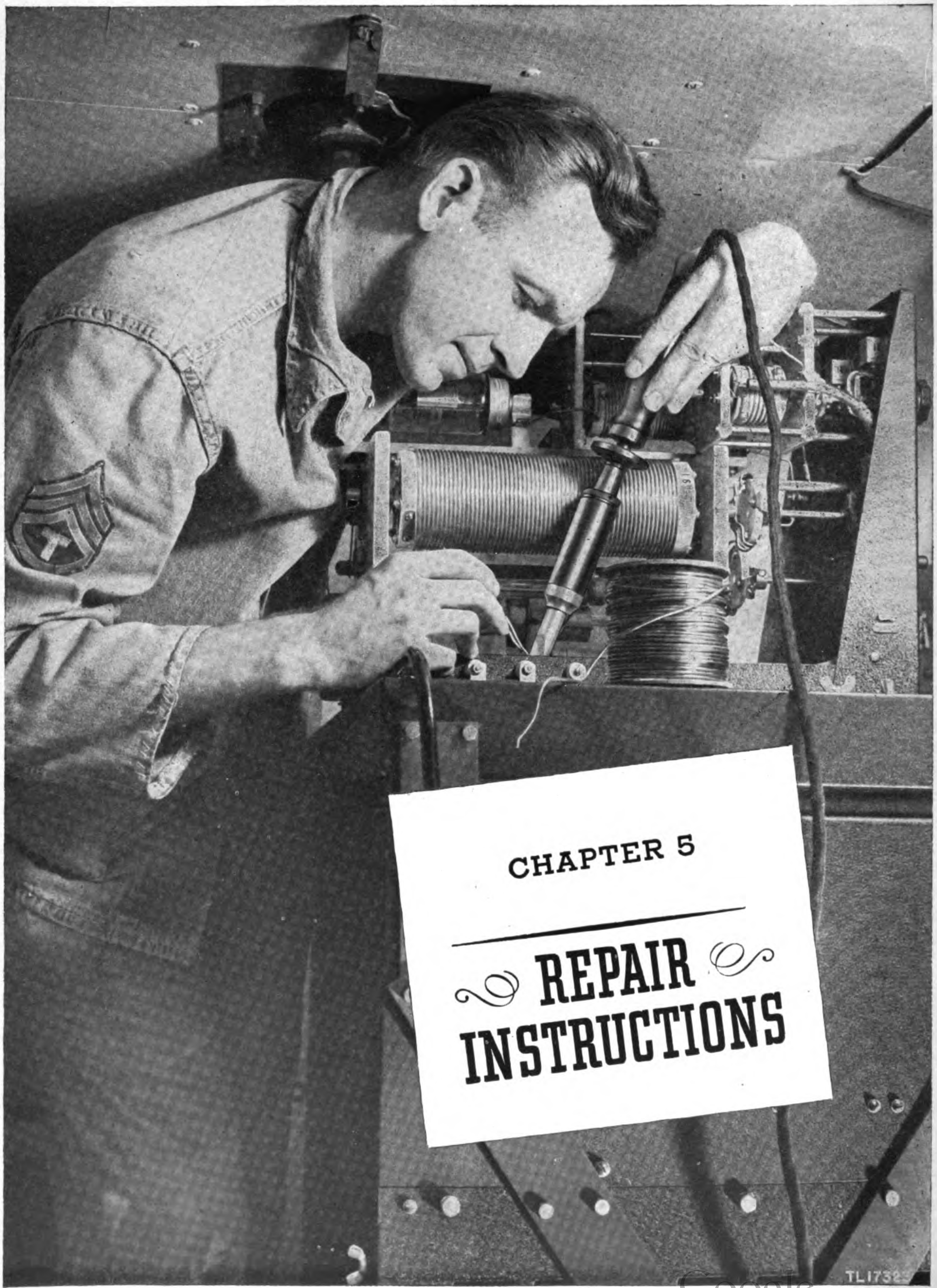


Figure 49. Method of feeding power to the antennas.

b. CORD CD–1290 (50-FOOT). When an untuned transmission line is used to feed power to the antenna, the line must be terminated in its characteristic impedance. The characteristic impedance of coaxial-cable Cord CD–1290 is approximately 70 ohms. Therefore, an impedance match is effected by connecting the coaxial-cable (Cord CD–1290) directly to the center of a half-wave doublet antenna. Cord CD–1290 is supplied in 50-foot lengths. Several lengths can be connected without materially increasing the losses in the transmission line.

c. COUPLING COILS. The coupling coils supplied with the doublet antenna kit couple the power amplifier to the transmission line. The seven coils cover a frequency range of 2.0 to 18.0 and are provided with variable link coils. These coils take the place of the fixed link p-a tank coils normally supplied with the transmitter. The desired power output from the power amplifier is obtained by varying the degree of coupling between the p-a plate circuit and the load. This is accomplished as follows: One end of Cord CD–1290 is connected to the center of the half-wave doublet antenna, and the other end is connected to the variable link coil inside the p-a tank coil. The transmission line, which is terminated in its characteristic impedance, represents a purely resistive load of approximately 70 ohms. (See fig. 49.) This resistance is reflected into the p-a plate tank circuit because of the mutual reactance existing between the variable link coil and the p-a tank coil. The magnitude of the reflected resistance increases or decreases as the coupling between the variable link coil and the p-a tank coil is increased or decreased. The reflected resistance lowers the *Q* of the p-a plate tank circuit, and consequently, the impedance in the p-a plate circuit. When the impedance in the p-a plate circuit is lowered, the d-c plate current increases. The correct setting of the variable link coil is the setting which allows the p-a tube to draw the recommended d-c plate current.


CHAPTER 5
REPAIR INSTRUCTIONS
TL1732

CHAPTER 5

REPAIR INSTRUCTIONS

Note. Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on WD AGO Form 468 (Unsatisfactory Equipment Report). For particulars see paragraph 195. If Form 468 is not available, see TM 38–250. Failure or unsatisfactory performance of equipment used by Army Air Forces will be reported on Army Air Forces Form No. 54 (Unsatisfactory Report).

Section I. SIMPLIFIED BLOCK DIAGRAMS

130. Radio Transmitter BC–610–E, C-W Operation (fig. 50)

Radio Transmitter BC–610–E is a master-oscillator power-amplifier transmitter. The frequency of the transmitted signal is accurately controlled by a variable-frequency or crystal-controlled master oscillator, which is keyed for c–w operation. The output of the oscillator is fed into a buffer-doubler stage. When the variable-frequency master oscillator is used, the buffer-doubler stage operates as a frequency doubler for all frequencies up to 12 mc, and as a frequency quadrupler for frequencies from 12 to 18 mc. For crystal operation in the 2– to 4–mc range, the buffer-doubler stage is tuned to the crystal frequency, and operates only as a buffer amplifier; in the 4– to 12–mc range, this stage operates as a buffer-doubler; and in the 12– to 18–mc range, it operates as a frequency quadrupler. The buffer-doubler stage improves the frequency stability of the transmitter by isolating the oscillator stage from the i-p-a and p-a stages. The r-f output of the buffer-doubler stage is adequate to excite the i-p-a stage. In turn, the i-p-a stage develops the power necessary to drive the p-a stage. The p-a stage develops the r-f energy which is radiated from the transmitting antenna. The tuned circuits for the oscillator, buffer-doubler, and i-p-a stages are mounted in a single plug-in tuning unit. The transmitter accommodates three of these plug-in tuning units, any one of which can be selected by the BAND SWITCH. Seven plug-in tank coils and a vacuum capacitor are provided for tuning the p-a stage over the frequency range of the transmitter. The vacuum capacitor is required when operating on frequencies from 2 to 2.5 mc. Antenna Tuning Unit BC–939–A couples the transmitting antenna to the output of the p-a stage.

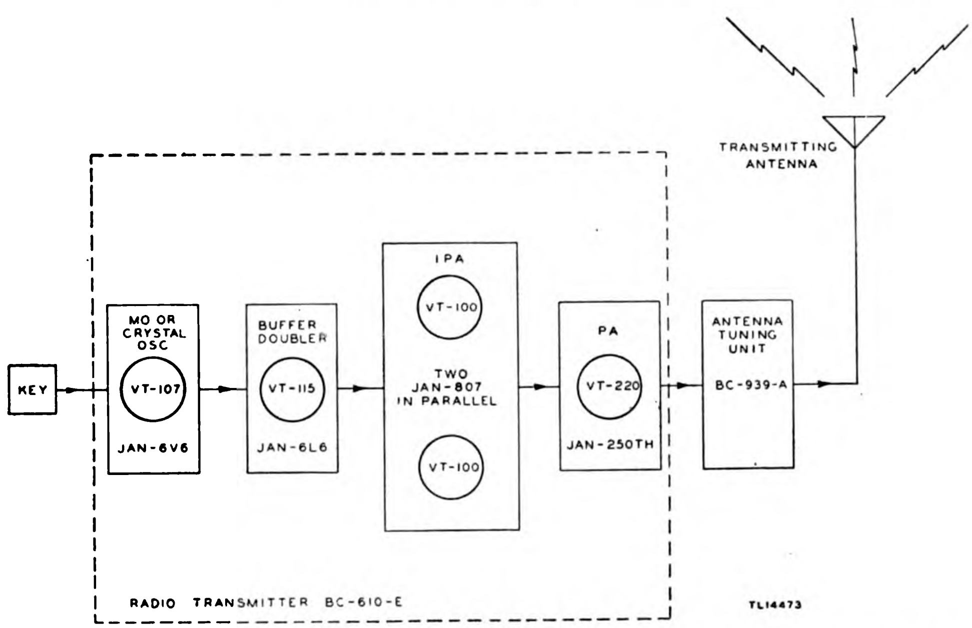


Figure 50. Radio Transmitter BC–610–E—simplified block diagram, c–w operation.

131. Speech Amplifier BC–614–E (fig. 51)
When in use, the remote telephone or the dynamic microphone is connected to the input of the first a-f (audio-frequency) amplifier, but the carbon microphone is connected to the input of the second a-f amplifier. This arrangement provides proper impedance matching without complicated switching arrangements. The output of the first amplifier is applied to the input of the second amplifier which in turn feeds the third a-f amplifier and the phase inverter. A portion of the a-f output of the third amplifier is applied to the modulation limiter. The modulation limiter produces a d-c control voltage which is applied to the second audio stage as a bias voltage which reduces the gain and prevents over-modulation of the transmitter. The outputs of the third a-f amplifier and the phase inverter are coupled to the fourth amplifier. The output voltage of the fourth amplifier is used to excite the driver stage for the modulator in Radio Transmitter BC–610–E. The c–w sidetone oscillator and the sidetone amplifier supply a sidetone signal to the headsets during c–w operation.

132. Radio Transmitter BC–610–E and Speech Amplifier BC–614–E [Phone Operation] (fig. 52)
The output of the speech amplifier is applied to the push-pull driver stage in Radio Transmitter BC–610–E. The power output of the driver is sufficient to operate the push-pull modulator which develops power enough to modulate the transmitter properly. The output of the push-pull modulator is applied to the p-a stage in which the r-f and a-f voltages are combined to produce the amplitude-modulated r-f energy that is radiated from the transmitting antenna. For a discussion of the other stage shown in figure 52, see paragraphs 130 and 131.

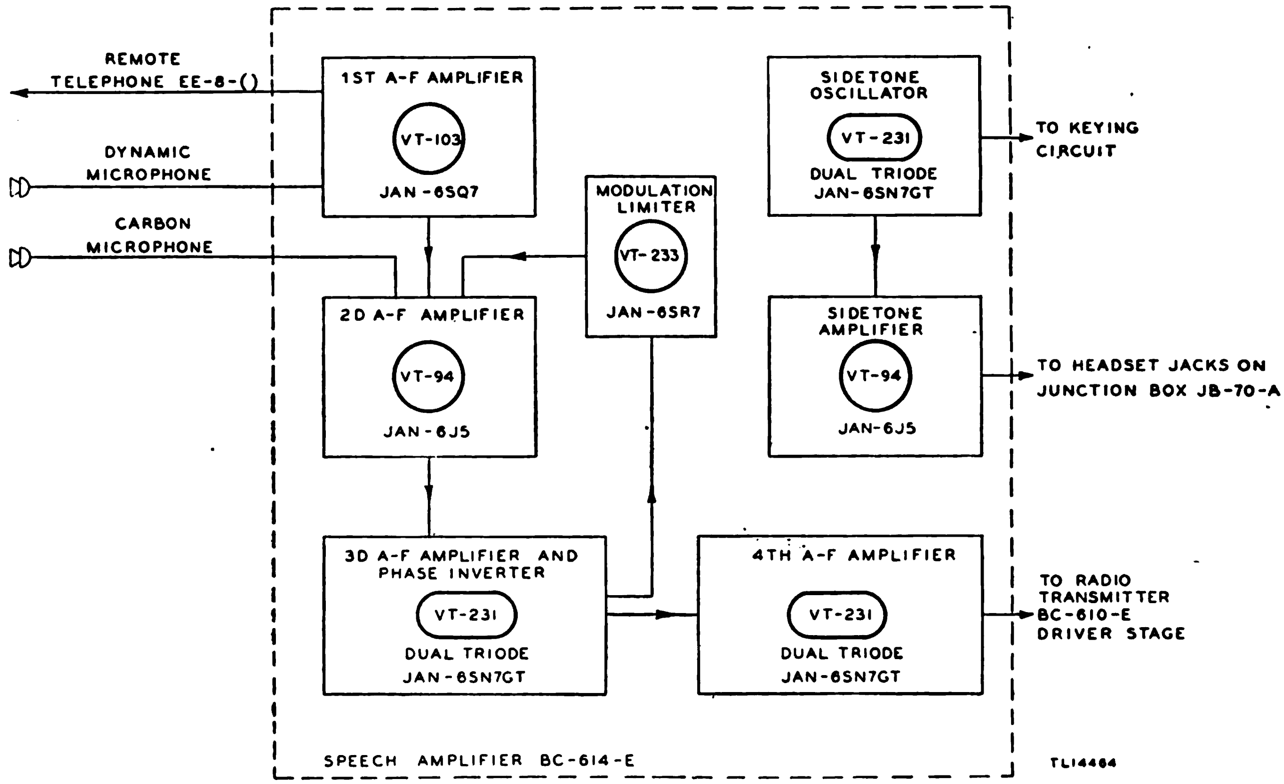


Figure 51. Speech Amplifier BC–614–E—simplified block diagram.

Section II. THEORY OF RADIO TRANSMITTER BC–610–E

133. Oscillator Stage
The m-o stage develops r-f oscillations which are stable in frequency. The m-o stage can be operated as an electron-coupled variable-frequency oscillator, or as a crystal-controlled electron-coupled oscillator. (See fig. 53.) The M.O.-XTAL switch SW_{15} on the tuning unit is used to select the desired type of m-o operation. For simplicity, only the variable-frequency oscillator is called the master oscillator; however, the crystal oscillator is also a master oscil-

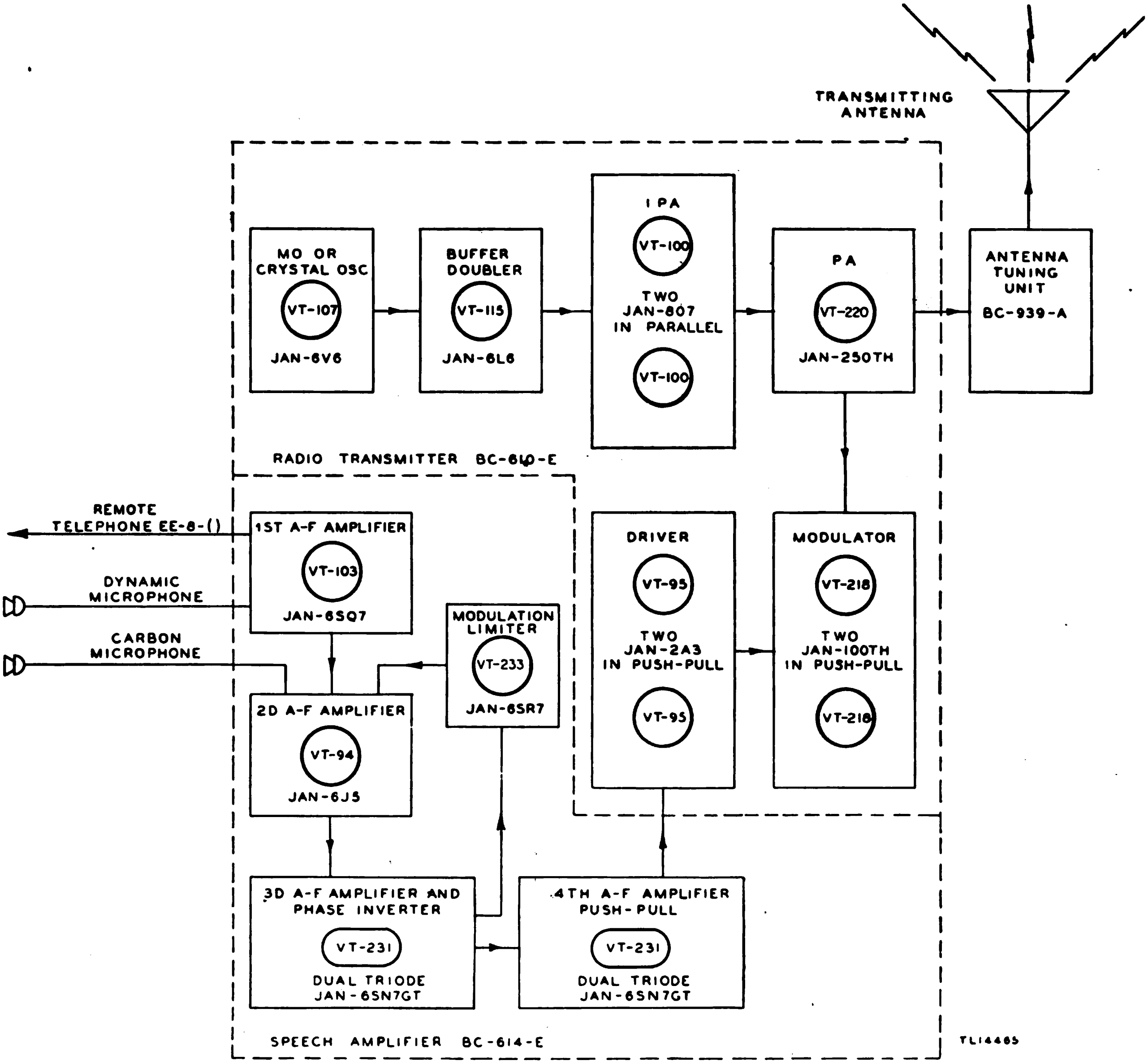


Figure 52. Radio Transmitter BC–610–E and Speech Amplifier BC–614–E—simplified block diagram, phone operation.

lator in Radio Transmitter BC–610–E. The operation of both oscillators is explained in terms of the Hartley oscillator.

a. HARTLEY OSCILLATOR. For purposes of comparison, each part in the Hartley circuit (fig. 54(A)) is given the part number of the corresponding part used in Radio Transmitter BC–610–E. The functioning of the parts in the shunt-feed Hartley oscillator (fig. 54(A)) is as follows:

(1) The screen grid of tube V_8 (Tube JAN–6V6 (VT–107)) acts as the anode (plate) of a triode oscillator for which the control grid and cathode form the other two triode elements.

(2) Inductor L_8 is connected so that the turns between 1 and 2 are between the grid and cathode, and the turns between 2 and 3 are between the cathode and plate.

(3) Capacitors C_{31} and C_{36} are connected in parallel across inductor L_8 so that L_8 and C_{31} plus C_{36} form the resonant LC circuit. The resonant frequency can be adjusted by means of variable capacitor C_{31}.

(4) Capacitor C_{42} is the grid capacitor.

(5) Capacitor C_2 blocks the d-c plate voltage from the tuned circuit and the grid, but couples r-f variations to inductor L_8.

(6) Choke coil CH_1 isolates r-f voltages on the grid.

(7) Resistor R_1 is a grid leak and acts with the grid capacitor to provide grid bias.

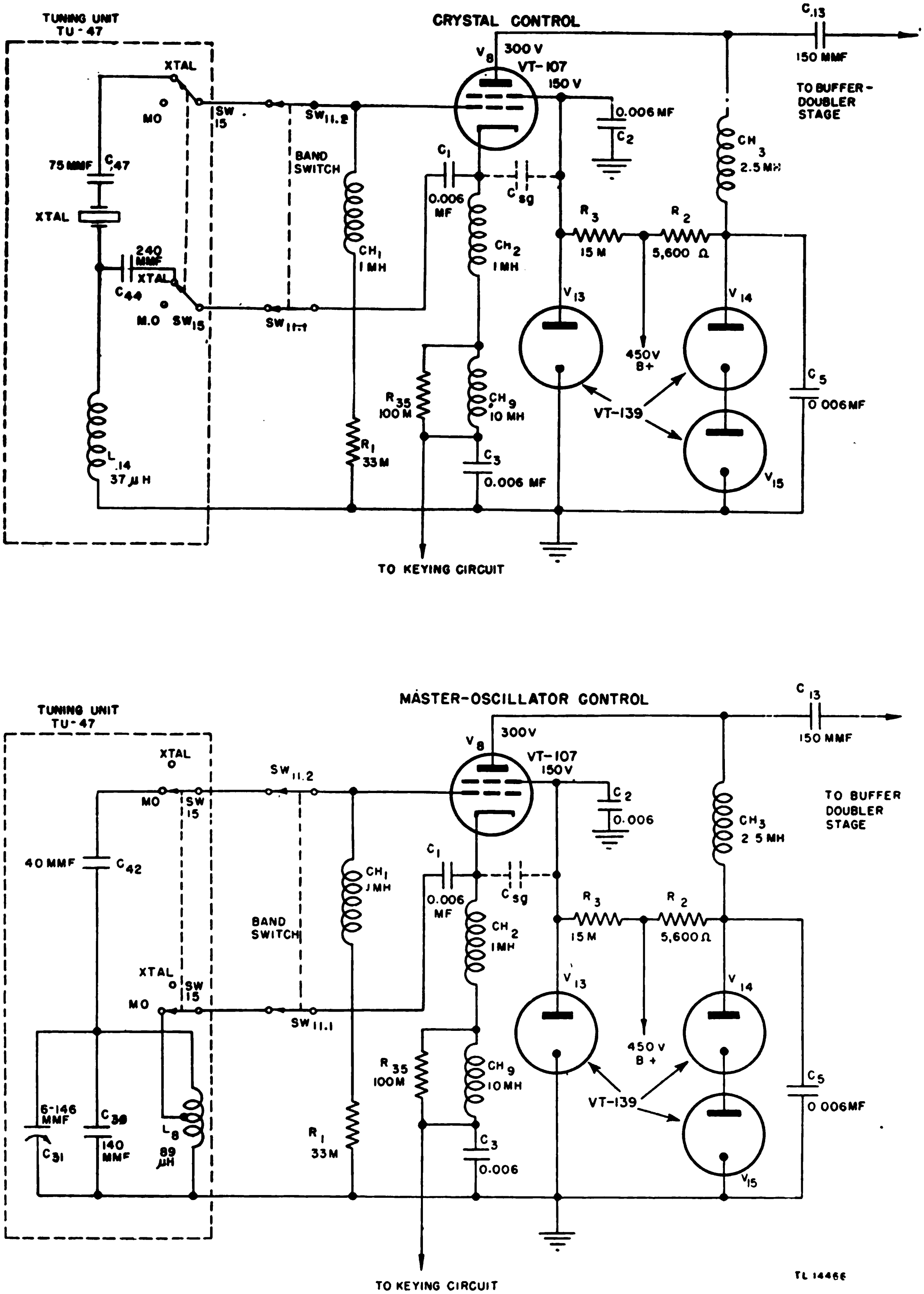


Figure 53. Functional diagram of oscillator stage.

(8) Before the key is closed, the bias is zero. When the key is closed, d-c supply voltage is applied between the oscillator anode and cathode. This change of plate voltage causes a flow of energy from the anode through capacitor C_2 and the plate section (2–3) of coil L_8 to the cathode. This current in the plate section of L_8 induces a voltage across both the plate and the grid section (1–2) of L_8. The voltage induced across L_8 charges capacitor C_{31} and C_{36}, and the resonant circuit starts oscillating. The oscillating current in L_8 causes an r-f voltage across both sections of the coil. The voltage across the grid section (1–2) is coupled through the grid capacitor to the grid, and this voltage is the grid excitation voltage. The excitation voltage is an r-f voltage at the resonant frequency of L_8, C_{31}, and C_{32}. As the excitation voltage varies the grid to cathode voltage, corresponding variations of anode voltage occur and additional energy is fed back through C_2 to the plate section of L_8 in the resonant circuit. The energy thus fed back is sufficient to make up for the losses in the resonant circuit, so that its oscillations continue. As the grid excitation voltage swings the grid positive, capacitor C_{42} charges to a voltage nearly equal to the positive peak of the excitation voltage. The voltage of C_{42} acts as a bias voltage. Grid leak R_1 prevents C_{42} from discharging rapidly when the excitation voltage is lower than the grid capacitor voltage. In other words, the grid capacitor and the grid leak work together to develop the bias voltage for the oscillator stage.

b. Modified Hartley Circuit in Master Oscillator. The modified Hartley circuit of Tuning Unit TU–47 (fig. 54(B)) operates the same as the ordinary Hartley circuit, except for the following circuit changes:

(1) Chokes CH_2 and CH_9 are inserted between the cathode of V_8 and the key.

(2) R_{35} is across CH_9 and acts as a parasitic suppressor.

(3) Capacitor C_1 is between the cathode of V_8 and point 2, the junction of the plate and grid sections of L_8.

(4) When the key is closed, the cathode is connected through the low d-c resistance of choke coils CH_2 and CH_9 to ground. The oscillator action is then the same as explained in *a* above, except that the high r-f impedance of choke coils CH_2 and CH_9 forces the r-f variations at the oscillator anode to feed back through the lower r-f impedance of the cathode section (2–3) of L_8. Capacitor C_1 is included to keep the d-c current from flowing through the cathode section of L_8, but C_1 effectively connects the cathode to point 2 at radio frequencies. Thus in this circuit, the cathode is above ground at r-f potentials.

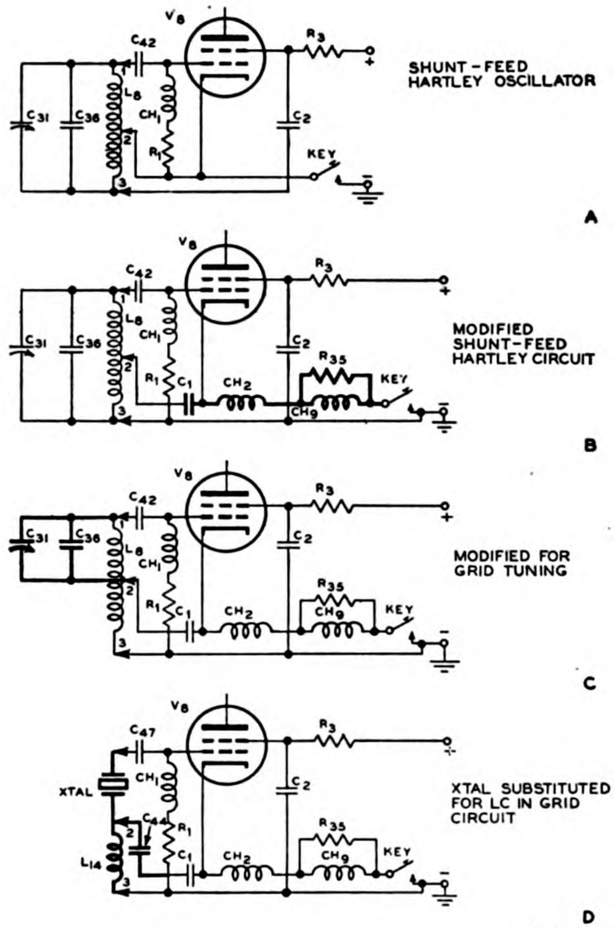


Figure 54. Equivalent circuits of master oscillator.

134. Crystal Control of Master Oscillator

a. Crystal Control with Tuning Unit TU–47. The modified Hartley circuit of figure 54(B) could be further modified as shown in figure 54(C). Under this condition, the cathode section (2–3) of L_8 would not form a part of the resonant LC circuit. The frequency of oscillation would now be determined by the resonant circuit composed of the grid section (1–2) of L_8 and capacitors C_{36} and C_{31}. The resonant circuit (L_8, C_{36}, and C_{31}) is the equivalent circuit of a crystal at its resonant frequency. When the M.O.–XTAL switch of Tuning Unit TU–47 is placed in the XTAL position, the m-o circuit of figure 54(D) is in use. Examination of this circuit shows that—

(1) The crystal has been substituted for its equivalent circuit.

(2) Capacitor C_{44} has been placed in series with capacitor C_1.

(3) Inductor L_{14} has been substituted for L_8.

(4) The circuit functions the same as explained

in *a* and *b* above, except that L_{14} and C_{44} form a series resonant circuit between the cathode of V_8 and ground. The value of L_{14} and C_{44} are so chosen that their resonant frequency is somewhat lower than that of the lowest frequency crystal to be used in the circuit. This choice of values assures proper operation of the circuit without tuning to each of the available crystal frequencies, since the circuit will act as an inductive cathode load over the entire frequency range of which Tuning Unit TU–47 is designed. As in the modified circuit of figure 54(B), the r-f variations at the oscillator anode are fed back through inductor L_{14}, because of the high r-f impedance choke coils CH_2 and CH_9. The voltage thus developed across L_{14} exerts an electrical strain on the crystal so that it vibrates mechanically and develops the grid excitation voltage.

b. OTHER TUNING UNITS. With other tuning units, the operation of the master oscillator is the same as described for Tuning Unit TU–47. The values of the components in each tuning unit are chosen to give the best results in the frequency range for which the unit is designed.

c. OUTPUT OF OSCILLATOR STAGE. The plate load circuit of the m-o stage is electron-coupled to the oscillator section of V_8. The output voltage is developed across r-f choke CH_3 (fig. 53) and coupled to the buffer-doubler stage through capacitor C_{13}.

d. D-C SUPPLY VOLTAGE. The d-c supply voltage for m-o stage V_8 is obtained from the exciter power supply. The plate voltage is regulated at 300 volts by means of the voltage regulator circuit composed of resistor R_2 and voltage regulator tubes V_{14} and V_{15} (Tubes JAN–OD3/VR–150). The oscillator anode voltage is regulated at 150 volts by means of the regulator circuit composed of resistor R_3 and voltage regulator tube V_{13} (Tube JAN–OD3/VR–150).

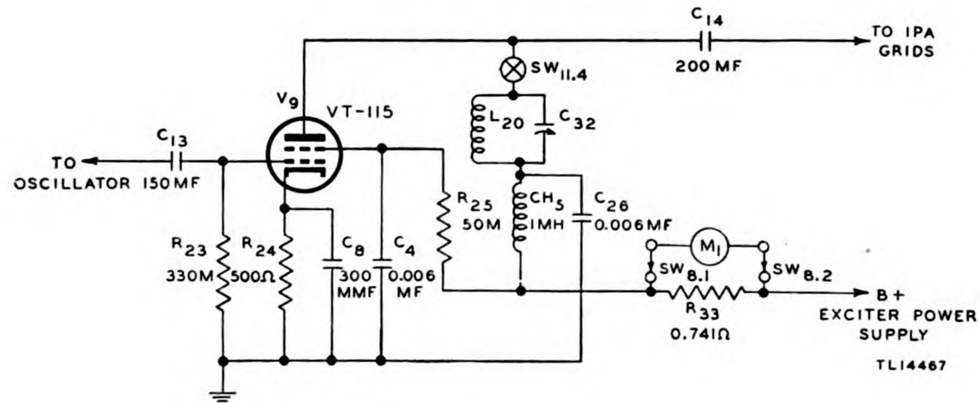


Figure 55. Functional diagram of buffer-doubler stage.

135. Buffer-Doubler Stage (fig. 55)

The r-f signal from the oscillator is fed through blocking capacitor C_{13} to the grid of tube V_9 (Tube JAN–6L6 (VT–115)), which is operated as a Class C amplifier. The operating grid bias is developed across grid leak R_{23} when excitation voltage is applied to the grid. When no excitation voltage is applied to the grid, a protective bias is provided by the cathode bias resistor R_{24} which is bypassed by capacitor C_8. This bias prevents excessive plate current through V_9 during the key-up periods of c-w transmission as well as when the grid is not properly excited because of oscillator failure. The plate-tank circuit consists of variable capacitor C_{32} and coil L_{20} in the tuning unit and it is connected to the plate of tube V_9 through contacts on switch SW_{11}. The plate-tank circuit is tuned by variable capacitor C_{32}, which is controlled from the tuning unit by a knob marked DOUB. Plate voltage is supplied by the exciter power supply, and is applied through coil L_{20}, r-f choke coil CH_5, and meter shunt resistor R_{33}. Choke CH_5 offers high impedance to r-f currents, and accordingly these currents flow to ground through bypass capacitor C_{26} which has negligible reactance at operating frequencies. The tube receives screen-grid voltage through screen-dropping resistor R_{25} and meter shunt resistor R_{33}. Bypass capacitor C_4 maintains the screen grid at r-f ground potential. When switch SW_8, the EXCITATION METER SWITCH, is set to DOUBLER PLATE, the EXCITATION METER M_1 indicates the sum of the plate and screen currents through tube V_9. When the master oscillator is used, the buffer-doubler stage operates as a frequency doubler for all frequencies up to 12 mc; for frequencies from 12 to 18 mc, the buffer-doubler stage operates as a quadrupler. When the crystal oscillator is used, this stage operates as a buffer amplifier in the 2–to 4–mc range; as a frequency doubler in the 4- to 12-mc range; and as a quadrupler in the 12- to 18-mc range. The r-f output from the buffer-doubler tank is coupled through capacitor C_{14} to tubes V_{10} and V_{11}.

136. Intermediate-Power-Amplifier Stage (fig. 56)

Tubes V_{10} and V_{11} (Tubes JAN-807 (VT-100)) are connected in parallel and operated as a Class C amplifier stage. The grid bias for Class C operation is furnished by the bias power supply and applied to the grids of tubes V_{10} and V_{11} through parasitic resistors R_{21} and R_{22}, r-f choke coil CH_7, resistor R_8, and meter shunt resistor R_{28}. A small amount of self bias is obtained as a result of rectified grid-current flow through resistor R_8. This feature improves the Class C operation. When switch SW_8 is set to INT. AMP. GRID, meter M_1 indicates the grid current for tubes V_{10} and V_{11}. Grid excitation voltage is obtained from tube V_9 through coupling capacitor C_{14}. The excitation voltage is applied to the grids of tubes V_{10} and V_{11} through parasitic resistors R_{21} and R_{22} which effectively prevent this stage from producing parasitic oscillations. The high r-f impedance of choke CH_7 confines the r-f excitation voltage to the grids of V_{10} and V_{11}, thus keeping r-f energy out of the bias power-supply circuits and insuring maximum grid excitation voltage. The plate-tank circuit consists of variable capacitor C_{34} and coil L_{26}, in the tuning unit, and it is connected to the plates of tubes V_{10} and V_{11} through the contacts on switch SW_{11}. The plate-tank coil is tuned to resonance by variable capacitor C_{34}, which is controlled by the knob marked INT AMP on the tuning unit. Plate voltage is supplied by the exciter power supply and is applied to the plates of tubes V_{10} and V_{11} through coil L_{26}, r-f choke coil CH_6, and meter shunt resistor R_{27}. R-f energy is kept out of the power-supply circuit by the action of choke CH_6 and bypass capacitor C_{24}. The screen grids obtain voltage through screen-dropping resistors R_6 and R_7 and meter shunt resistor R_{27}. Capacitors C_6 and C_7 are the screen grid r-f bypass capacitors. When switch SW_8 is set to INT. AMP. PLATE, meter M_1 indicates the total plate and screen current for tubes V_{10} and V_{11}.

137. Power-Amplifier Stage (fig. 57)

The r-f output of the intermediate power amplifier is coupled through capacitor C_{15} to the grid of power-amplifier tube V_{16}. Tube V_{16} (Tube JAN-250-TH (VT-220)) is operated as a Class C, plate-neutralized, power amplifier. The grid bias required for this class of operation is furnished by the bias power supply. It is applied to the grid of tube V_{16} through r-f choke coil CH_8 and meter shunt resistor R_{26}. Choke CH_8 confines the r-f excitation voltage to the grid and keeps r-f energy out of bias power-supply circuit. When switch SW_8 is set to P. A. GRID, meter M_1 indicates the p-a grid current,

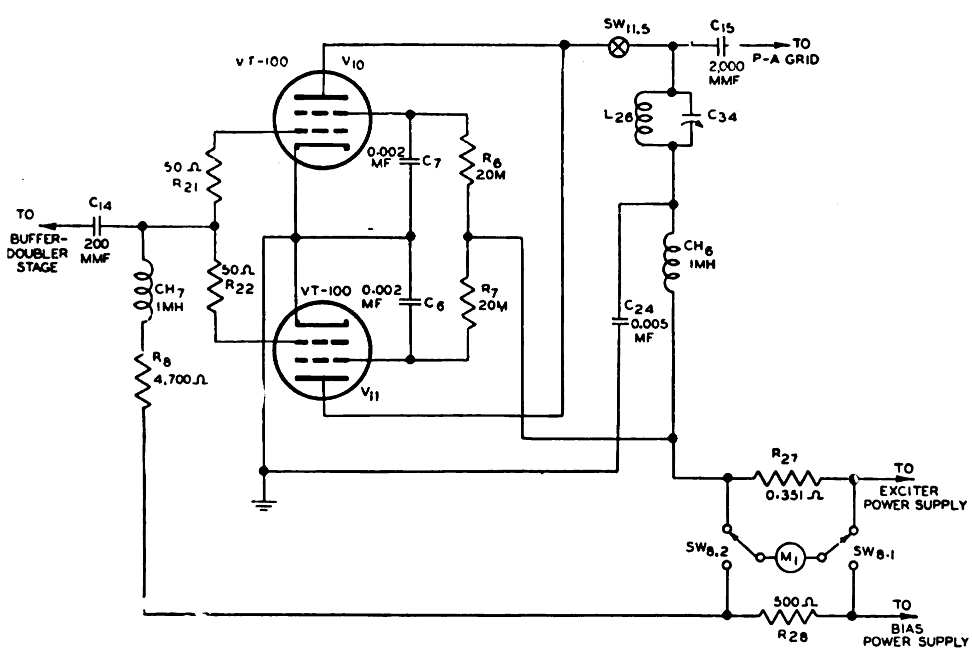


Figure 56. I-p-a amplifier stage—functional diagram.

tube V_{16}. The plate-tank circuit consists of variable capacitor C_{12} and p-a tank coil L_7. The p-a tank circuit is tuned to resonance by the variable capacitor C_{12} which is controlled by the PLATE TUNING dial on the front of the transmitter. Plate voltage for tube V_{16} is furnished by the high-voltage power supply and is applied to the plate through P. A. PLATE meter M_2, r-f choke coil CH_4, and coil L_7. For phone operation the secondary winding of modulation transformer T_9 is also included in the plate-voltage circuit. Meter M_2 indicates the p-a plate current. Radio frequency energy is kept out of the plate power supply circuit by means of bypass capacitor C_{11}. The inductance of choke CH_4 together with its distributed capacitance forms a parallel-resonant circuit at a frequency between 2 and 4 mc. Accordingly resistor R_9 is placed in parallel with choke CH_4 to prevent a high oscillating current in the choke coil. An out-of-phase voltage is fed back to the grid of tube V_{16} through capacitors C_{18} and C_{29} to neutralize the effect of the interelectrode capacity existing between grid and plate in the p-a tube (plate neutralization). Capacitor C_{29} has a low reactance at the signal frequency and serves only as a d-c blocking capacitor to isolate the neutralizing capacitor C_{18} from the high d-c voltage of the p-a plate-tank circuit. Bypass capacitors C_9 and C_{10} maintain the filament circuit of tube V_{16} at r-f ground potential, and filament meter M_3 indicates the a-c voltage applied to the filament. R-f power is taken from the p-a tank circuit by means of a link inductively coupled to the tank coil, and power is fed to the antenna tuning unit through a short coaxial cable. When the transmitter is not in operation, contacts on relay RY_4 short circuit the coupling link and detune the transmitting antenna so that it does not absorb signal energy at the frequency to which the radio receiving equipment is tuned.

138. Antenna Tuning Unit (g. 58)

Antenna Tuning Unit BC–939–A is used to match the impedance of the transmitting antenna to that of the final p-a tube plate circuit. The tuning unit is so designed that the transmitter will operate satisfactorily with a five-section rod antenna or with a long wire auxiliary antenna over a frequency range of 2.0 to 18 mc. Figure 59 is a functional schematic drawing of the antenna tuning unit when it is connected to a five-section rod antenna and the antenna range switch SW_9 is set to 2–10MC. Since the antenna is electrically much shorter than a quarter-wavelength, it presents a highly capacitive load to the transmitter. This capacitive antenna can be tuned to resonance by the addition of a portion of inductance L_6, the low-frequency loading coil, which is made variable by a movable tap is controlled from the front panel of the tuning unit by a crank handle marked FREQUENCY 10MC—INCREASE—2MC. When the inductive reactance of coil L_6 is made equal to the capacitive reactance of the antenna, the load presented to the transmitter is purely resistive. Coupling coil L_5, which is link-coupled to the p-a tank coil, acts as an impedance-matching transformer so that the resistance of the antenna, as reflected back into the p-a tank circuit, presents the optimum plate-load resistance, as viewed from the plate of the p-a tube. Coil L_5 is made variable by a movable tap which is controlled by a knob marked COUPLING INCREASE. Figure 60 is a functional schematic of the tuning unit connected to a five-section rod

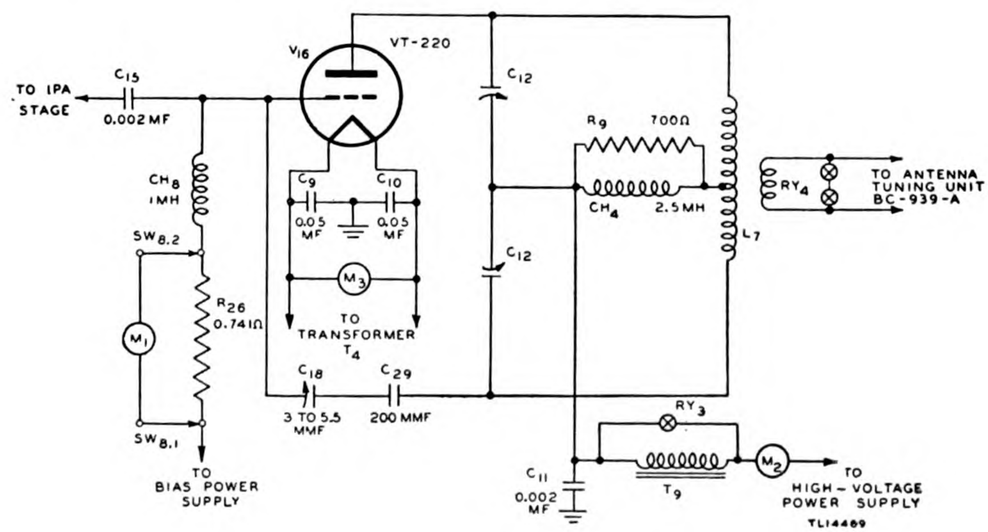


Figure 57. P–a stage—functional diagram.

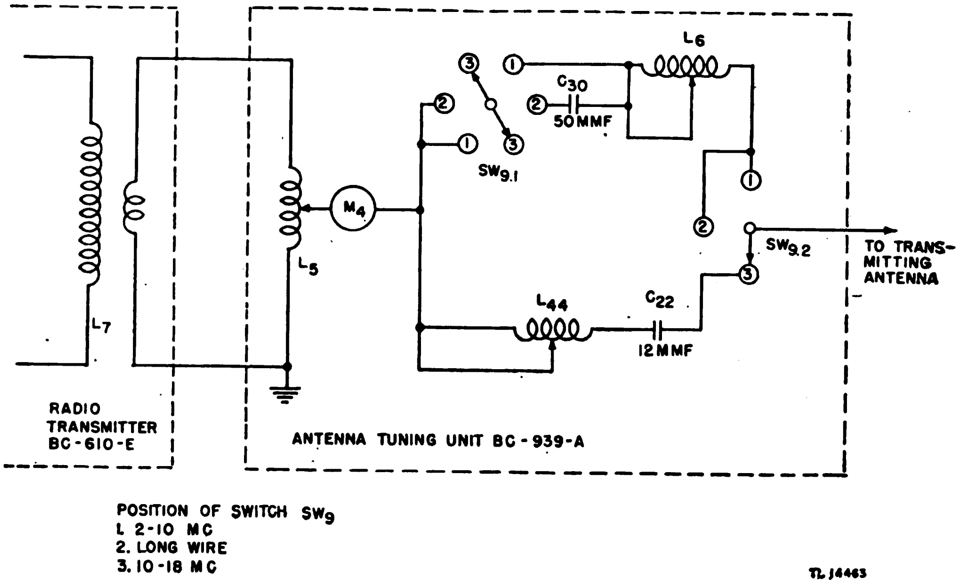


Figure 58. Antenna Tuning Unit BC–939–A—functional diagram.

antenna, with the antenna range switch SW_9 set to 10–18MC. From 10 to 12.5 mc the reactance of the antenna is capacitive; from 12.5 to 18 mc the reactance is inductive.

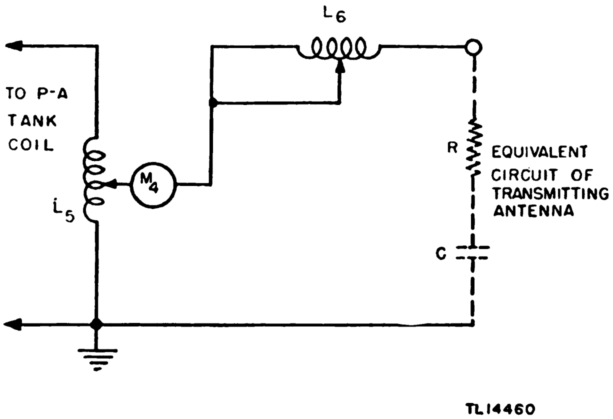


Figure 59. Antenna Tuning Unit BC–939–A—functional diagram with range switch in 2–10MC position.

At approximately 12.5 mc the antenna is purely resistive. The antenna is tuned to resonance by high-frequency loading coil L_{44} which is made variable by a movable tap, and is controlled by a crank marked FREQUENCY 18 MC—INCREASE —10MC. Vacuum capacitor C_{22} provides the added capacitance necessary when operating from 12.5 to 18 mc. Its effect is neutralized when operating from 10 to 12.5 mc by including more turns of coil L_{44} in the circuit. Figure 61 is a functional schematic diagram of the tuning unit connected to a long wire antenna, with the antenna range switch set to LONG WIRE.

The antenna may be either capacitive or inductive depending on the length of the wire and frequency used. The net reactance is made equal to zero by adjusting coil L_6, the low-frequency loading coil.

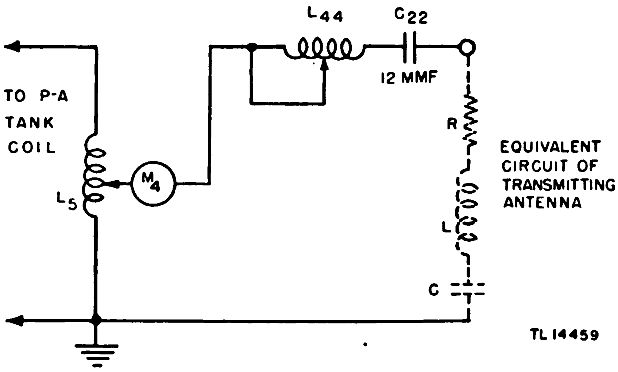


Figure 60. Antenna Tuning Unit BC–939–A—functional diagram with range switch in 10–18MC position.

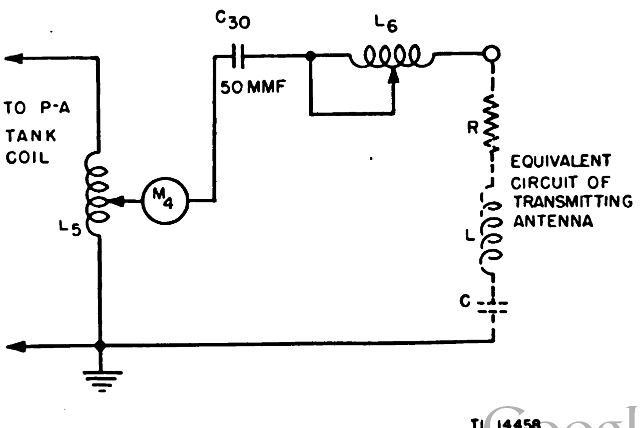


Figure 61. Antenna Tuning Unit BC–939–A—functional diagram with range switch in LONG WIRE position.

Vacuum capacitor C_{30} is included in the circuit to provide the necessary capacitance when the reactance of the antenna is inductive because of the length of the wire and the frequency used. ANTENNA CURRENT meter M_4 indicates the r-f current flowing in the series circuit which consists of the antenna and the antenna loading circuit. R-f current will be at maximum when the antenna is tuned to resonance with the transmitter frequency by means of the antenna loading circuits in the antenna tuning units.

139. Modulator Section

a. DRIVER STAGE (fig. 62). Tubes V_1 and V_2 (Tubes JAN–2A3 (VT–95)) are operated as Class AB_1 a-f amplifiers connected in a push-pull circuit. The suffix 1 after AB denotes that grid current is not allowed to flow during any part of the input cycle. Plate voltage for tubes V_1 and V_2 is furnished by the bias-voltage power supply. This power supply has the positive side of the output voltage grounded, and therefore the ungrounded side of the output voltage is approximately 360 volts negative with respect to ground. The filaments of the driver tubes are connected through resistor R_{20} to 360 volts negative, and the plates are connected to ground through the center tap of driver transformer T_8. This places the plates at a potential of approximately 300 volts positive with respect to the filaments. Approximately 60 volts negative grid bias is obtained as a result of the voltage drop across resistor R_{20} because of the d-c plate-current flow. The grids are connected to the negative side of resistor R_{20} through the center tap on input transformer T_7. Resistor R_{20} is bypassed by capacitor C_{27} which has enough capacity to offer a very low reactance to all audio frequencies above approximately 50 cps (cycles per second). Its purpose is to keep the a-f voltage out of the bias power supply and to prevent degeneration of the a-f signal in self-biasing resistor R_{20}. A-f voltage is fed to the primary winding of transformer T_7 over a 500-ohm transmission line. The secondary winding of transformer T_7 is connected to the grids of tubes V_1 and V_2; the grid circuit is completed to the filaments through the center tap on transformer T_7 and resistor R_{20}. The primary-to-secondary turns ratio of transformer T_7 is such that when the secondary is loaded by resistor R_{14} and R_{15}, the impedance, looking into the primary winding, is 500 ohms. This is the correct impedance to properly terminate the a-f transmission line from the speech amplifier. The driver stage is coupled to the modulator stage by transformer T_8. The secondary winding of transformer T_8 is loaded by resistors R_{16} and R_{17} to provide a more constant plate-load impedance for the driver tubes.

b. MODULATOR STAGE (fig. 62). Tubes V_3 and V_4 (Tubes JAN–100–TH (VT–218)) are operated as a Class B push-pull modulator stage. Class B operation requires that the tubes be biased near plate current cut-off. Under this condition, the

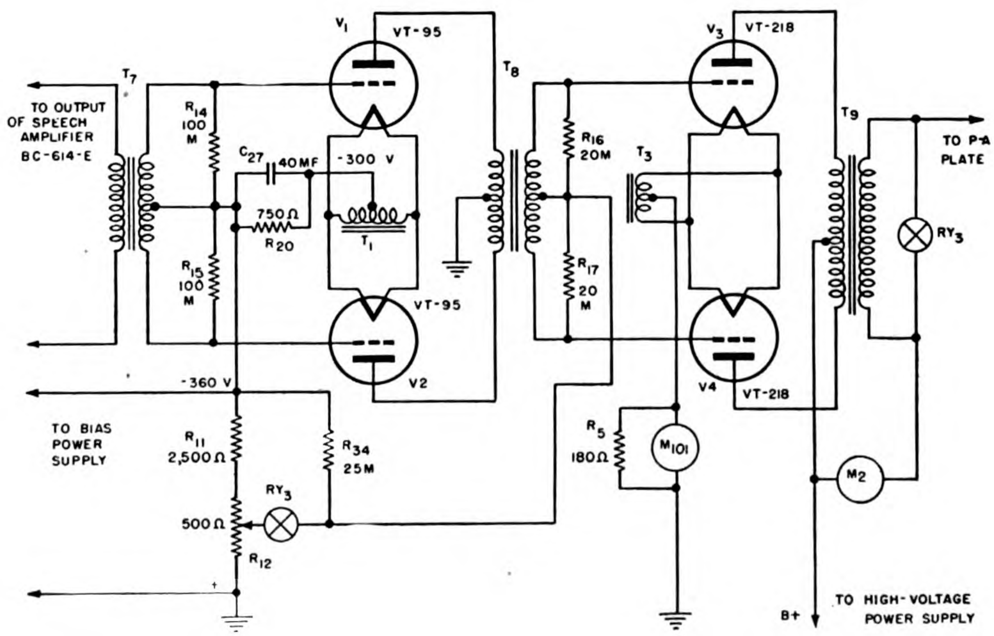


Figure 62. Driver and modulator stages—functional diagram.

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plate current which flows when no signal is applied to the grids is relatively small; but when peak signal voltage is applied to the grids, the plate current may rise to several times the zero signal value. Grid bias for tubes V_3 and V_4 is furnished by the bias power supply, and during phone operations, is applied to the grids through contacts on relay RY_3 and the secondary center tap on transformer T_8. The bias voltage is set to the correct value by potentiometer R_{12}, the MODULATOR BIAS control on the front of the transmitter. During c-w operation, potentiometer R_{12} is disconnected by contacts on relay RY_3, and the total output voltage of the bias power supply is applied to the grids of tubes V_3 and V_4 through resistor R_{34}. This voltage is sufficient to cause plate current cut-off. Plate voltage for the modulator stage is furnished by the high-voltage power supply, and is applied to the plates through the center tap on modulation transformer T_9. The filaments of tubes V_3 and V_4 are connected to ground through resistor R_5 in parallel with MODULATOR PLATE meter M_{101}. Meter M_{101} is located in the speech amplifier and indicates the d-c plate current for tubes V_3 and V_4. If meter M_{101} or the circuit to the meter becomes open, resistor R_5 provides a protective bias for tubes V_3 and V_4, regardless of the setting of MODULATOR BIAS control R_{12}. In addition, it maintains the filament circuit of the modulator tubes and the wiring to the meter near ground potential. Under certain conditions, it may be necessary to apply plate power to the transmitter without having the speech amplifier and junction box connected. This can be done by setting PLATE POWER switch SW_6 to ON; resistor R_5 affords the protection described above. The a-f voltage developed across the secondary of transformer T_9 adds to and subtracts from the d-c plate voltage applied to the p-a tube. Because the r-f output voltage of a Class C amplifier is proportional to the applied plate voltage, the r-f carrier is amplitude modulated by the a-f voltage developed in the modulator stage. Transformer T_9 is, in effect, loaded by a resistor whose value is equal to the d-c plate resistance of the p-a tube. Because of the impedance-transforming properties of transformer T_9, the resistance which is reflected into the primary circuit is the optimum plate-load impedance for modulator tubes V_3 and V_4. During c-w operation, the secondary winding of transformer T_9 is short-circuited by a pair of contacts on relay RY_3.

140. Power Supplies

a. Exciter Power Supply (fig. 63). The exciter power supply furnishes plate and screen-grid voltage for oscillator tube V_8, buffer-doubler tube V_9 and intermediate-amplifier tubes V_{10} and V_{11}. Fila-

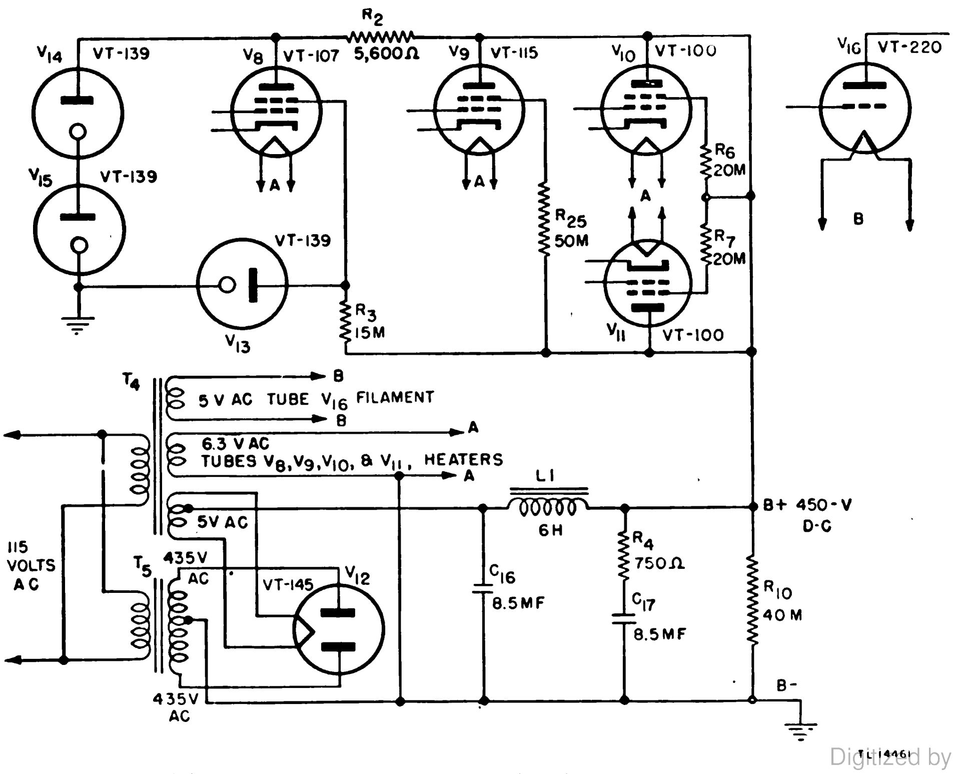


Figure 63. Exciter power supply—functional diagram.

ment transformer T_4 has three low-voltage secondary windings. They are: (1) 5.0-volt, 10.5-ampere, (2) 6.3-volt, 3.5-ampere, and (3) 5.0-volt, 3-ampere. The 5.0-volt, 10.5-ampere winding furnishes filament current for p-a tube V_{16}; the 6.3-volt, 3.5-ampere winding furnishes heater current for tubes V_8, V_9, V_{10}, and V_{11}; and the 5.0-volt, 3-ampere winding furnishes filament current for rectifier tube V_{12}. Rectifier tube V_{12} (Tube JAN–5Z3 (VT–145)) is connected in a full-wave rectifier circuit. The a-c plate voltage for tube V_{12} is furnished by the high-voltage secondary winding on transformer T_5. The rectified output voltage of tube V_{12} is applied to a pi-section filter consisting of filter capacitors C_{17} and C_{16} and choke L_1. R_4 is in series with capacitor C_{17} to prevent key clicks due to excessive voltage surges when the transmitter is keyed. Resistor R_{10} is the power-supply bleeder resistor which serves to discharge the filter capacitors when the power supply is turned off.

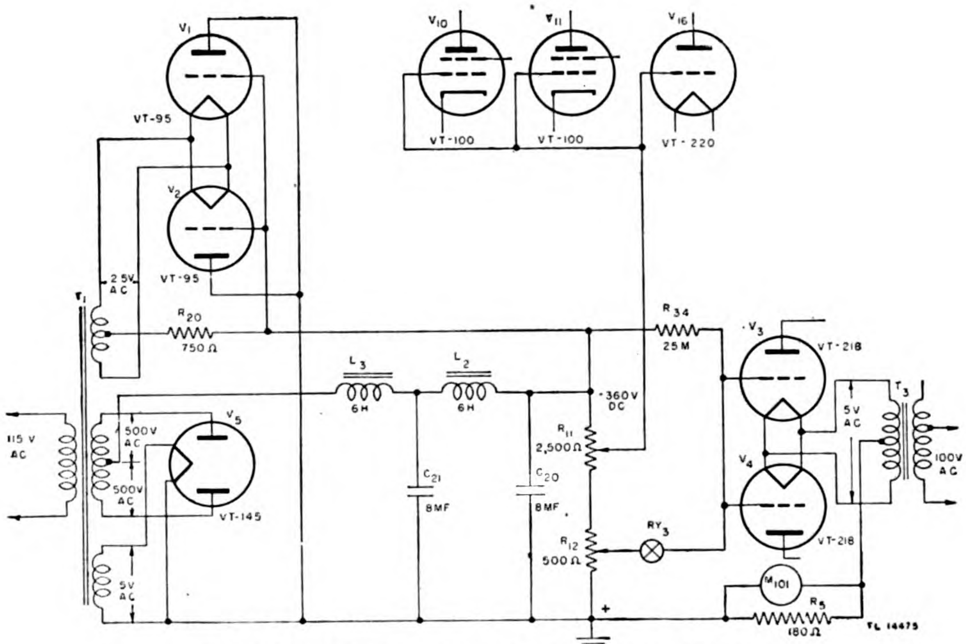


Figure 64. Bias power supply—functional diagram.

b. Bias Power Supply (fig. 64). The bias power supply furnishes filament and plate voltage for tubes V_1 and V_2, and bias voltage for tubes V_{10}, V_{11}, V_{16}, V_3 and V_4. Transformer T_1 supplies filament and plate voltage to rectifier tube V_5 (Tube JAN–5Z3 (VT–145)) which is connected as a full-wave rectifier. The rectifier output voltage is applied to a choke input pi-section filter consisting of filter chokes L_2 and L_3, and capacitors C_{20} and C_{21}. Resistor R_{11} and potentiometer R_{12} connected across the output of the power supply serve as bleeder resistors. The voltage regulation of this power supply is relatively good because of the use of a choke input filter and a high value of bleeder current. An adjustable tap is provided on resistor R_{11} for the purpose of adjusting the bias voltage to tubes V_{10}, V_{11}, and V_{16} to the correct value. Filament current for modulator tubes V_3 and V_4 is supplied by filament transformer T_3. The function of all other parts shown in figure 64 has been described in other paragraphs.

c. High-voltage Power Supply (fig. 65). The high-voltage power supply furnishes d-c plate voltage for modulator tubes V_3 and V_4, and p-a tube V_{16}. Tubes V_6 and V_7 (Tubes JAN–866A (VT–46A)) are connected in a full-wave rectifier circuit. Transformer T_2 furnishes filament current to the rectifier tubes; transformer T_6 furnishes the high a-c voltage to the rectifier plates. The rectified high voltage is applied to an L-section filter consisting of filter choke L_4, and filter capacitors C_{19} and C_{23} in parallel. Resistor R_{13}, the bleeder resistor, is connected across the output of the power supply and serves to discharge capacitors C_{19} and C_{23} when the power is turned off. Switch SW_7, the C.W.-PHONE switch, reduces the voltage applied to the plates of the rectifier tubes during phone operation. Switch SW_4 is the HIGH VOLTAGE PROTECT switch. When set to HIGH VOLTAGE PROTECT it connects resistor R_{19} (heater element) in series with one side of the primary of transformer T_6 to reduce the output voltage of the rectifier during tune-up

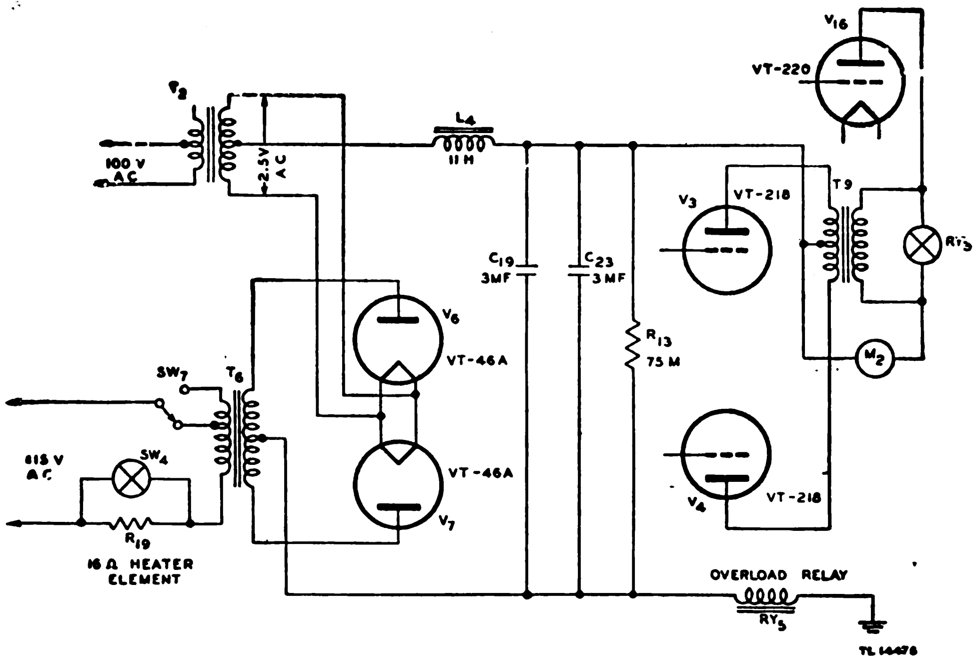


Figure 65. High-voltage power supply—functional diagram.

operations. During c-w operation, contacts on relay RY_3 short-circuit the secondary winding of modulation transformer T_9. The coil of relay RY_5 is connected between the center tap of the high-voltage secondary winding of transformer T_6 and ground. Its purpose is to actuate contacts which disconnect the primary voltage from transformer T_6 when excessive current flows through the relay coil. This prevents damage to the high-voltage rectifier tubes because of overloads.

141. Switches

a. FILAMENT POWER SWITCH SW_1 (fig. 66). FILAMENT POWER switch SW_1 is located on the front panel of the transmitter. When set to ON, it applies a-c power to the primary windings of transformers T_1, T_2, T_3, T_4, and T_{103}. Transformer T_{103} is the speech-amplifier power-supply transformer. It also applies a-c voltage to lamp LM_3 which lights the green jewel above the switch.

b. EXCITER PLATE POWER SWITCH SW_3 (fig. 67). EXCITER PLATE POWER switch SW_3 is located on the front panel of the transmitter. When set to ON, one pair of contacts applies a-c power to the primary winding of transformer T_5, and another pair of contacts grounds the cathode circuit of oscillator tube V_8. This switch is used to apply plate power to the exciter stages during tune-up operations.

c. HIGH VOLTAGE PROTECT SWITCH SW_4 (fig. 68). HIGH VOLTAGE PROTECT switch SW_4 is located on the front panel of the transmitter. When set

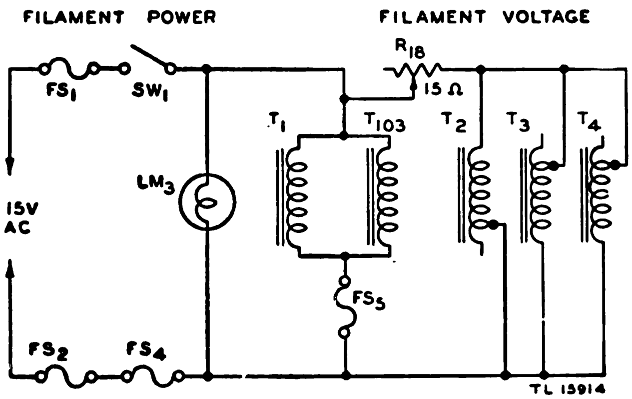


Figure 66. FILAMENT POWER switch—functional diagram.

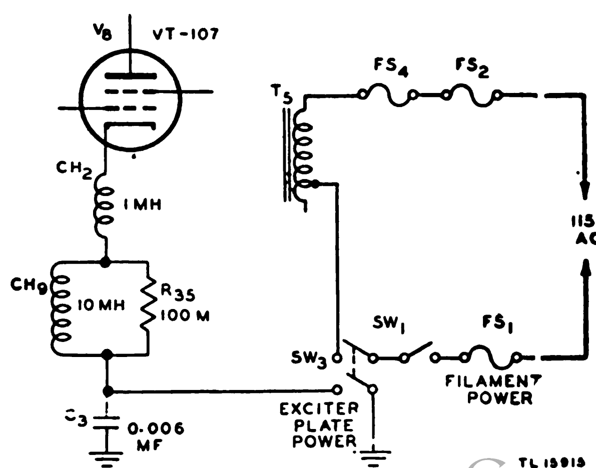


Figure 67. EXCITER PLATE POWER switch—functional diagram.

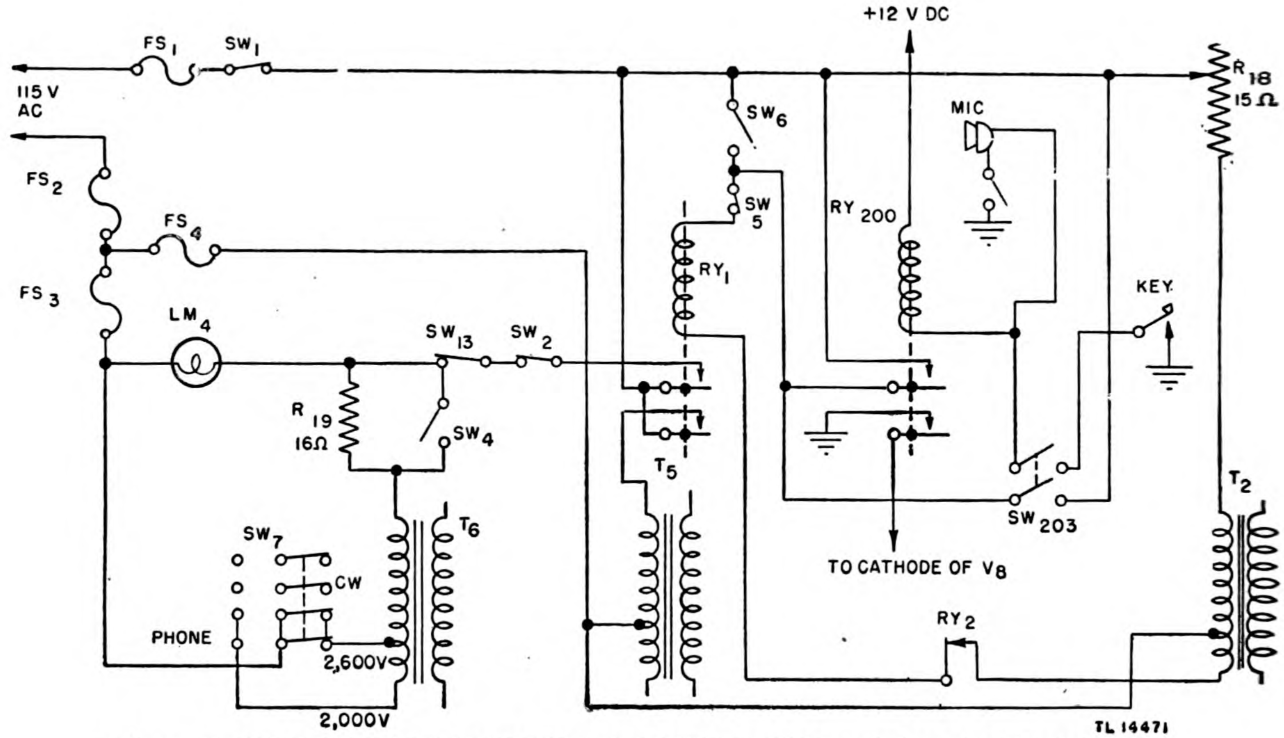


Figure 68. HIGH VOLTAGE PROTECT and PLATE POWER switches—functional diagram.

to HIGH VOLTAGE PROTECT, it connects resistor R_{19} in series with the primary winding of transformer T_6. Resistor R_{19} is a 16-ohm, 600-watt heater element and reduces the plate voltage applied to p-a tube V_{16} during tune-up operations. When switch SW_4 is set at OFF, it short-circuits resistor R_{19}, and thus applies full voltage to the plate of the p-a tube. Lamp LM_4 lights a red jewel above the switch when power is applied to high-voltage transformer T_6.

d. PLATE POWER SWITCH SW_6 (fig. 68). PLATE POWER switch SW_6 is located on the front panel

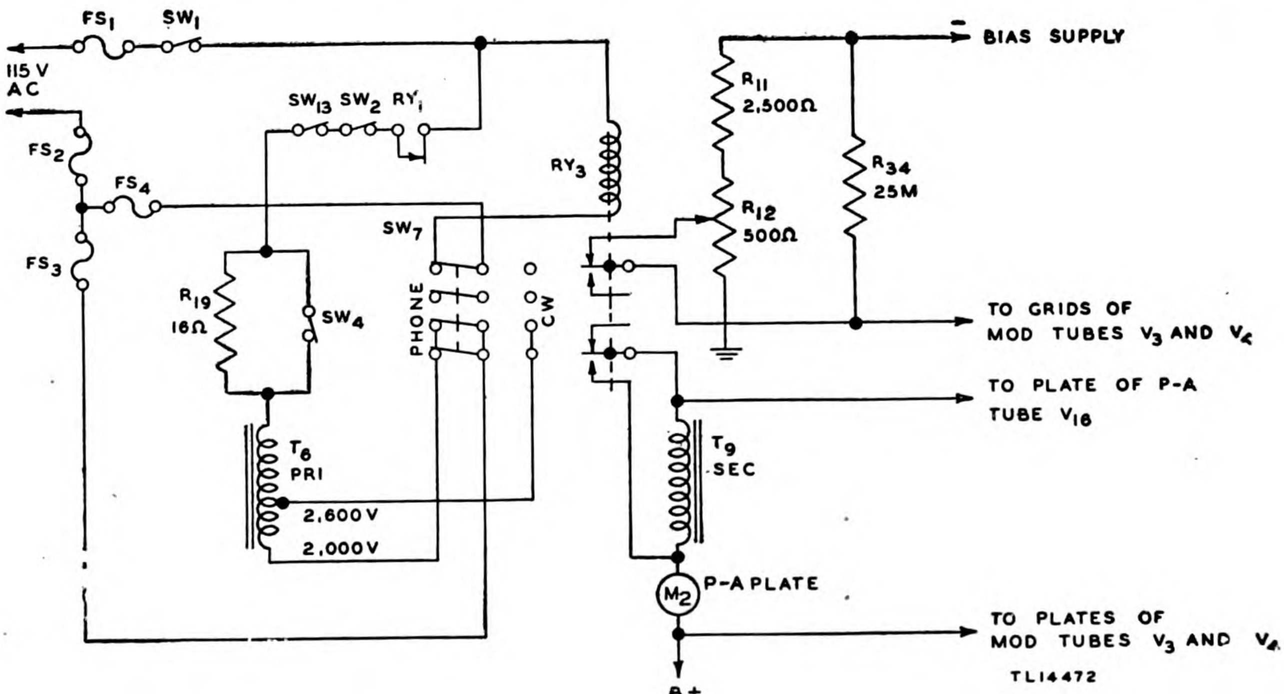


Figure 69. C.W. PHONE switch—functional diagram.

of the transmitter. When set to ON, it applies voltage to the coil of relay RY_1. A pair of contacts on relay RY_1 applies power to the primary winding of high-voltage transformer T_6.

e. C. W. PHONE SWITCH SW_7 (fig. 69). C. W. PHONE switch SW_7 is a four-pole, double-throw toggle switch located on the front panel of the transmitter. Its purpose is to select either c-w or phone operation. In the C. W. position, switch SW_7 applies a-c power to only a portion of the primary winding of transformer T_6. Thus full plate voltage is applied to the p-a tube. In the PHONE position, switch SW_7 applies a-c power to the whole primary winding of transformer T_6 and, as a result, reduced plate voltage is applied to p-a tube V_{16} and modulator tubes V_3 and V_4. Two poles of switch SW_7 are connected in parallel to carry the primary current required by transformer T_6. In the PHONE position, another pole on switch SW_7 applies voltage to the coil of relay RY_3. The contacts on relay RY_3 short-circuit the secondary winding of modulation transformer T_9, and these contacts remain closed until current flows through the coil of relay RY_3. One pole on switch SW_9 is not used.

Caution: Never throw this switch when the plate power is turned on. To do so will damage the switch, because the switch is not designed to break the primary current to high-voltage plate-power transformer T_6.

f. BAND SWITCH SW_{11} (fig. 70). Switch SW_{11} is a four-section, three-position switch, controlled from the front panel of the transmitter by a knob marked BAND SWITCH. Its purpose is to provide selection of any one of three tuning units which have been set to a predetermined frequency. The switch sections are numbered (on the functional schematic diagram) $SW_{11\text{-}1}$, $SW_{11\text{-}2}$, $SW_{11\text{-}3}$, and $SW_{11\text{-}4}$. Section 1 is the section nearest the front panel of the transmitter. Switches $SW_{11\text{-}1}$ and

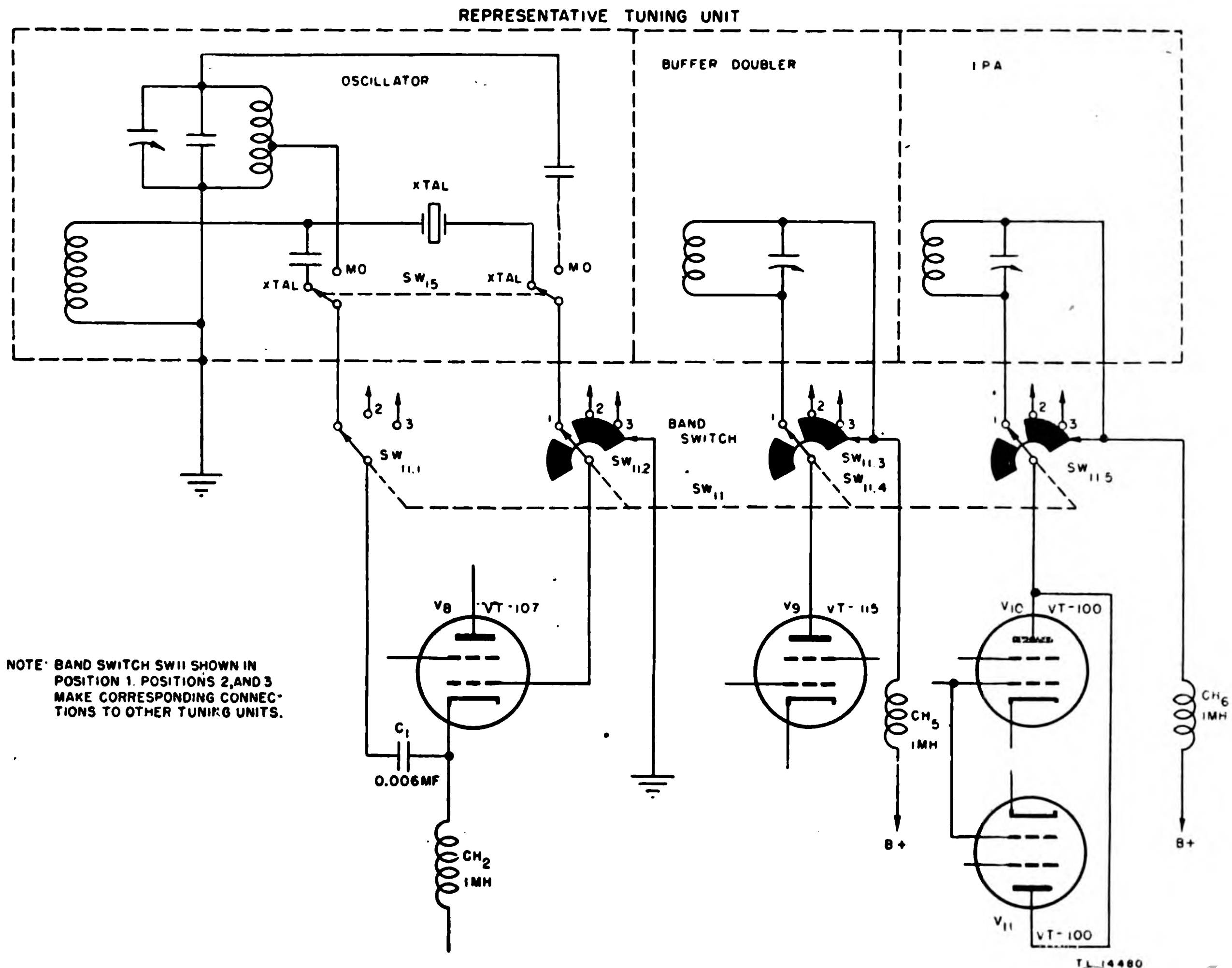


Figure 70. BAND SWITCH—functional diagram.

$SW_{11.2}$ connect the grid and cathode circuits of oscillator tube V_8 to the oscillator circuits in the tuning unit. Switch $SW_{11.3}$ connects the buffer-doubler tank coil of the tuning unit to the plate of buffer-doubler tube V_9. Switch $SW_{11.4}$ connects the plates of the intermediate-amplifier tubes V_{10} and V_{11} to the intermediate tank coil of the tuning unit. To avoid undesirable resonant effects, coils of tuning units which are not in use are short-circuited by shorting plates on switch SW_{11}.

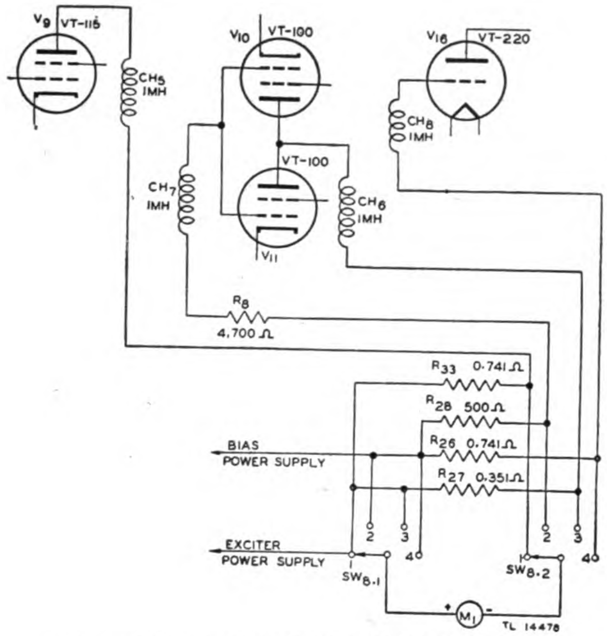


Figure 71. EXCITATION METER switch—functional diagram.

g. EXCITATION METER SWITCH SW_8 (fig. 71). Switch SW_8 is a two-section, four-position switch located on the front panel of the transmitter. It is controlled by a knob marked EXCITATION METER SWITCH. When the switch is set to DOUBLER PLATE, meter M_1 is connected in the plate circuit of buffer-doubler tube V_9. When the switch is set to INT. AMP. GRID, meter M_1 is connected in the grid-return circuit of intermediate-amplifier tubes V_{10} and V_{11}. When the switch is set to INT. AMP. PLATE, meter M_1 is connected in the plate circuit of intermediate-amplifier tubes V_{10} and V_{11}. When the switch is set to P.A. GRID, meter M_1 is connected in the grid-return circuit of p-a tube V_{16}.

h. OVERLOAD RESET SWITCH SW_{12} (fig. 72). Switch SW_{12} is a momentary push-button type of switch located on the front panel of the transmitter. The switch is normally closed; but when pressed, it interrupts the energizing current through the coil of overload reset relay RY_2, which in turn operates

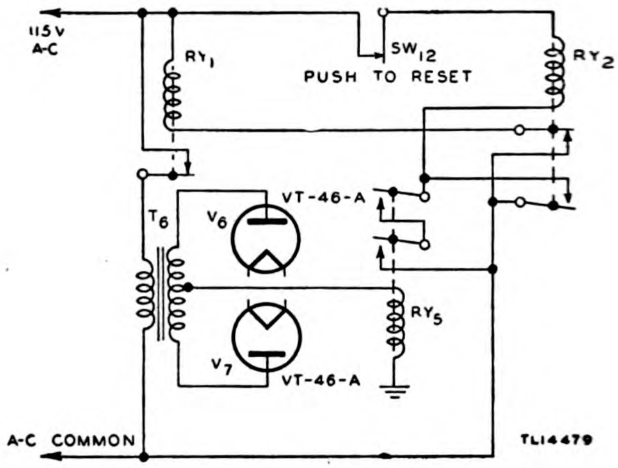


Figure 72. OVERLOAD RESET switch—functional diagram.

relay RY_1 to restore plate power to the transmitter.

i. INTERLOCK SWITCHES SW_2, SW_5, SW_{10}, and SW_{13} (fig. 73). Interlock switches are provided wherever opening a door or removing a cover of the transmitter exposes the operator to dangerously

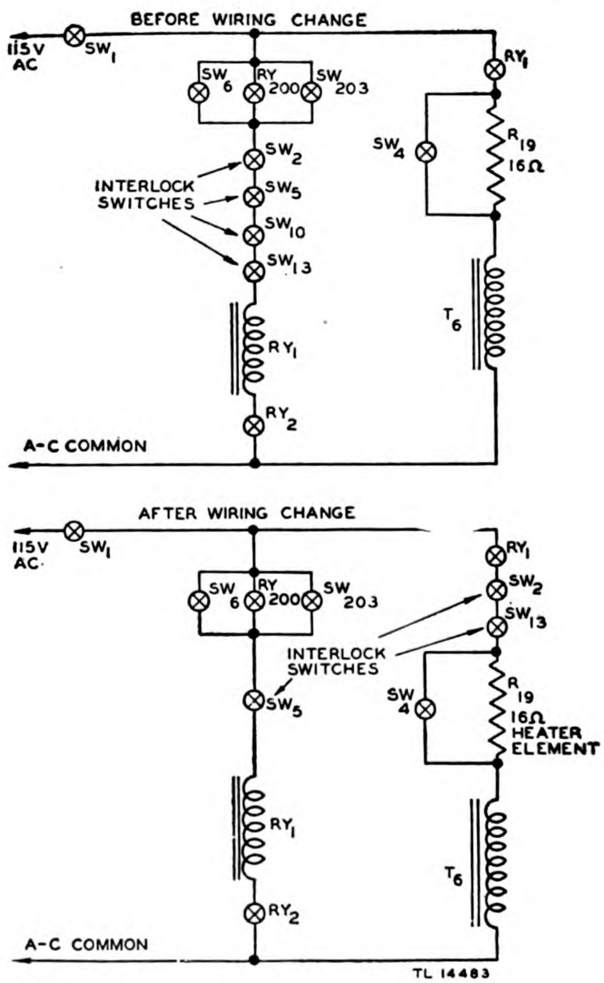


Figure 73. Interlock switches—functional diagram.

high voltages. Their purpose is to disconnect the a-c power from the primary winding of high-voltage power transformer T_6. On transmitters with serial numbers below 5191, switches SW_2, SW_5, SW_{10}, and SW_{13} are connected in series with the coil of relay RY_1. Beginning with serial number 5191, the interlock wiring has been changed; and switches SW_2 and SW_{13} are connected in series with the contacts of relay RY_1, providing positive protection even though the contacts on relay RY_1 should freeze closed. Interlock switch SW_{10} is not used on transmitters with serial numbers above 5191. Switch SW_2 is located on the under side of the left-hand top cover just above the r-f tank coil. Switch SW_5 is located on the rear apron of the modulator deck of the transmitter in such a manner that the switch opens when the rear cover of the transmitter is removed. Switch SW_{13} is located on the under side of the right-hand top cover and operates when the door over the tuning units is opened. On transmitters with serial numbers below 5191, switch SW_{10} is installed in such a manner as to disconnect the a-c power from transformer T_6 when the entire top section of the transmitter is removed.

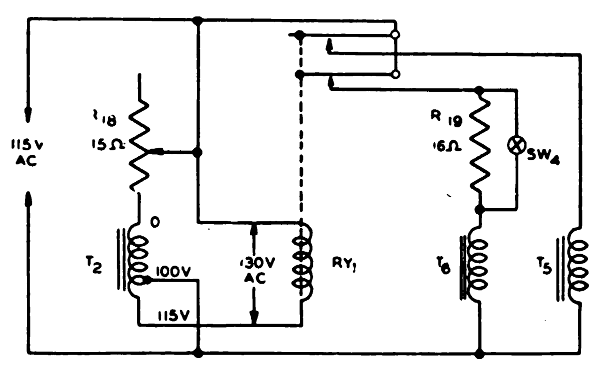


Figure 74. Plate power relay RY_1—functional diagram.

142. Relays

a. Plate Power Relay RY_1 (fig. 74). Relay RY_1 is a double-pole, single-throw relay located on the modulator deck of the transmitter. Its purpose is to apply plate power to the transmitter. When the coil of relay RY_1 is energized, one pair of the relay contacts applies a-c power to the primary winding of the high-voltage power transformer T_6 and the other pair of contacts apply a-c power to the primary winding of the exciter power-supply transformer T_5.

b. Phone-continuous Wave Switching Relay RY_3 (fig. 75). Relay RY_3 is a double-pole, double-throw relay located on the modulator deck of the transmitter. This relay operates in conjunction with the C.W. PHONE switch SW_7 and its purpose is to select either c-w or phone operation. When switch SW_7 is set to C.W., no current flows through the coil of relay RY_3 and a closed pair of contacts short-circuit the secondary winding of modulation transformer T_9. When switch SW_7 is set to PHONE, the coil of the relay is energized and the closed contacts which short-circuit the secondary winding of transformer T_9 are drawn apart, removing the short circuit. At the same time, another pair of contacts on relay RY_3 close and these contacts apply the correct bias for Class B operation of modulator tubes V_3 and V_4 through potentiometer R_{12}.

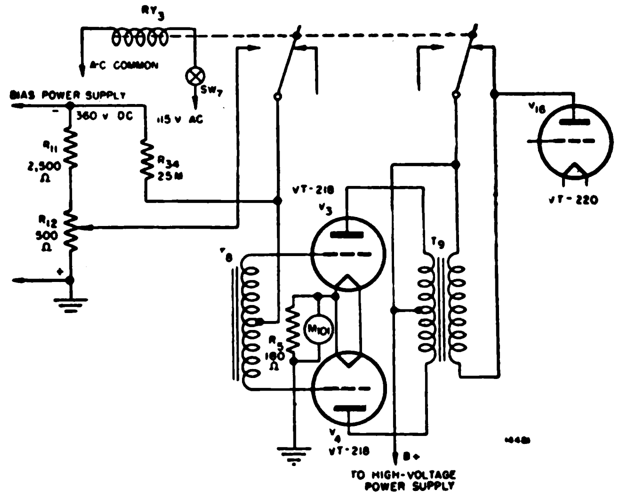


Figure 75. Phone-continuous wave switching relay RY_3—functional diagram.

c. Antenna Shorting Relay RY_4 (fig. 76). Relay RY_4 is a double-pole, double-throw relay located on the r-f deck of the transmitter near the p-a tank coil. Its purpose is to short-circuit the antenna-coupling coil of the p-a tank coil when the transmitter is not in operation. The coil of relay RY_4 is connected in parallel with the coil of relay RY_1; therefore both relays operate at the same time. When relay RY_4 is not energized, the contacts are connected in series across the antenna-coupling coil, shorting it out. When the relay is energized, the contacts are drawn apart, removing the short circuit from across the coupling coil.

d. Overload Protection Relays RY_2 and RY_5 (fig. 72). Relays RY_2 and RY_5 are located on the lower deck of the transmitter. They protect high-voltage rectifier tubes V_6 and V_7 from damage due to heavy current surges or serious overloads. All current drawn from the high-voltage power supply must pass through the coil of relay RY_5 and is designed to operate the contacts when the current through the coil exceeds approximately 750 ma.

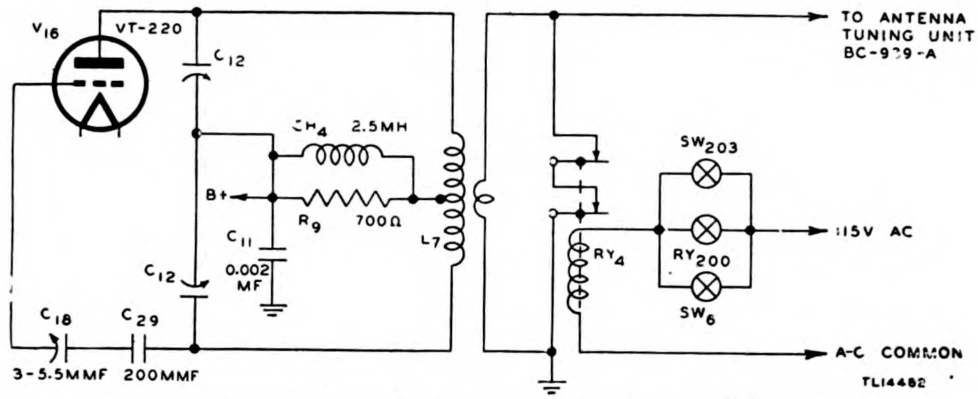


Figure 76. Antenna shorting relay RY4—functional diagram.

When the contacts on relay RY_5 close, relay RY_2 is energized. One pair of contacts on relay RY_2 closes and maintains the energizing current; another pair of contacts opens the circuit to relay RY_1, which removes plate power from the transmitter. Relay RY_2 remains energized until the relay current is interrupted by pressing the OVERLOAD RESET switch SW_{12}. The armature then returns to its relaxed position and closes the pair of contacts which applies energizing current to relay RY_1 and thus restores the plate power to the transmitter.

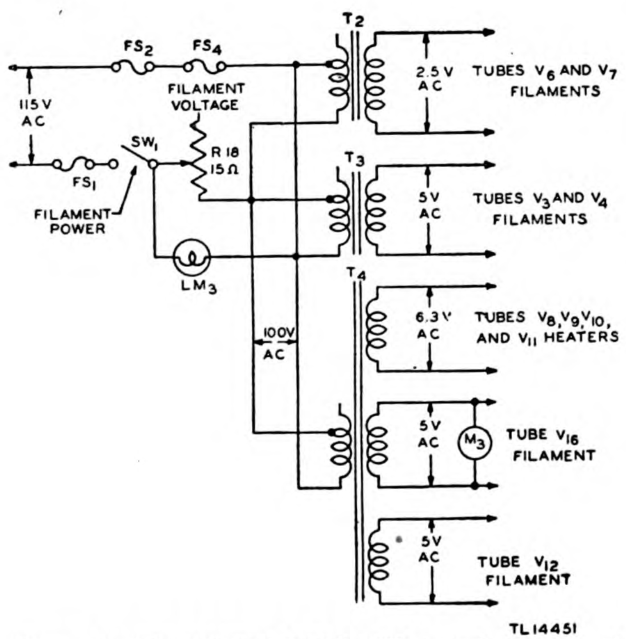


Figure 77. FILAMENT VOLTAGE control—functional diagram.

143. Controls and Meters

a. Filament Voltage Control Resistor R_{18} (fig. 77). FILAMENT VOLTAGE control resistor R_{18} is located on the lower front panel of the transmitter. It controls the filament voltage to tubes V_3, V_4, V_6, V_7, V_{12}, and V_{16} and the heater voltage to tubes V_8, V_9, V_{10}, and V_{11}. Resistor R_{18} is connected in series with the line voltage and the 100-volt taps on the primary windings of transformers T_2, T_3, and T_4. Correct filament voltage is obtained from secondary windings on these transformers by proper adjustment of the primary voltage.

b. Modulator Bias Control Resistor R_{12} (fig. 62). The MODULATOR BIAS control resistor R_{12} is located on the lower front panel of the transmitter. It adjusts the bias voltage to modulator tubes V_3 and V_4. Resistor R_{12} also serves in conjunction with resistor R_{11} as a bleeder resistor for the bias-voltage power supply.

c. Excitation Meter M_1 (fig. 71). The excitation meter indicates through a suitable switching arrangement, the buffer-doubler plate current, the intermediate-amplifier grid and plate currents, and the final p-a grid current. The excitation meter is a d-c milliameter having scales of 0 to 15 ma, 0 to 150 ma, and 0 to 300 ma. When the EXCITATION METER SWITCH SW_8 is set to DOUBLER PLATE, meter M_1 is connected across resistor R_{33}, which is in the plate circuit of buffer-doubler tube V_9. The meter indicates the buffer-doubler plate current on the 0- to 150-ma scale. Resistor R_{33} is the meter shunt resistor. When switch SW_8 is set to INT. AMP. GRID, meter M_1 is connected across resistor R_{28}, which is in the grid circuit of intermediate-amplifier tubes V_{10} and V_{11}. The meter indicates the intermediate-amplifier grid current on the 0- to 15-ma scale. Resistor R_{28} is the meter shunt resistor. When switch SW_8 is set to INT. AMP. PLATE, meter M_1 is connected across resistor R_{27}, which is in the plate circuit of intermediate-amplifier tubes V_{10} and V_{11}. The meter indicates the intermediate-amplifier plate current on the 0- to 300-ma scale. Resistor R_{27} is the meter shunt resistor. When switch SW_8 is set to P. A. GRID, meter M_1 is connected across resistor R_{26} which is in the grid circuit of p-a tube V_{16}. The meter indicates the p-a grid current on the 0- to 150-ma scale; resistor R_{26} is the meter shunt resistor.

d. P. A. PLATE METER M_2 (fig. 65). P. A. PLATE meter M_2 is a 0- to 500-ma, d-c milliameter located on the front panel of the transmitter. Its purpose is to indicate the d-c plate current of p-a tube V_{16}. The meter is connected in the high-voltage plate lead to tube V_{16}, and is isolated from the radio frequency in the tank coil by r-f choke coil CH_4 and bypass capacitor C_{11}.

e. FIL. VOLTAGE METER M_3 (fig. 66). Filament voltage meter M_3 is a 0- to 10-volt a-c voltmeter located on the front panel of the transmitter. It indicates the filament voltage to p-a tube V_{16}. The meter is connected directly across the filament winding of transformer T_4 which supplies filament current to p-a tube V_{16}. Since the primary windings of transformers T_2, T_3, and T_4 are connected in parallel and receive a-c primary current through the common variable resistor R_{18}, it necessarily follows that when resistor R_{18} is adjusted so that meter M_3 indicates the correct voltage across the filament winding of transformer T_4, the filament voltages supplied by transformers T_2 and T_3 will also be nearly correct.

Section III. THEORY OF SPEECH AMPLIFIER BC–614–E

144. First A-F Amplifier (fig. 78)

Tube V_{101} (Tube JAN–6SQ7 (VT–103)) is connected as a triode in a Class A resistance-coupled amplifier stage. Its purpose is to amplify the output of dynamic Microphone T–50 or remote Telephone EE–8–( ). The tube is self-biased as a result of the d-c voltage drop across the cathode-bias resistor R_{106}. Plate voltage is furnished by the power supply in the speech amplifier, and is applied to the plate of tube V_{101} through a decoupling resistor R_{128} and plate-load resistor R_{107}. Capacitor C_{113} is the a-f bypass capacitor for decoupling resistor R_{128}. The filter, consisting of resistor R_{128} and capacitor C_{113}, prevents feedback from succeeding stages because of coupling through the common impedance of the power supply. The network in the grid circuit, consisting of resistors R_{101}, R_{102}, R_{103}, R_{104}, and R_{105}, is designed to properly match the impedance of either dynamic Microphone T–50 or a telephone line, the far end of which is connected to a field Telephone EE–8–( ). Microphone T–50 requires high-impedance input; Telephone EE–8–( ) requires a low-impedance input. In addition to matching impedance, the network also provides the correct attenuation of the input a-f voltage when using Microphone T–50 or field Telephone EE–8–( ). This is a necessary function because the output voltage levels of Microphone T–50 and Telephone EE–8–( ) differ considerably. Solution of the resistance network, consisting of resistors R_{101}, R_{102}, R_{103}, R_{104}, and R_{105}, yields the equivalent circuits shown in figure 78(A) and (B). Figure 78(A) is an equivalent circuit of the 1st a-f amplifier stage when using Microphone T–50; figure 78(B) is an equivalent circuit when using remote Telephone EE–8–( ). In either case, the a-f voltage applied to the grid of tube V_{101} is, in effect, obtained from a tap on a voltage divider. When using Microphone T–50, the microphone output voltage is attenuated approximately 15 decibels; when using remote Telephone EE–8–( ), the degree of attenuation is approximately 20 decibels. Capacitor C_{130} is an r-f bypass capacitor to prevent high-frequency interference from affecting the amplifier when the input is connected to a telephone line. The output voltage of tube V_{101} is developed across resistor R_{107} and is applied to the grid of the second a-f amplifier through audio-coupling capacitors C_{102} and C_{119}.

145. Second A-F Amplifier (fig. 79)

Tube V_{102} (Tube JAN–6J5 (VT–94)) is operated as a Class A resistance-coupled amplifier stage. Its purpose is to amplify the output of the first a-f amplifier tube V_{101} and to amplify the output of a carbon microphone when one is used. Bias voltage is provided partly by the modulation limiter and partly from the self-biasing action of resistor R_{112} in the cathode circuit. The action of the modulation limiter is described in paragraph 148. Plate voltage is applied through decoupling resistor R_{127} and plate-load resistor R_{113}. Capacitor C_{112} is the a-f bypass capacitor for decoupling resistor R_{113}. The decoupling filter consisting of resistor R_{127} and capacitor C_{112} performs the same function as the decoupling filter described in paragraph 144. When a dynamic microphone or field telephone is used, the output voltage of the first a-f stage is impressed on the grid of tube V_{102} through coupling capacitor C_{102}, resistor R_{108}, potentiometer R_{111} (gain control), and another coupling capacitor C_{119}. Capacitor C_{119} also serves as a d-c blocking capacitor for the bias voltage supplied by the modulation limiter. The purpose of resistor R_{108} is to provide a more constant plate-load impedance for tube V_{101} as the gain control R_{111} is varied. This improves the low-frequency response of the amplifier at low settings of gain control R_{111}. Gain control R_{111} controls the output of the speech amplifier when using a dynamic

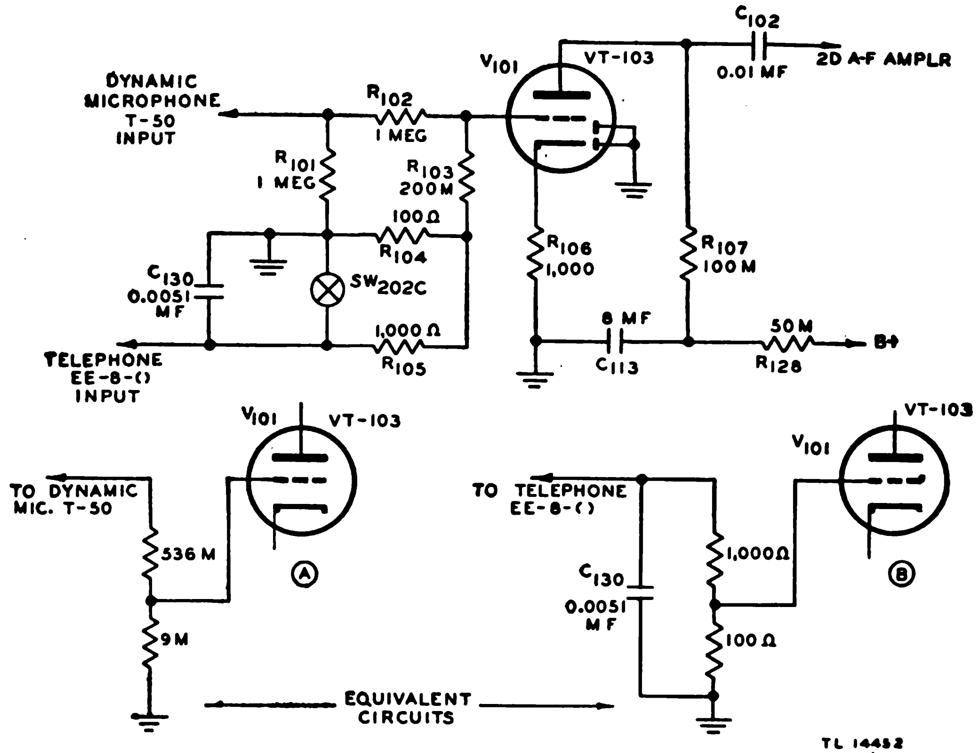


Figure 78. First a-f amplifier stage—functional diagram.

microphone or field telephone. When a carbon microphone is used, a-f voltage is developed across the secondary winding of transformer T_{101} and is applied to the grid of tube V_{102} through resistor R_{110} and potentiometer R_{123}. Potentiometer R_{123} controls the output of the speech amplifier when using a carbon microphone. Resistor R_{110} and potentiometer R_{123} serve as a terminating resistance for transformer T_{101}. In addition, resistor R_{110} isolates the secondary winding of transformer T_{101} from the grid circuit of tube V_{102}, and thus effectively prevents the winding from lowering the plate-load impedance for tube V_{101} in case the gain control for the carbon microphone is left open when using a dynamic microphone or field telephone. Current for the carbon microphone is obtained from the speech-amplifier power supply, and is applied to the microphone through resistor R_{124} and the primary winding of transformer T_{101}. Resistor R_{142} is connected in parallel with the carbon microphone. It limits the current through the microphone to approximately 25 ma. Resistor R_{124} and capacitors C_{120} and C_{110} form a pi-section filter which filters all a-c hum voltage from the current supplied to the microphone. Capacitor C_{129} is connected across the microphone and serves as a high-frequency bypass capacitor to reduce microphone hiss and r-f interference which may enter the amplifier by way of the microphone cord. The output voltage of tube V_{102} is developed across resistor R_{113} and is applied to the third a-f stage through audio-coupling capacitor C_{103}.

146. Third A-F Amplifier and Phase Inverter (fig. 80)

Tube V_{103} (Tube JAN-6SN7 (VT-231)) is connected in a self-balancing phase inverter circuit. The tube contains two triode sections in the same envelope. One section functions as a conventional resistance-coupled amplifier; the other section provides the 180° phase reversal required to excite the grids of the fourth a-f push-pull amplifier stage. The tube is self-biased as a result of the d-c voltage drop across cathode-bias resistor R_{115}. Capacitor C_{104} is the a-f bypass capacitor for resistor R_{115}. Plate voltage for each section of the tube is applied through decoupling resistor R_{126} and plate-load resistors R_{116} and R_{117} respectively. Capacitor C_{111} is the a-f bypass capacitor for decoupling resistor R_{126}. The a-f signal from tube V_{102} is applied to the grid of the amplifier section of twin triode tube V_{103} through coupling capacitor C_{103}. The output signal from the amplifier section of tube V_{103} is applied to grid 1 of tube V_{104} through capacitor C_{105}. This signal also appears across the series-resistance path consisting of resistors R_{118} and R_{120}. The portion of this signal appearing across resistor R_{120} provides grid excitation for the phase-inverter section

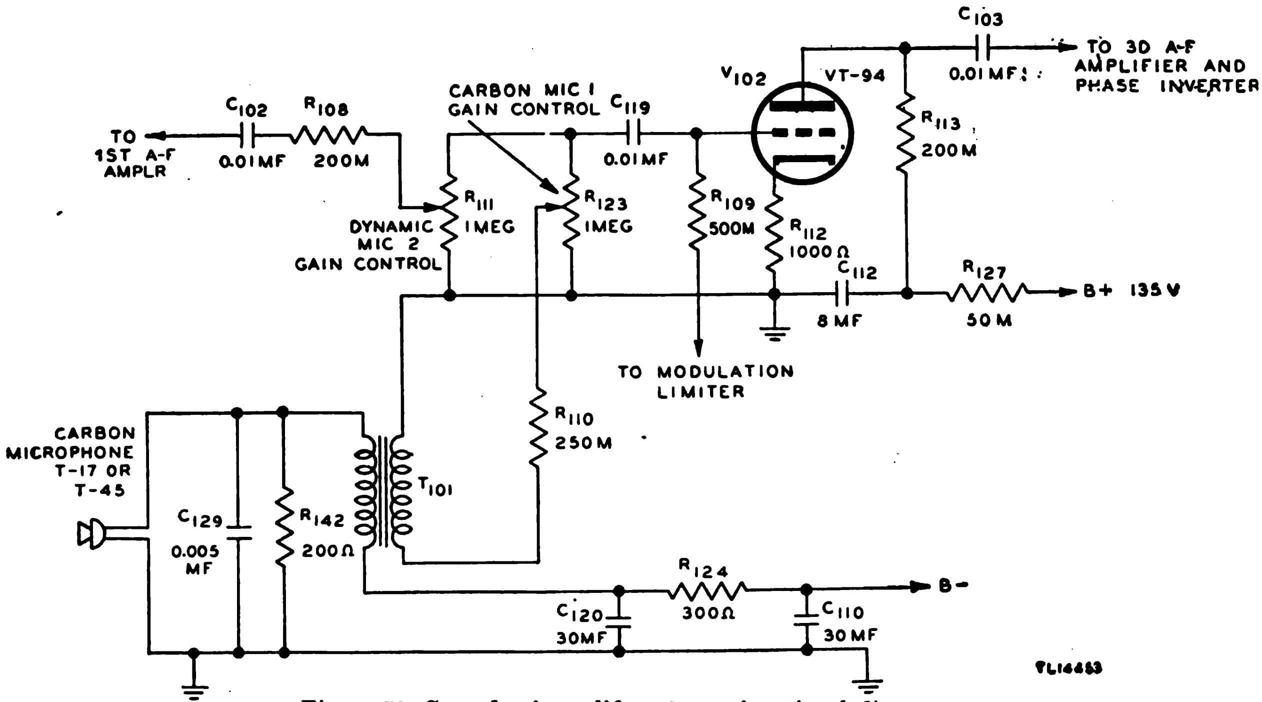


Figure 79. Second a-f amplifier stage—functional diagram.

of tube V_{103}. The plate circuit of this section of tube V_{103} provides, through capacitor C_{106}, a signal for grid 2 of tube V_{104} which is opposite in polarity at any instant to the signal applied to grid number 1 of tube V_{104}. This signal voltage also appears across resistors R_{119} and R_{120}. Resistors R_{118} and R_{119} are equal in resistance value. As the signal applied to grid 1 of tube V_{104} becomes greater than the signal applied to grid 2, the polarity, at any instant, of the voltage developed across resistor R_{120} is such as to cause greater instantaneous output from the phase inverter section of tube V_{103}. The two grids of tube V_{104} are therefore excited almost equally, and the voltage drop across resistor R_{120}, caused by the signal applied to grid 1 of tube V_{104}, is almost cancelled by a voltage of opposite polarity and nearly equal amplitude caused by the signal applied to grid 2 of tube V_{104}. The remaining uncancelled voltage across resistor R_{120} corresponds to the unbalance between the signals applied to the two grids of tube V_{104}. This unbalanced voltage then excites the grid of the phase-inverter section of tube V_{103} so that the output of the phase inverter tends to reduce the unbalance. The high gain of tube V_{103} results in a very small percentage of unbalance, even with considerable variations in the two sections of tube V_{103} and variations in circuit constants.

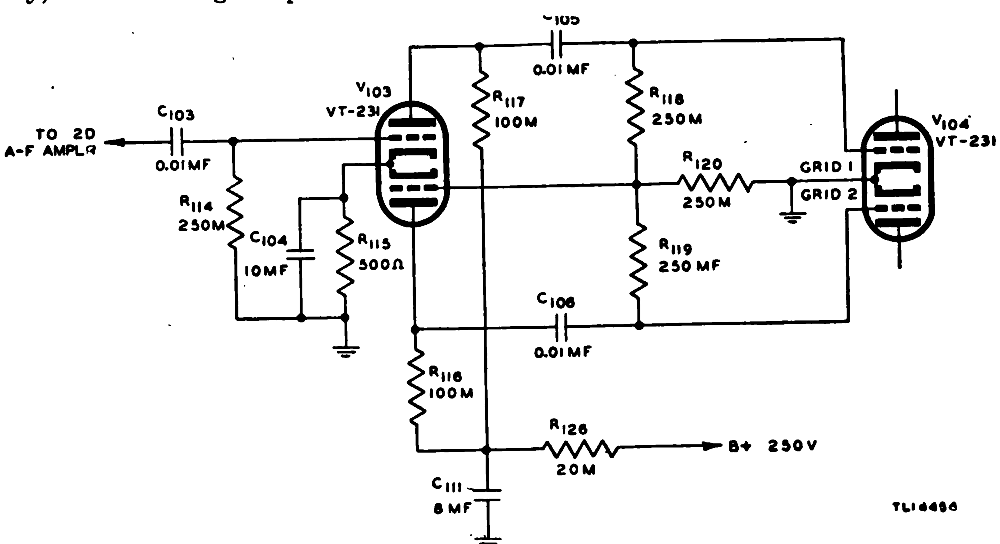


Figure 80. Third a-f amplifier and phase inverter—functional diagram.

147. Fourth A-F Amplifier (fig. 81)

Tube V_{104} (Tube JAN–6SN7 (VT–231)) is connected in a Class A push-pull amplifier stage. Its purpose is to amplify the output of the third a-f amplifier stage sufficiently to excite the grids of the push-pull driver stage located in the transmitter. The tube is self-biased as a result of the d-c voltage drop across cathode-bias resistor R_{121} which is bypassed for audio frequencies by capacitor C_{107}. Plate voltage is obtained from the speech-amplifier

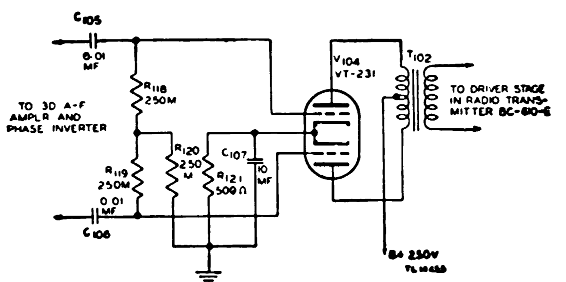


Figure 81. Fourth a-f amplifier stage—functional diagram.

power supply, and is applied to the plates of the tube through the center tap on the push-pull output transformer T_{102}. Transformer T_{102} is designed to match the plate-to-plate impedance of tube V_{104} to a 500-ohm transmission line. Grid excitation for tube V_{104} is provided by the third a-f amplifier and phase inverter. The a-f output voltage appearing across the secondary winding of the output transformer is fed to the driver stage in the transmitter over a 500-ohm transmission line.

148. Modulation Limiter (fig. 82)

Tube V_{105} (Tube JAN–6SR7 (VT–233)) is connected in a modulation limiter circuit. Its purpose is to produce a d-c control voltage which is proportional to the peak amplitude of the speech-amplifier output voltage. This d-c control voltage is then used to bias the second a-f amplifier tube; its effect is to vary the gain of the second a-f amplifier tube V_{102} in inverse proportion to the amplitude of the output voltage of the speech amplifier. Tube V_{105} performs two functions: The triode section of the tube functions as an a-f amplifier, and the two diodes are connected in a full-wave rectifier circuit. The tube is self-biased as a result of the d-c voltage across cathode-bias resistor R_{131} and plate voltage is applied through decoupling resistor R_{129} and plate-load resistor R_{130}. Capacitor C_{115} is the a-f bypass capacitor for resistor R_{129}. Excitation voltage for the grid of tube V_{105} is obtained from one of the grids of tube V_{104} through potentiometer R_{134}, the modulation LIMITER CONTROL. The a-f output voltage of tube V_{105} appears across resistor R_{130} and is applied to the primary winding of transformer T_{104} through audio-coupling capacitor C_{114}. The a-f voltage appearing across the secondary winding of transformer T_{104} is applied to the two diodes of tube V_{105} and the diodes are returned to ground through the center tap of the secondary winding and diode load resistor R_{133}. The rectified a-f voltage which appears across resistor R_{133} is filtered by an RC (resistance-capacitance) network consisting of resistor R_{132} and capacitor C_{116}. The d-c voltage appearing across capacitor C_{116} is ap-

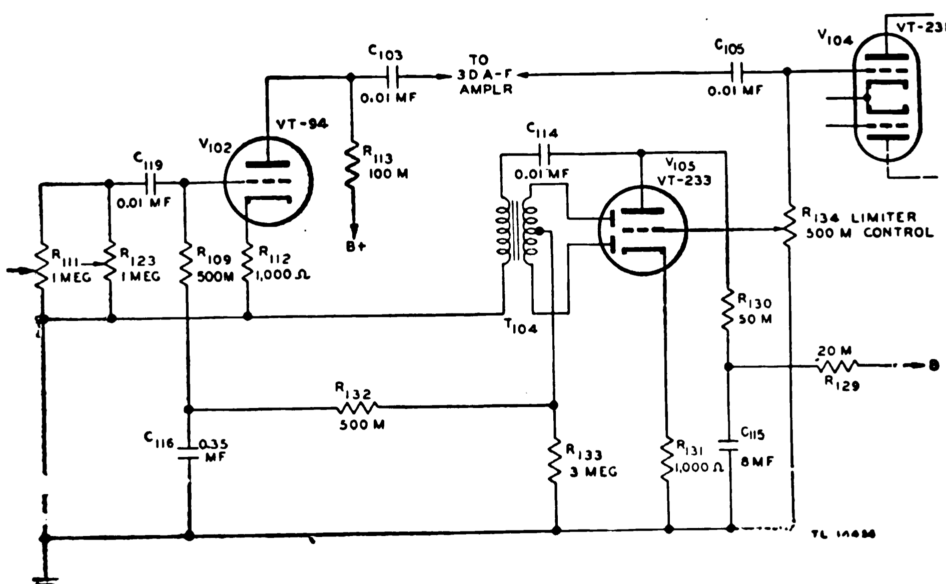


Figure 82. Modulation limiter circuit—functional diagram.

proximately equal to the peak amplitude of the signal applied to the diodes of tube V_{105}, and this d-c voltage is applied to the grid of tube V_{102} through resistor R_{109}. Tube V_{102} is operated on the curved portion of its mutual characteristic curve. Under this condition the transconductance of the tube varies rapidly with variations in grid bias; that is, an increase in grid bias decreases the transconductance, and vice versa. When the LIMITER CONTROL (potentiometer R_{134}) has been properly adjusted, the modulation limiter provides a minimum of 3 decibels compression at 100 percent modulation; this has the effect of raising the average modulation level approximately 7 decibels without exceeding 100 percent modulation on voice peaks. For the adjustment procedure for the LIMITER CONTROL see paragraph 197.

149. C-W Sidetone

a. SIDETONE OSCILLATOR (fig. 83). Tube V_{106} (Tube JAN–6SN7 (VT–231)) is connected in a multivibrator circuit. Its purpose is to generate a sidetone signal for monitoring the c-w transmission. When the transmitter is keyed, the cathode circuit of tube V_{106} is completed to ground through the contacts on switch SW_{206B} and relay RY_{200}. The multivibrator circuit is essentially a two-stage, resistance-coupled amplifier in which the voltage developed by the output of the second tube is fed back to the input of the first tube. Tube V_{106} is a dual triode tube and is self-biased as a result of the d-c voltage drop across the cathode-bias resistor R_{136}. Capacitor C_{128} is the a-f bypass capacitor for resistor R_{136}. Plate current flow through the left-hand triode of tube V_{106} causes a voltage drop across plate-load resistor R_{139}. This voltage drop is applied to the grid of the right-hand triode through capacitor C_{118}. This change of grid voltage produces a corresponding change of plate current and voltage drop across plate-load resistor R_{140}. The voltage drop across resistor R_{140} is then applied to the grid of the left-hand triode through capacitor C_{117}. Resistor R_{135} is the grid resistor for one triode section; resistor R_{138} in series with potentiometer R_{137} forms the grid resistor for the other triode section. The frequency oscillation is determined by the values of coupling capacitors C_{117} and C_{118} and the grid resistors. The audio output of the sidetone oscillator appears across potentiometer R_{137}.

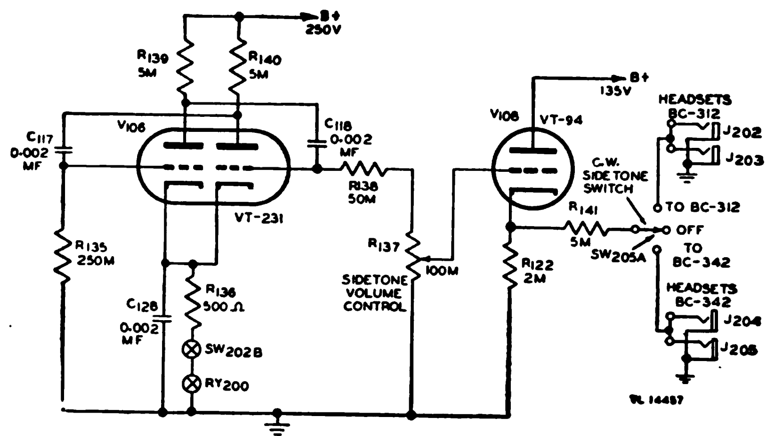


Figure 83. Sidetone oscillator circuit—functional diagram.

b. SIDETONE AMPLIFIER (fig. 83). Tube V_{108} (Tube JAN–6J5 (VT–94)) is connected as a cathode-follower amplifier. Its purpose is to isolate the headphones from the sidetone oscillator and to provide a low-impedance output to which the headphones are connected. This stage, strictly speaking, is not an amplifier because theroetically the gain of the stage can never exceed unity and practically the gain of a cathode-follower stage is in the range of 0.6 to 0.8. In this type of amplifier, the plate of the tube is connected directly to B+; and the cathode-bias resistor serves as the load resistor. Resistor R_{122} is the cathode-bias resistor for tube V_{108} and also acts as the load resistor. Grid excitation voltage for tube V_{108} is obtained from the movable contact on potentiometer R_{137} which also serves as the d-c grid return to ground. Potentiometer R_{137} controls the volume level of the sidetone signal applied to the grid of tube V_{108}; resistor R_{138} limits the maximum signal that can be applied to approximately two-thirds the available output of the sidetone oscillator. The output voltage appearing across R_{122} is applied to the headphones through resistor R_{141}. The output impedance of tube V_{108}

is approximately 300 ohms; accordingly, resistor R_{141} is connected in series with the cathode of tube V_{108} and the headphones to provide a better impedance match.

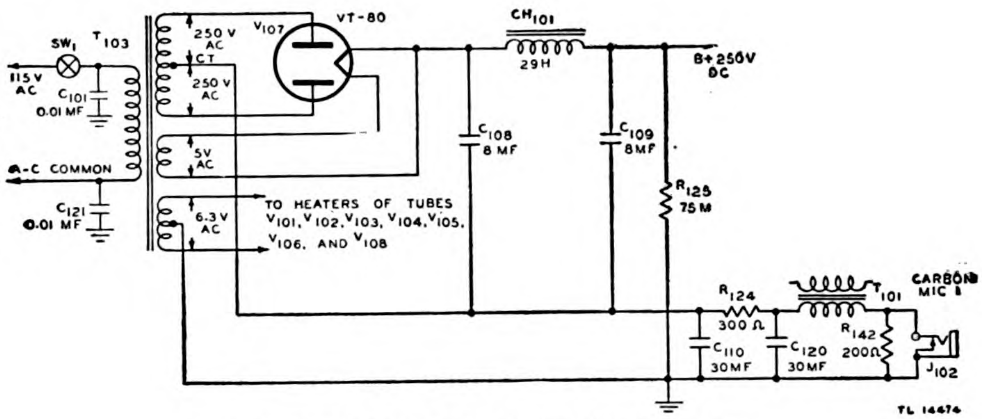


Figure 84. Power supply—functional diagram.

150. Power Supply (fig. 84)

Plate and filament voltage for the tubes in the speech amplifier, and microphone current for a carbon microphone is supplied by the speech-amplifier power supply. Transformer T_{103} furnishes all tubes with a-c filament voltage, and in addition it supplies the a-c plate voltage for rectifier tube V_{107}. Tube V_{107} (Tube JAN–80 (VT–80)) is connected in a full-wave rectifier circuit. The rectified output voltage is applied to a pi-section filter consisting of filter choke coil CH_{101} and filter capacitors C_{108} and C_{109}. Resistor R_{125} is the bleeder resistor for the speech-amplifier power supply. The primary leads to transformer T_{103} are bypassed for radio frequency by capacitors C_{101} and C_{121}. Lamp LM_{101} is connected across the 6.3-volt winding of the power transformer. It lights a red jewel on the front of the speech amplifier when the power is turned on by means of the FILAMENT POWER switch located on the front panel of the transmitter.

151. Jacks, Controls, and Meters

a. Microphone T–17 or T–45 (fig. 85). The control and jack marked CARBON MIC. 1, located on the upper left-hand side of the front panel of the speech amplifier, are for use with carbon Microphones T–17 or T–45. The cords of these microphones are equipped with Plugs PL–68. Jack J_{102} is a two-circuit jack which accommodates a Plug PL–68. One pair of contacts on jack J_{102} is normally closed; these contacts short circuit resistor R_{142}. When a microphone is plugged into jack J_{102}, the closed contacts open and connect the microphone in series with the primary winding of transformer T_{101} and the microphone current supply. Another contact on jack J_{102} completes a 12-volt d-c circuit through relay RY_{200} (located in Junction Box JB–70–A) and the microphone switch. The CARBON MIC. 1 control (resistor R_{123}) functions as a gain control for the speech amplifier when using a carbon microphone. (See fig. 79.)

b. Dynamic Microphone T–50 (fig. 86). The control and socket marked DYNAMIC MIC. 2, located on the upper left-hand side of the front panel of the speech amplifier, are for use with a dynamic Microphone T–50. The cord for the dynamic microphone is equipped with an amphenol connector which fits into sockets SO_{101}. When a dynamic microphone is connected to socket SO_{101}, the a-f signal from the microphone is applied to the amplifier through pins 1 and 3. The microphone switch completes a 12-volt d-c circuit to ground

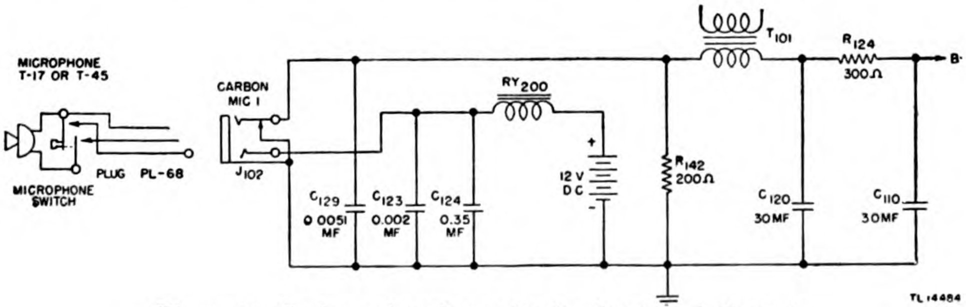


Figure 85. Carbon microphone circuit—functional diagram.

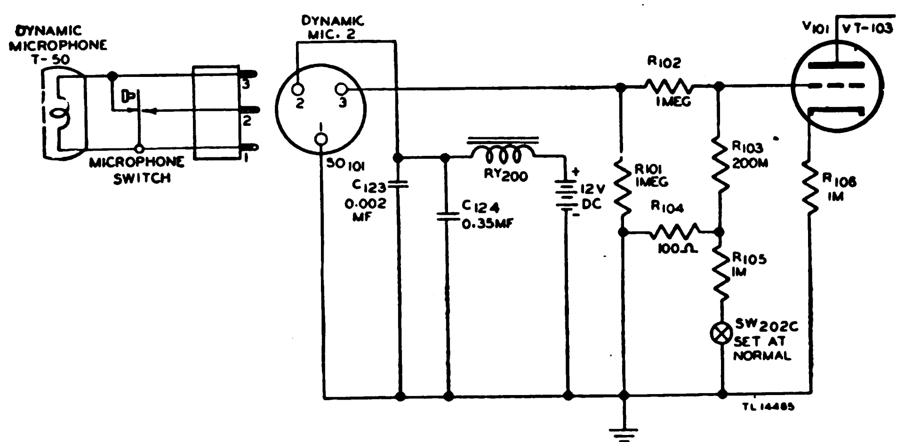


Figure 86. Dynamic microphone circuit—functional diagram.

through pin No. 2 on socket SO_{101} and relay RY_{200}. Capacitor C_{123} is an r-f bypass to prevent high-frequency interference from entering the amplifier by way of the microphone cords. Capacitor C_{124} prevents sparking at the microphone switch contacts when breaking the d-c current through relay RY_{200}. The DYNAMIC MIC. 1 control (resistor R_{111}) functions as a gain control for the speech amplifier when a dynamic miscrophone or field telephone is used to modulate the transmitter. (See fig. 79.)

c. Modulation Limiter Control. The LIMITER CONTROL (resistor R_{134}) (fig. 82) is located on the front panel of the speech amplifier behind a cover plate. Its purpose is to control the amplitude of the a-f signal applied to the modulation limiter tube V_{105}. The control is provided with a slotted shaft which is accessible when the cover plate is removed. See paragraph 197 for instructions as to the proper procedure for adjusting the modulation limiter control.

d. Sidetone Volume Control. The sidetone volume control (fig. 83) is located on the rear side of the speech-amplifier chassis. Its purpose is to control the amplitude of the a-f signal applied to the grid of the sidetone amplifier tube V_{10}.

e. Auxiliary Key Jack. The KEY jack located on the front panel of the speech amplifier is connected in the cathode circuit of oscillator tube V_8, located in the transmitter. The jack accommodates Plug PL–55. The transmitter can be keyed for c-w operation by inserting a key plug into this jack.

Caution: When the transmitter is keyed from this jack, the receiver disabling circuits do not operate. Therefore, be sure that neither radio receiver is tuned to the transmitter frequency or a harmonic thereof.

f. Modulator Plate Meter. The MODULATOR PLATE meter M_{101} (fig. 62) indicates the d-c current to the Class B modulator tubes V_3 and V_4. Correct zero-signal bias to tubes V_3 and V_4 is obtained by adjusting the MODULATOR BIAS control (located on the front panel of the transmitter) while observing the indication of the meter. When modulating the transmitter, the microphone gain controls are adjusted properly by observing the indication of the meter on voice peaks.

Section IV. THEORY OF JUNCTION BOX JB–70–A

Note. Junction Box JB–70–A (fig. 124) contains all the electrical circuits necessary for the control of Power Unit PE–95–( ), Radio Transmitter BC–610–E, and Radio Receivers BC–312–( ), BC–342–( ). A-c power outlets are provided for Rectifier RA–63–(*), lights, heater, blower, etc.

152. Transmitter Control Switch SW_{203}

a. General. The transmitter control switch SW_{203} is a three-position lever-key type of switch and is located on the front panel of the junction box. The switch is marked TRANS. ON TRANS. OFF REC. TO EE–8. The switch performs four major functions:

(1) Applies 115 a-c volts to coils of relays RY_1 and RY_4.

(2) Connects coil of relay RY_{200} to KEY jacks or remote telephone line through contacts on switch SW_{202B}.

(3) Connects remote telephone line through capacitor C_{202} and contacts on switch SW_{202C} to input of speech amplifier.

(4) Connects remote telephone line through capacitor C_{202} and contacts on switch SW_{202A} to the receiver outputs.

b. Trans. on Position (fig. 87).

(1) When switch SW_{203} is set to TRANS. ON and the REMOTE CONTROL EE–8 switch SW_{202} is set to NORMAL, switch SW_{203} performs two functions:

(*a*) Switch SW_{203} applies 115 a-c volts to relays RY_1 and RY_4. Relay RY_1 applies plate power to the transmitter; relay RY_4 is the antenna shorting relay. See paragraph 142 for a detailed description of the functions of these relays.

(*b*) Switch SW_{203} connects one side of the coil of relay RY_{200} to the KEY jacks located on the junction box. Relay RY_{200} is keyed during c-w operation. For a detailed description of relay RY_{200} see paragraph 154.

(2) When switch SW_{203} is set to TRANS. ON and switch SW_{202} is set to either TELEPHONE position, switch SW_{203} performs three functions:

(*a*) Switch SW_{203} applies 115 a-c volts to relays RY_1 and RY_4.

(*b*) Switch SW_{203} applies 12 d-c volts to the coil of relay RY_{200}.

(*c*) Switch SW_{203} connects the ungrounded REMOTE TELEPHONE terminal through capacitor C_{202} to the grid of the first a-f amplifier tube V_{101}.

(3) When switch SW_{203} is set to TRANS. ON and switch SW_{202} is set to either TELEGRAPH position, switch SW_{203} performs two functions:

(*a*) Switch SW_{203} applies 115 volts a-c to relays RY_1 and RY_4.

(*b*) Switch SW_{203} connects one side of the coil of relay RY_{200} to the ungrounded REMOTE TELEPHONE terminal of the junction box. The transmitter can then be keyed from the far end of a telephone line connected to the REMOTE TELEPHONE terminals.

c. TRANS. OFF POSITION. In the TRANS. OFF position, all circuits to which switch SW_{203} is connected are open.

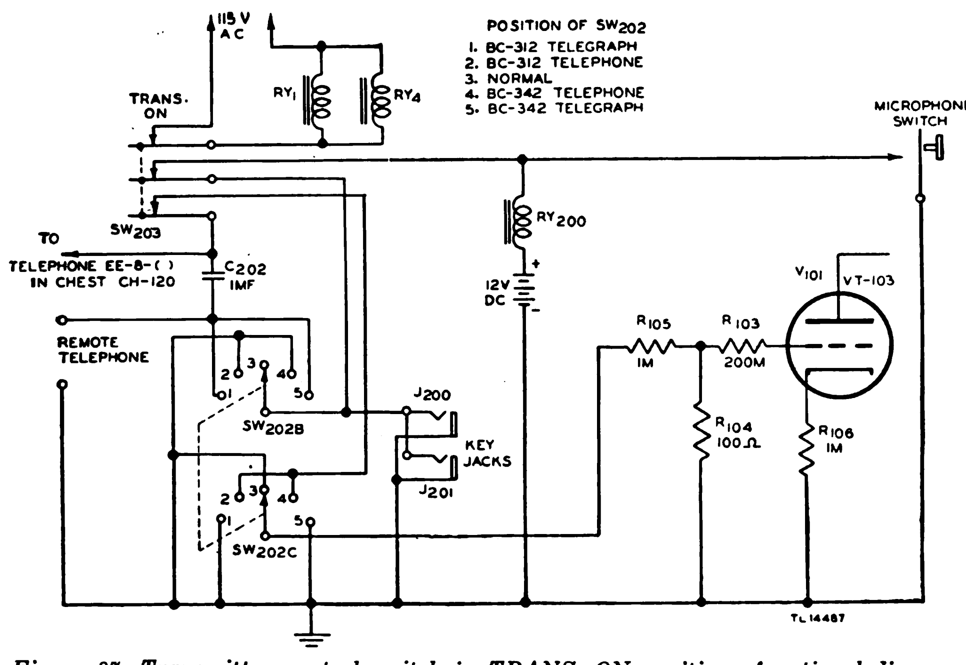


Figure 87. Transmitter control switch in TRANS. ON position—functional diagram.

d. REC. TO EE–8 POSITION (fig. 88). When switch SW_{203} is set to REC. TO EE–8 and switch SW_{202} is set to either TELEPHONE position, switch SW_{203} performs one function: Switch SW_{203} connects the output from either Radio Receiver BC–312–( ) or BC–342–( ) to the ungrounded REMOTE TELEPHONE terminal through capacitor C_{202}.

153. Remote Control EE–8 Switch SW_{202}

a. GENERAL. The remote control switch SW_{202} has three sections and five positions. Its functions are as follows:

(1) When switch SW_{203} is set to REC. TO EE–8, the A section of switch SW_{202} (fig. 88) switches the a-f outputs from either Radio Receiver BC–312–( ) or BC–342–( ) to the REMOTE TELEPHONE terminals of the junction box.

(2) When switch SW_{203} is set to the TRANS. ON position, the B section of switch SW_{202} (fig. 87) operates keying relay RY_{200} (for remote phone operation), or connects the keying relay to the ungrounded REMOTE TELEPHONE terminal of the junction box for remote keying of the transmitter.

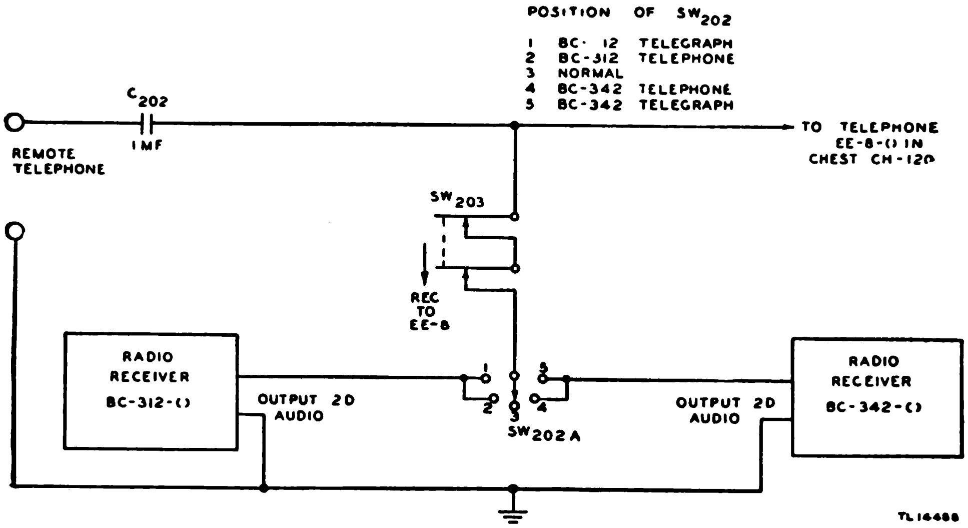


Figure 88. Transmitter control switch in REC. TO EE-8 position—functional diagram.

(3) When switch SW_{203} is set to the TRANS. ON position, the C section of switch SW_{202} (fig. 87) switches the input of the speech amplifier to the REMOTE TELEPHONE terminals of the junction box for remote modulation of the transmitter.

b. TELEGRAPH POSITIONS (fig. 87). When switch SW_{202} is set to either TELEGRAPH position and switch SW_{203} is set to TRANS. ON, switch SW_{202B} connects keying relay RY_{200} to the REMOTE TELEPHONE terminals of the junction box. The transmitter can then be keyed from the far end of a telephone line connected to the REMOTE TELEPHONE terminals. When switch SW_{203} is set to REC. TO EE-8, switch SW_{202A} connects the a-f output from Radio Receiver BC-312-( ) or BC-342-( ) to the telephone line. This enables the operator at the remote station to hear the signals received by either receiver. The choice of receivers depends on whether switch SW_{202} is set to the BC-312 or BC-342 position. Switch SW_{202C} grounds the Telephone EE-8 input to the speech amplifier. Capacitor C_{202} isolates the a-f circuits in the junction box from the d-c circuits.

c. TELEPHONE POSITIONS (fig. 87). When switch SW_{202} is set to either TELEPHONE position and switch SW_{203} is set to TRANS. ON, switch SW_{202B} completes the d-c circuit through relay RY_{200}, and switch SW_{202C} connects the REMOTE TELEPHONE terminals (through capacitor C_{202}) to the Telephone EE-8 input to the speech amplifier. This enables the operator at the remote station to voice modulate the transmitter by speaking into the microphone of the Telephone EE-8-( ) at the remote station. When switch SW_{203} is set to REC. TO EE-8, switch SW_{202A} connects the a-f output from either radio receiver to the telephone line. This enables the operator at the remote station to hear the signals received by either receiver. The choice of receivers depends on whether switch SW_{202} is set to the BC-312 or BC-342 position.

d. NORMAL POSITION (fig. 87). When switch SW_{202} is set to NORMAL, switch SW_{202C} grounds the Telephone EE-8 input to the speech amplifier.

154. Relay RY_{200} (fig. 89)

a. GENERAL. Relay RY_{200} is a five-pole, single-throw relay located in the junction box. This relay can be energized by keys plugged into either KEY jack, by the microphone switches, or by setting switches SW_{203} and SW_{202B} to TRANS. ON and TELEPHONE respectively. The relay can also be energized from a remote station by Key J-45 plugged into Junction Box JB-60-A. When energized relay RY_{200} performs the following functions:

(1) Keys the cathode circuit of the master (or crystal oscillator) and the c-w sidetone oscillator.

(2) Operates relays RY_1 and RY_4 in the transmitter for phone operation.

(3) Disables Radio Receivers BC-312-( ) and BC-342-( ).

b. KEYING CIRCUITS. When the transmitter is keyed for c-w operation, or when the microphone switches are pressed for phone operation, relay RY_{200} is energized. When energized by a microphone switch, one pair of contacts on relay RY_{200} applies 115 a-c volts to relays RY_1 and RY_4 located in the transmitter. When relay RY_{200} is keyed for c-w operation, this pair of contacts is short-circuited by contacts on switch SW_{203}. This is necessary to protect relays RY_1 and RY_4 from excessive wear. When relay RY_{200} is energized,

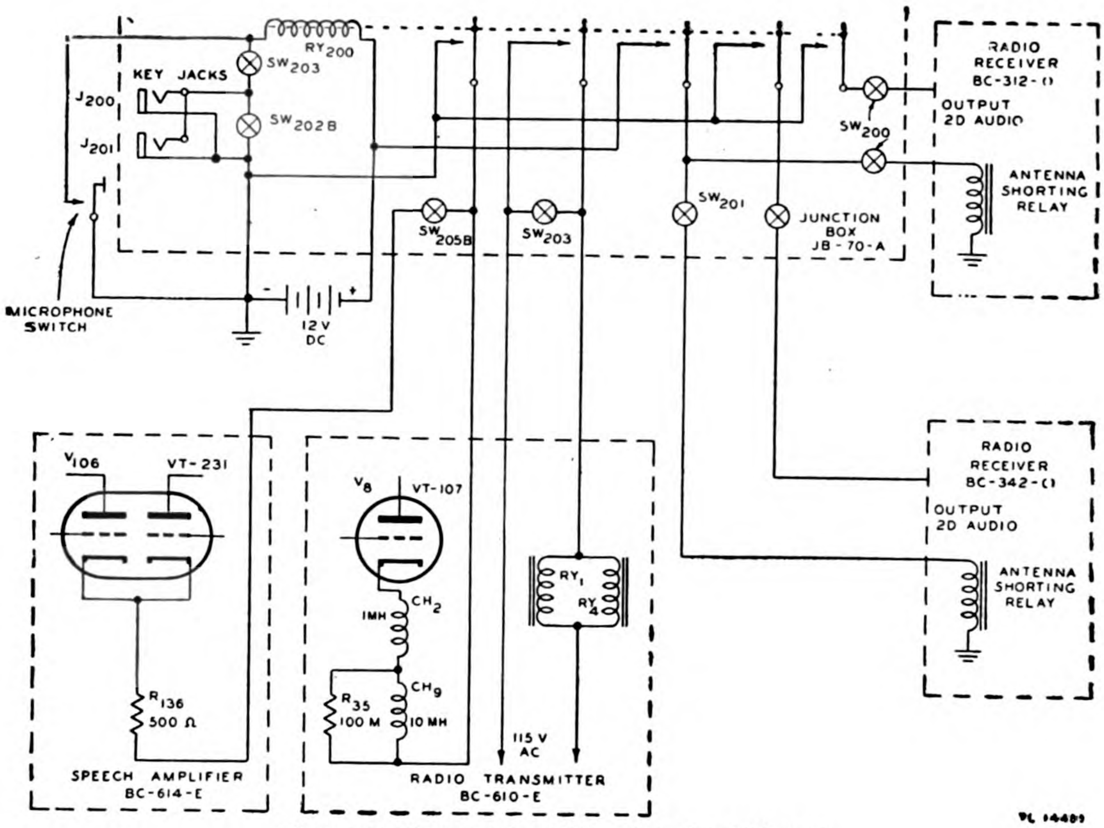


Figure 89. Keying relay RY_{200}—functional diagram.

another pair of contacts completes the cathode circuits of the m-o or crystal-oscillator tube V_8 and the c-w sidetone oscillator tube V_{106}. The C.W. SIDETONE switch SW_{202B} is also connected in the cathode circuit of tube V_{106}; its function is described in paragraph 157.

c. RECEIVER DISABLING CIRCUITS. One pair of contacts on relay RY_{200} applies 12 d-c volts (through switches SW_{200} and SW_{201}) to the antenna shorting relays in Radio Receivers BC–312–( ) and BC–342–( ). One pair of contacts grounds the audio output of Radio Receiver BC–312–( ) through switch SW_{200}; another pair of contacts ground the audio output of Radio Receiver BC–342–( ) through switches SW_{200} and SW_{201}. See paragraph 155 for a functional description of RECEIVER DISABLING switches SW_{200} and SW_{201}. Because of the close proximity of the receiving and transmitting antennas, the receiver input circuits are subjected to large amounts of r-f energy when the receivers are turned to the transmitter frequency or a harmonic of the transmitter frequency. Radio Receivers BC–312–( ) and BC–342–( ) are provided with antenna shorting relays. To prevent damage to the input circuits when the transmitter is operating, contacts on these relays ground the receiving antennas.

155. Receiver Disabling Switches SW_{200} and SW_{201} (fig. 90)

Switches SW_{200} and SW_{201} are double-pole, double-throw toggle switches. When these switches are thrown to the ON position and relay RY_{200} is energized, they perform two functions: One pair of contacts on switches SW_{200} and SW_{201} connects

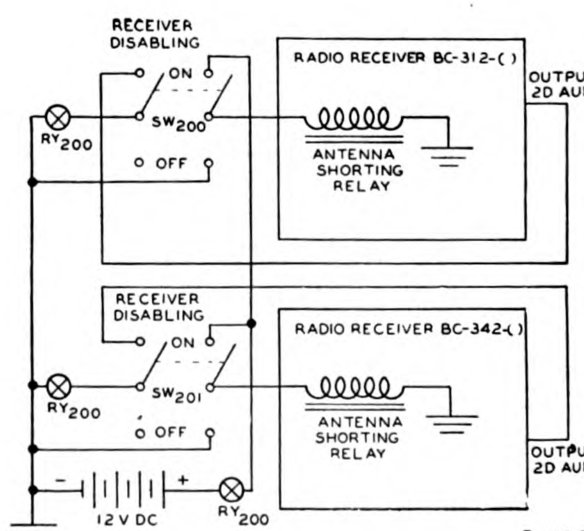


Figure 90. Receiver disabling switches—functional diagram.

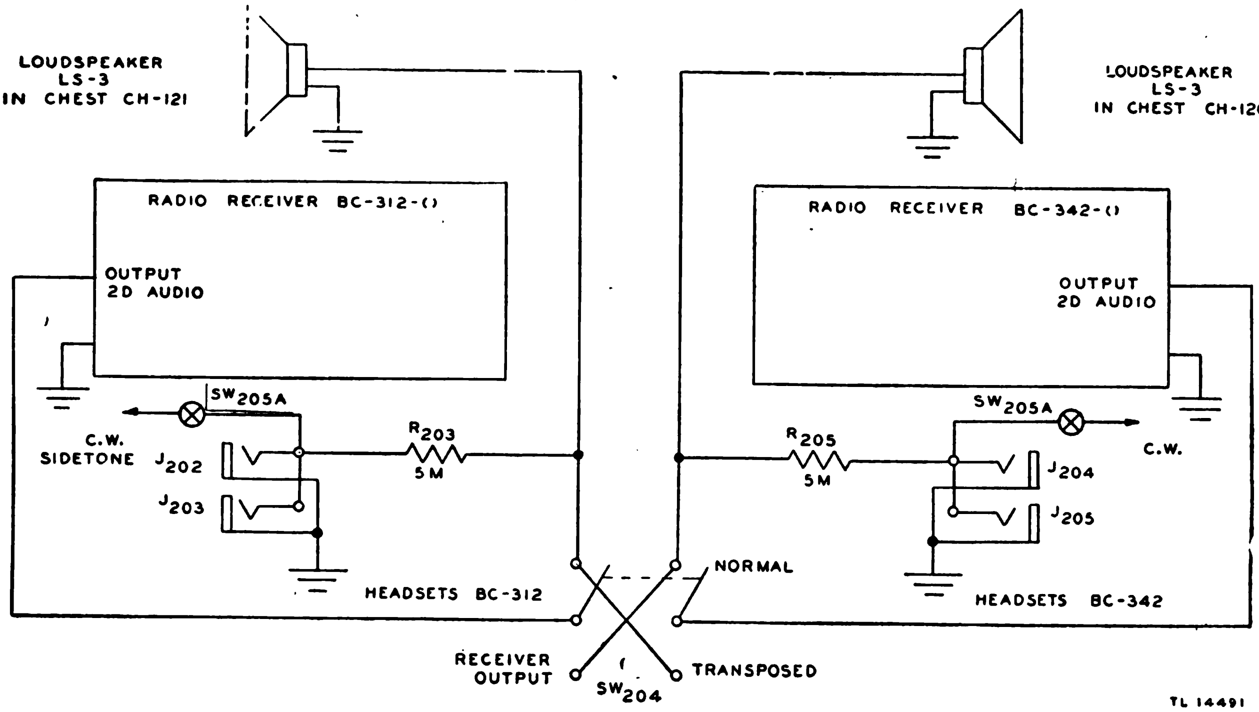


Figure 91. RECEIVER OUTPUT switch—functional diagram.

12 d-c volts to the antenna shorting relays; the other pair of contacts grounds the a-f outputs of the two receivers. Switch SW_{200} (BC–312) disables Radio Receiver BC–312–( ), and switch SW_{201} (BC–342) disables Radio Receiver BC–342–( ). When these two switches are thrown to the OFF position, the antenna shorting relays are grounded. See paragraph 154 for the functions of relay RY_{200}.

156. Receiver Output Switch SW_{204} (fig. 91)

Switch SW_{204} is a double-pole, double-throw toggle switch and it functions as follows: When switch SW_{204} is set to NORMAL, the a-f output of Radio Receiver BC–312–( ) is connected to the HEADSETS jacks mounted toward the left-hand side of the junction box and to Loudspeaker LS–3 located in Chest CH–121. The a-f output of Radio Receiver BC–342–( ) is connected to the HEADSETS jacks mounted toward the right-hand side of the junction box and to Loudspeaker LS–3 located in Chest CH–120. When switch SW_{204} is set to TRANSPOSE, the a-f output of Radio Receiver BC–312–( ) is connected to the right-hand HEADSETS jacks and to Loudspeaker LS–3 located in Chest CH–120. The a-f output of Radio Receiver BC–342–( ) is connected to the left-hand HEADSETS jacks and to Loudspeaker LS–3 located in Chest CH–121. By the use of switch SW_{204}, the operator at Radio Receiver BC–312–( ) can instantly switch his loudspeaker and headsets to the output of Radio Receiver BC–342–( ), and vice versa. Switch SW_{204} does not effect the functioning of the RECEIVER DISABLING switches. The a-f signal applied to the HEADSETS jacks is attenuated an appropriate amount by resistors R_{203} and R_{205}. These resistors also serve to isolate the headsets from the receiver output circuits to prevent grounding the c-w sidetone signal when the receivers are disabled.

157. C.W. Sidetone Switch SW_{205} (fig. 92)

Electrically, switch SW_{205} is a two-section, three-position switch. Its purpose is to complete the cathode circuit of the c-w sidetone oscillator tube V_{106} and to switch the c-w sidetone signal output of the sidetone amplifier tube V_{108} to either pair of HEADSETS jacks. When switch SW_{205} is set to position 1 (TO BC–312), the A section applies the sidetone signal to the left-hand HEADSETS jacks of the junction box; when the switch is set to position 3 (TO BC–342), the A section applies the sidetone signal to the right-hand HEADSETS jacks.

158. Start-Stop Switch SW_{206} (fig. 93)

Switch SW_{206} is used to start and stop Power Unit PE–95–( ). When the START button is pressed, current from the 12-volt battery in the power unit flows through the starting relay in the power unit.

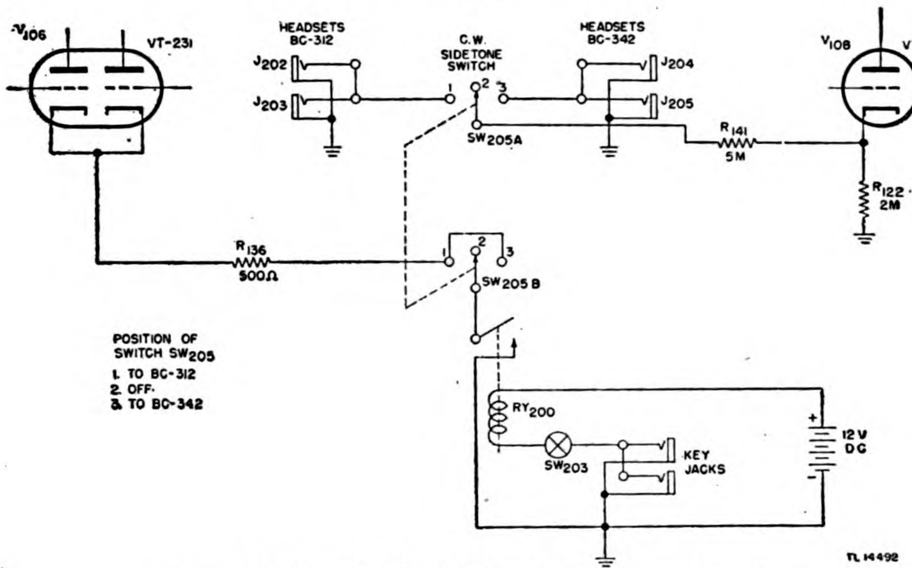


Figure 92. C. W. SIDETONE switch—functional diagram.

Contacts on the starting relay complete the starting circuit and start the motor of Power Unit PE–95–( ). When the STOP button is pressed,

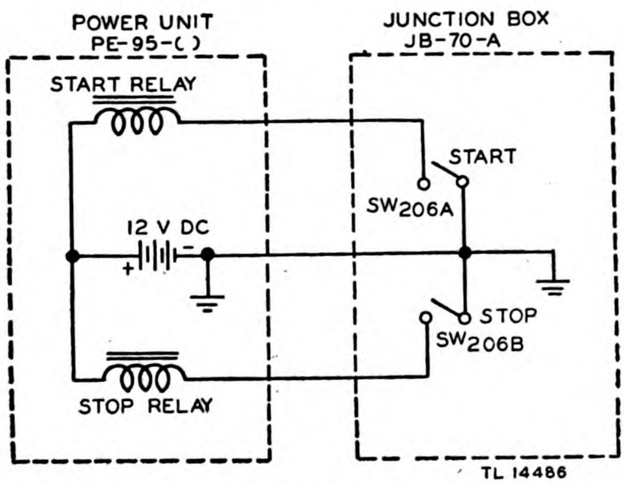


Figure 93. START-STOP switch—functional diagram.

current from the 12-volt battery flows through the stopping relay. Contacts on the stopping relay short-circuit the ignition system and stop the motor of Power Unit PE–95–( ).

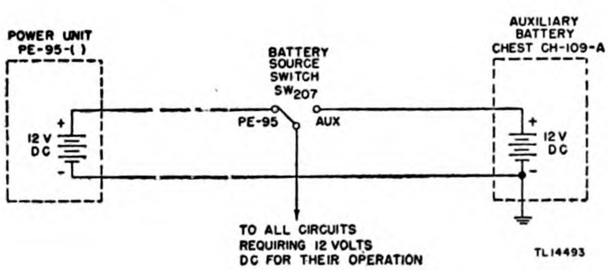


Figure 94. Battery source switch—functional diagram.

159. Battery Source Switch SW_{207} (fig. 94)

Switch SW_{207} is a single-pole, double-throw toggle switch. When switch SW_{207} is set to PE–95, the 12-volt storage battery located in the trailer with Power Unit PR–95–( ) is connected to all circuits requiring 12 d-c volts for their operation. When switch SW_{207} is set to AUX., the 12-volt d-c circuits are connected to the 12-volt storage battery in Chest CH–109–A. The negative terminals of the storage batteries are grounded and the positive terminals are connected to switch SW_{207}.

160. Circuit Breaker CB_{200} (fig. 124)

Circuit breaker CB_{200} is designed to break a current in excess of approximately 50 amperes. One side of the 115-volt a-c line from Power Unit PE–95–( ) is common to all equipment. The other side of the line is connected to the equipment through circuit breaker CB_{200}. The normal current required by the equipment passes through the circuit breaker without interruption; however, a short circuit on the line, or a load in excess of 50 amperes trips the circuit breaker. The circuit breaker can be reset by pressing the PRESS TO RESET button on the front of the junction box. When switch SW_{205} is set to position number 1 or 3, the B section grounds the cathode resistor R_{136} of the c-w sidetone oscillator tube V_{106} through a pair of contacts on relay RY_{200}. When switch SW_{205} is set to position number 2 (OFF) the c-w sidetone circuits are open.

161. Surge Filters

When the circuit to a coil carrying a current is broken, the magnetic field about the coil collapses. The collapsing magnetic field induces a back emf (electromotive force) in the coil that is proportional to the product of the inductance of the coil and the time rate of change of the current through the coil. The current through the coil changes very rapidly at the instant the circuit is broken; accordingly, the voltage induced in the coil may reach extremely high proportions. In a circuit containing

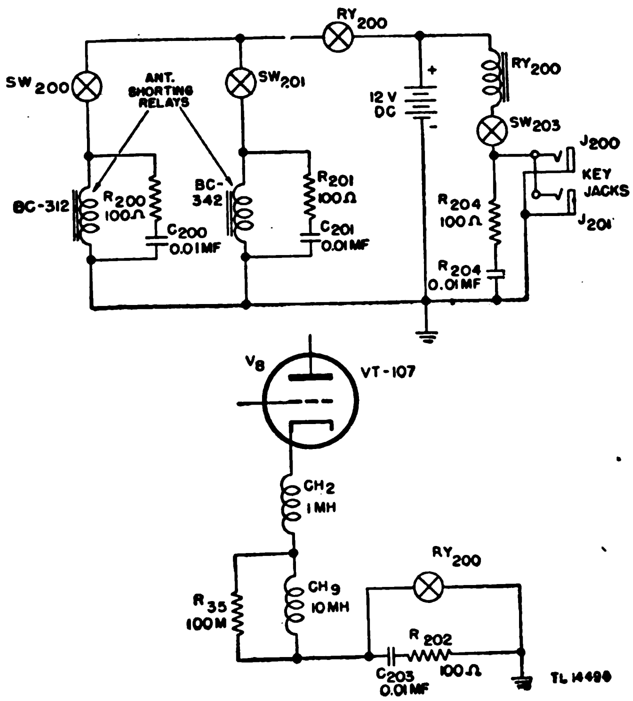


Figure 95. Surge filters—functional diagram.

inductance, a dissipative network is connected across the coil to prevent arcing at the contacts of the switch which breaks the current. This network, sometimes called a surge filter, consists of a resistor in series with a capacitor. In Junction Box JB–70–A there are four of these dissipative networks. (See fig. 95.) The action of a surge filter can best be shown by an example. When the transmitter is keyed for c-w operation, the current through relay RY_{200} is interrupted in accordance with the dots and dashes to be transmitted. When the current is interrupted, the back emf induced in the coil of relay RY_{200} charges capacitor C_{204} through resistor R_{204}. Capacitor C_{204} then discharges back through resistor R_{204} and the coil. However, the resistance of the coil together with resistor R_{204} is high enough that only a few highly damped oscillations occur and the transient voltage dies out in a very short period of time. Thus the back emf, induced in the coil at the instant the current is interrupted, is dissipated in the form of heat in resistor R_{204} and the resistance of the coil. The antenna shorting relays of Radio Receivers BC–312–( ) and BC–342–( ) are provided with surge filters consisting of resistor R_{200} with capacitor C_{200} and resistor R_{201} with capacitor C_{201}. Because of the inductance of choke coils CH_2, and CH_9 in the cathode circuit of oscillator tube V_8, a surge filter is required. This filter consists of capacitor C_{203} and resistor R_{202}.

Section V. OVER-ALL SYSTEM FUNCTION

162. General

Figure 96, an over-all system block diagram, shows the complete function of Radio Sets SCR–399–A and SCR–499–A. The major components of the radio set are: Radio Transmitter BC–610–E, Antenna Tuning Unit BC–939–A, Speech Amplifier BC–614–E, Junction Box JB–70–A, and Radio Receivers BC–312–( ) and BC–342–( ). The signal paths are as shown in figure 96.

163. C-W Operation

The transmitter uses a master or crystal oscillator which is keyed for c-w operation. To key the transmitter Key J–37 is connected to either KEY jack of Junction Box JB–70–A. The output of the oscillator is applied successively to the buffer-doubler, the i-p-a, and the p-a stages. The r-f power output of the p-a stage is approximately 400 watts in the 2- to 8-mc range, 300 watts in the 8- to 12-mc range, and 275 watts in the 12- to 18-mc range. The r-f output of the p-a stage is coupled to the transmitting antenna by means of Antenna Tuning Unit BC–939–A. Plate and screen-grid voltage for the oscillator buffer-doubler, and i-p-a tubes is supplied by the exciter power supply; plate voltage for the p-a tube is supplied by the high-voltage power supply; bias voltage for the i-p-a and p-a tubes is supplied by the bias power supply. The sidetone oscillator in the speech amplifier operates when the transmitter is keyed, and the output of the sidetone oscillator is applied to the sidetone amplifier. The output of the sidetone amplifier is connected to the HEADSETS jacks in the junction box through the C.W. SIDETONE switch. Keying the transmitter operates the receiver disabling circuits when the RECEIVER DISABLING switches in the junction box are set to ON. Figure 97 is a functional schematic wiring diagram of the transmitter, speech amplifier, and junction box for c-w operation.

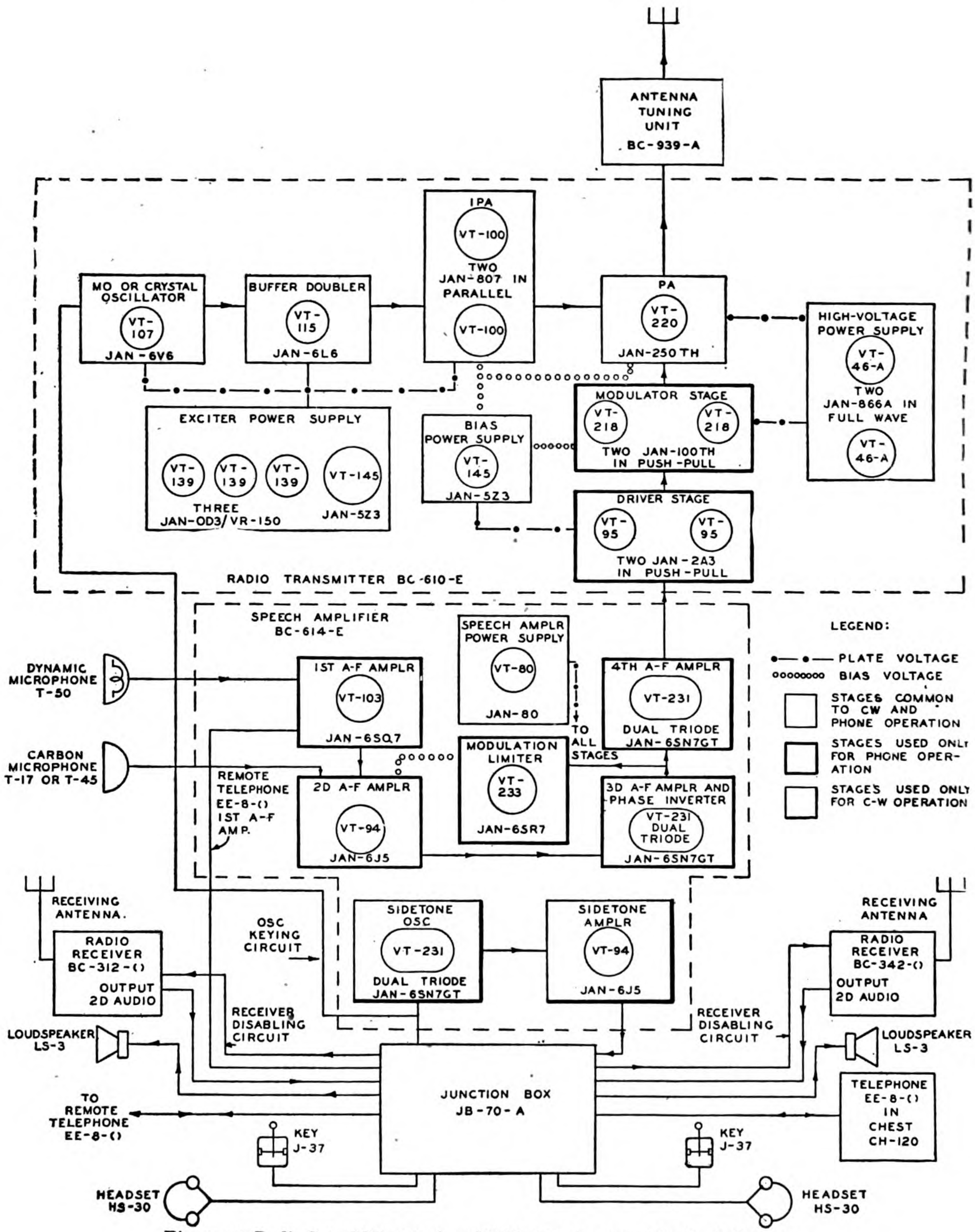


Figure 96. Radio Sets SCR-399-A and SCR-499-A—complete block diagram.

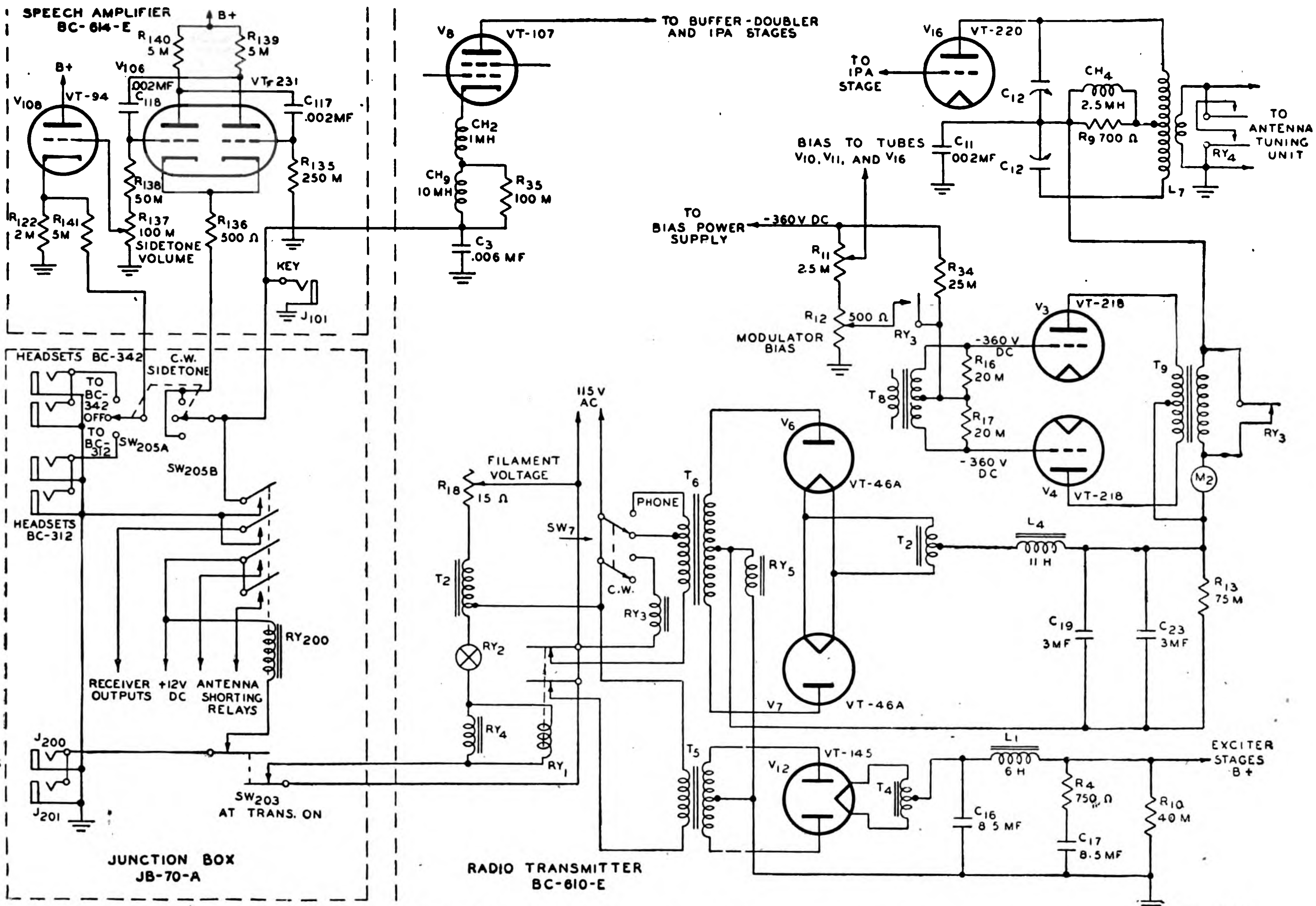


Figure 97. Radio Sets SCR-399-A and SCR-499-A for c-w operation—functional diagram.

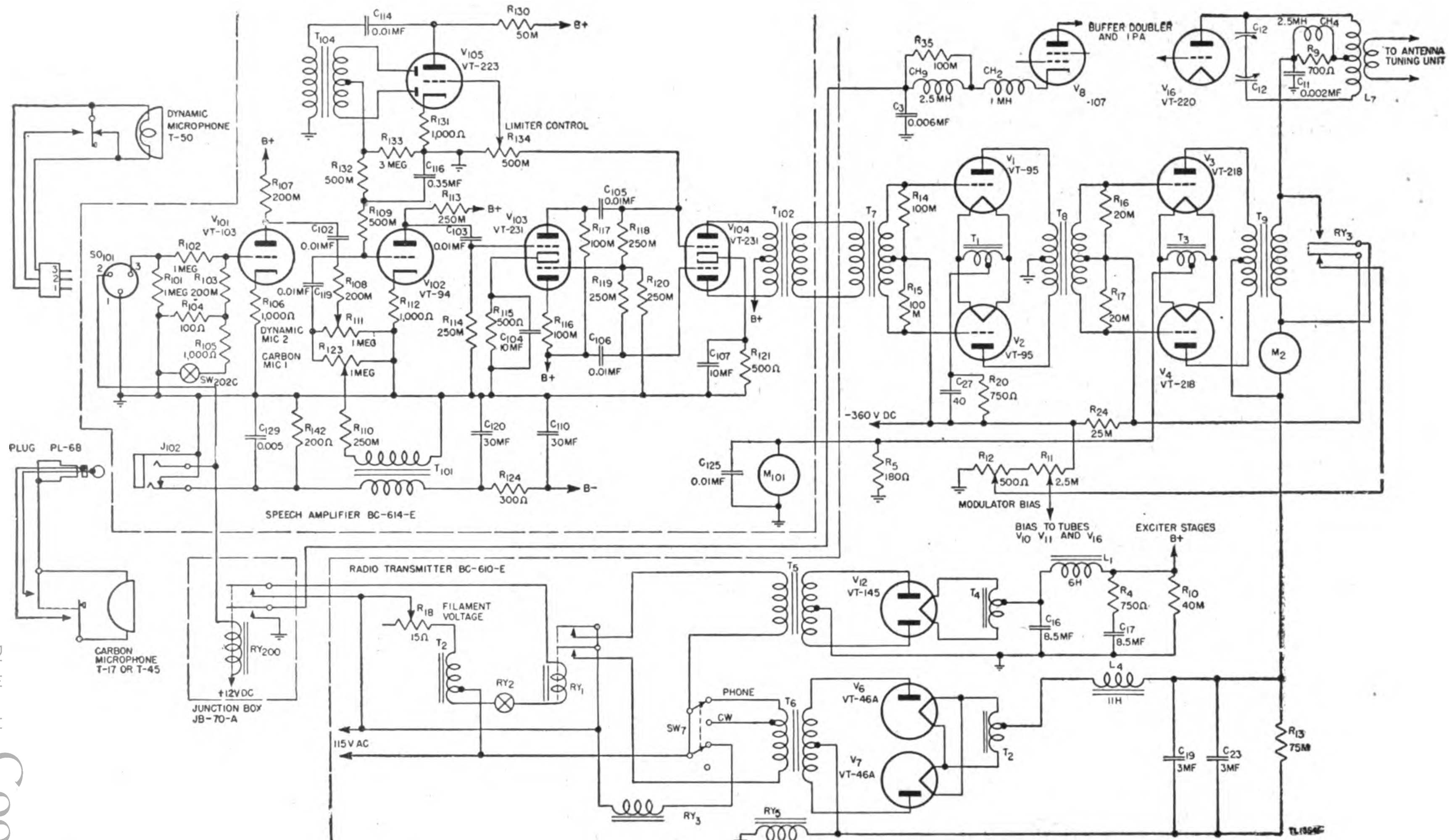


Figure 98. Radio Sets SCR-399-A and SCR-499-A for phone operation—functional diagram.

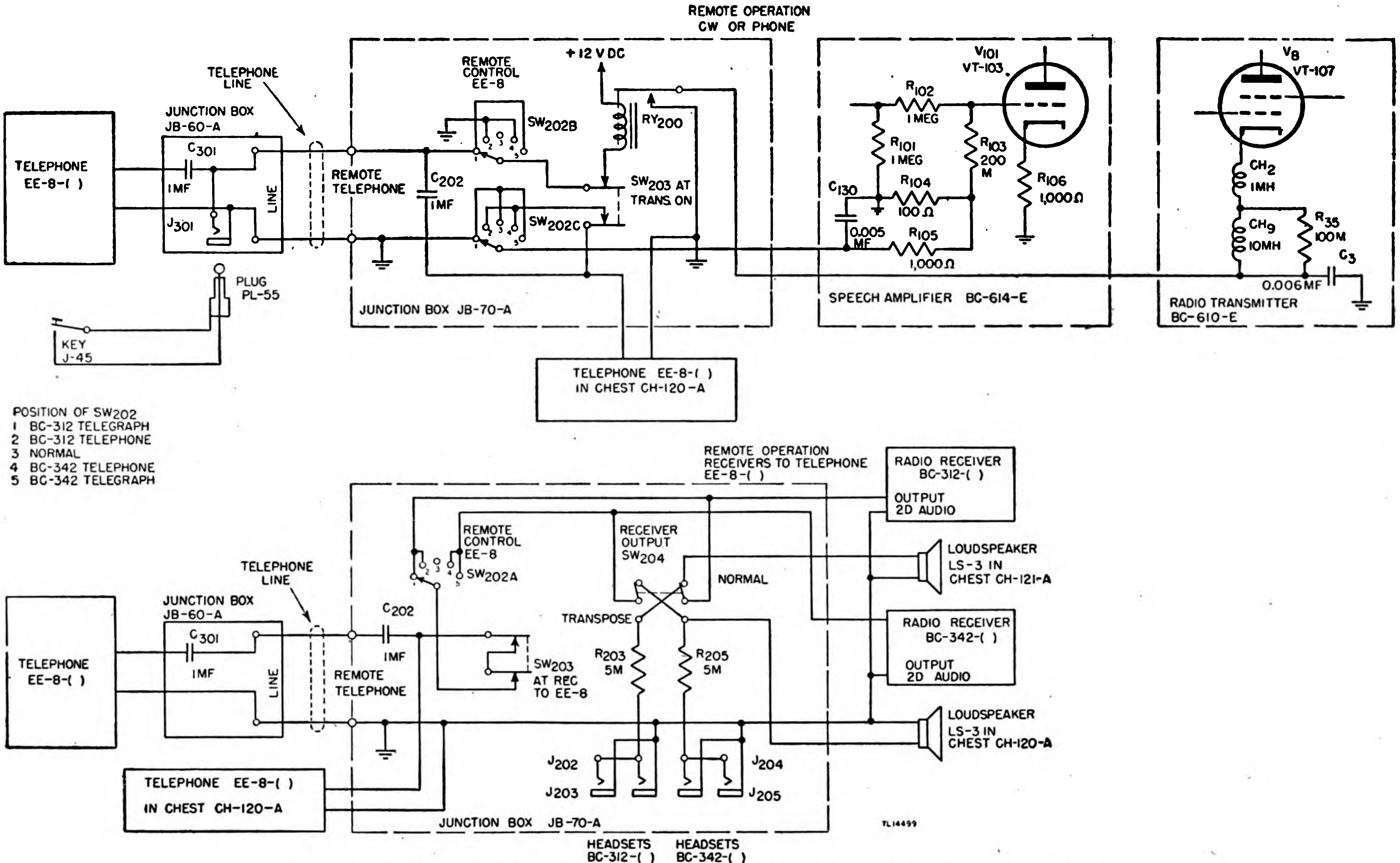


Figure 99. Radio Sets SCR-399-A and SCR-499-A for remote operation—functional diagram.

164. Phone Operation

For phone operation, the transmitter oscillator produces continuous oscillations which are applied successively to the buffer-doubler, i-p-a, and p-a stages. The r-f carrier output of the p-a stage is approximately 300 watts when operating in the 2- to 8-mc range, 250 watts in the 8- to 12-mc range, and 200 watts in the 12- to 18-mc range. The r-f carrier is amplitude modulated in the p-a stage (plate modulation). The transmitter can be modulated approximately 90 percent by a carbon Microphone T–17 or T–45 or a dynamic Microphone T–50 connected to the CARBON MIC. 1 and DYNAMIC MIC. 2 jack and socket, respectively, of Speech Amplifier BC–614–E. Microphone T–50 connects to the input of the first a-f amplifier; Microphone T–17 or T–45 connects to the input of the second a-f amplifier. The output of Microphones T–17 and T–45 is amplified by the second, third, and fourth a-f amplifiers; the output of Microphone T–50 is amplified by the first, second, third, and fourth a-f amplifier. A portion of the output of the third a-f amplifier is applied to a modulation limiter. The modulation limiter produces a d-c bias voltage which reduces the gain of the second a-f amplifier on extreme voice peaks to prevent over modulation of the transmitter. The speech amplifier power supply furnishes plate and filament voltage for all tubes in the speech amplifier, and current for a carbon microphone. The output of the fourth a-f amplifier is applied to the push-pull driver stage in the transmitter. The driver stage develops the a-f voltage and power required to drive the push-pull Class B modulator. The a-f output of the modulator stage is combined with the r-f carrier in the p-a stage to produce the amplitude-modulated r-f wave which is radiated from the transmitting antenna. The microphone switches operate the transmitter and the receiver disabling circuits when the RECEIVER DISABLING switches in the junction box are set to ON. Figure 98 is a functional schematic diagram of the transmitter, speech amplifier, and junction box for phone operation.

165. Remote Operation (fig. 99)

a. The transmitter can be keyed for c-w operation or voice modulated for phone operation from a remote station located as far away as 1 mile. The remote station consists of Telephone EE–8–( ) and Junction Box JB–60–A, and is connected to the REMOTE TELEPHONE terminals of the junction box by means of Wire W–110–B. To key the transmitter, Key J–45 is connected to the KEY jack of Junction Box JB–60–A. The a-f output of the Telephone EE–8–( ) is used to modulate the transmitter for remote phone operation. The operator at the remote station can hear signals received by Radio Receiver BC–312–( ) or BC–342–( ) when the transmitter control switch SW_{203} is set to REC. TO EE–8. The output of either receiver is selected by the REMOTE CONTROL EE–8 switch SW_{202A}. Telephone EE–8, located in Chest CH–120–A, is connected to the telephone line, and provides telephone facilities between the remote station and shelter.

b. Junction Box JB–60–A provides a convenient means of connecting a remote field Telephone EE–8–( ) and Key J–45 to a telephone line. Key jack J_{301} is connected across the LINE terminals. This jack accommodates Plug PL–55 and is used with key J–45 to key the transmitter. The short two-conductor rubber-covered cord entering the junction box through a rubber grommet marked EE–8 connects to field Telephone EE–8–( ). Capacitor C_{301} prevents Telephone EE–8 from short-circuiting jack J_{301}, and in addition, serves as a low-impedance path for the telephone ringer voltage and voice frequencies.

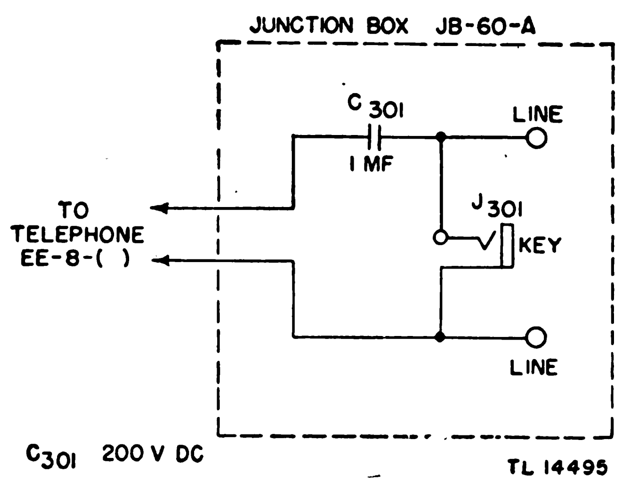


Figure 100. Junction Box JB–60–A—functional diagram.

166. Rectifier RA–63–(*)

Rectifier RA–63–(*) operates on an input voltage of 105 to 125 volts, 50- to 60-cycle alternating current. The rectifier furnishes a d-c output voltage sufficient to charge the 12-volt storage battery in Chest CH–109 at a 5-ampere rate when the battery is in a completely discharged condition. The rectifier is equipped with a cord and plug for connecting it to Junction Box JB–70–A. A-c voltage is applied to the primary winding of transformer T_{500} through circuit breaker CB_{500} and control switch SW_{200}.

(See fig. 101.) The circuit breaker protects transformer T_{500} from damage if the secondary circuit is subjected to a short circuit or overload. The circuit breaker can be reset by pressing the red PRESS TO RESET button. The rectifier can be turned on or off and the charging rate can be controlled by switch SW_{500}. When the switch is set to TRICKLE, the rectifier provides a trickle charging current of approximately 0.5 amperes into a fully charged battery. When the switch is set to FULL CHARGE, the rectifier furnishes a current of approximately 1.5 to 5 amperes, depending on the condition of the battery and the dry disk rectifier RA_{500}. Rectifier unit RA_{500} is connected in a full-wave bridge-type rectifier circuit. The secondary winding of transformer T_{500} furnishes a-c voltage to rectifier RA_{500} and relay RY_{500}. When the power is turned on, relay RY_{500} is energized and the relay contacts close. The d-c output of rectifier RA_{500} is applied to the d-c terminals of plug PL_{500}. When the power is turned off, the relay contacts open and prevent the battery from discharging back through the rectifier.

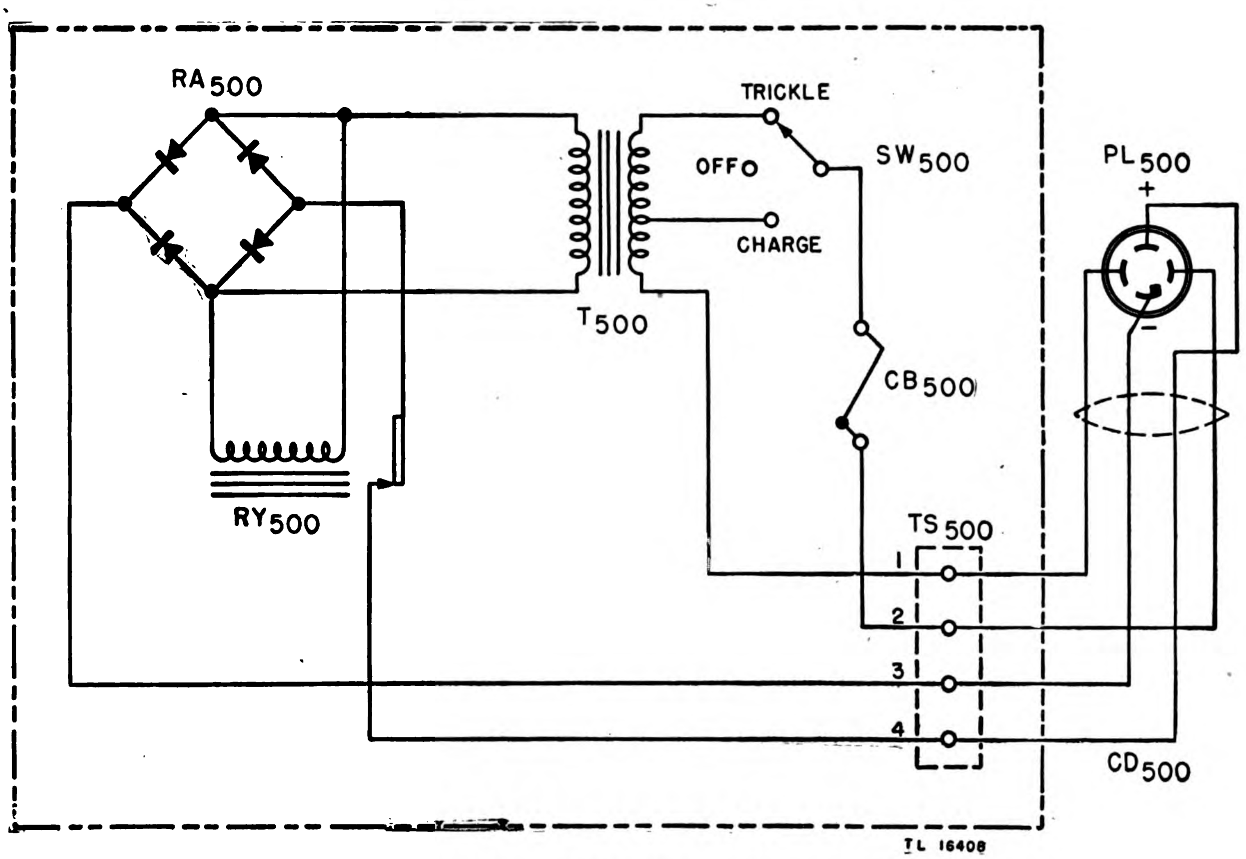


Figure 101. Rectifier RA-63-(*)—functional diagram.

Section VI. CHANGES IN EQUIPMENT

167. Changes in Radio Transmitter BC–610–E

a. RECTIFIER FILAMENT TRANSFORMER T_2. Beginning with serial number 5191 on Order No. 30204–Phila–43, a change has been made in rectifier filament transformer T_2. This change was necessary to prevent break-down caused by arc-over in the transformer. A hermetically sealed transformer with ceramic stand-off terminal insulators (Signal Corps stock No. 2Z9611.144) has been substituted for Stancor type 10P34 (Signal Corps stock No. 2Z9611). The new transformer does not have a secondary center tap and requires connection of the positive high-voltage lead to one of the 2.5-volt filament terminals. For equipments manufactured before the change was made, MWO SIG 11–281–4 applies.

b. PLATE POWER RELAY RY_1. Beginning with serial number 1353 on Order No. 30203–Phila–43, and serial number 5191 on Order No. 30204–Phila–43, a change has been made in plate power relay RY_1. This change was necessary to prevent failure of the transmitter due to arcing and sticking of the plate power relay contacts. An industrial contactor type relay, Allen-Bradley type A–209 bearing Hallicrafters part No. 21D056, is used to replace the Leach type 1154 relay.

c. NEUTRALIZATION HIGH-VOLTAGE ISOLATION CAPACITOR C_{29}. Beginning with serial No. 5003 on Order No. 30204–Phila–43, capacitor C_{29} has been changed. This change was necessary to prevent failure of capacitor C_{29} due to the extremely high r-f potentials to which it is subjected during tuning of the transmitter or during periods of accidental overmodulation. The modification provides a capacitor of higher voltage rating, which prevents flash-over on the adjustable neutralizing capacitor C_{18} and injury to operating personnel by assuring complete isolation of capacitor C_{18} from the high-voltage d-c circuit. The original capacitor C_{29}, a Sangamo type HIL 0.001–mf, 2,500 d-c volts (working) Signal Corps stock No. 30A1–80, is replaced with an American War Standard capacitor CM–70–B201–J, 200–mmf, 5,000 d-c volts (working), Signal Corps stock No. 3K7020122. For equipments manufactured before the change was made, MWO SIG 11–281–5 applies.

d. FILTER CHOKE L_1. Beginning with serial number 5191 on Order No. 30204–Phila–43, filter choke L_1 has been changed. The redesign of choke L_1 was necessary because of excessive temperature rise. A new filter choke L_1 Hallicrafters part No. 56C043, is used to replace the original choke L_1, Hallicrafters part No. 56B018. The new choke has the same base-mounting dimensions but is slightly higher than the original unit. Therefore, it is not interchangeable with the original choke unless switch SW_{10} is removed, *e* below.

e. INTERLOCK SWITCHES SW_2, SW_{10}, SW_{13}, AND CIRCUIT WIRING. Beginning with serial number 5191 on Order No. 30204–Phila–43, interlock switches SW_2 and SW_{13} and the circuit wiring to these switches has been changed. Interlock switch SW_{10} has been removed from the transmitter since it performs no necessary function, and because additional space is required for the new choke coil L_1 (*d* above). Interlock switches SW_2 and SW_{10} have been changed to open type contactor switches capable of breaking the primary current to the high-voltage plate supply transformer T_6. In addition, these switches have been rewired so that opening of the access doors breaks the primary circuit to the high-voltage plate supply transformer T_6 instead of the circuit to the plate power relay RY_1. (See fig. 73.) This modification of interlock switch wiring is necessary to prevent injury to operating personnel resulting from failure of relay RY_1 to open the high-voltage when the relay contacts freeze or stick.

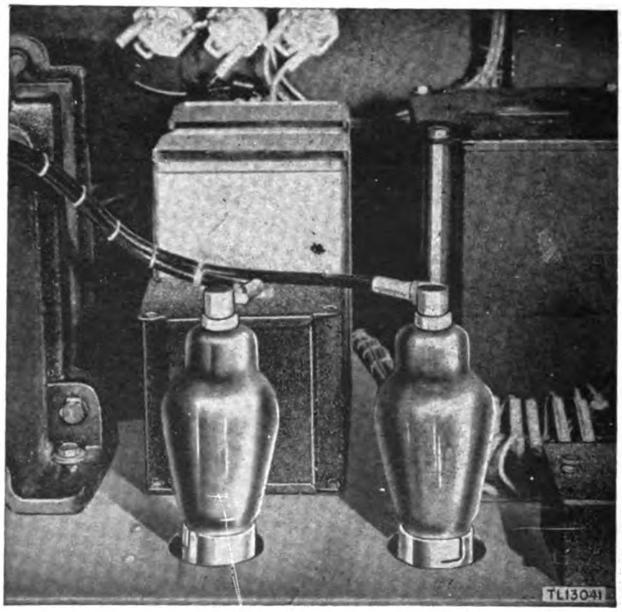


Figure 102. Mounting of tubes V_6 and V_7 before modification.

f. MOUNTING OF RECTIFIER TUBES VT–46A. When operating Radio Transmitter BC–610–E in dusty localities, large amounts of dust may accumulate underneath and around the sockets for high-voltage rectifier Tubes VT–46A. This accumulation of dust can absorb moisture and cause flash-over from high-voltage terminals to ground. To facilitate cleaning of the tube sockets and to prevent failure of the transmitter due to flash-over, rectifier Tubes VT–46A can be remounted. Figures 102 and 103 show the original mounting and remounting of rectifier Tubes VT–46A, respectively. For equipments that show symptoms of the above trouble, and have not already been modified, MWO SIG 11–281–2 applies.

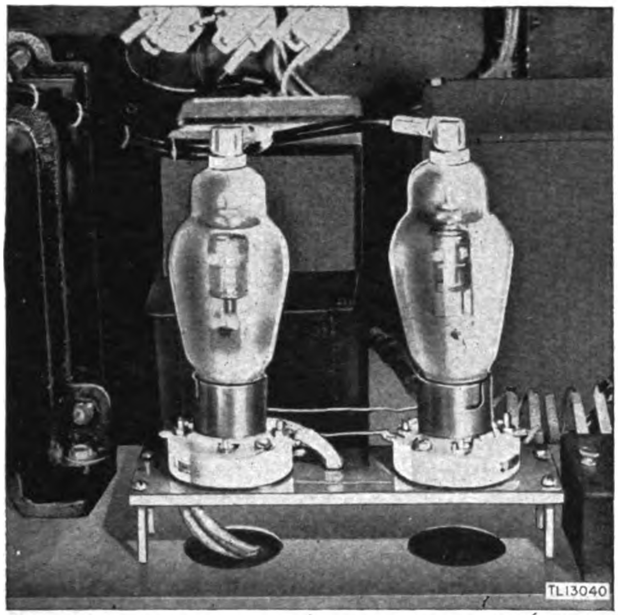


Figure 103. Mounting of tubes V_6 and V_7 after modification.

168. Changes in Speech Amplifier BC–614–E

a. Beginning with serial number 1151 on Order No. 30203–Phila–43, a change has been made in the c-w sidetone circuit. The change increases the available sidetone signal level and compensates for a possible loss in signal level due to circuit element deterioration. The plate-voltage supply connection for tube V_{106} has been changed from the junction of resistors R_{126} and R_{127} to the junction of resistors R_{125} and R_{126}. (See fig. 104.) This change increases the plate-voltage to the sidetone oscillator tube V_{106}. The increased plate voltage results in an increase in output of the sidetone oscillator tube V_{106}. Resistor R_{138} has been changed from 100,000 ohms to 50,000 ohms. This change increases the level of the sidetone signal available at the sidetone volume control R_{137} slightly more than 2 db (decibels). The plate-supply lead for sidetone amplifier tube V_{108} remains connected to the junction of resistors R_{126} and R_{127}.

b. An improved replacement for dual electrolytic capacitors, reference Nos. C108, 109, C111, 115, and C112, 113 in Speech Amplifier BC–614–E have been procured and are now available for requisition from the field. The improved capacitor, Signal Corps stock No. 3DB8–117, should be requisitioned and installed in place of the original, Signal Corps stock No. 3DB8–35, whenever replacement becomes necessary.

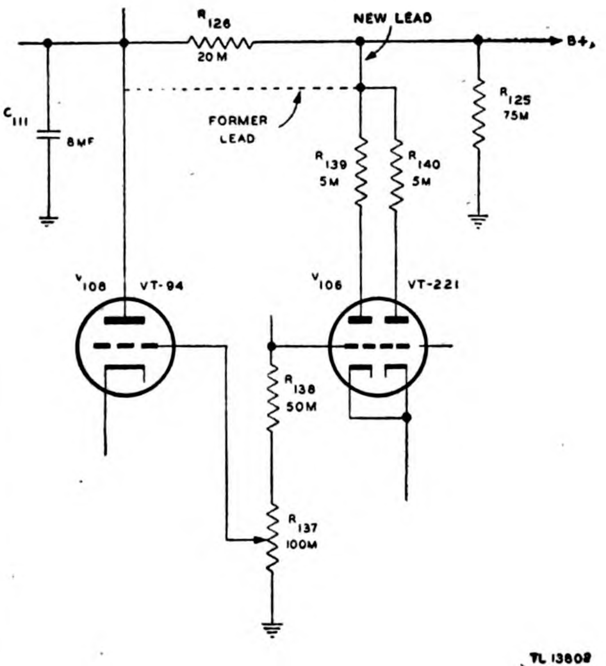


Figure 104. Diagram of change in sidetone oscillator circuit.

169. Wiring Change in Junction Box JB–70–A

If operation of RECEIVER DISABLING switches SW_{200} and SW_{201} does not provide disabling of Radio Receivers BC–312–( ) and BC–342–( ), respectively, regardless of the position of RECEIVER OUTPUT switch SW_{204}, the switches are incorrectly wired. (See fig. 105.) On an incorrectly wired Junction Box JB–70–A, operation of RECEIVER OUTPUT switch SW_{204} transposes the disabling action as well as the audio output of Radio Receivers BC–312–( ) and BC–342–( ) (except when RECEIVER OUTPUT switch SW_{204} is in NORMAL position). Such method of operation of these switches is undesirable. Correction in wiring of Junction Box JB–70–A to eliminate this fault was accomplished in production after approximately 200 Radio Sets SCR–399–A had been shipped on Order No. 14153–Phila–43.

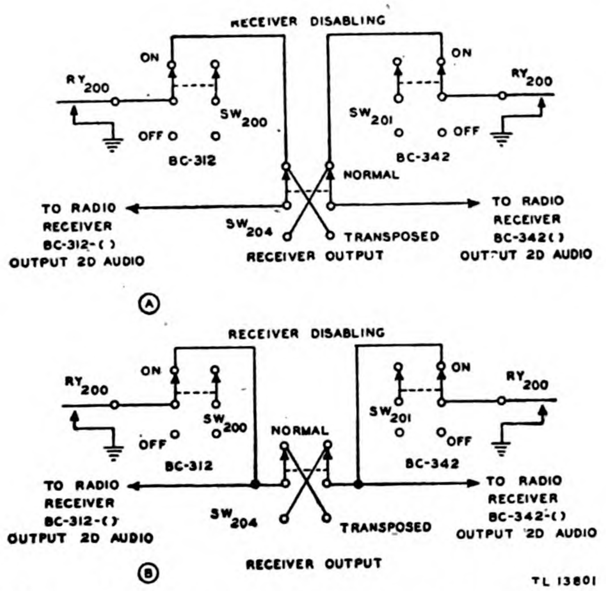


Figure 105. Diagram of change in receiver disabling circuits.

170. Change in Coupling Coils for Doublet Antenna Kit

a. A change has been made in the coupling coils for the doublet antenna kits supplied with Radio Sets SCR–399–A and SCR–499–A. However, 85 Radio Sets SCR–499–A were shipped with doublet antenna kits (on Order No. 18372–Phila–44) before the coupling coils were changed. These radio sets bear serial numbers 1 to 17 inclusive, 19 to 41 inclusive, and 43 to 87 inclusive. The doublet antenna kits supplied with these 85 radio sets are equipped with Coil Units C–451, C–452, and C–453. These coupling coils are designed to fit inside the p-a tank coils of the transmitter. The desired degree of coupling to the antenna is obtained by moving the coupling coils in or out of the p-a tank coil.

b. All doublet antenna kits except those mentioned in subparagraph *a* above are supplied with Coil Units C–387–D, C–388–C, C–389–C, C–390–C, C–447–B, C–448–B, and C–449–B. These coil units have a variable coupling link and replace the fixed link p-a tank coils previously supplied with the transmitter.

c. As soon as circumstances will permit, Radio Sets SCR–399–A and SCR–499–A will be delivered with the variable link tank coils listed above instead of with the old fixed link tank coils. When the doublet antenna kit is issued for use with such sets, either the oils will be omitted from the kit or, if issued, should be returned to stock.

Section VII. TROUBLE SHOOTING

171. General Trouble-Shooting Information

No matter how well equipment is designed and manufactured, faults occur in service. When such faults occur, the repairman must locate and correct them as rapidly as possible. This section contains general information to aid personnel engaged in the important duty of trouble shooting.

a. TROUBLE-SHOOTING DATA. Take advantage of the material supplied in this manual to help in the rapid location of faults. Consult the following trouble-shooting data when necessary:

(1) Block diagram of Radio Sets SCR–399–A and SCR–499–A. (See fig. 96.)

(2) Complete schematic diagrams. (See figs. 120 through 124.)

(3) Simplified and partial schematic diagrams. These diagrams are particularly useful in trouble shooting, because the repairman can follow the electrical functioning of the circuits more easily than on the regular schematics, thus speeding trouble location.

(4) Voltage and resistance data for all socket connections.

(5) Illustrations of components. Front, top, and bottom views which aid in locating and identifying parts.

(6) Pin connections. Pin connections on sockets, plugs, and receptacles are numbered or lettered on the various diagrams.

(*a*) Seen from the bottom, pin connections are numbered in a clockwise direction around the sockets. On octal sockets the first pin clockwise from the keyway is the No. 1 pin.

(*b*) Plugs and receptacles are numbered on the side to which the associated connector is attached. To avoid confusion, some individual pins are identified by letters which appear directly on the connector.

b. TROUBLE-SHOOTING STEPS. The first step in servicing a defective radio set is to sectionalize the fault. *Sectionalization* means tracing the fault to the component or circuit responsible for the abnormal operation of the set. The second step is to localize the fault. *Localization* means tracing the fault to the defective part responsible for the abnormal condition. Some faults such as burned-out resistors, r-f arcing, and shorted transformers can be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltage and resistance.

c. SECTIONALIZATION. Careful observation of the performance of the radio set while turning the equipment on often sectionalizes the fault to the transmitter or the receiver, and careful observation of the meters on the transmitter front panel often determines the stage or circuit at fault. Additional sectionalizing of the fault will be discussed in paragraphs 178 and 179.

d. LOCALIZATION. Paragraphs 178 and 180 through 182 describe the method of localizing faults within the individual components. These paragraphs include trouble-shooting charts which list abnormal symptoms and their probable causes. The charts also give the procedure for determining which of the probable locations of the fault is the exact one. In addition, there are a number of drawings which show the resistance and voltage at every socket pin connection.

172. Voltage Measurements

a. GENERAL. Voltage measurements are an almost indispensable aid to the repairman, because most troubles either result from abnormal voltage or produce abnormal voltages. Voltage measurements are taken easily, because they are always made between two points in a circuit and the circuit need not be interrupted.

(1) Unless otherwise specified, the voltages listed on the voltage charts are measured between the indicated points and ground.

(2) Always begin by setting the voltmeter on the highest range so that the voltmeter will not be overloaded. Then, if it is necessary to obtain increased accuracy, set the voltmeter to a lower range.

(3) In checking cathode voltage, remember that a reading can be obtained when the cathode resistor is actually open. The resistance of the meter may act as a cathode resistor. Thus, the cathode voltage may be approximately normal only as long as the voltmeter is connected between cathode and ground. Before the cathode voltage is measured, make a resistance check with a cold circuit to determine whether the cathode resistor is normal.

b. PRECAUTIONS AGAINST HIGH VOLTAGE. Certain precautions must be followed when measuring voltages above a few hundred volts. High voltages are dangerous and can be fatal. When it is necessary to measure high voltages, observe the following rules:

(1) Connect the ground lead to the voltmeter.

(2) Place one hand in your pocket. This will eliminate the possibility of making accidental contact with either ground or another part of the circuit and causing the electricity to travel from one hand to the other.

(3) If the voltage is less than 300 volts, connect the test lead to the hot terminal (which may be either positive or negative with respect to ground).

(4) If the voltage is greater than 300 volts, shut off the power, connect to the hot lead, step away from the voltmeter, turn on the power, and note the reading on the voltmeter. Do not touch any part of the voltmeter, particularly when it is necessary to measure the voltage between two points which are above ground.

c. VOLTMETER LOADING. It is essential that the voltmeter resistance be at least 10 times as large as the resistance of the circuit across which the voltage is measured. If the voltmeter resistance is comparable to the circuit resistance, the voltmeter will indicate a voltage lower than the actual voltage present when the voltmeter is removed from the circuit.

(1) The resistance of the voltmeter or any range can always be calculated by the following simple rule: Resistance of the voltmeter equals the ohms per volt multiplied by the full-scale range in volts. For example: The resistance of a 1,000-ohm-per-volt meter on the 300-volt range is 300,000 ohms ($R = 1{,}000$ ohms per volt times 300 volts $= 300{,}000$ ohms).

(2) To minimize the voltmeter loading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained (possibly only 5 divisions on a 100-division scale), the accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than compensate for the inaccuracy which results from reading only a small deflection on the scale of the voltmeter.

(3) When a voltmeter is loading a circuit, the effect can always be noted by comparing the voltage reading on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The

reading (not the deflection) on the highest range will be greater than that on the lowest range. If the voltmeter is loading the circuit heavily, the deflection of the pointer will remain nearly the same when the voltmeter is shifted from one range to another.

(4) The ohm-per-volt sensitivity of the voltmeter used to obtain the readings recorded on the voltage and resistance charts in this manual is printed on each chart. Use a meter having the same ohm-per-volt sensitivity; otherwise it will be necessary to consider the effect of loading.

173. Resistance Measurements

a. NORMAL RESISTANCE VALUES. When a fault develops in a circuit, its effect will often show up as a change in the resistance values. To assist in the localization of such faults, trouble-shooting data includes the normal resistance values as measured at the tube sockets and at key terminal points. These values are measured between the indicated points and ground, unless otherwise stated. Often it is desirable to measure the resistance from other points in the circuit to determine whether the particular points in the circuit are normal. The normal resistance values at any point can be determined by referring to the resistance values shown in the schematic diagram, or by use of the resistor color code. (See fig. 154.)

b. PRECAUTIONS. (1) Before making any resistance measurements, turn off the power. An ohmmeter is essentially a low-range voltmeter and battery. If the ohmmeter is connected to a circuit which already has voltages in it, the needle will be knocked off scale and the voltmeter movement may be burned out.

(2) Capacitors must always be discharged before resistance measurements are made. This is very important when checking power supplies that are disconnected from their load. The discharge of the capacitor through the meter will burn out its movement, and in some cases may endanger life.

c. CORRECT USE OF LOW AND HIGH RANGES. It is important to know when to use the low-resistance range and when to use the high-resistance range of an ohmmeter. When checking the circuit continuity, the ohmmeter should be set on the lowest range. If a medium or high range is used, the pointer may indicate zero ohms, even if the resistance is as high as 500 ohms. When checking high resistances or measuring the leakage resistance of capacitors or cables, the highest range should be used. If a low range is used, the pointer will indicate *infinite* ohms, even though the actual resistance is less than a megohm.

d. PARALLEL RESISTANCE CONNECTIONS. In a parallel circuit the total resistance is less than the smallest resistance in the circuit. This is important to remember when trouble shooting with the aid of a schematic diagram.

(1) When a resistance is measured and the value is found to be less than expected, make a careful study of the schematic to be certain that there are no resistances in parallel with the one that has been measured. Before replacing a resistor because its resistance measures too low, disconnect one terminal from the circuit and measure its resistance again to make sure that the low reading does not occur because some part of the circuit is in parallel with the resistor.

(2) In some cases it will be impossible to check a resistor because it has a low-voltage transformer winding connected across it. If the resistor must be checked, disconnect one terminal from the circuit before measuring its resistance.

e. CHECKING GRID RESISTANCE. When grid resistance is checked, a false reading may be obtained if the tube is still warm and the cathode is emitting electrons. Allow the tube to cool, or reverse the ohmmeter test leads so that the negative ohmmeter test lead is applied to the grid.

f. TOLERANCE VALUES FOR RESISTANCE MEASUREMENTS. *Tolerance* means the normal difference that is expected between the rated value of the resistor and its actual value.

(1) Most resistors that are used in radio circuits have a tolerance of at least 20 percent. For example, the grid resistor of a stage might have a rated value of 1 megohm. If the resistor were measured and found to have a value between 0.8 and 1.2 megohms, it would be considered normal. As a rule, the ordinary resistors used in circuits are not replaced unless their values are off more than 20 percent. However, in some cases precision resistors and potentiometers are used. When a resistor is used whose value must be very close to its rated value, the tolerance is usually stated on the diagram or the maintenance parts list.

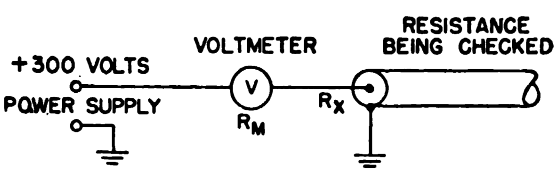
(2) The tolerance values for transformer

windings are generally between 1 and 5 percent. As a rule, suspect a transformer which shows a resistance deviating more than 5 percent from its rated value. Allow the transformer to cool off before the resistance test is made.

g. HIGH-RESISTANCE MEASUREMENTS. Many leakages will not show up when measured at low voltages. Most ohmmeters use a maximum test voltage of 15 volts on the highest resistance range. Where it is necessary to measure resistance above a few megohms or the leakage resistance between conductors of a cable, the test should be made using an applied voltage of 100 volts or more. If it is possible to ground one end of the resistance being checked, one of the low-voltage power supplies in the equipment can be used to provide about 300 volts for making these high-resistance measurements. The manner in which such measurements are made is indicated in figure 106. This method should be used only when the resistance being measured is very high. Be careful not to handle the meter after the circuit has been completed. The meter used should have an ohm-per-volt sensitivity of 1,000 ohms or more. The resistance of the meter is equal to the ohm-per-volt sensitivity multiplied by the range to which the meter is set. The derivation of the formula $R_x = \frac{300R_m}{V}$ is shown below. R_x is the unknown resistance, R_m is the meter resistance, and V is the voltmeter reading.

$$\frac{R_x}{R_m} = \frac{300-V}{V}$$

If R_x is very large, V will be small in comparison to 300. Assuming that 300–V can be replaced by 300, the formula $\frac{R_x}{R_m} = \frac{300}{V}$ is obtained. When solved for R_x this gives $R_x = \frac{300R_m}{V}$. When making the measurement, the meter should first be put on the 300-volt scale to protect it in case R_x is very low. If the voltage used is not 300 volts, the correct value should be inserted in the formula in place of 300.



$R_X = \frac{300}{V} R_M$ (APPROX.)

EXAMPLE

V = 5 VOLTS. THE METER IS USED ON ITS 300 VOLT RANGE AND HAS A RESISTANCE OF 1,000 OHMS-PER-VOLT.

$R_M = 300 \times 1{,}000 = 300{,}000$ OHMS.

$R_X = \frac{300}{5} \times 300{,}000 = 18$ MEGOHMS.

TL35530

Figure 106. Measurement of high resistance.

174. Capacitor Tests

Capacitors which are leaky or shorted can be found by resistance checks of the stage. A capacitor which is suspected of being open can best be checked by shunting a good capacitor across it. In i-f (intermediate-frequency) circuits, keep the lead to the capacitor as short as the original capacitor leads. In l-f (low-frequency) circuits (less than 1 megacycle), the test capacitor leads may be several inches long. A capacitor color code is shown in figures 152 and 153 for checking the capacitor value against the value shown on the circuit diagram.

175. Current Measurements

Current measurements, other than those indicated by panel meters, are not ordinarily required in trouble shooting in the radio set. Under special circumstances, where the voltage and resistance measurements by themselves are not sufficient to localize the trouble, a current measurement can be made by opening the circuit and connecting an ammeter to measure the current. This procedure is not recommended except in very difficult cases.

a. When the meter is inserted in a circuit to measure current, it should always be inserted away from the r-f end of the resistance. For example, when measuring *plate* current, do not insert the meter next to the plate of a tube, but insert it next to the end of the resistor which connects to the power. This precaution is necessary to keep the meter from upsetting the r-f voltages.

Caution: A meter has least protection against damage when it is used to measure current. Always set the current range to the highest value. Then if necessary, decrease the range to give a more accurate reading. Avoid working close to full-scale reading because this increases the danger of overload.

b. In most cases, the current to be measured flows through a resistance which is either known or can be measured with an ohmmeter.

The current flowing in the circuit can be determined by dividing the voltage drop across the resistor by its resistance value. The drop across the cathode resistor is a convenient method of determining the cathode current.

176. Tube Checking

Tube checkers are used to check the emission of electrons from the cathode and to test for shorted elements. Tube checkers will not test the performance of high-voltage tubes, rectifiers, or some special tubes in the modulator and rectifier. Tube checkers are useful, however, for checking receiving-type tubes used in the various components.

a. Results obtained from a tube checker are not always conclusive, because the conditions are not the same as those under which the tube operates in the set. For this reason, the final test of a tube must be its replacement with a tube which is known to be good. In many cases it is quicker and more reliable to replace a suspected tube with a good one than to check it with the tube checker.

b. An operating chart and an instruction book or technical manual are provided with the tube checker. This chart indicates the setting of the tube checker for each tube type. The number of controls, their arrangement, and their settings vary with different types of tube checkers.

177. Analyzer BC–1052–E

a. GENERAL. Analyzer BC–1052–E is packed in Chest CH–89–A. Directions for setting the analyzer will be found on the chart in the cover of the chest. This equipment can be used for the following purposes:

(1) Voltage measurements, both direct and alternating, from less than 1 to 3,000 volts.

(2) Continuity tests.

(3) Determining values of resistors, 0 to 10 megohms.

(4) D-c measurements from 0.1 ma to 15 amperes.

b. RESISTANCE MEASUREMENTS. To test any resistor—

(1) Set the analyzer switches and make test prod connections as indicated in the chart for the range into which the resistor falls.

(2) Short the test prods and adjust the meter for full-scale deflection (zero ohms) by use of OHMS ADJUST knob.

(3) Touch the test prods to the ends of the resistor, at least one end of which should be disconnected from the circuit.

(4) Read the ohms on the OHMS scale, and multiply that reading by the value indicated on the ohms range on the rotary selector switch.

Note. The ohms adjustment must be made every time the range switch is changed from one range to another.

c. MEASUREMENT OF ALTERNATING AND DIRECT VOLTAGES.

Caution: Whenever the approximate voltage, current, or db level is unknown, always begin measurements with the highest range to prevent damaging the instrument by an overload.

(1) Refer to the chart for correct settings of controls, switches, jacks, and test prods before making any measurements.

(2) The DECIBEL calibration is for use across 500-ohm lines and loads. The scale is read directly in db.

(3) The OUTPUT jacks are for measuring the voltage or db level of any a-c or audio voltage. Internal circuits are made through a 0.1-mf isolating capacitor inside the instrument, and in such cases alternating current or audio superimposed on a d-c voltage may be read without harm to the analyzer.

d. HIGH-VOLTAGE MEASUREMENTS.

Warning: It is extremely dangerous to make this measurement. Contact with the high voltage in Radio Transmitter BC–610–E may be fatal. Do not make this measurement except as a last resort, and then always arrange to have someone else present. The recommended procedure for measuring the high voltage is as follows:

(1) Insulate the analyzer well above ground by placing it on dry boards or other insulating material at least 1 inch thick.

(2) Set analyzer controls to proper positions for measuring 3,000 volts as indicated on the analyzer chart.

(3) Remove coil unit L_7.

(4) Place red (positive) test lead prod into center jack of the jack bar of the coil unit.

(5) Connect black (negative) test lead to any convenient ground on the transmitter frame.

(6) Open right-hand cover door (over tuning units) to open its interlock switch. (This switch will be used to close the circuit (13) below).

(7) Fasten down the interlock switch at the left-hand cover door so that it is closed.

(8) See that the back screen is in place so that its interlock is closed.

(9) Arrange the red (positive) test prod and cord so that the cord is extremely well insulated. The cord should be carefully supported so that it is free and clear of the door and frame of the transmitter and any components.

(10) Stand clear of the red (positive) test lead and see that no one comes in contact with it when voltage is on.

(11) Set PLATE POWER switch of the transmitter at ON.

(12) Put your left hand in your pocket.

(13) With your right hand, turn on the high voltage by pressing the interlock switch at the right-hand cover door.

(14) Read the voltage indication on the analyzer and release the interlock switch.

(15) Set PLATE POWER switch to OFF and remove fastening from left-hand cover interlock when finished.

e. INTERNAL BATTERIES. The self-contained batteries of the analyzer consist of two 7½-volt C batteries (Batteries BA–34), one 1½-volt heavy-duty dry cell (Batteries BA–34), and one 1½-volt heavy-duty dry cell (Battery BA–30). These may be replaced by removing the four screws from the front panel. Remove the batteries by loosening the screws holding the brackets which hold the batteries in place. Be sure to observe the polarity when replacing batteries. The 1½-volt battery is held in place by spring clamps. Be sure to cut out a section of the battery paper cover to permit a good connection to the zinc shell.

178. Trouble-Shooting Procedures

Caution: Do not change fuses or make repairs with the high voltages on, for under this condition a potential of 2,000 to 2,500 d-c volts is present on all three decks of the transmitter.

a. Failure of this equipment to operate properly will usually be caused by one or more of the following faults.

(1) Improperly connected power cable between Power Unit PE–95–( ) and Shelter HO–17–A.

(2) Worn, broken, or disconnected cords or plugs.

(3) Defective fuses.

(4) Burned relay contacts due to overloads.

(5) Wires broken from excessive vibration.

(6) Defective tubes.

(7) Inactive (dirty or cracked) crystal.

b. When failure is encountered and the cause is not immediately apparent, check the above items before starting a detailed examination of the component parts of the system.

c. Check fuses at an early stage in trouble shooting. Do not continue to burn out fuses before looking elsewhere to determine the basic source of the trouble. Insertion of an electric lamp in place of a fuse will often prove helpful in tracing the source of the trouble if fuses continue to burn out.

d. The cause of the trouble can usually be traced to the component at fault by means of the meters and controls on the equipment itself. The use of the schematic diagrams and a logical system of reasoning will almost always isolate the fault. For example: If the transmitter cannot be keyed from either KEY jack or Junction Box JB–70–A, the trouble might be in the 12-volt power supply, relay RY_{200}, switch SW_{203}, the cording from the junction box to the speech amplifier, the cord from the speech amplifier to the transmitter, or the transmitter itself. To isolate the trouble proceed as follows:

(1) Switch the BATTERY SOURCE switch on Junction Box JB–70–A to the other 12-volt source. If this does not clear the trouble, the 12-volt supply is probably not at fault.

(2) Plug the key into the KEY jack on the speech amplifier and try to key the set. If the transmitter cannot be keyed, the trouble is in the junction box or the connecting cord. If the transmitter still cannot be keyed, the trouble is in the cord from the speech amplifier to the transmitter or in the transmitter.

(3) Throw the EXCITER PLATE POWER switch on the transmitter to ON. If no excitation is indicated on the EXCITATION METER the trouble is in the transmitter.

179. Trouble-Shooting Charts

The accompanying trouble-shooting charts, if properly used, simplify trouble shooting. There are four charts. The first chart covers the sectionalization of trouble in Radio Sets SCR–399–A and SCR–499–A. This chart lists the various symptoms which may be recognized easily by the operator, and gives the probable location for the existing trouble as well as the recommended correction. It tells the operator whether the trouble is in the transmitter, the receivers, the speech amplifier, the junction box, or the power supply. By proper use of this chart, the operator can isolate the trouble to one particular component of the equipment, and thus save time that might otherwise be lost in checking components that are free of trouble. The second chart shows the localization of trouble in Radio Transmitter BC–610–E. This chart will aid in determining which stage in the transmitter is at fault, and will aid in localizing the trouble to the individual part in the circuit which is causing the abnormal condition. The third and fourth charts are similar to the second, except that they deal with localizing the trouble in Speech Amplifier BC–614–E and Junction Box JB–70–A respectively. Therefore, the first chart will be used mainly by the operator, whereas the last three, covering trouble shooting within the various components, will be used by the repairman.

180. Sectionalizing Trouble in Radio Sets SCR–399–A and SCR–499–A

Symptoms	Probable trouble	Corrections
1. Power Unit PE–95–( ) fails to start when START button is pressed	1. Discharged battery in power unit might operate start relay, but fails to turn over the engine Broken wire in power cord or bad connection at plug START and STOP leads interchanged or disconnected either at Junction Box JB–70–A or at trailer terminal board	1. Start power unit with hand crank: See TM 11–904 Repair cord or connection Connect leads properly
2. Power unit starts, but no power is available at Radio Set SCR–399–A or SCR–499–A	2. Loose socket connection. Circuit breaker defective or circuit breaker not closed	2. Tighten connection. Replace or close circuit breaker
3. No filament power when FILAMENT POWER switch is set to ON	3. Fuse FS_1, FS_2, or FS_4 open. FILAMENT POWER switch, defective Damaged Cord CD–763 or poor plug connections Filament resistor R_{18} defective	3. Replace open fuse. Replace switch Repair cord or connection
4. Low or zero reading on ANTENNA CURRENT meter	4. Incorrect control setting on Antenna Tuning Unit BC–939–A. Sections of transmitting antenna missing Insufficient antenna coupling	4. Set control according to tuning chart Replace missing sections Increase antenna coupling
5. No grid excitation indicated when EXCITATION METER switch is set to P.A. GRID position (assuming intermediate amplifier is operating properly)	5. Tube V_{16} defective or improperly inserted Open r-f choke CHg_2 Adjustable resistor R_{11} defective	5. Replace tube or insert tube properly
6. No plate current indicated on P.A. PLATE meter. Necessary grid current present. HIGH VOLTAGE PROTECT switch set to HIGH VOLTAGE PROTECT	6. TRANS. ON-OFF switch on Junction Box JB–70–A not thrown to TRANS. ON position Reset necessary on overload relay Open fuse FS_3 Interlock switches not closed Short in high-voltage circuit continually tripping overload relay Rectifier tube V_6 or V_7 defective Missing or improperly installed coil unit on jack bar Resistor R_{19} defective, or loose in socket	6. Throw switch to ON Press OVERLOAD RESET switch Replace fuse Close panels on top of transmitter tightly Check high-voltage circuit Replace defective tube Install coil unit properly Replace resistor R_{19}, or tighten
7. Excessive plate current indicated on P.A. PLATE meter	7. Improper tuning of tank circuit Wrong coil unit Failure to use vacuum capacitor C_{28} when operating below 2.5 mc Excessive antenna coupling No bias voltage due to open fuse FS_5 or tube V_5 defective	7. Tune tank circuit according to tuning chart Use proper coil unit Install capacitor C_{28} Reduce coupling Replace fuse FS_5 or tube V_5
8. PLATE POWER switch thrown to OFF. P.A. PLATE meter indicates plate current still flowing	8. Contacts on relay RY_1 sticking because of severe overload	8. Clean contacts of relay RY_1 *Caution:* Leave plug out of socket SO_6 when working on this relay
9. No excitation indicated by EXCITATION METER when EXCITER PLATE POWER switch is set to ON position	9. Tuning unit improperly seated in socket Tube V_8 or V_9 defective EXCITER PLATE POWER switch defective BAND SWITCH not set to proper channel	9. Insert tuning unit firmly in socket Replace tube Set switch to proper channel
10. Transmitter functioning normally. Radio Receivers BC–312–( ) and BC–342–( ) fail to disable during transmission	10. RECEIVER DISABLING switches not turned to ON position Junction Box JB–70–A not functioning properly	10. Turn switch to ON position See paragraph 182.

181. Localizing Trouble in Radio Transmitter BC–610–E

Symptoms	Probable trouble	Corrections
1. FILAMENT POWER switch thrown to ON position. Green lamp does not light. FIL. VOLTAGE meter indicates filament voltage	1. Lamp LM_3 burned out	1. Replace lamp
2. FILAMENT POWER switch thrown to ON position. Green lamp does not light. No voltage indicated by FIL. VOLTAGE meter	2. Fuse FS_1, FS_2 or FS_4 burned out FILAMENT POWER switch defective Damaged power Cord CD–763, or poor contacts at sockets SO_{201} or SO_6	2. Replace fuse Replace switch Repair cord or sockets
3. FILAMENT POWER switch at ON position. Green lamp lights. No voltage indicated on FIL. VOLTAGE meter	3. Tube V_{13}, V_{14}, or V_{15} not in sockets Filament resistor R_{18} defective	3. Place tubes in sockets Replace resistor R_{18}
4. FILAMENT POWER switch at ON position. Green lamp lights. FIL. VOLTAGE meter indicated filament power present. Tubes V_1, V_2, and V_5 not lighted	4. Fuse FS_5 open	4. Replace fuse FS_5
5. EXCITER PLATE POWER switch at ON position. No intermediate-amplifier grid current indicated when EXCITATION METER SWITCH is at INT. AMP. GRID position. Tuning unit set according to tuning chart. M.O.–XTAL switch and BAND SWITCH at proper positions	5. Switch SW_3 defective . Tube V_8 or V_9 defective Defective rectifier tube V_{12} Open resistor R_8 or choke CH_7	5. Replace switch Replace defective tube Replace defective tube Replace defective part

182. Localizing Trouble in Junction Box JB–70–A

Symptoms	Probable trouble	Corrections
1. TRANS. ON-OFF switch at the TRANS. OFF position during c-w operation. No plate current indicated on P.A. PLATE meter when transmitter is keyed	1. Contacts of switch SW_{203} closing circuit of relay RY_1 fail to close Relay RY_{200} fails to function Wiring from SW_{203} to PL_{200} defective Contacts of relay RY_{200} in circuit of the cathode of oscillator tube V_8 fail to close	1. Repair, adjust, and clean contacts 12-volt power supply lacking Repair relay RY_{200} Repair wiring Repair, clean, or adjust contacts
2. Press-to-talk switch is depressed during phone operation. No plate current indicated on P.A. PLATE meter	2. Relay RY_{200} fails to function Press-to-talk switch defective 12-volt power supply for energizing relay RY_{200} lacking Contacts of relay RY_{200} in the circuit of relay RY_1 fail to operate	2. Repair or replace relay RY_{200} Repair or replace switch, or replace microphone Repair 12-volt power supply from Power Unit PE–95–( ) Switch to auxiliary battery supply Repair, clean, or adjust contacts of relay RY_{200}
3. Transmitter functioning normally on both c-w and phone operation. Radio Receivers BC–312–( ) and BC–342–( ) fail to disable during transmissions	3. RECEIVER DISABLING switch SW_{200} or SW_{201} not turned to ON position Switches SW_{200} and SW_{201} defective	3. Turn switch to ON position Repair or replace switches SW_{200} and SW_{201}
4. Transmitter operating normally. Sidetone is not being received at Radio Receivers BC–312–( ) and BC–342–( )	4. C.W.–SIDETONE switch SW_{205} at OFF position Relay contacts of RY_{200} in circuit of switch SW_{205B} fail to close	4. Turn C.W.–SIDETONE switch to TO BC–312 or to TO BC–342 position Clean, adjust, or repair contacts of relay RY_{200}
5. Transmitter cannot be keyed during c-w operation from a remote position	5. REMOTE CONTROL EE–8 switch SW_{202} at incorrect position. (Also see 1 above)	5. Place switch SW_{202} at correct position
6. Transmitter cannot be modulated from a remote position	6. Capacitor C_{202} defective. TRANS. ON–OFF switch SW_{203} at incorrect position	6. Replace defective capacitor C_{202} Place TRANS. ON–OFF switch at TRANS. ON position
7. During remote operation the telephone is not being fed reception from Radio Receiver BC–312–( ) or BC–342–( )	7. TRANS. ON–OFF switch SW_{203} at an incorrect position REMOTE CONTROL EE–8 switch SW_{202} at incorrect position	7. Place TRANS. ON–OFF switch at REC. TO EE–8 position Turn REMOTE CONTROL EE–8 switch to correct position

183. Localizing Trouble in Speech Amplifier BC–614–E

Symptoms	Probable trouble	Corrections
1. FILAMENT POWER switch on transmitter power panel closed. Red lamp fails to light	1. Fuse FS_5 open, lamp LM_{101} burned out	1. Replace fuse FS_5, replace lamp LM_{101}
2. FILAMENT POWER switch at ON position, filament voltage present at all tubes, plate voltage lacking	2. Rectifier tube V_{107} defective Secondary 250-volt winding of transformer T_{103} burned out Shorted filter capacitor C_{108} or C_{109} Open filter choke CH_{101}	2. Replace tube V_{107} Replace transformer T_{103} Replace shorted capacitor Replace defective choke
3. Transmitter can be modulated by a dynamic microphone or Telephone EE–8–( ), but not by a carbon microphone	3. Resistor R_{110} or R_{123} defective Transformer T_{101} defective Shorted capacitor C_{120} or C_{110}	3. Replace defective resistor Replace transformer Replace capacitor
4. Transmitter can be modulated by a carbon microphone, but not by a dynamic microphone or Telephone EE–8–( )	4. Tube V_{101} defective Resistor R_{102} or R_{103} defective	4. Replace defective tube Replace defective resistor
5. Transmitter can be modulated by carbon or dynamic microphone, but not by Telephone EE–8–( )	5. Resistor R_{105} defective	5. Replace defective resistor
6. Filament voltage and plate power supplied to all tubes. Transmitter can be modulated. Sidetone lacking during c-w operation	6. Oscillator tube V_{106} defective Resistor R_{139}, R_{140}, R_{136}, R_{138}, or R_{137} defective Amplifier tube V_{108} defective Resistor R_{122} or R_{141} defective Capacitor C_{117} or C_{118} defective	6. Replace defective tube Replace defective resistor Replace defective tube Replace defective resistor Replace defective capacitor
7. Filament voltage and plate power supplied to all tubes. Transmitter can be modulated. Speech limiter fails to limit speech peaks.	7. LIMITER CONTROL R_{134} defective Speech limiter tube V_{105} defective Transformer T_{104} defective Capacitor C_{116} defective Capacitor C_{114} defective Resistor R_{109} defective	7. Replace resistor Replace tube Replace transformer Replace capacitor Replace capacitor Replace resistor

Section VIII. REPAIRS

184. Replacement of Parts

Careless replacement of parts often make new faults inevitable. Note the following points:

a. Before a part is unsoldered, note the position of the leads. If the part (such as a transformer) has a number of connections to it, tag each of the leads.

b. Be careful not to damage other leads by pulling or pushing them out of the way.

c. Do not allow drops of solder to fall into the set, since they may cause short circuits.

d. A carelessly soldered connection may create a new fault. Be very careful to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

e. When a part is replaced in r-f or i-f circuits, place it exactly as the original one was placed. A part which has the same electrical value but different physical size may cause trouble in h-f (high-frequency) circuits. Give particular attention to proper grounding when replacing a part. Use the same ground point as in the original wiring. Failure to observe these precautions may result in decreased gain, or in oscillation of the circuit.

185. Replacement of Tubes

a. Tube V_{16} is removed as follows:

(1) Open the doors in the top of the transmitter over the plate coil and the tuning units.

(2) Take out the tuning units and remove tubes V_8 and V_9 from their sockets.

(3) Remove the grid lead from the grid cap on the side of tube V_{16} and the plate lead from the plate cap on top.

(4) Turn the tube counterclockwise until it can be lifted out of its socket.

(5) Remove the tube through the door over the tuning unit side of the transmitter.

b. Modulator tubes V_3 and V_4 are removed as follows:

(1) Remove the back screen.

(2) Take off the plate and grid leads from the caps.

(3) Turn the tube counterclockwise and lift it out of the socket.

c. High-voltage rectifier tubes V_6 and V_7 are removed as follows:

(1) Remove the back screen.

(2) Disconnect the plate lead from the cap.

(3) Turn the tube counterclockwise and lift it out of the socket.

d. To remove tubes V_{10}, V_{11}, and V_{12}, proceed as follows:

(1) Lift up the two doors in the top cover.

(2) Remove the tuning units.

(3) Loosen the clamp around the base of the tube with a screwdriver by reaching in through the door over the plate coil.

(4) Pull the tube straight up, gently rocking it from side to side.

186. Removal of Antenna Tuning Unit BC–939–A

To remove the antenna tuning unit proceed as follows:

a. Disconnect the antenna and ground leads.

b. Disconnect the coaxial cable leading from the transmitter.

c. Take off the four wingnuts holding the tuning unit to the top of the transmitter.

d. Lift the unit up and forward.

187. Removal of Top of Transmitter Cabinet

The top of the transmitter cabinet should be taken off when extensive work is to be done in the r-f section. Remove the antenna tuning unit first (par. 186); then proceed as follows:

a. Remove the eight bolts holding the top to the mounting straps.

b. Unscrew the four wing-head screws which secure the top to the cabinet.

c. Disconnect the two leads which are plugged in terminal strip TS_5 on the exciter deck.

d. Lift the cover clear from the cabinet.

188. Removal of R-F Section

The r-f section may be removed from the transmitter as follows:

a. Remove all tubes for safekeeping.

b. Disconnect the leads from terminals 1 and 3 on terminal strip TS_1 on the exciter chassis apron.

c. Disconnect the two leads to the coil of relay RY_4, and release them from the clamp on the side of the cabinet.

d. Disconnect the leads to meter M_2, and clear them from the bracket under the meter.

e. Disconnect the black lead to capacitor C_{12}.

f. Pull out plugs PL_1 and PL_2 from their sockets on the modulator deck, and release the laced cable from its bracket on the modulator chassis.

g. Remove the eight bolts which hold the r-f section to the straps of the cradle.

h. Remove the 14 bolts which fasten the r-f section to the modulator section.

i. Lift the r-f section off.

189. Removal of Chests From Shelter

Whenever it is necessary to remove any of the major components of Radio Set SCR–399–A from Shelter HO–17–A, move the truck in such a position as to jack-knife Trailer K–52–( ), so that the rear of the truck will become more readily accessible. If possible, disconnect the trailer.

a. REMOVAL OF CHEST CH–89–A (SEAT BENCH). Two men are required to remove Chest CH–89–A from the shelter.

(1) Unscrew the six wing-head bolts holding the chest to the floor.

(2) Lower the chest from the floor of the truck to the ground, holding it by its handles.

b. REMOVAL OF CHEST CH–88–A (WALL). Two men are required to remove Chest CH–88–A from the shelter.

(1) Remove cotter pins from trunk clamps.

(2) Unclasp all four trunk clamps.

(3) Remove chest by its handles.

c. REMOVAL OF CHEST CH–119–A. Two men are required to remove Chest CH–119–A from the shelter.

(1) Remove Chests CH–88–A and CH–89–A.

(2) Remove Tool Equipment TE–48 and Cord CD–652 from Chest CH–119–A to lighten weight.

(3) Unclasp the four trunk clamps.

(4) Slide chest to the door and lower to ground.

d. REMOVAL OF CHEST CH–120–E. Four men are required to remove Chest CH–120–E from the shelter.

(1) Disconnect all cords connecting Chest CH–121–A to Chest CH–120–A and close the cover of the latter.

(2) Disconnect Cord CD–659 from Chest CH–109–A.

(3) Disconnect all cords from the bottom of Junction Box JB–70–A.

(4) Disconnect ground straps from bottom of chest.

(5) Disconnect Cord CD–764 from front of Speech Amplifier BC–614–E, and remove cord.

(6) Loosen turnbuckles holding Chest CH–120–A to table frame after removing safety wires.

(7) Remove chest from table frame and lower to ground.

190. Removal of Radio Transmitter BC–610–E

Four men are required to remove Radio Transmitter BC–610–E from the shelter.

a. Remove Chest CH–89–A as described in paragraph 189.

b. Disconnect Cords CD–763 and CD–764 from their sockets on the rear of the transmitter.

c. Remove Antenna Tuning Unit BC–939–A from the top of the transmitter as described in paragraph 186.

d. Unscrew the four long wrench nuts holding the cradle of the transmitter to the floor of the shelter.

e. Move the transmitter and its cradle directly toward the right wall to the center of the shelter.

f. Move the transmitter around into the center aisle and toward the rear of the truck. (It will now be necessary to have three of the men on the ground to assist in lowering the transmitter from the floor of the shelter to the ground.)

g. Lower the transmitter directly to the ground by the four handles.

191. Replacement of Switches in Radio Transmitter BC–610–E

a. GENERAL. The method of removal and replacement of the majority of the switches in the transmitter is apparent upon inspection. It is important, however, that all leads to the switch be tagged before they are disconnected from the lugs or terminals.

b. REMOVAL OF BAND SWITCH SW_8. First remove the r-f section as described in paragraph 188. Rest the r-f section on its top, and remove bank switch SW_8 as follows:

(1) Disconnect all leads to the switch; tag each one.

(2) Remove the knob from the shaft by loosening the two setscrews.

(3) Remove the nut and washer from the shaft on the front of the panel.

(4) Remove the switch from the bottom of the exciter deck by unscrewing the five nuts which secure it to the deck.

(5) Replace in reverse order. When replacing the knob, see that the setscrew in the side of the handle engages the flat side of the shaft.

192. Replacement of Parts in Speech Amplifier BC–614–E

The parts of Speech Amplifier BC–614–E are easily accessible when the chassis is removed from the cabinet. To remove the chassis, disconnect the three cords from the front panel. Release the four winged panel locks and pull the chassis straight out of the cabinet.

a. LIMITER CONTROL R_{134}. To replace the limiter control, first loosen the resistor mounting strip just behind the control by unscrewing the two nuts holding the strip to its mounting. Move the strip to the rear. Unsolder the three leads to the control, and tag each. Unscrew the two nuts holding the control to the front of the chassis, and remove the control. Replace in reverse order.

b. MICROPHONE GAIN CONTROLS. To replace either microphone gain control, first disconnect the leads to the control. Remove the knob by loosening the setscrew holding it on the shaft. Remove the nut and washer securing the control to the panel, and take the control off the panel. Replace in reverse order.

193. Removal of Junction Box JB–70–A

To remove Junction Box JB–70–A from the cabinet, first disconnect all cords from the right side, front panel, and bottom of the chassis. Disconnect the grounding braid from the bottom of the chassis with a screw driver. Disconnect the remote telephone line, if connected. Disconnect the cord which connects the junction box to the speech amplifier from its socket on the panel of the speech amplifier. Release the four panel locks and pull the chassis forward. With a screw driver, disconnect the leads from terminal 9, 10, 11, and 12 on TS_{200}; and pull the cord through the rubber grommet in the right side of the junction box. Pull the chassis all the way out of the cabinet.

194. Rustproofing and Repainting

When the finish on the cabinets or panels of any of the components of Radio Set SCR–399–A or

SCR–499–A has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surface as follows:

a. Use #00 or #000 sandpaper to clean the surface down to the bare metal. Obtain a bright smooth finish.

Caution: Do not use steel wool to remove rust. Although it permits rapid removal of rust, minute particles of steel wool frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. When numerous scars and scratches warrant complete repainting, remove rust from the case by cleaning corroded metal with dry-cleaning solvent. In severe cases it may be necessary to use dry-cleaning solvent to soften the rust and sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

195. War Department Unsatisfactory Equipment Report (fig. 151)

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equipment Report, WD AGO Form 468 should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C. See TM 38–250 for complete instructions on the handling of this report.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form No. 54 should be filled out and forwarded through channels.

Section IX. ALIGNMENT AND ADJUSTMENT

196. Neutralization

a. Radio Transmitter BC–610–E has been adjusted for neutralization and will not require adjustment in the field, unless neutralizing capacitor C_{18} has been tampered with.

b. If necessary, readjustment may be made as follows:

(1) Install Tuning Unit TU–52 and associated Coil Unit C–390–A.

(2) Disconnect the two leads of the coaxial cable from the transmitter output terminals.

(3) Set the FILAMENT POWER switch at ON.

Note. In this operation high-voltage plate power is not applied. Therefore, leave the transmitter control switch on the Junction Box JB–70–A at TRANS. OFF, and set the PLATE POWER switch on the transmitter at OFF.

(4) Set EXCITATION METER switch at P.A. GRID.

(5) Set EXCITER PLATE POWER switch at ON.

(6) Adjust controls of tuning unit to resonance at some frequency near the h-f end of the range.

(7) Adjust the PLATE TUNING wheel slowly through resonance. (If neutralization is faulty, resonance will be indicated by a sharp dip in the reading of the GRID CURRENT meter.)

(8) Adjust neutralizing capicitor C_{18}, little by little, checking after each adjustment, until rotating the PLATE TUNING wheel through resonance causes only a slight dip in the reading of the GRID CURRENT meter. (When properly neutralized this dip will not exceed 3 ma.)

197. Modulation Limiter

a. The modulation limiter in Speech Amplifier BC–614–E has been properly set to provide a minimum of 3 db compression at 100 percent modulation, and no change in setting is recommended. Readjustment should be made only if the LIMITER CONTROL has been tampered with. No adjustment in the field is recommended unless an audio oscillator is available.

b. If necessary, adjustment of the modulation limiter is accomplished as follows:

(1) Disconnect Microphone T–50 from its socket on the panel of the speech amplifier.

(2) Connect a 400-cycle audio generator to terminals 1 and 3. The grounded side of the generator should be connected to terminal 1 of the socket. See figure 123 for socket SO_{101} connections.

(3) Turn on the transmitter and adjust it for phone operation.

(4) Remove the metal plate under the panel marking LIMITER CONTROL on the speech

amplifier. The screw adjustment for this control is under the plate.

(5) Turn the LIMITER CONTROL to the extreme counterclockwise position.

(6) Turn on the 400-cycle generator and adjust its output and the DYNAMIC MIC. 2 gain control for a MODULATOR PLATE meter reading of 225 ma.

(7) Turn the LIMITER CONTROL clockwise until the MODULATOR PLATE meter reads 160 ma.

(8) The modulation limiter has now been adjusted for normal operation. The metal plate should be put back in place and firmly secured. Reconnect Microphone T-50 and resume operation.

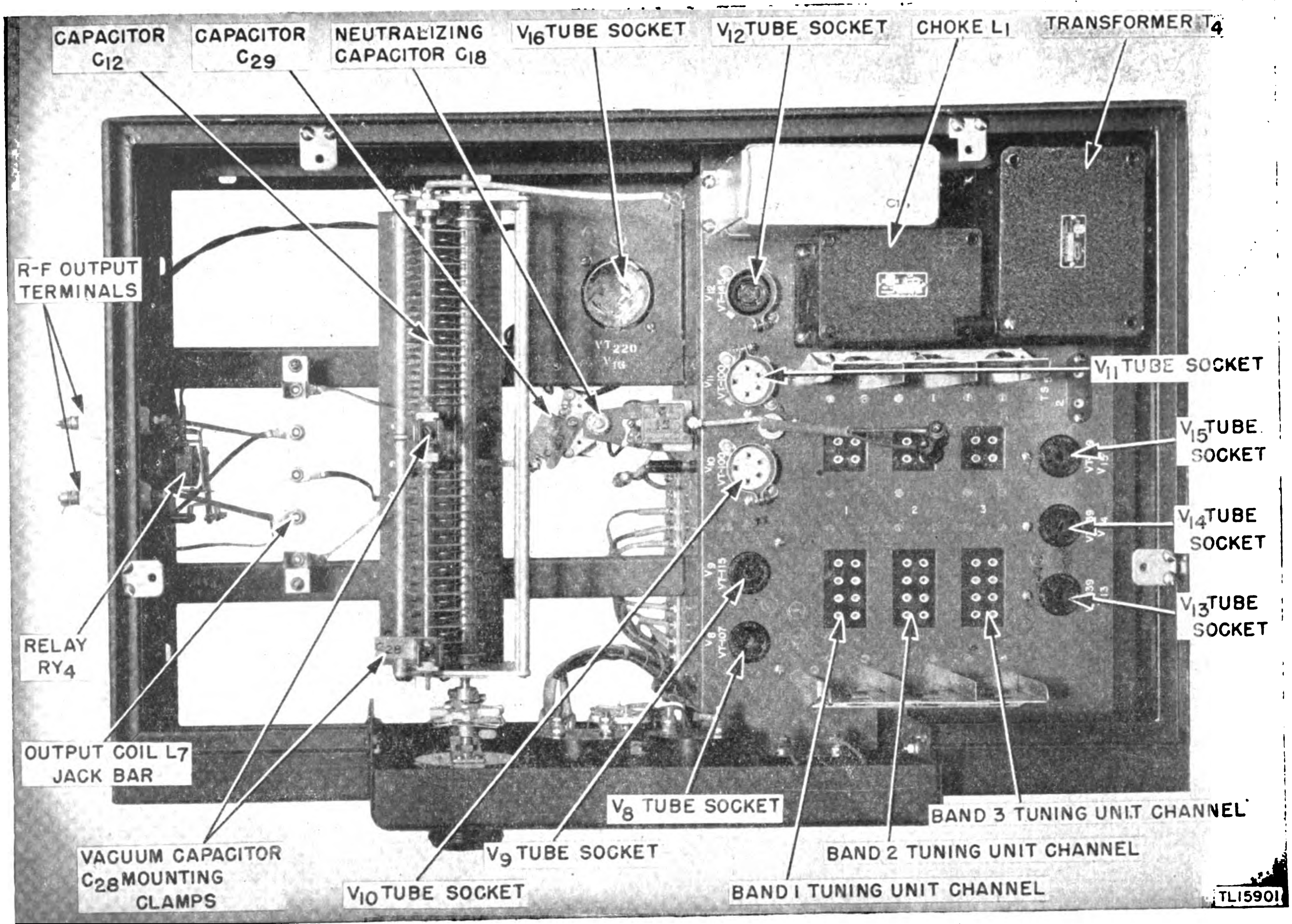


Figure 107. Radio Transmitter BC–610–E—top view of r-f deck.

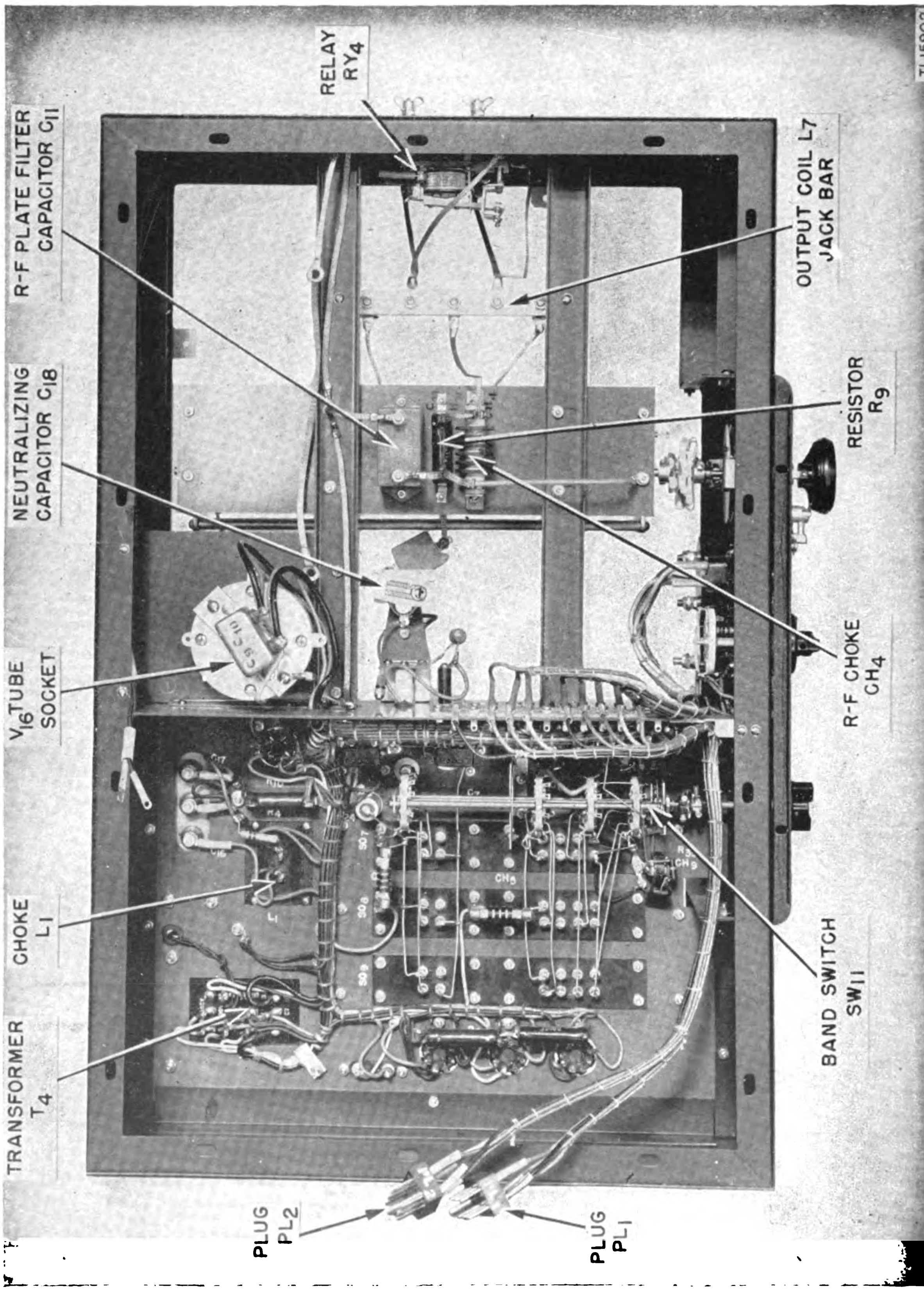


Figure 108. Radio Transmitter BC-610-E—bottom view of r-f deck.

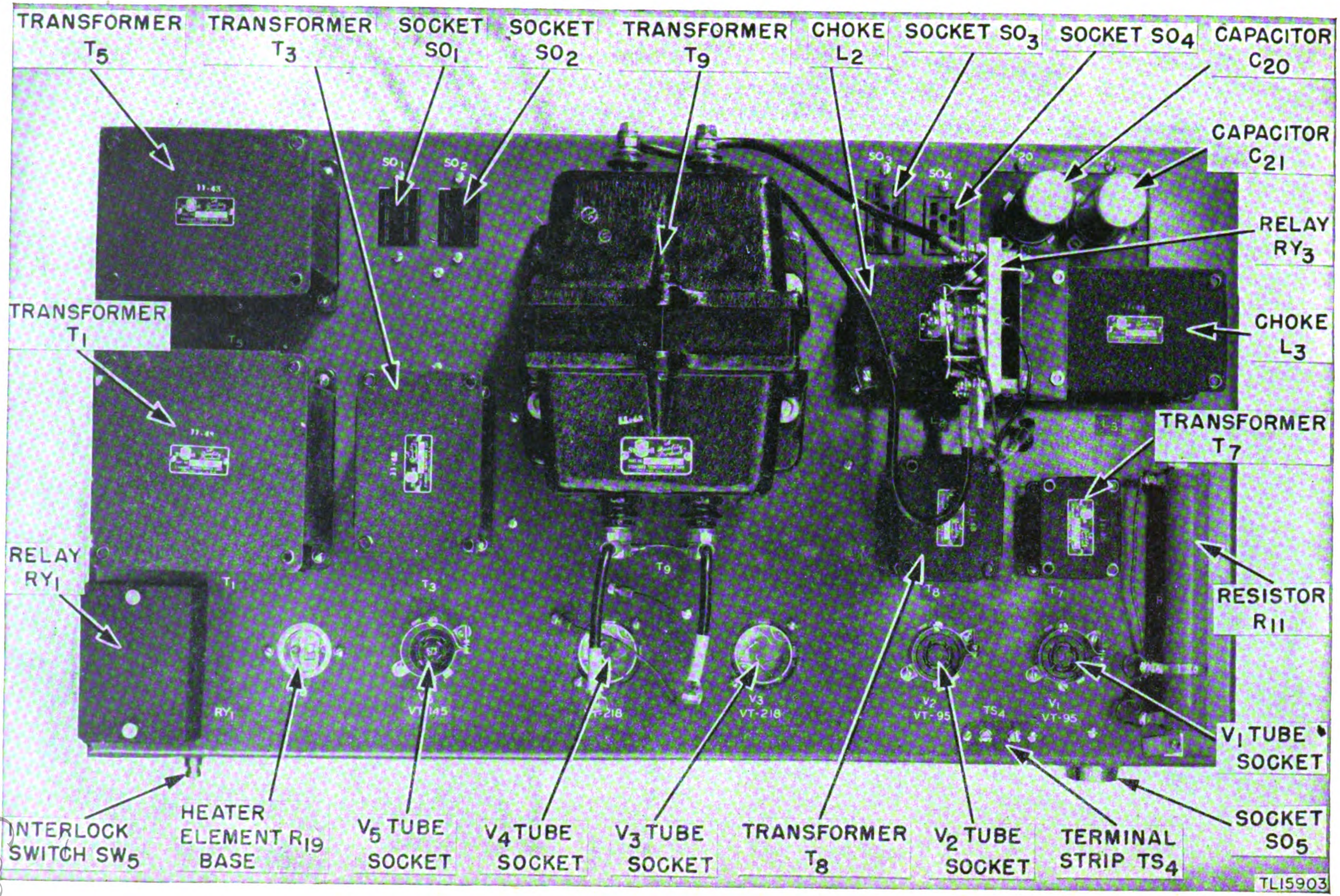


Figure 109. Radio Transmitter BC-610-E—top view of modulator deck.

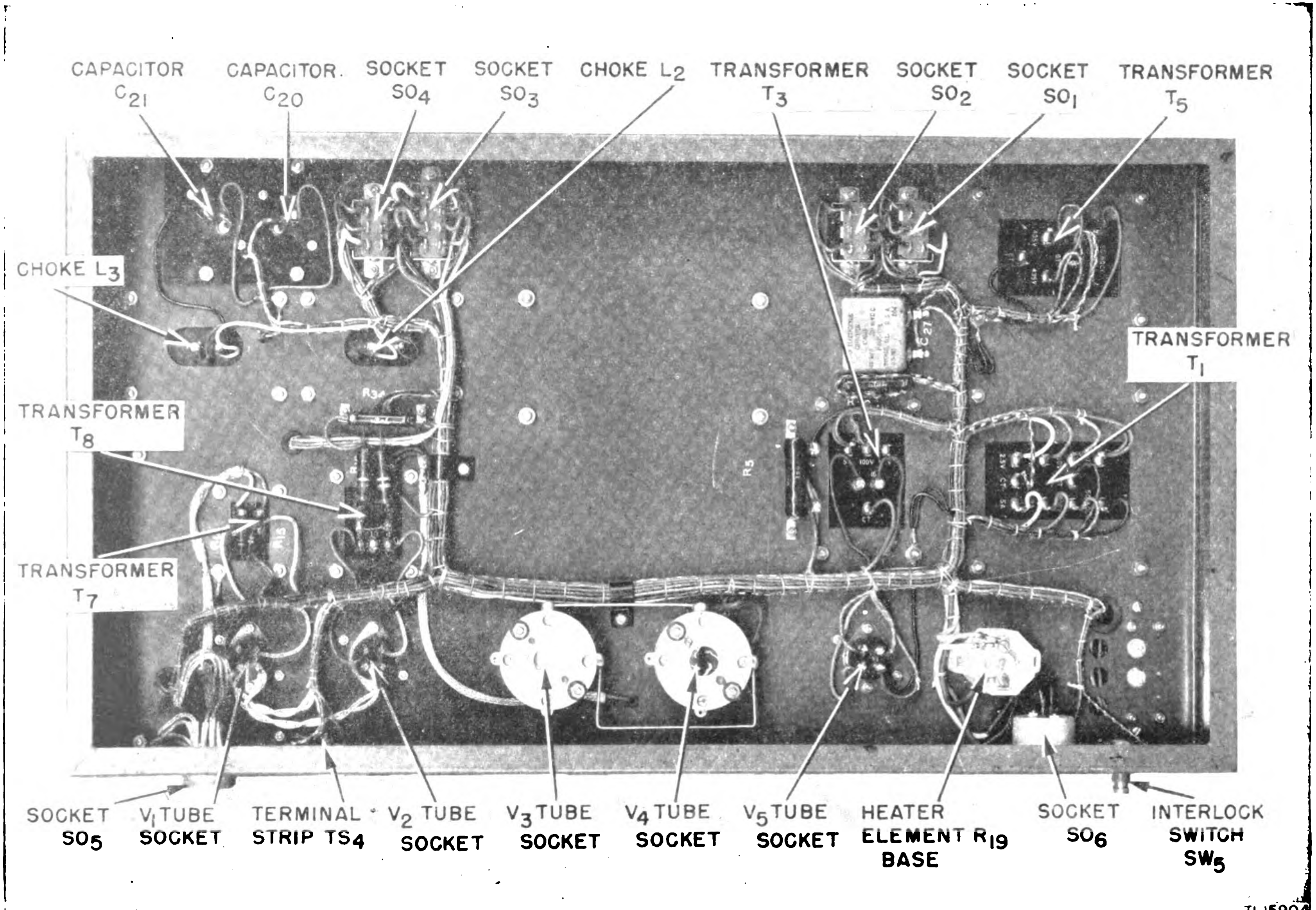


Figure 110. Radio Transmitter BC–610–E—bottom view of modulator deck.

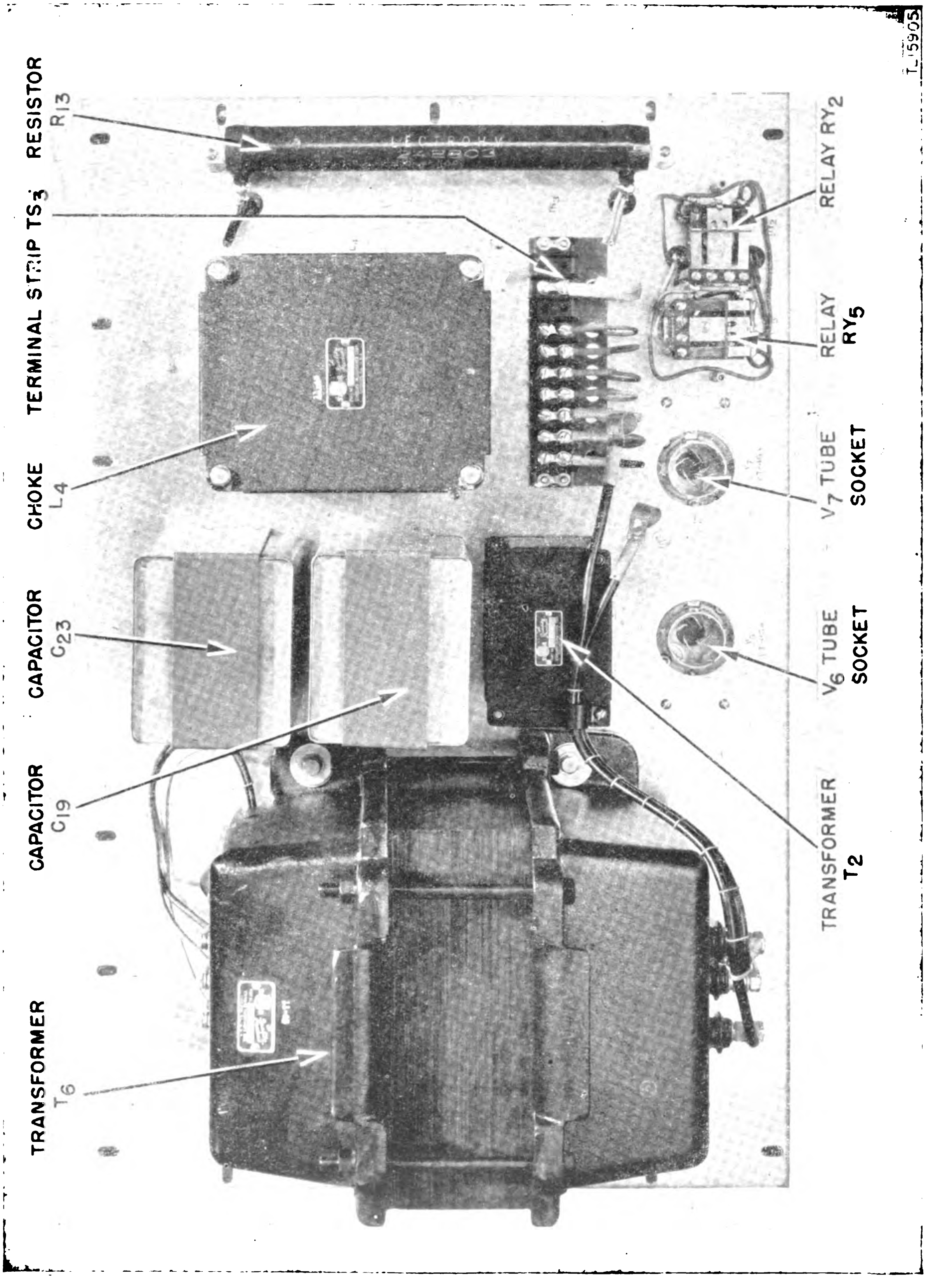


Figure 111. Radio Transmitter BC-610-E—top view of power-supply deck.

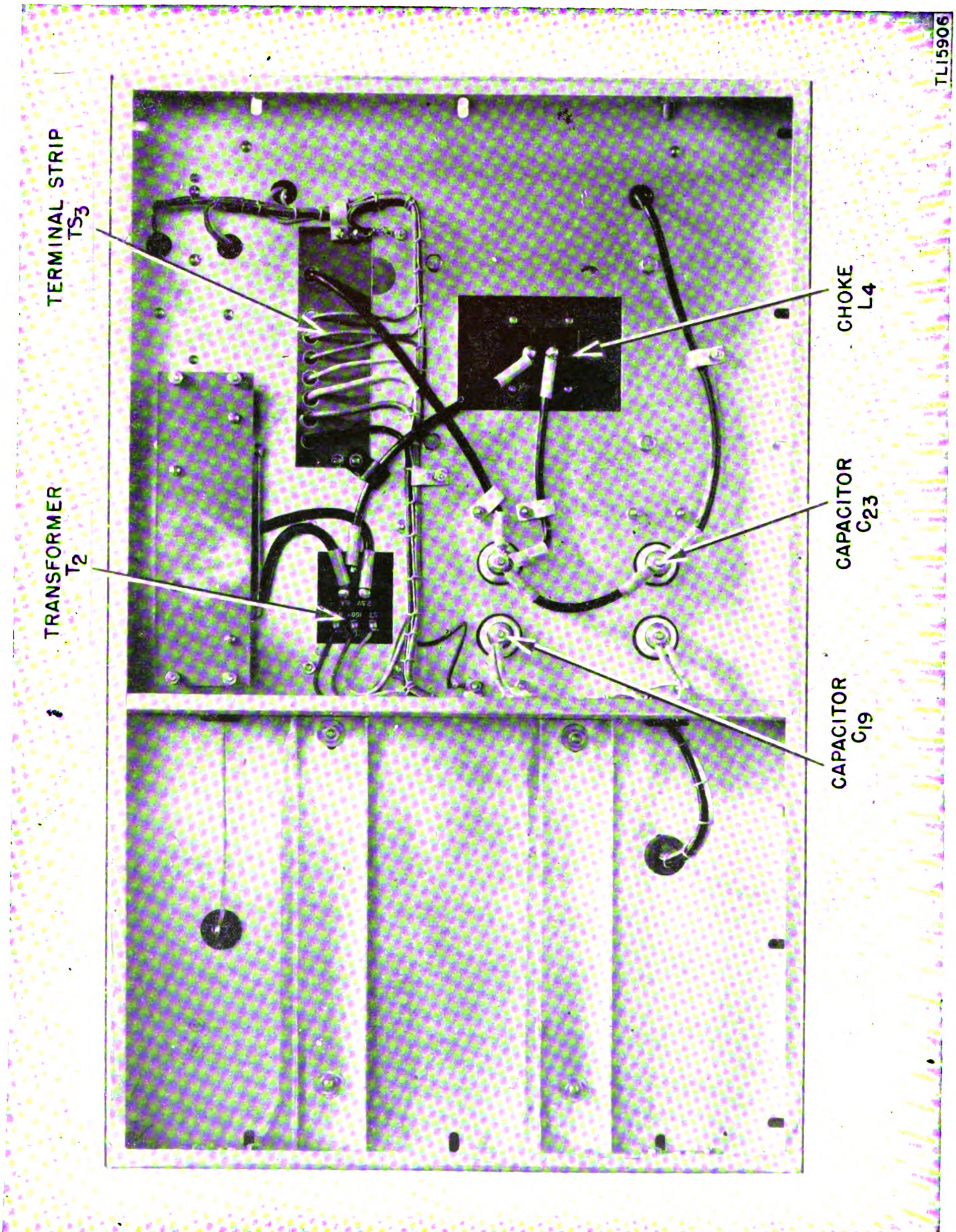


Figure 112. Radio Transmitter BC-610-E—bottom view of power-supply deck.

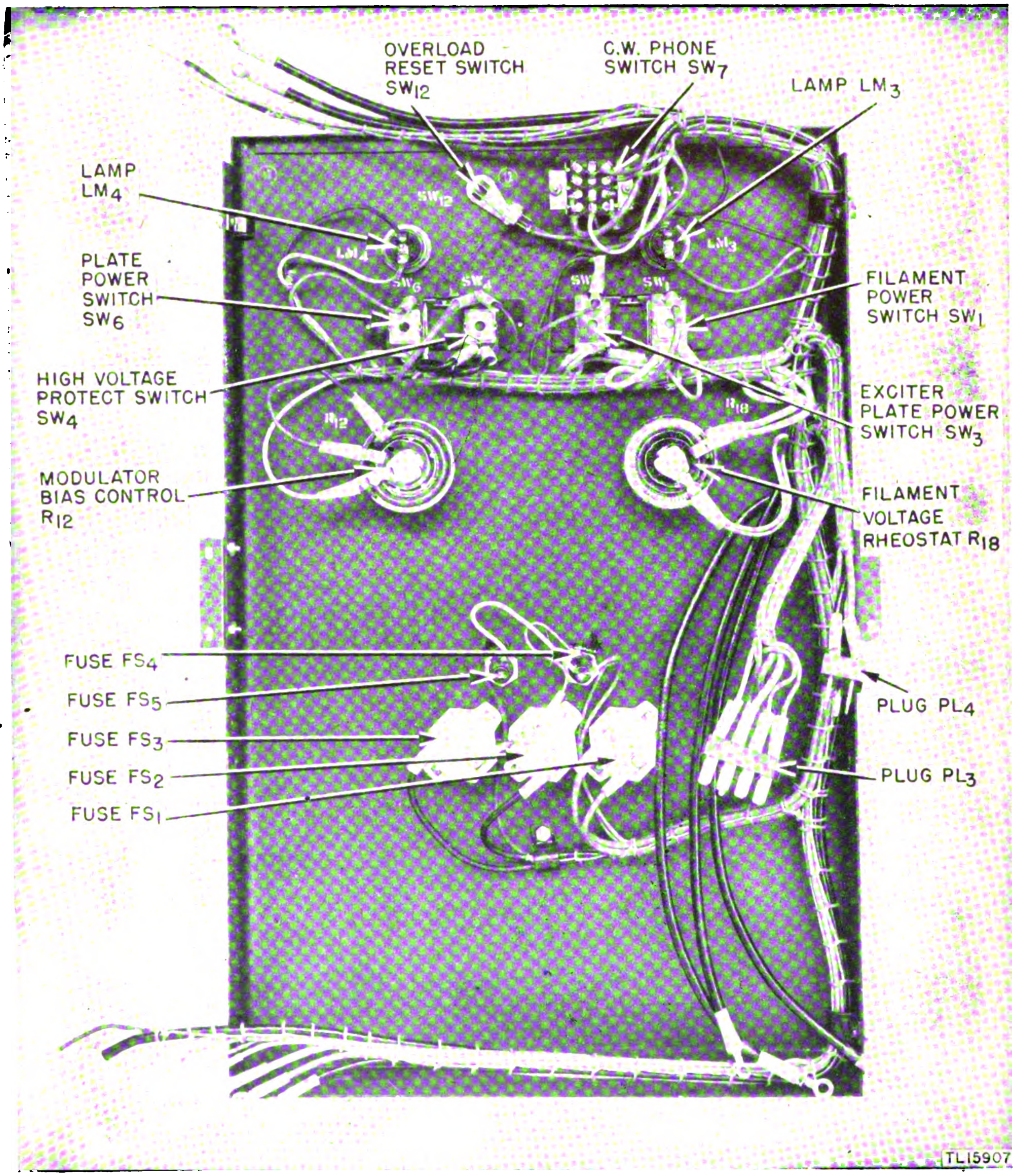


Figure 113. Radio Transmitter BC–610–E—rear view of power panel.

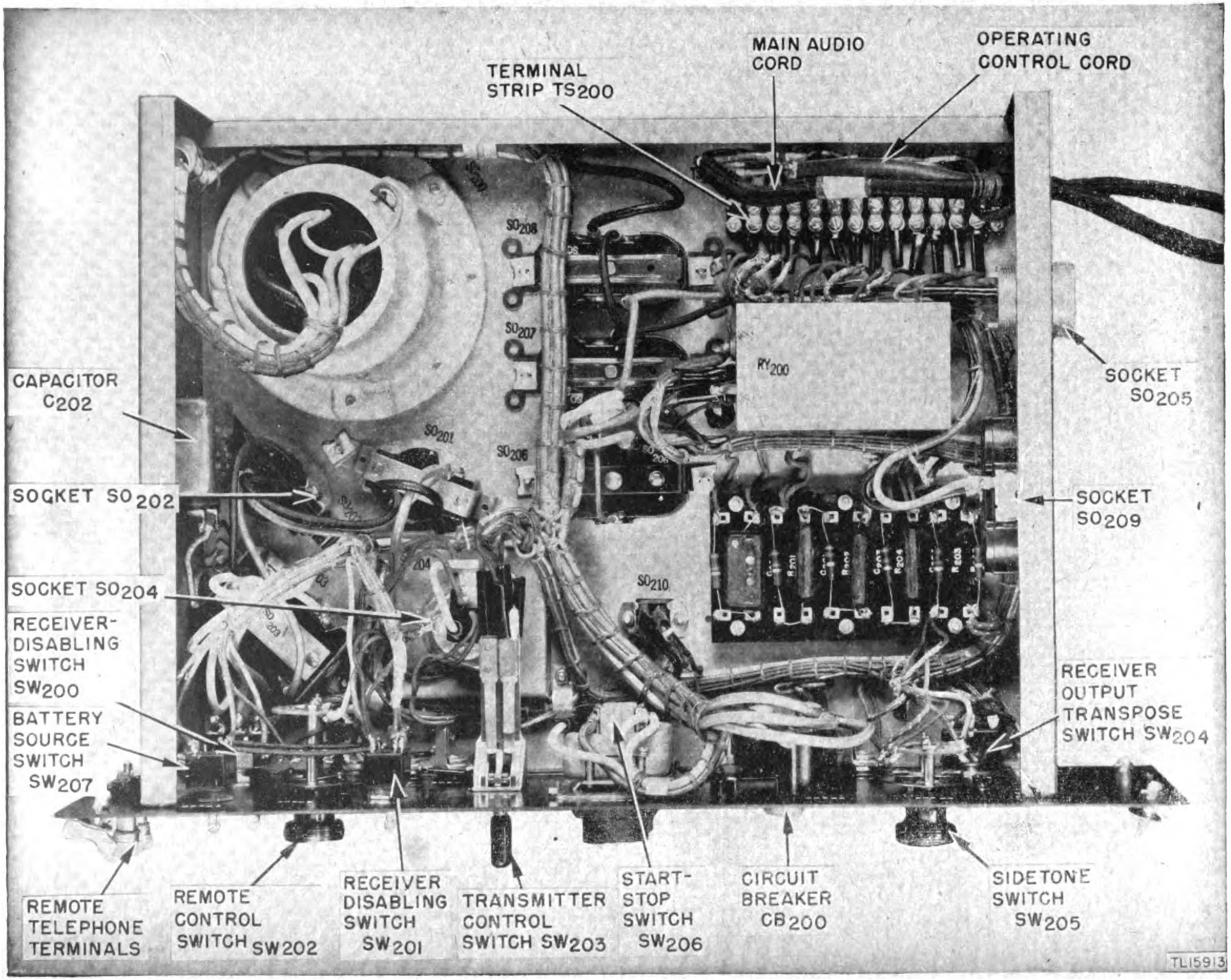


Figure 114. Junction Box JB–70–A—top interior view of chassis.

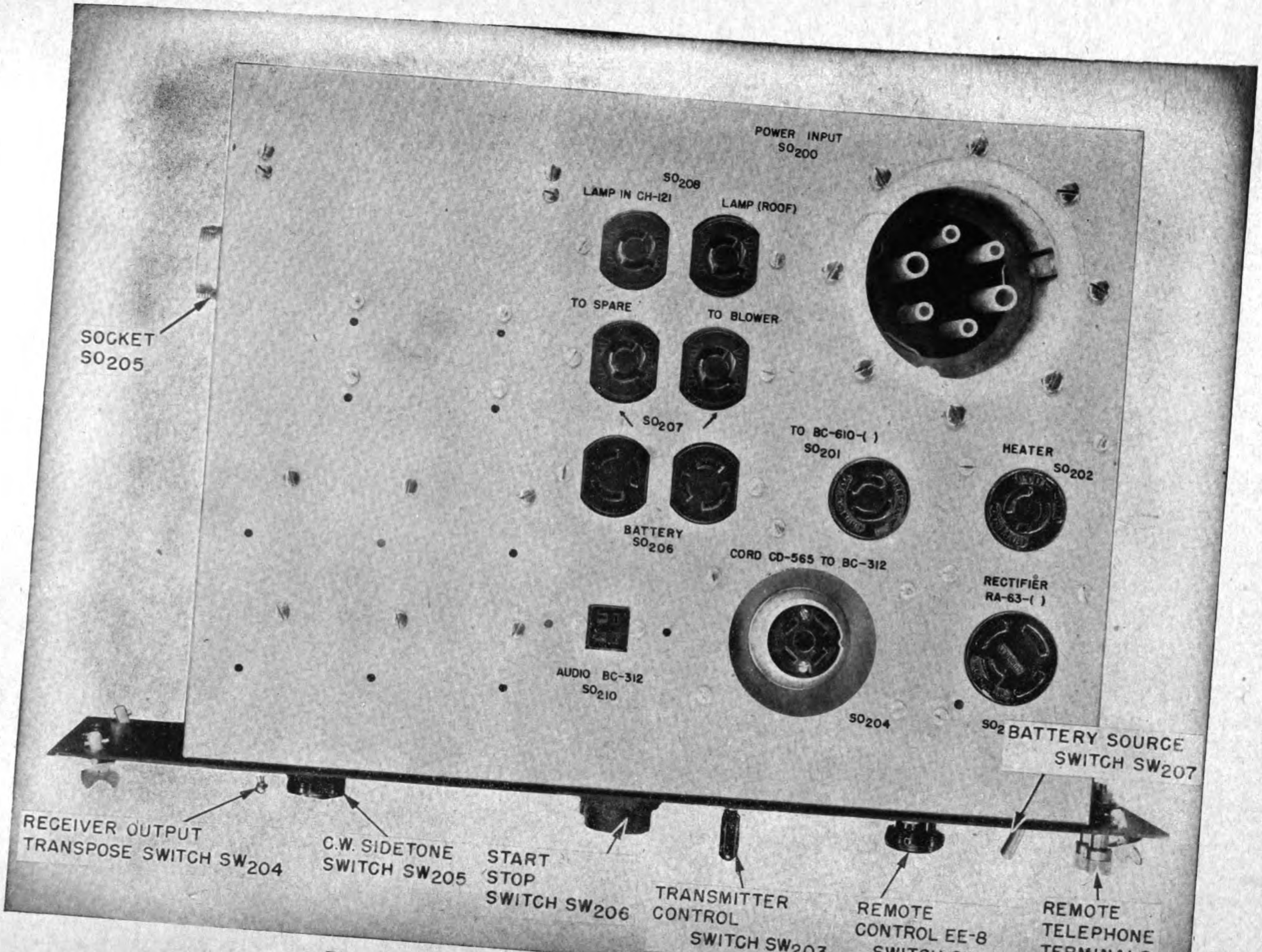


Figure 115. Junction Box JB-70-A—bottom view of chassis.

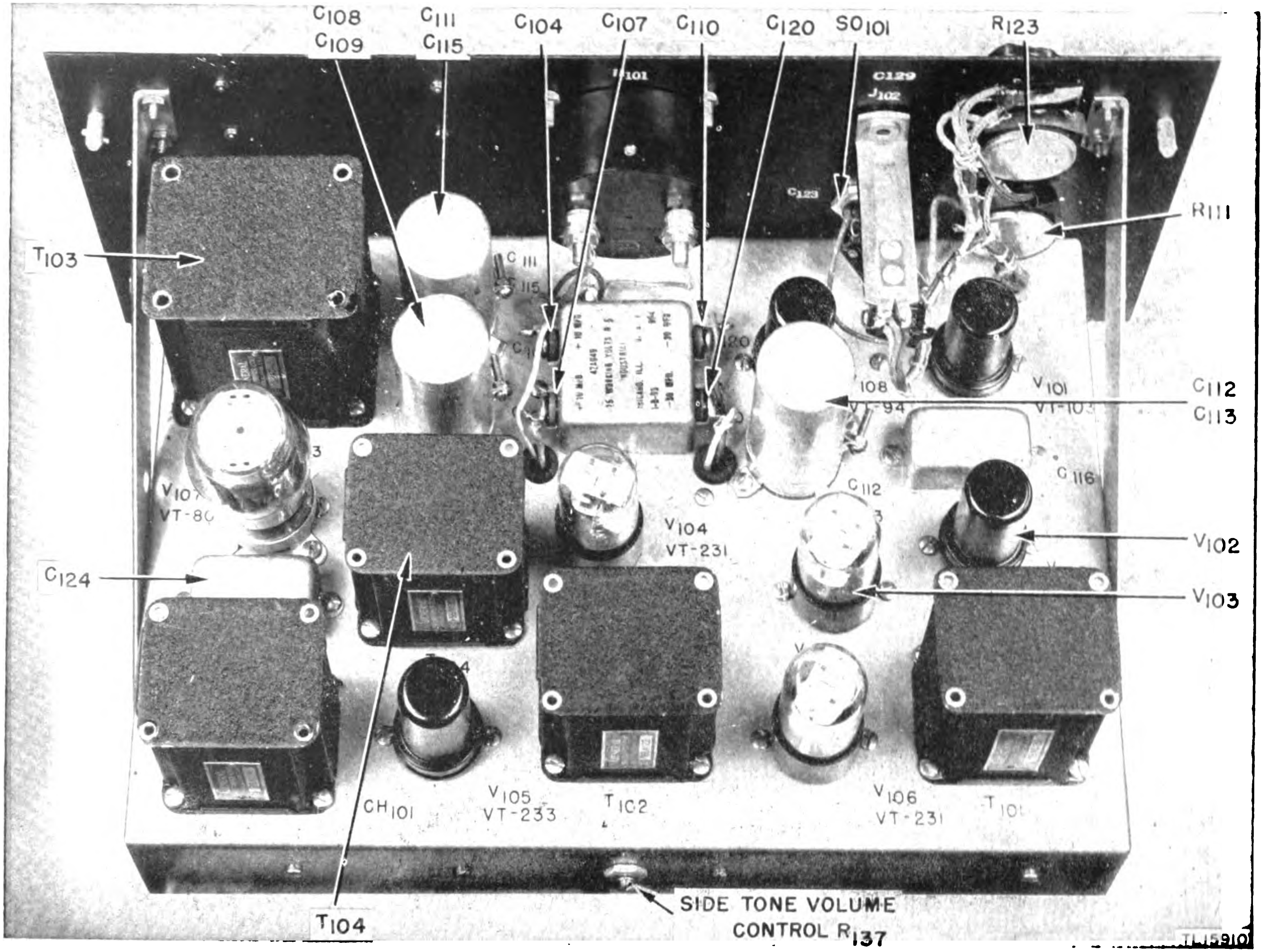


Figure 116. Speech Amplifier BC-614-E—top interior view of chassis.

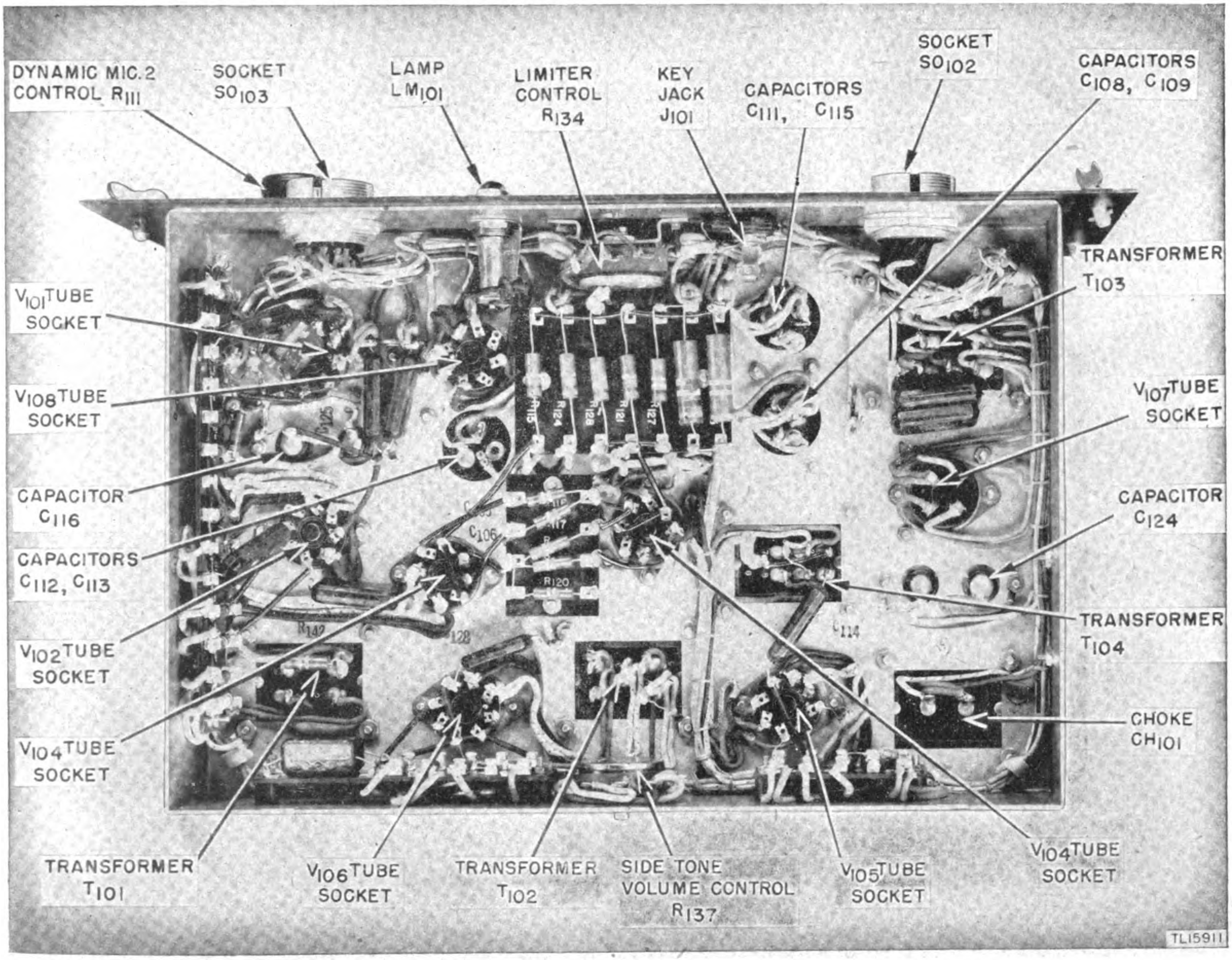


Figure 117. Speech Amplifier BC-614-E—bottom interior view of chassis.

C108 C111 C104 C107 C110 C120 SO101 R123

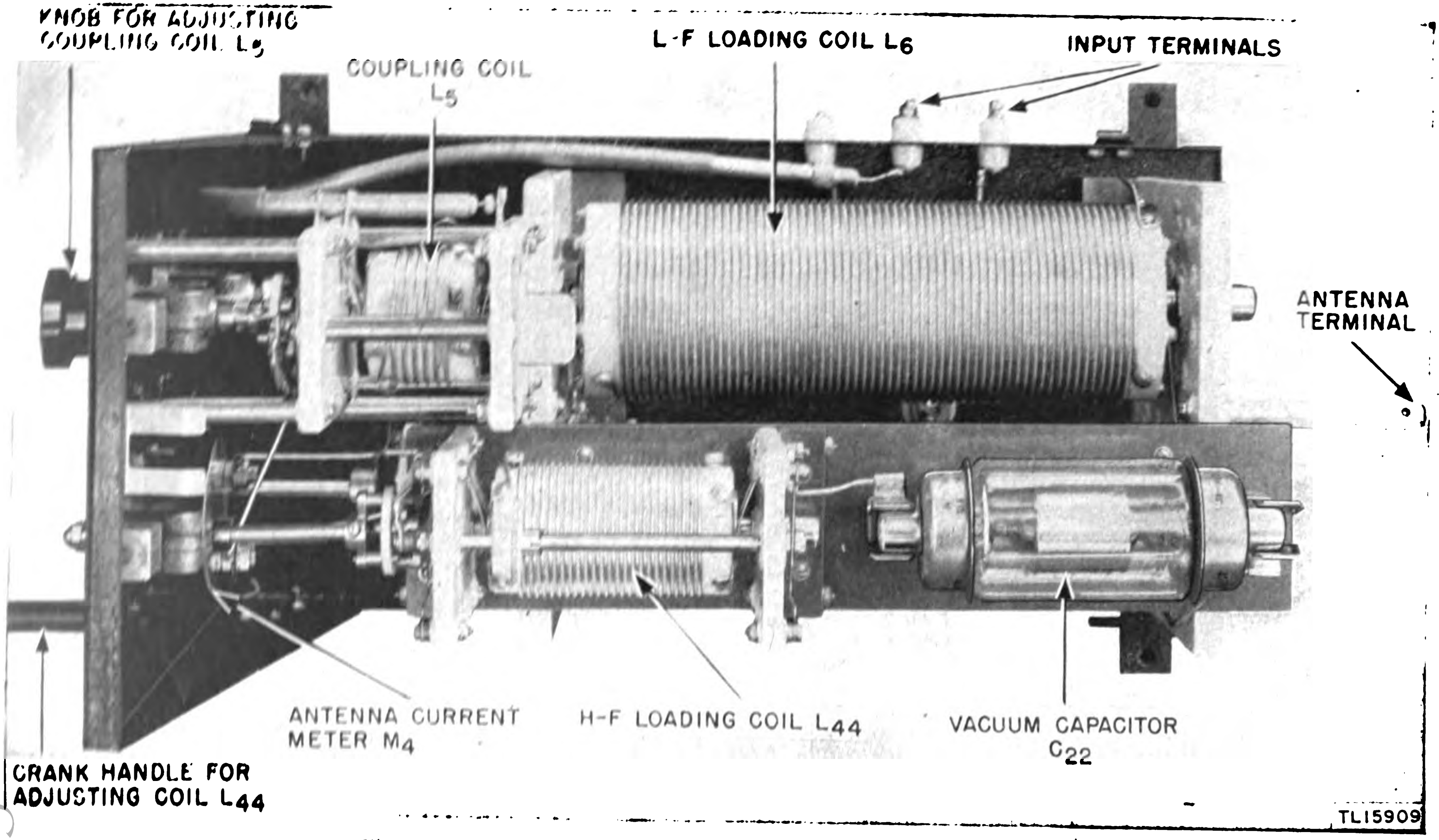


Figure 118. Antenna Tuning Unit BC-939-A—top interior view of chassis.

H-F
LOADING COIL
L44

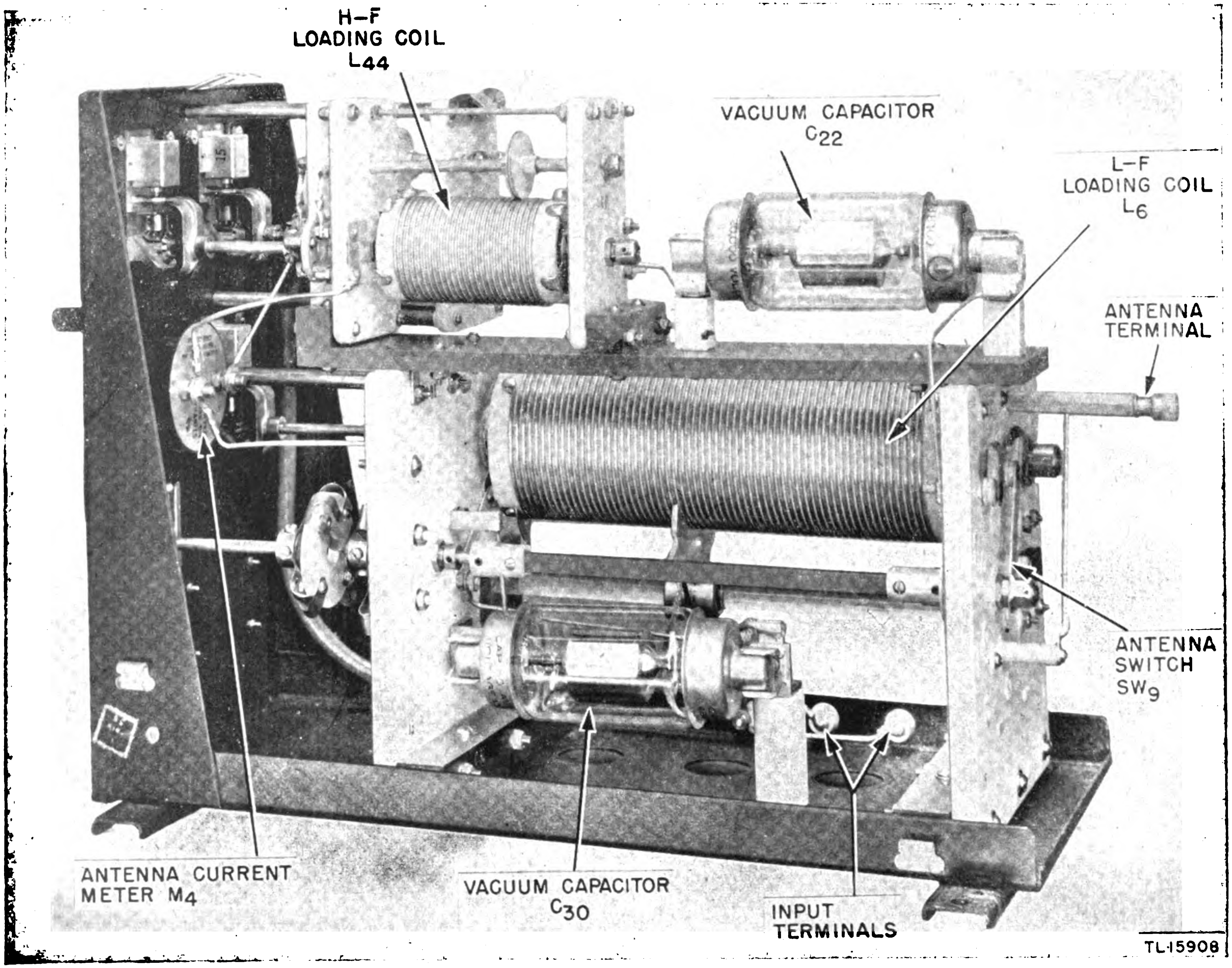
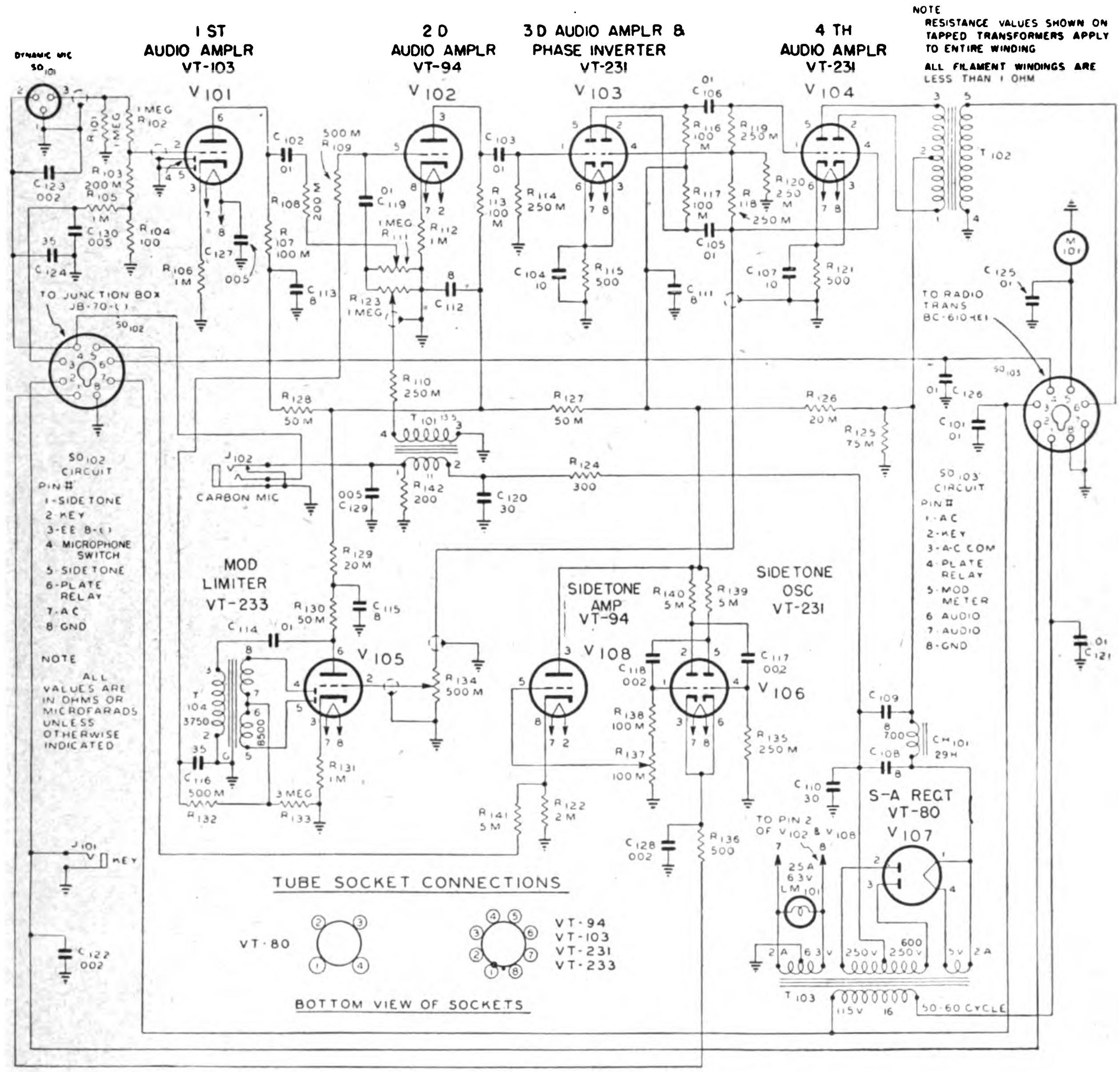


Figure 119. Antenna Tuning Unit BC-939-A—side interior view of chassis.

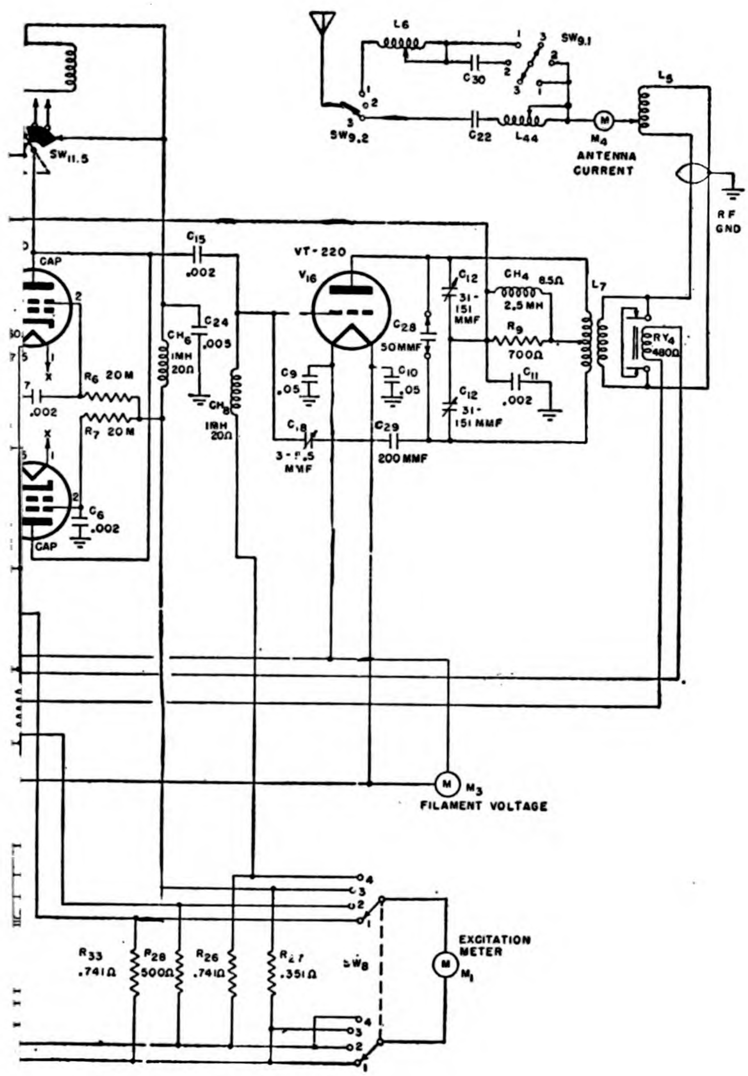


CAPACITORS				
REF SYMBOL	WORKING VOLTS		REF SYMBOL	WORKING VOLTS
C_{101}	600 V DC		C_{116}	400 V DC
C_{102}	600 V DC		C_{117}	600 V DC
C_{103}	600 V DC		C_{118}	600 V DC
C_{104}	25 V DC		C_{119}	600 V DC
C_{105}	600 V DC		C_{120}	25 V DC
C_{106}	600 V DC		C_{121}	600 V DC
C_{107}	25 V DC		C_{122}	600 V DC
C_{108}	475 V DC		C_{123}	600 V DC
C_{109}	475 V DC		C_{124}	400 V DC
C_{110}	25 V DC		C_{125}	600 V DC
C_{111}	475 V DC		C_{126}	600 V DC
C_{112}	475 V DC		C_{127}	500 V DC
C_{113}	475 V DC		C_{128}	600 V DC
C_{114}	600 V DC		C_{129}	500 V DC
C_{115}	475 V DC		C_{130}	500 V DC

RESISTORS				
REF SYMBOL	WATTS		REF SYMBOL	WATTS
R_{101}	1/2		R_{121}	1
R_{102}	1/2		R_{122}	1/2
R_{103}	1/2		R_{124}	1
R_{104}	1/2		R_{125}	2
R_{105}	1/2		R_{126}	2
R_{106}	1/2		R_{127}	1
R_{107}	1/2		R_{128}	1
R_{108}	1/2		R_{129}	1/2
R_{109}	1/2		R_{130}	1/2
R_{110}	1/2		R_{131}	1/2
R_{112}	1/2		R_{132}	1/2
R_{113}	1/2		R_{133}	1/2
R_{114}	1/2		R_{135}	1/2
R_{115}	1		R_{136}	1/2
R_{116}	1/2		R_{138}	1/2
R_{117}	1/2		R_{139}	1/2
R_{118}	1/2		R_{140}	1/2
R_{119}	1/2		R_{141}	1/2
R_{120}	1/2		R_{142}	1/2

TL-8481A

Figure 123. Speech Amplifier BC–614–E—schematic diagram.



L6
SW9.1
C30
L5
SW9.2
C22
L44
M4
ANTENNA CURRENT
RF GND
SW11.5
CAP
C15
.002
VT-220
V16
C12
31-151 MMF
CH4
8.5Ω
2.5 MH
L7
R9
700Ω
RY4
480Ω
C28
50 MMF
C24
.005
CH6
1MH
20Ω
CH5
1MH
20Ω
R6 20M
R7 20M
.002
C9
.05
C10
.05
C11
.002
C12
31-151 MMF
C18
3-7.5 MMF
C29
200 MMF
C6
.002
CAP
M3
FILAMENT VOLTAGE
EXCITATION METER
M1
R33
.741Ω
R28
500Ω
R26
.741Ω
R27
.351Ω
SW8

TL 14497

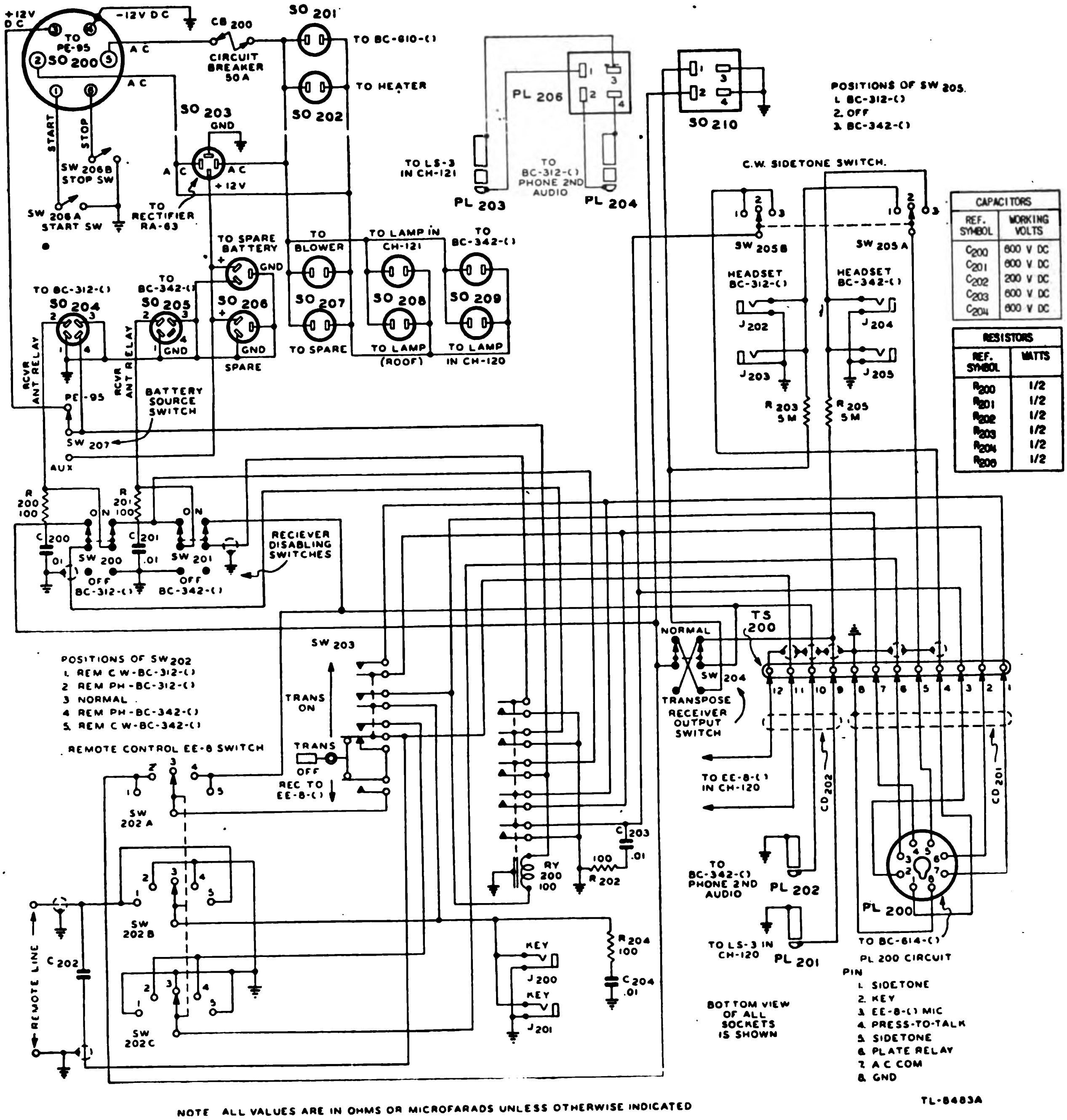


Figure 124. Junction Box JB-70-A—schematic diagram.

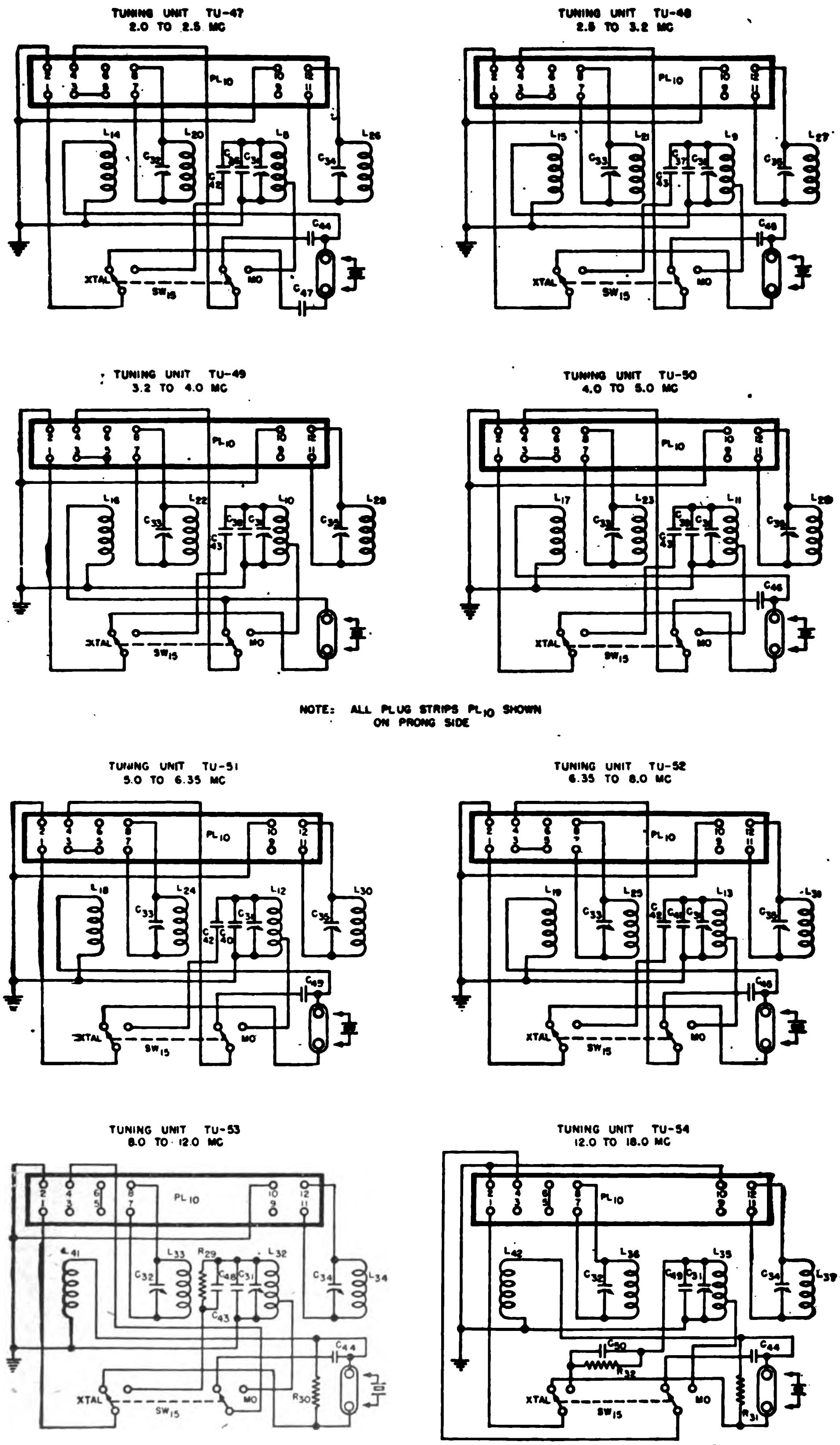
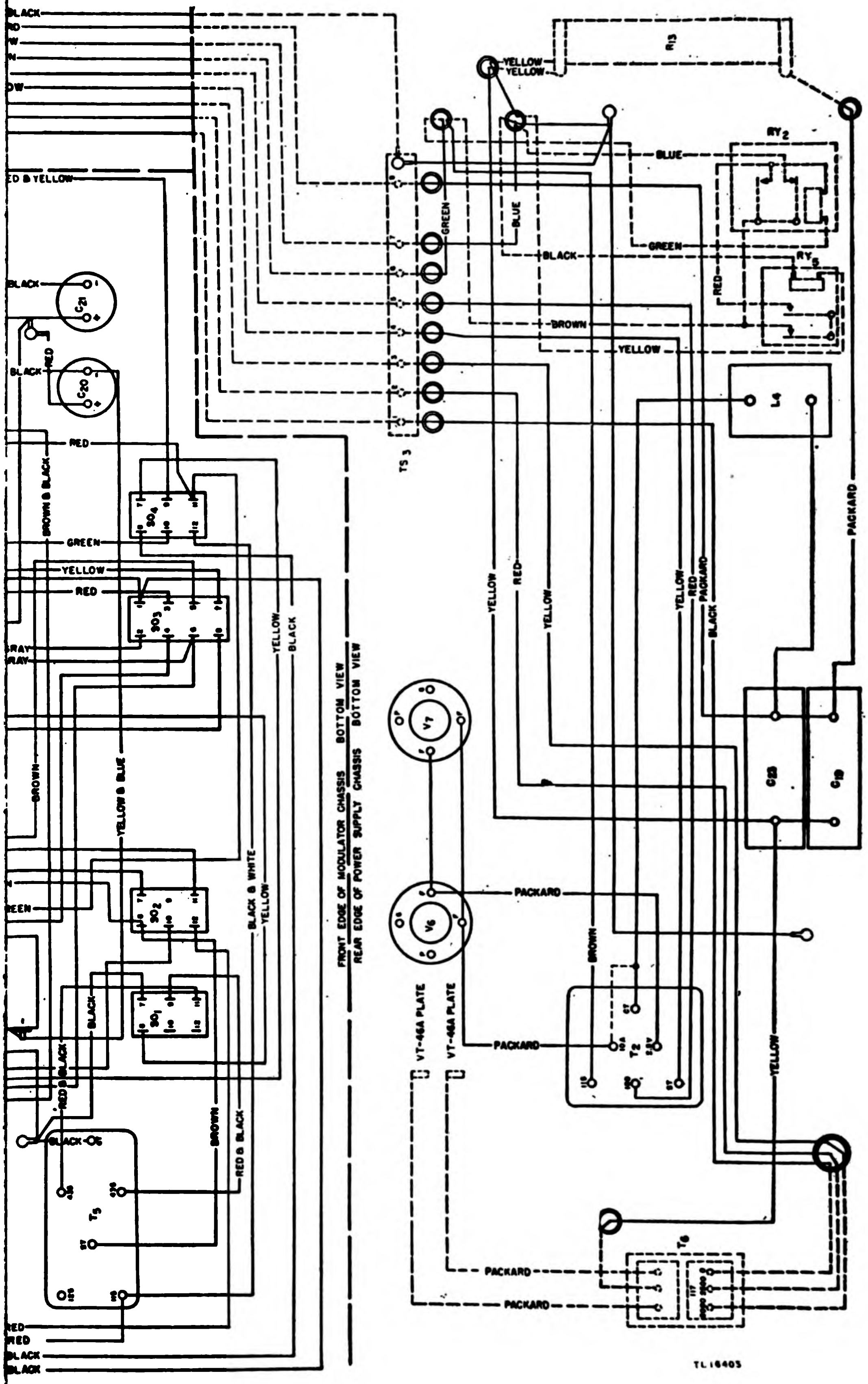


Figure 125. Tuning Units TU-47 through TU-54—schematic diagram.



hassis—practical wiring diagram.

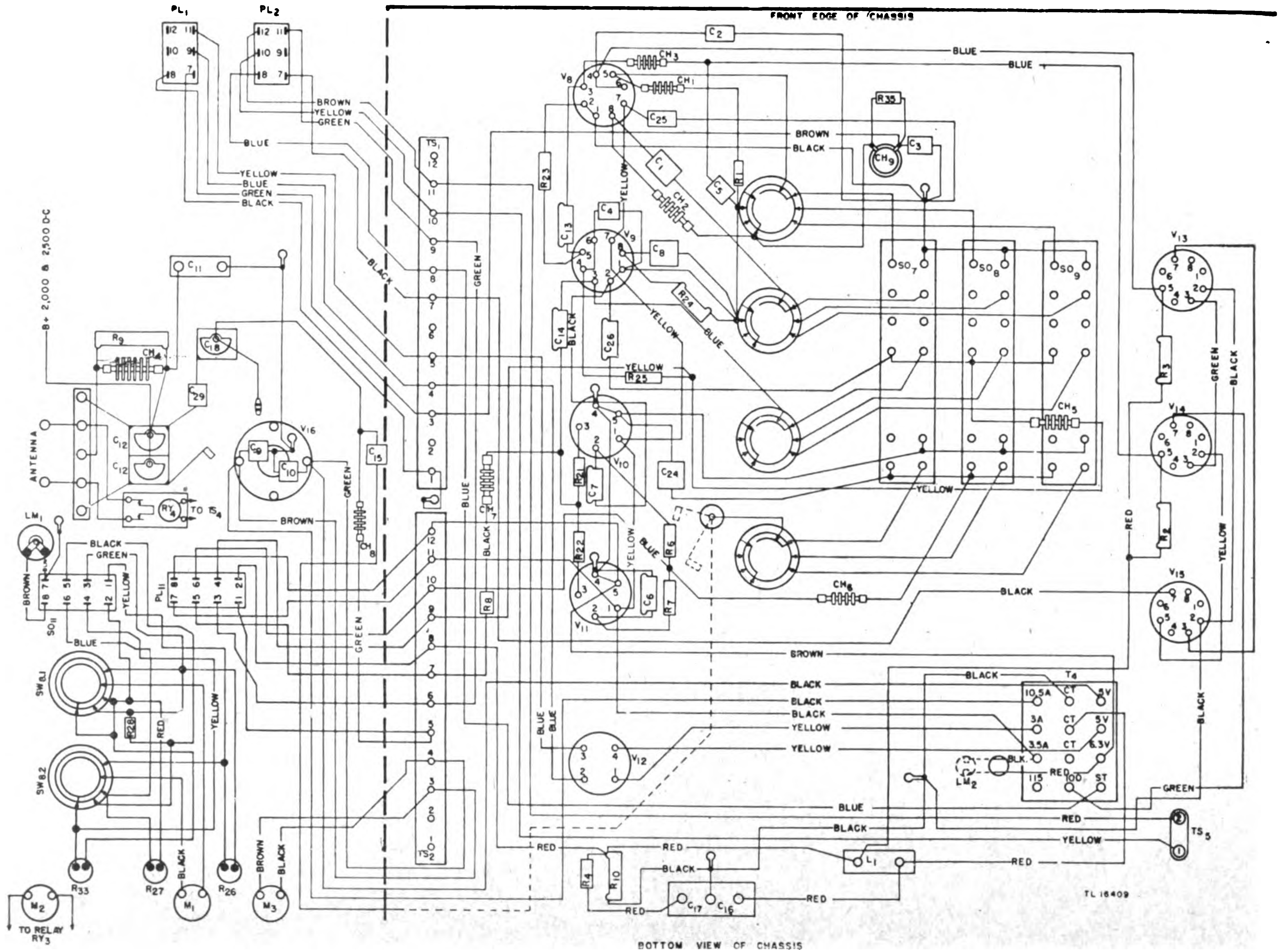


Figure 126. Radio Transmitter BC–610–E, exciter deck—practical wiring diagram.

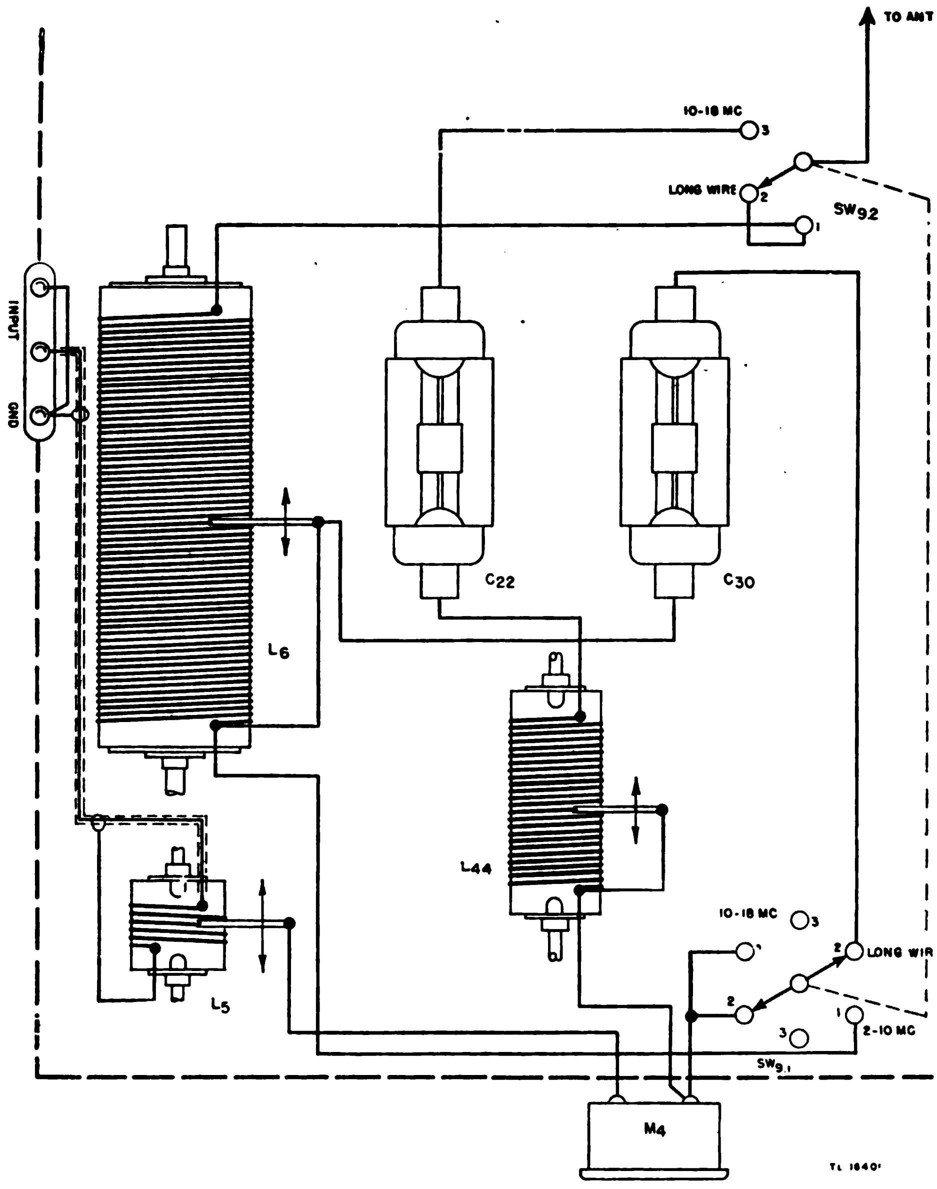
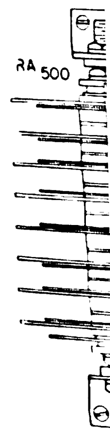


Figure 128. Antenna Tuning Unit BC-939-A—practical wiring diagram.


C129


RA 500

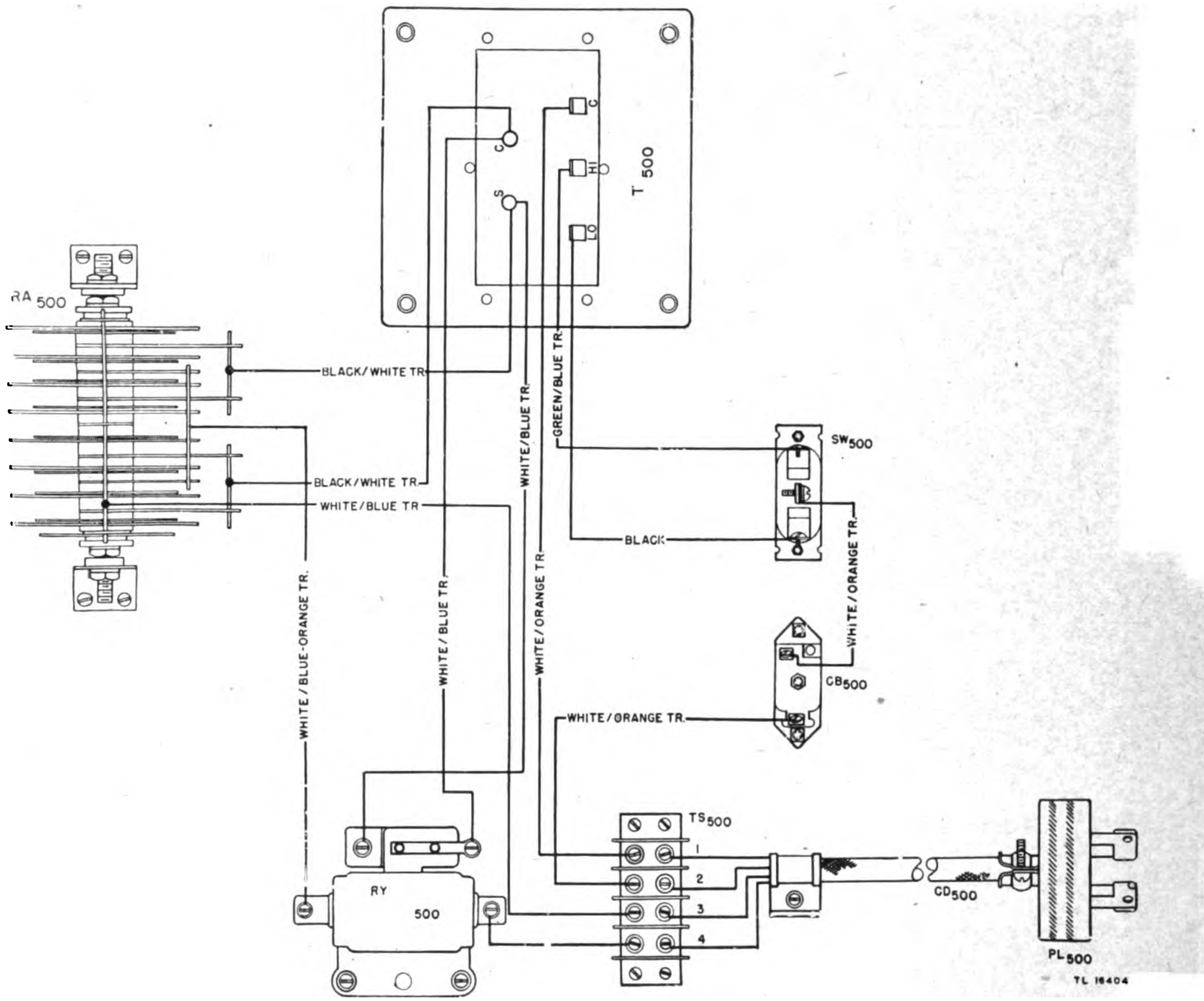


Figure 131. Rectifier RA-63-A—practical wiring diagram.

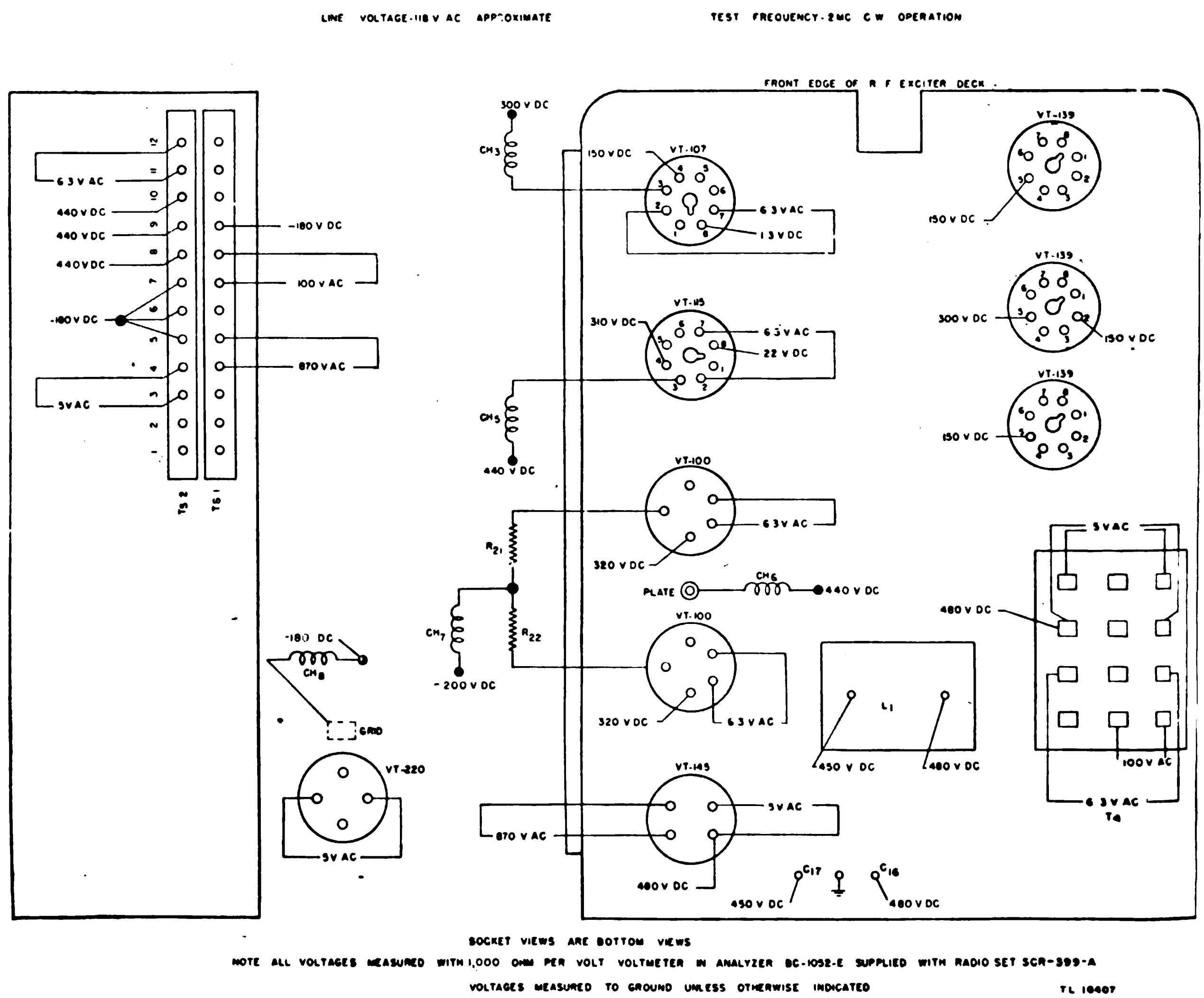
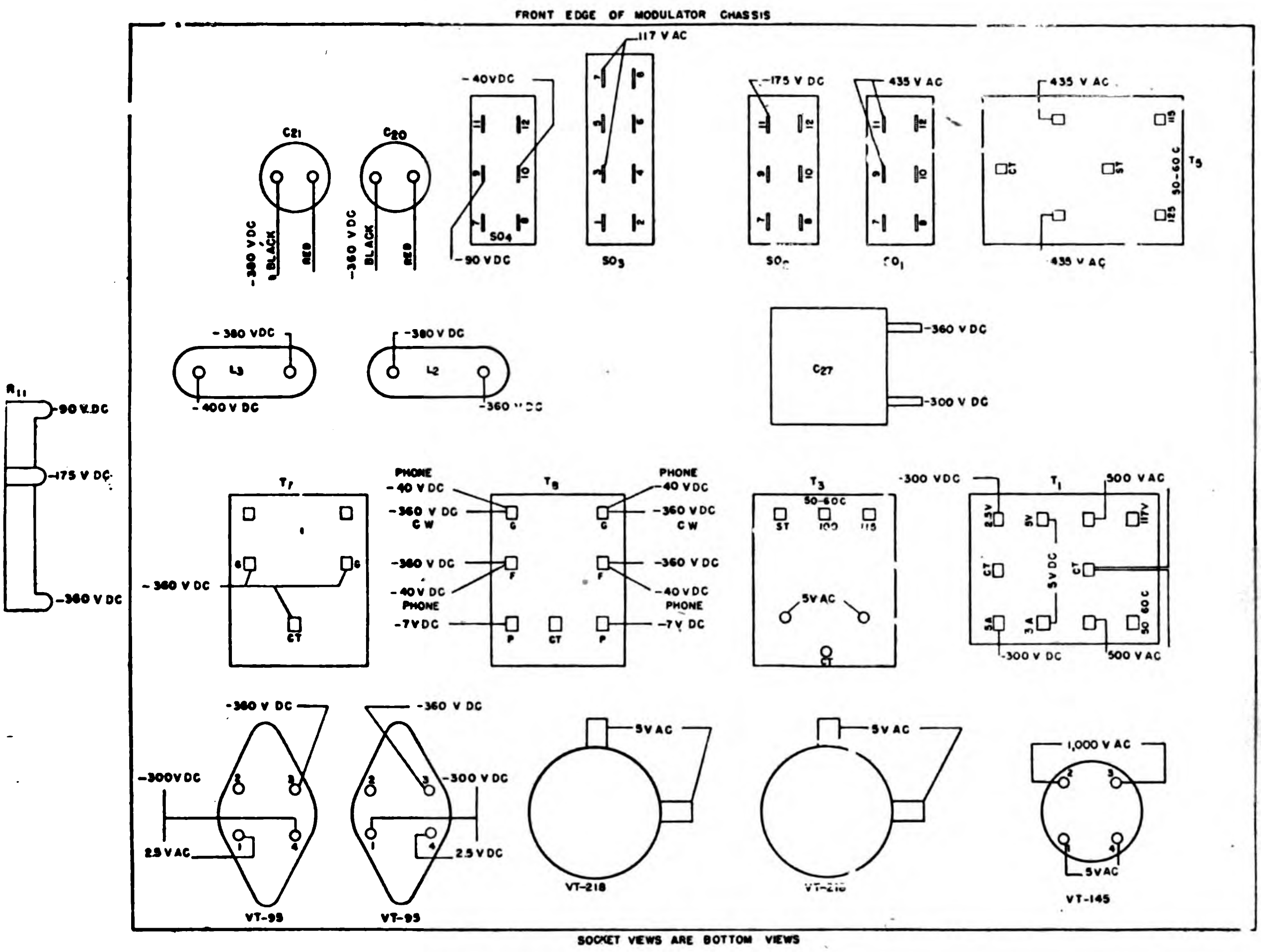


Figure 132. Radio Transmitter BC–610–E, exciter deck, voltages at tube sockets and terminal strips.



NOTE: ALL VOLTAGES MEASURED WITH 1,000 OHM PER VOLT VOLTMETER IN ANALYZER BC-1052-E SUPPLIED WITH RADIO SET SCR-399-A

VOLTAGES MEASURED TO GROUND UNLESS OTHERWISE INDICATED

TL 16411

Figure 133. Radio Transmitter BC-610-E, modulator deck, voltages at tube sockets and transformers.

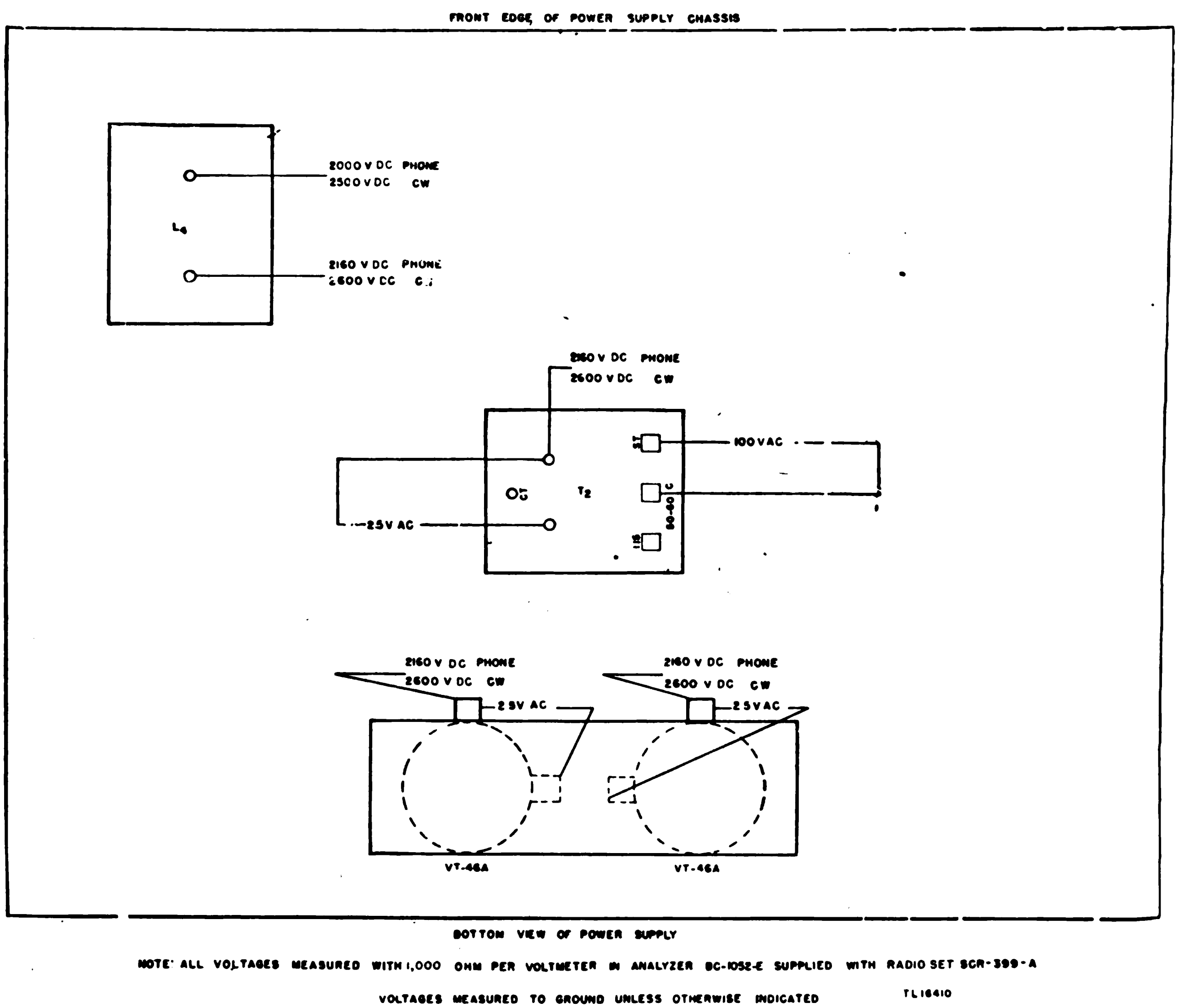
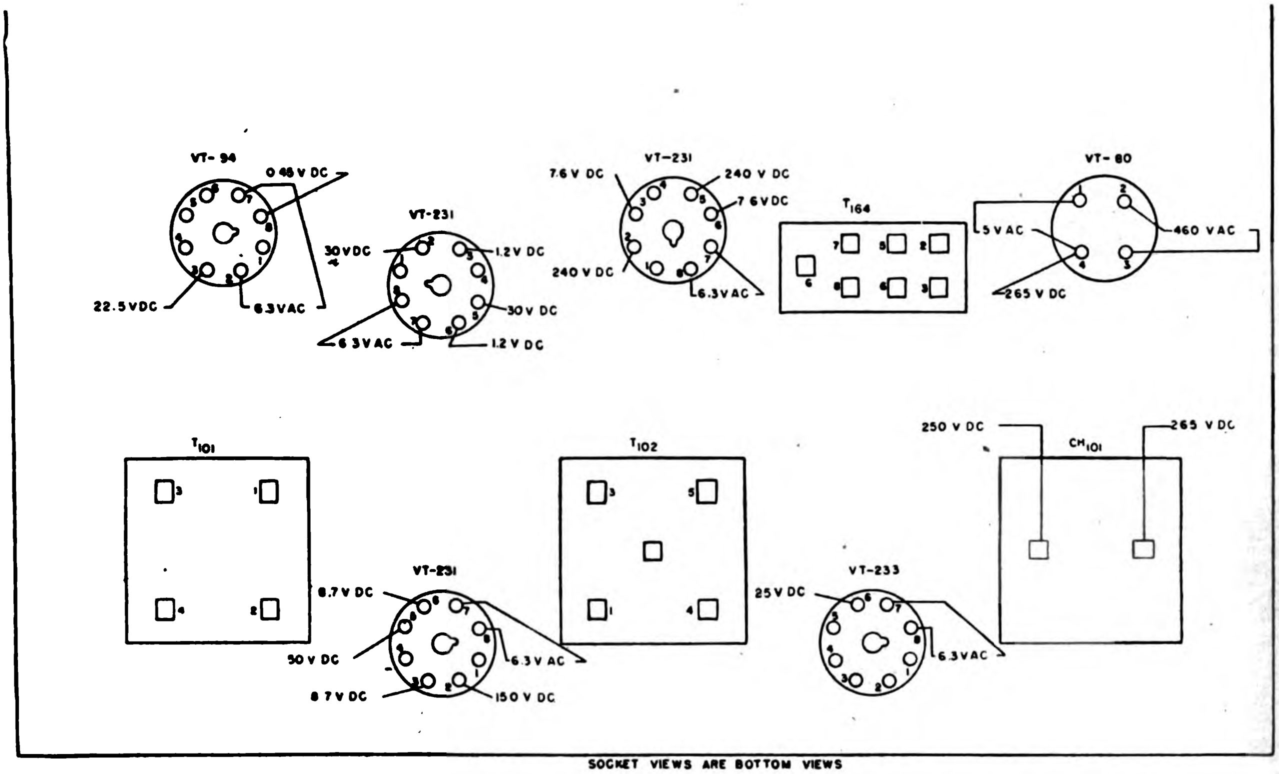


Figure 134. Radio Transmitter BC-610-E, power-supply deck, voltages at tube sockets and transformers.



SOCKET VIEWS ARE BOTTOM VIEWS

NOTE ALL VOLTAGES MEASURED WITH 1,000 OHM PER VOLT VOLTMETER IN ANALYZER BC-1052-E SUPPLIED WITH RADIO SET SCR-399-A
VOLTAGES MEASURED TO GROUND UNLESS OTHERWISE INDICATED TL 16412

Figure 135. Speech Amplifier BC–614–E, voltages from tube sockets to chassis.

APPENDIX I

MAINTENANCE PARTS LIST

For maintenance parts information, see appropriate sections of Army Service Forces Catalogs SIG–7 SCR–399 and SIG–7 SCR–499, Organizational Spare Parts, and SIG–8 SCR–299, SCR–399, SCR–499, Higher Echelon Spare Parts.

APPENDIX II

REFERENCES

1. Parts List

SIG 1	Introduction to ASF Signal Supply Catalog (when published).
SIG 2	Complete Index to ASF Signal Supply Catalog (when published).
SIG 3	List of Items for Troop Issue.
SIG 4–1	Allowances of Expendable Supplies.
SIG 4–2	Allowances of Expendable Supplies for Schools, Training Centers, and Boards.
SIG 5	Stock List of all Items.
SIG 6	Sets (when published).
SIG 7	Organizational Spare Parts.
SIG 8	Higher Echelon Spare Parts for Radio Sets SCR–399–A and SCR–499–A.
SIG 8	Higher Echelon Spare Parts for Radio Receivers BC–312–( ) and BC–342–( ).
SIG 8	Higher Echelon Spare Parts for Radio Transmitter BC–610.
SIG 8	Higher Echelon Spare Parts for Speech Amplifier BC–614–( ).
SIG 8	Higher Echelon Spare Parts for Antenna Tuning Unit BC–939–A.
SIG 8	Higher Echelon Spare Parts for Telephones EE–8–( ).
SIG 8	Higher Echelon Spare Parts for Headset HS–30–( ).
SIG 8	Higher Echelon Spare Parts for Shelter HO–17.
SIG 8	Higher Echelon Spare Parts for Junction Box JB–70–A.
SIG 8	Higher Echelon Spare Parts for Power Unit PE–95–A, B, C, D.
SIG 8	Higher Echelon Spare Parts for Frequency Meter Set SCR–211–( ).
SIG 8	Higher Echelon Spare Parts for Microphone T–30–( ).
SB 11–8	Chests for Running Spares.
SB 11–10	Signal Corps Kit and Materials for Moisture and Fungi-Resistant Treatment.

2. Technical Manuals on Auxiliary Equipment and Test Equipment

TM 11–300	Frequency Meter Sets SCR–211–A, SCR–211–B, and SCR–211–C.
TM 11–303	Test Sets I–56–C, I–56–D, I–56–H, and I–56–J.
TM 11–307	Signal Generators I–72–G, I–72–H, and I–72–J.
TM 11–321	Test Set I–56–E.
TM 11–2613	Voltommeter I–166.
TM 11–2626	Test Unit I–176.
TM 11–2627	Tube Tester I–177.
TM 11–472	Repair and Calibration of Electrical Measuring Instruments.

3. Painting, Preserving, and Lubrication

SB 11–10	Signal Corps Kit and Materials for Moisture and Fungi-Resistant Treatment.

4. Shipping Instructions

U. S. Army Spec No. 100–14A	Army-Navy General Specification for Packaging and Packing for Oversea Shipment.

5. Decontamination

TM 3–220	Decontamination.

6. Demolition

FM 5–25	Explosives and Demolitions.

7. Camouflage

FM 5–20	Camouflage, Basic Principles.

8. Other Technical Publications

FM 21–6	List of Publications for Training.
FM 21–7	List of War Department Films, Film Strips, and Recognition Film Slides.
FM 21–8	Military Training Aids.
FM 21–40	Defense Against Chemical Attack.
FM 24–6	Radio Operator's Manual, Army Ground Forces.
FM 24–11	Combined Operating Signals.
FM 24–18	Radio Communication.
TB SIG 5	Defense Against Radio Jamming.
TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Ground Signal Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 143	Installation Instructions for Vehicular Radio Sets.
TM 1–455	Electrical Fundamentals.
TM 11–227	Signal Communication Equipment Directory, Radio Communication Equipment.
TM 11–300	Frequency Meter Set SCR–211–( ).
TM 11–310	Schematic Diagrams for Maintenance of Ground Radio Communication Sets.
TM 11–314	Antennas and Antenna Systems.
TM 11–333	Telephones EE–8, EE–8–A and EE–8–B.
TM 11–430	Batteries for Signal Communication Except those Pertaining to Aircraft.
TM 11–453	Shop Work.
TM 11–454	The Radio Operator.
TM 11–455	Radio Fundamentals.
TM 11–462	Signal Corps Reference Data.
TM 11–483	Suppression of Radio Noises (when published).
TM 11–496	Training Text and Applicatory Exercises for Amplitude-modulated Radio Sets.
TM 11–499	Radio Propagation Handbook.
TM 11–904–H	Power Units PE–95–G and PE–95–H.
TM 11–850–N	Radio Receivers BC–312–N, BC–312–NX, BC–342–N, BC–314–G, and BC–344–D.
TM 11–2737	Installation of Radio and Interphone Equipment in Shelter HO–17 (when published).
TM 38–250	Basic Maintenance Manual.

9. Forms

Unsatisfactory Equipment Report. (See fig. 151.)

10. List of Abbreviations

a-c	alternating-current
a-f	audio-frequency
a-v-c	automatic-volume-control
BFO	beat-frequency-oscillator
cps	cycles per second
c-w	continuous-wave
db	decibel (s)
d-c	direct current
h-f	high-frequency
i-f	intermediate-frequency
i-p-a	intermediate-power-amplifier
kc	kilocycle (s)
l-f	low-frequency
ma	milliampere (s)
mc	megacycle (s)
mmf	micromicrofarad (s)
m-o	master-oscillator
m-v-c	manual-volume-control

p-a	power-amplifier
r-f	radio-frequency

11. Glossary

See glossary, TM 11–455.

Table VIII. Continuity checks for cables and terminal strips

a. RADIO TRANSMITTER BC-610-E

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Plug PL_1 (in modulator)	PL_1	7	Remove plug PL_1 from socket SO_1	Terminal 1 of terminal strip TS_1	0
		8	Remove plug PL_1 from socket SO_1	Terminal 3 of terminal strip TS_1	0
		9	Remove plug PL_1 from socket SO_1	Terminal 4 of terminal strip TS_1	0
		11	Remove plug PL_1 from socket SO_1	Terminal 5 of terminal strip TS_1	0
Plug PL_2 (in modulator)	PL_2	7	Remove plug PL_2 from socket SO_2	Terminal 7 of terminal strip TS_1	0
		8	Remove plug PL_2 from socket SO_2	Terminal 8 of terminal strip TS_1	0
		10	Remove plug PL_2 from socket SO_2	Terminal 10 of terminal strip TS_1	0
		11	Remove plug PL_2 from socket SO_2	Terminal 9 of terminal strip TS_1	0
		12	Remove plug PL_2 from socket SO_2	Terminal 11 of terminal strip TS_1	0
Plug PL_3 (in Modulator)	PL_3	1	Fuse FS_5 in operating condition. Remove plug PL_3 from socket SO_3	Terminal 5 of terminal strip TS_3	0
		1	Fuse FS_5 in operating condition. Remove plug PL_3 from socket SO_3	Terminal 5 of plug PL_3	0
		1	Fuse FS_5 in operating condition; lamp LM_3 in its socket. Remove plug PL_3 from socket SO_3	Terminal 6 of plug PL_3 *Note.* Setting of potentiometer R_{18} varies resistance reading.	9–21
		1	Fuses FS_1 and FS_5 in operating condition; lamp LM_3 in its socket; switch SW_1 at ON. Remove plug PL_3 from socket SO_3	Terminal 3 of plug PL_3 *Note.* Setting of potentiometer R_{18} varies resistance reading.	9–21
		1	Fuse FS_5 in operating condition; lamp LM_3 in its socket; switch SW_6 at ON. Remove plug PL_3 from socket SO_3 and plug PL_4 from socket SO_4	Terminal 11 of plug PL_4 *Note.* Setting of potentiometer R_{18} varies resistance reading.	9–21
		1	Fuse FS_5 in operating condition; lamp LM_3 in its socket; switch SW_3 at ON. Remove plug PL_3 from socket SO_3 and plug PL_4 from socket SO_4	Terminal 12 of plug PL_4 *Note.* Setting of potentiometer R_{18} varies resistance reading.	9–21
		1	Switch SW_7 at PHONE; fuse FS_5 in operating condition. Remove plug PL_3 from socket SO_3	Terminal 2 of plug PL_3	0
		4		Terminal 4 of terminal strip TS_3	0
		4	Switch SW_{12} closed. Remove plug PL_3 from socket SO_3	Terminal 6 of terminal strip TS_3	0
		4	Potentiometer R_{18} full counterclockwise. Remove plug PL_3 from socket SO_3	Terminal 6 of plug PL_3	15
		5	Fuses FS_2 and FS_4 in operating condition. Remove plug PL_3 from socket SO_3	Terminal 7 of plug PL_3	0
		7	Fuses FS_2 and FS_3 in operating condition; lamp LM_4 in its socket. Remove plug PL_3 from socket SO_3 and plug PL_4 from socket SO_4	Terminal 7 of plug PL_4	340
		7	Fuses FS_2 and FS_3 in operating condition; lamp LM_4 in its socket; switch SW_4 at NORMAL. Remove plug PL_3 from socket SO_3; remove plug PL_4 from socket SO_4	Terminal 8 of plug PL_4	.1
		7	Fuses FS_2 and FS_3 in operating condition; lamp LM_4 in its socket; switch SW_4 at NORMAL. Remove plug PL_3 from socket SO_3	Terminal 1 of terminal strip TS_3	.1
		7	Fuses FS_2 and FS_3 in operating condition; switch SW_7 at C.W. Remove plug PL_3 from socket SO_3	Terminal 2 of terminal strip TS_3	0
		7	Fuses FS_2 and FS_3 in operating condition; switch SW_7 at PHONE. Remove plug PL_3 from socket SO_4	Terminal 3 of terminal strip TS_3	0
		8	Remove plug PL_3 from socket SO_3	Terminal 7 of terminal strip TS_3	0

a. Radio Transmitter BC–610–E (Contd.)

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Plug PL_4 (in modulator)	PL_4	9	Remove plug PL_4 from socket SO_4	Ground or chassis	500
		9	Potentiometer R_{12} full clockwise. Remove plug PL_4 from socket SO_4	Terminal 10 of plug PL_4	500
Plug PL_{11} (on meter panel)		1	Remove plug PL_{11} from socket SO_{11}	Terminal 5 of terminal strip TS_2	0
		2	Remove plug PL_{11} from socket SO_{11}	Terminal 8 of terminal strip TS_2	0
		3	Remove plug PL_{11} from socket SO_{11}	Terminal 6 of terminal strip TS_2	0
		4	Remove plug PL_{11} from socket SO_{11}	Terminal 9 of terminal strip TS_2	0
		5	Remove plug PL_{11} from socket SO_{11}	Terminal 7 of terminal strip TS_2	0
		6	Remove plug PL_{11} from socket SO_{11}	Terminal 10 of terminal strip TS_2	0
		7	Remove plug PL_{11} from socket SO_{11}	Terminal 12 of terminal strip TS_2	0
		8	Remove plug PL_{11} from socket SO_{11}	Terminal 11 of terminal strip TS_2	0
Socket SO_1 (in modulator)	SO_1	7	Remove plug PL_1 from socket SO_1	Ground or chassis	0
		8	Remove plug PL_1 from socket SO_1	Terminal 2 of socket SO_5	0
		9	Remove plug PL_1 from socket SO_1	Terminal 11 of socket SO_1	85
Socket SO_2 (in modulator)	SO_2	7	Remove plug PL_2 from socket SO_2; remove plug PL_3 from socket SO_3	Terminal 4 of socket SO_3	0
		7	Remove plug PL_2 from socket SO_2	Terminal 8 of socket SO_2	3
		7	Remove plug PL_2 from socket SO_2; remove plug PL_3 from socket SO_3	Terminal 5 of socket SO_3	3
		10	Remove plug PL_2 from socket SO_2; remove plug PL_4 from socket SO_4	Terminal 11 of socket SO_4	0
		11	Remove plug PL_2 from socket SO_2	Tap on resistor R_{11}	0
Socket SO_3 (in modulator)	SO_3	1	Remove plug PL_3 from socket SO_3	Terminal 6 of socket SO_3	1.5
		1	Remove plug PL_3 from socket SO_3	Terminal 1 of socket SO_5	0
		1	Remove plug PL_3 from socket SO_3	Terminal 3 of socket SO_5	1.5
		2	Remove plug PL_3 from socket SO_3	Terminal 6 of socket SO_3	280
		3	Remove plug PL_3 from socket SO_3	One side of socket SO_6	0
		7	Remove plug PL_3 from socket SO_3	Other side of socket SO_6	0
Socket SO_4 (in modulator)	SO_4	7	Remove plug PL_4 from socket SO_4	Terminal 8 of socket SO_4	16
		9	Remove plug PL_4 from socket SO_4	Terminal CT of transformer T_1 (2.5-volt winding)	3,200
		10	Remove plug PL_4 from socket SO_4	An open bias voltage contact on relay RY_3	0
		11	Switch SW_5 closed. Remove plug PL_3 from socket SO_3; remove plug PL_4 from socket SO_4	Terminal 8 of socket SO_3	80
Socket SO_5 (in modulator)	SO_5	8		Ground or chassis	0
		6		Terminal 7 of socket SO_5	37
		5		Terminal 8 of socket SO_5, ground, or chassis	180
		4	Remove plug PL_4 from socket SO_4	Terminal 11 of socket SO_4	0
Sockets SO_7, SO_8, and SO_9 (in tuning unit)	SO_7	1	Switch SW_{11} at position 1	Terminal 5 of tube V_8 (JAN–6V6)	0
	SO_7	1	Switch SW_{11} at position 2 or 3	Ground or chassis	0
	SO_8	1	Switch SW_{11} at position 2	Terminal 5 of tube V_8 (JAN–6V6)	0
	SO_8	1	Switch SW_{11} at position 1 or 3	Ground or chassis	0
	SO_9	1	Switch SW_{11} at position 3	Terminal 5 of tube V_8 (JAN–6V6)	0
	SO_9	1	Switch SW_{11} at position 1 or 2	Ground or chassis	0
	SO_7, SO_8, SO_9	2		Ground or chassis	0

a. RADIO TRANSMITTER BC-610-E (Contd.)

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Socket SO_7, SO_8, and SO_9 (in tuning unit) (Contd.)	SO_7	4	Switch SW_{11} at position 1	One side only of capacitor C_1	0
	SO_8	4	Switch SW_{11} at position 2	One side only of capacitor C_1	0
	SO_9	4	Switch SW_{11} at position 3	One side only of capacitor C_1	0
	SO_7, SO_8, SO_9	7		Terminal 9 of terminal strip TS_2	20
	SO_7	8	Switch SW_{11} at position 1	Terminal 3 of socket for tube V_9 (JAN-6L6)	0
	SO_7	8	Switch SW_{11} at position 2 or 3	Terminal 7 of sockets SO_8 and SO_9	0
	SO_8	8	Switch SW_{11} at position 2	Terminal 3 of socket for tube V_9 (JAN-6L6)	0
	SO_8	8	Switch SW_{11} at position 1 or 3	Terminal 7 of sockets SO_7 and SO_9	0
	SO_9	8	Switch SW_{11} at position 3	Terminal 3 of socket for tube V_9 (JAN-6L6)	0
	SO_9	8	Switch SW_{11} at position 1 or 2	Terminal 7 of sockets SO_7 and SO_8	0
	SO_7, SO_8, SO_9	10		Ground or chassis	0
	SO_7, SO_8, SO_9	11		Terminal 10 of terminal strip TS_2	20
	SO_7	11	Switch SW_{11} at position 2 or 3	Terminal 12 of socket SO_7	0
	SO_8	11	Switch SW_{11} at position 1 or 3	Terminal 12 of socket SO_8	0
	SO_9	11	Switch SW_{11} at position 1 or 2	Terminal 12 of socket SO_9	0
	SO_7	12	Switch SW_{11} at position 1	Plate caps of tubes V_{10} and V_{11}	0
	SO_8	12	Switch SW_{11} at position 2	Plate caps of tubes V_{10} and V_{11}	0
	SO_9	12	Switch SW_{11} at position 3	Plate caps of tubes V_{10} and V_{11}	0
Socket SO_{11} (on upper control panel)	SO_{11}	1	Meter switch SW_8 at DOUBLER PLATE. Remove plug PL_{11} from socket SO_{11}	Terminal 3 of socket SO_{11}	.6
		2	Meter switch SW_8 at DOUBLER PLATE. Remove plug PL_{11} from socket SO_{11}	Terminal 4 of socket SO_{11}	.6
		2	Meter switch SW_8 at DOUBLER PLATE. Remove plug PL_{11} from socket SO_{11}	Terminal 6 of socket SO_{11}	.4
		6	Meter switch SW_8 at DOUBLER PLATE. Remove plug PL_{11} from socket SO_{11}	Terminal 5 of socket SO_{11}	500
		7	Remove plug PL_{11} from socket SO_{11}	Ground or chassis	0
		8	Remove plug PL_{11} from socket SO_{11}	One side of socket for lamp LM_1	0
Terminal strip TS_1	TS_1	1		Ground or chassis	0
		1		Terminal 8 of terminal strip TS_2	35,000
		1		Terminal 12 of terminal strip TS_2	0
		1	Remove tube V_{16} from its socket	Terminal 3 of terminal strip TS_2	0
		1	Remove tube V_{16} from its socket	Terminal 4 of terminal strip TS_2	0
		1	Remove lamp LM_2 from its socket. Remove plug PL_{11} from socket SO_{11}	Terminal 11 of terminal strip TS_2	0
		3		Terminal 8 of socket for tube V_8 (JAN-6V6)	70
		4		Terminal 2 or 3 of socket for tube V_{12} (JAN-5Z3)	0
		5		Terminal 2 or 3 of socket for tube V_{12} (JAN-5Z3)	0

a. RADIO TRANSMITTER BC–610–E (Contd.)

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Terminal strip TS_1 (Contd.)		7	Tubes V_{13}, V_{14}, V_{15} in their sockets	Terminal 8 of terminal strip TS_1	1.0
		9		Terminal 6 of terminal strip TS_2	0
		10	Switches SW_2, *SW_{10}, SW_{13} closed	Terminal 11 of terminal strip TS_1	0
Terminal strip TS_2	TS_2	3		One side of meter M_3	0
		4		Other side of meter M_3	0
		5		Grid connection of tube V_{16}	20
		7		Terminal 3 of sockets for tubes V_{10} and V_{11}	5,000
		9		Terminal 4 of socket for tube V_9	50,000
		10		Terminal 2 of sockets for tubes V_{10} and V_{11}	20,000
		12		Ground or chassis	0
Terminal strip TS_3	TS_3	1		Terminal 0 of transformer T_6	0
		2		Terminal 2600 of transformer T_6	0
		3		Terminal 2000 of transformer T_6	0
		4		Terminal 5 of terminal strip TS_3	1
		4	Relay RY_2 at normal	Terminal 7 of terminal strip TS_3	3
		6		An open contact on relays RY_2 and RY_5	775
		8		Ground or chassis	75,000
		8		+side of meter M_2	0
		9		Ground or chassis	0

* SW_{10} was omitted on models beginning with Serial No. 5191 on Signal Corps Order No. 30204–P–44 and on all transmitters thereafter.

b. SPEECH AMPLIFIER BC–614–E

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Socket SO_{101} (marked DYNAMIC MIC. 8)	SO_{101}	1		Ground or chassis	0
		2		Terminal 4 of socket SO_{102}	0
		2		Tip contact of jack J_{102}	0
		3		Terminal 3 of socket SO_{102}	500,000
Socket SO_{102}	SO_{102}	1		Terminal 3 or 6 of tube V_{106} (JAN–6N7)	500
		2		Tip contact of jack J_{101}	0
		2		Terminal 2 of socket SO_{103}	0
		5		Ground or chassis	7,000
		6		Terminal 4 of socket SO_{103}	0
		7		Terminal 3 of socket SO_{103}	0
		7		Terminal 1 of socket SO_{103}	16
		8		Ground or chassis	0
Socket SO_{103}	SO_{103}	5		Positive terminal of meter M_{101}	0
		6		Ground or chassis	35
		6		Terminal 7 of socket SO_{103}	35
		8		Ground or chassis	0
Transformer T_{103}	T_{103}	CT		Ground or chassis	311
		CT	Insert dummy phone plug in Jack J_{102}	Ground or chassis	511 *375

* This reading applied on all Signal Corps orders except Signal Corps Order No. 14153–P–43.

c. JUNCTION BOX JB-70-A

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Terminal strip TS_{200}	TS_{200}	1	Switch SW_{203} at TRANS. ON	Terminal 2 of terminal strip TS_{200}	0
		3	Switch SW_{205} at TO BC-312 or TO BC-342	Terminal 4 of terminal strip TS_{200}	0
		3	Hold relay RY_{200} closed	Ground or chassis	0
		6	Switch SW_{202} at position 1, 3, or 5	Ground or chassis	0
		6	Switch SW_{202} at position 2, or 4; switch SW_{203} at TRANS. ON	Terminal 11 of terminal strip TS_{200}	0
		8		Terminal 12 of terminal strip TS_{200}	0
		12		Other side of EE-8 in chest CH-120	0
		12		Sleeves of jacks J_{200}, J_{201}, J_{202}, J_{203}, J_{204}, and J_{205}	0
		12		Ground or chassis	0
Note. Disconnect all interconnecting cables when making the following checks except connections to terminal strip TS_{200}.					
Plug PL_{200}	PL_{200}	1		Terminal 4 of terminal strip TS_{200}	0
		2		Terminal 3 of terminal strip TS_{200}	0
		3		Terminal 6 of terminal strip TS_{200}	0
		4		Terminal 7 of terminal strip TS_{200}	0
		5		Terminal 5 of terminal strip TS_{200}	0
		6		Terminal 2 of terminal strip TS_{200}	0
		7		Terminal 1 of terminal strip TS_{200}	0
		8		Terminal 8 of terminal strip TS_{200}	0
Plug PL_{201} (to Loudspeaker LS-3 in Chest CH-20)	PL_{201}	Tip		Terminal 9 of terminal strip TS_{200}	0
		Sleeve		Terminal 12 of terminal strip TS_{200}	0
Plug PL_{202} (to BC-342 PHONE 2ND AUDIO)	PL_{202}	Tip	Receiver output transpose switch in NORMAL position	Terminal 9 of terminal strip TS_{200}	0
		Sleeve		Terminal 12 of terminal strip TS_{200}	0
Socket SO_{200} (power input)	SO_{200}	1	Press STOP button to close switch SW_{206A}	Terminal 4 of socket SO_{200}	0
		2		One side of sockets SO_{201} and SO_{202}	0
		2		One side of sockets SO_{207}, SO_{208}, and SO_{209}	0
		2		A-c contact of socket SO_{203}	0
		3	Switch SW_{207} at PE-95	Terminal 4 of socket SO_{204}	0
		3	Switch SW_{207} at PE-95	Terminal 7 of terminal strip TS_{200}	200
		3	Switch SW_{207} at PE-95; switch SW_{200} at BC-312 ON. Hold relay RY_{200} closed	Terminal 2 of socket SO_{204}	0
		3	Switch SW_{207} at PE-95; switch SW_{201} at BC-342 ON. Hold relay RY_{200} closed	Terminal 2 of socket SO_{205}	0
		3	Switch SW_{207} at PE-95; switch SW_{200} at ON. Hold relay RY_{200} closed	Terminal 2 of socket SO_{204}	0
		3	Switch SW_{207} at PE-95; switch SW_{201} at ON. Hold relay RY_{200} closed	Terminal 2 of socket SO_{205}	0
		3	Switch SW_{207} at PE-95; switch SW_{203} at TRANS. ON	Tip contact of jacks J_{200} and J_{201}	100
		3	Switch SW_{207} at PE-95; switch SW_{203} at TRANS. ON. Switch SW_{202} at position 1 or 5	One side of the remote line	100
		3	Switch SW_{207} at PE-95; switch SW_{203} at TRANS ON; switch SW_{202} at position 2 or 4	Ground or chassis	100

c. Junction Box JB–70–A (Contd.)

Measured from	Ref symbol	Term or lead No.	Action or condition	Measured to	Resistance (in ohms)
Socket SO_{200} (power input) (Contd.)		4		Ground or chassis	0
		5		One side of sockets SO_{201} and SO_{202}	0
		5		One side of duplex sockets SO_{207}, SO_{208}, and SO_{209}	0
		5		One a-c terminal of socket SO_{203}	0
		6	Press START button to close switch SW_{206A}	Terminal 4 of socket SO_{200}	0
Socket SO_{203} (on Rectifier RA–63–(*))	SO_{203}	+12V	Switch SW_{207} at AUX	Terminal 4 of socket SO_{204}	0
Socket SO_{204}	SO_{204}	1		One side of the remote line	0
		1		Ground or chassis	0
		3		Ground or chassis	0
Socket SO_{205}	SO_{205}	1		Ground or chassis	0
		3		Ground or chassis	0
Socket SO_{206} (duplex spare)	SO_{206}	Either GND terminal		Ground or chassis	0
Socket SO_{210} (audio cord)	SO_{210}	1		Tip contact of jacks J_{202} and J_{203}	5,000
		1	Switch SW_{205} at TO BC–312	Terminal 5 of terminal strip TS_{200}	5,000
		1	Switch SW_{204} at NORMAL	Terminal 2 of socket SO_{210}	0
		1	Switch SW_{204} at TRANSPOSE	Terminal 10 of terminal strip TS_{200}	0
		2	Switch SW_{204} at TRANSPOSE	Terminal 9 of terminal strip TS_{200}	0
		2	Switch SW_{204} at TRANSPOSE	Tip contact of jacks J_{204} and J_{205}	5,000
		2	Switch SW_{205} at TO BC–342; switch SW_{204} at TRANSPOSE	Terminal 5 of terminal strip TS_{200}	5,000
		3		Ground or chassis	0
		4		Ground or chassis	0

Table IX. Data for checking transformers, chokes, and inductors

Note. Resistances of less than 1 ohm are given as 0. All measurements are made with windings disconnected from the associated circuit.

a. RADIO TRANSMITTER BC–610–E AND ANTENNA TUNING UNIT BC–939–A.

Component		Ref symbol	Windings or terminals	D-c resistance (in ohms)	Inductance (in microhenries)
R-f choke		CH_1		20	1,000
R-f choke		CH_2		20	1,000
R-f choke		CH_3		32	2,500
R-f choke		CH_4		8.5	2,500
R-f choke		CH_5		20	1,000
R-f choke		CH_6		20	1,000
R-f choke		CH_7		20	1,000
R-f choke		CH_8		20	1,000
R-f choke		CH_9		42	10,000
Filter choke		L_1		90	6×10^6
Filter choke		L_2		125	6×10^6
Filter choke		L_3		125	6×10^6
Filter choke		L_4		58	11×10^6
Antenna coupling coil		L_5			1.8
Antenna loading coil		L_6			100
Coil Unit C–387–B		L_7			58
Coil Unit C–388–A		L_7			32
Coil Unit C–389–A		L_7			18
Coil Unit C–390–A		L_7			12
Coil Unit C–447		L_7			5.9
Coil Unit C–448		L_7			3.5
Coil Unit C–449		L_7			2
Antenna loading coil		L_{44}			14
Tuning unit					
M-o grid coil	TU–47	L_8			89
M-o grid coil	TU–48	L_9			55.5
M-o grid coil	TU–49	L_{10}			41.0
M-o grid coil	TU–50	L_{11}			21.4
M-o grid coil	TU–51	L_{12}			14.1
M-o grid coil	TU–52	L_{13}			7.4
Crystal-oscillator cathode coil	TU–47	L_{14}			37
Crystal-oscillator cathode coil	TU–48	L_{15}			19
Crystal-oscillator cathode coil	TU–49	L_{16}			9.2
Crystal-oscillator cathode coil	TU–50	L_{17}			66.0
Crystal-oscillator cathode coil	TU–51	L_{18}			22.8
Crystal-oscillator cathode coil	TU–52	L_{19}			18.0
Buffer-doubler plate coil	TU–47	L_{20}			40
Buffer-doubler plate coil	TU–48	L_{21}			30.8
Buffer-doubler plate coil	TU–49	L_{22}			20.6
Buffer-doubler plate coil	TU–50	L_{23}			12.6
Buffer-doubler plate coil	TU–51	L_{24}			8.6
Buffer-doubler plate coil	TU–52	L_{25}			5.66
Intermediate-amplifier plate coil	TU–47	L_{26}			40
Intermediate-amplifier plate coil	TU–48	L_{27}			30.8
Intermediate-amplifier plate coil	TU–49	L_{28}			20.6
Intermediate-amplifier plate coil	TU–50	L_{29}			12.6
Intermediate-amplifier plate coil	TU–51	L_{30}			8.6
Intermediate-amplifier plate coil	TU–52	L_{31}			5.66
M-o grid coil	TU–53	L_{32}			7.5
Buffer-doubler plate coil	TU–53	L_{33}			2.56
Intermediate-amplifier plate coil	TU–53	L_{34}			2.56
M-o grid coil	TU–54	L_{35}			12.7
Buffer-doubler plate coil	TU–54	L_{36}			4.84
Intermediate-amplifier plate coil	TU–54	L_{37}			1.15
Crystal-oscillator cathode coil	TU–53	L_{41}			8.0
Crystal-oscillator cathode coil	TU–54	L_{42}			14.2
Power transformer		T_1	500-0-500-volt secondary;	135	
			117-volt primary;	1.5	
			2.5-volt, 5.0-amp secondary.	0	
			5.0-volt, 3.0-amp secondary	0	
Filament transformer		T_2	117-volt primary;	11	
			100-volt primary;	10	
			2.5-volt 10-amp secondary	0	
Filament transformer		T_3	100-volt primary;	3	
			5-volt, 16-amp secondary	0	
Power transformer		T_4	100-volt primary;	2.0	
			5-volt, 10.5-amp secondary	0	

a. Radio Transmitter BC–610–E and Antenna Tuning Unit BC–939–A (Contd.).

Component	Ref symbol	Windings or terminals	D-c resistance (in ohms)	Inductance (in microhenries)
Power transformer (Contd.)		6.3-volt, 3.5 amp secondary;	0	
		5-volt, 3-amp secondary	0	
Power transformer	T_5	115-volt primary;	1.5	
		435-0-435 secondary	85	
Power transformer	T_6	2,000-volt primary tap;	0	
		2,600-volt primary tap;	0	
		total secondary	140	
Audio transformer	T_7	500 line primary;	35	
		G to G secondary;	950	
		G to CT secondary	475	
Audio transformer	T_8	P to P primary;	250	
		P to CT primary;	125	
		G to G secondary;	170	
		G to CT secondary	85	
Modulation transformer	T_9	P to P primary;	300	
		P to B primary;	150	
		P to B + secondary	135	
Relay winding	RY_1*		540	
Relay winding	RY_1		97	
Relay winding	RY_2		780	
Relay winding	RY_3		280	
Relay winding	RY_4		480	
Relay winding	RY_5		6	

* Supplied with Signal Corps Orders No. 14153–Phila–43 and 30204–Phila–43 only.

b. Speech Amplifier BC–614–E.

Component	Ref symbol	Windings or terminals	D-c resistance (in ohms)	Inductance (in microhenries)
Audio transformer	T_{101}	1 to 2;	11	
		3 to 4	13.5	
Audio transformer	T_{102}	1 to 3;	660	
		2 to 3; or		
		1 to 2;	330	
		4 to 5	35	
Power transformer	T_{103}	115-volt primary;	16	
		6.3-volt, 2-amp secondary;	0	
		5-volt, 2-amp secondary;	0	
		250-250 secondary	600	
Audio transformer	T_{104}	2 to 3;	3,750	
		8 to 5;	8,500	
		8 to 7; or		
		6 to 5	4,500	
Filter choke	CH_1		700	29

c. Junction Box JB–70–A.

Component	Ref symbol	Windings or terminals	D-c resistance (in ohms)	Inductance (in microhenries)
Relay winding	RY_{200}		200	1.5

Table X. Performance Characteristics

Description	Indicating meter	Meter switch position	Normal	Limits	
				Maximum	Minimum
Line voltage (a-c)			115 volts	125 volts	105 volts
Filament voltage	FIL. VOLTAGE		5.0 volts	5.3 volts	4.9 volts
Buffer-doubler plate current	EXCITATION METER	DOUBLER PLATE	35 ma		25 ma
Intermediate-amplifier grid current	EXCITATION METER	INT. AMP. GRID	2 ma	8 ma	1 ma
Intermediate-amplifier plate current	EXCITATION METER	INT. AMP. PLATE	150 ma	175 ma	
P-a grid current (PLATE POWER OFF)	EXCITATION METER	P. A. GRID	75–100 ma		60 ma
P-a grid current (PLATE POWER ON)	EXCITATION METER	P. A. GRID	65– 80 ma		50 ma
P-a plate current (PHONE)	P. A. PLATE		250 ma	260 ma	200 ma
P-a plate current (C.W.)	P. A. PLATE		290 ma	300 ma	200 ma
Modulator plate current (no modulation)	MODULATOR PLATE		40 ma	50 ma	35 ma
Modulator plate current (100% modulation)	MODULATOR PLATE		200 ma		
Power output (voice) (4 mc)			320 watts		210 watts
Power output (c-w)			500 watts		325 watts

Table XI. Characteristics of vacuum tubes

Signal Corps Tube	VT-46A	VT-80	VT-94	VT-95	VT-100	VT-103	VT-107	VT-115	VT-139	VT-145	VT-218	VT-220	VT-231	VT-233
JAN type	866A/866	80	6J5	2A3	807	6SQ7	6V6	6L6	OD3/VR-150	5Z3	100-TH	250-TH	6SN-7GT	6SR7
Description	Mercury vapor half-wave rectifier	High vacuum full-wave rectifier	Triode	Triode	Beam power	Duplex diode triode	Beam power	Beam power	Voltage regulator	High vacuum full-wave rectifier	Triode	Triode	Twin triode	Duplex diode triode
A-c filament voltage	2.5	5.0	6.3	2.5	6.3	6.3	6.3	6.3		5.0	5.0	5.0	6.3	6.3
A-c filament current (amp)	5.0	2.0	0.3	2.5	0.9	0.3	0.45	0.9		3.0	6.5	10.5	0.6	0.3
D-c plate voltage			250	300	600	250	300	375	150		2,000	2,500	250	250
D-c screen voltage					250		150	200						
D-c grid-bias voltage			−8.0	−62	−50	−2.0	−25	−35				−220	−8.0	−9.0
Max a-c voltage per plate		400								500				
Max inverse peak voltage	10,000	1,400								1,400				
D-c plate current (ma)			−9.0	40	100	0.8	35	88			225	290	9.0	9.5
D-c screen current (ma)					9.0		5	9						
D-c grid current (ma)					3.0		3.0	3.5				70		
Max d-c output current (ma)	250	110							30	250				
Plate dissipation (watts)					25		12	20			100	250		
Approx grid driving power (watts)					0.22			0.18				42		
Approx output power (watts)				15	37.5			17			380	600		0.3
Plate resistance (ohms)			7,700	800		91,000							7,700	8,500
Transconductance (microohms)			2,600	5,250		1,100							2,600	1,900
Amplification factor			20	4.2		100					30	32	20	16
Load resistance (ohms)				3,000							16,000			10,000

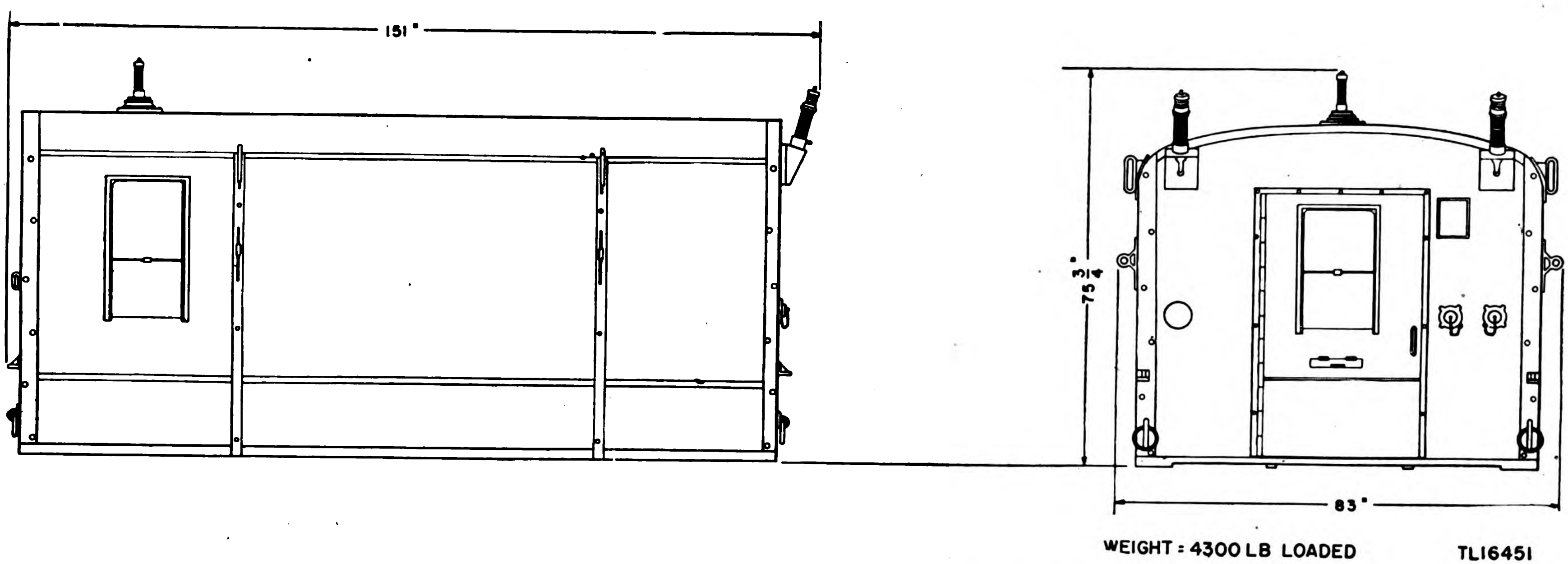


Figure 136. Shelter HO–17–A—dimensional outline sketch.

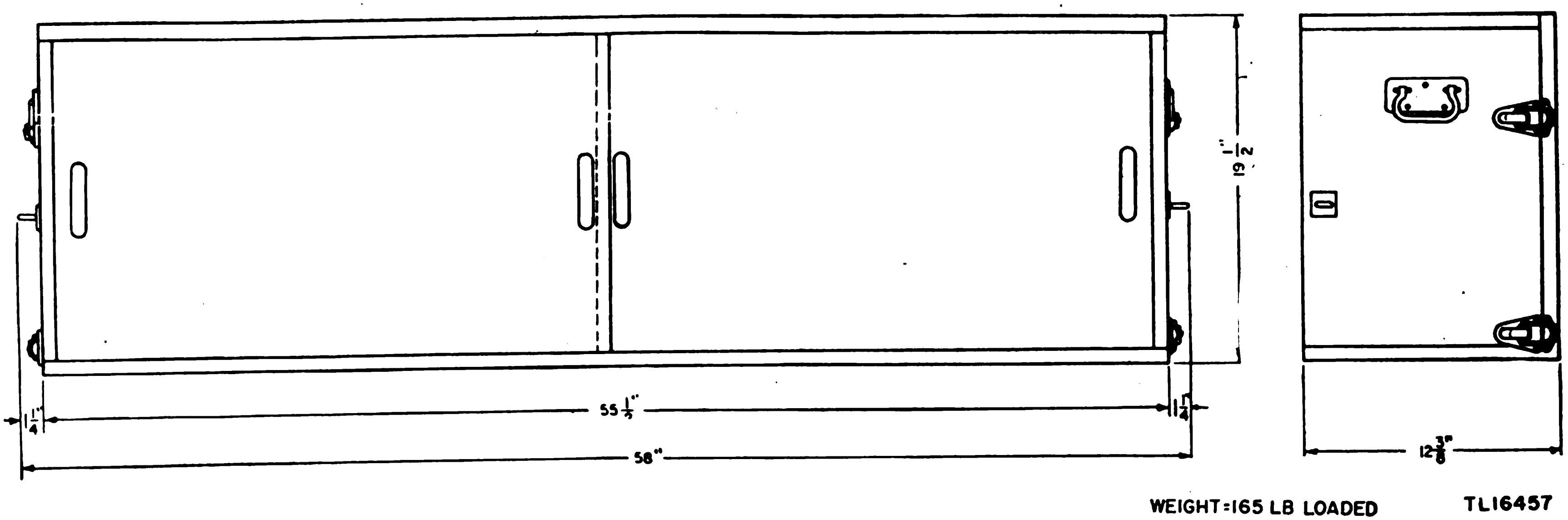


Figure 137. Chest CH–88–A—dimensional outline sketch.

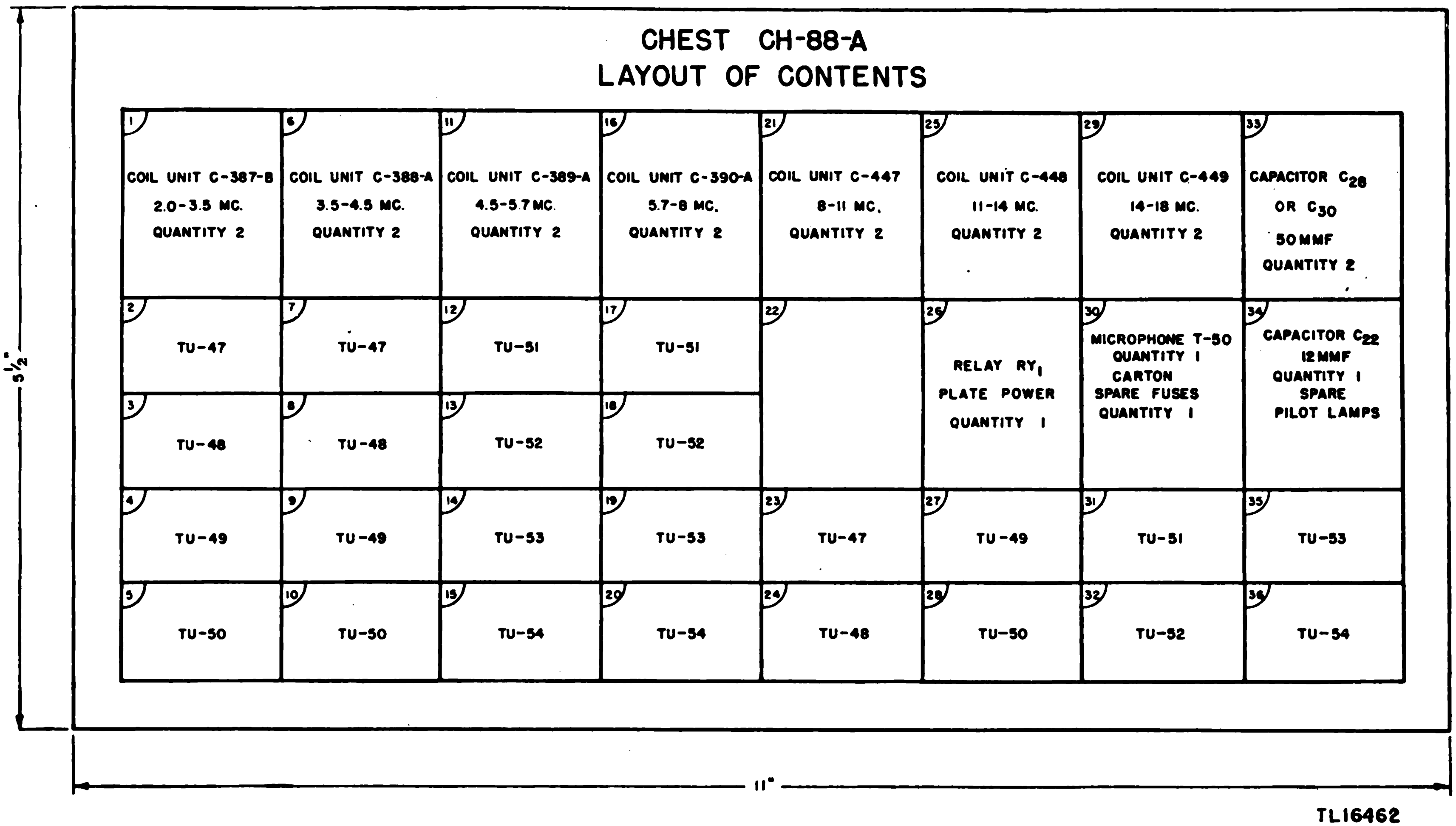


Figure 138. Chest CH-88-A—lay-out of contents.

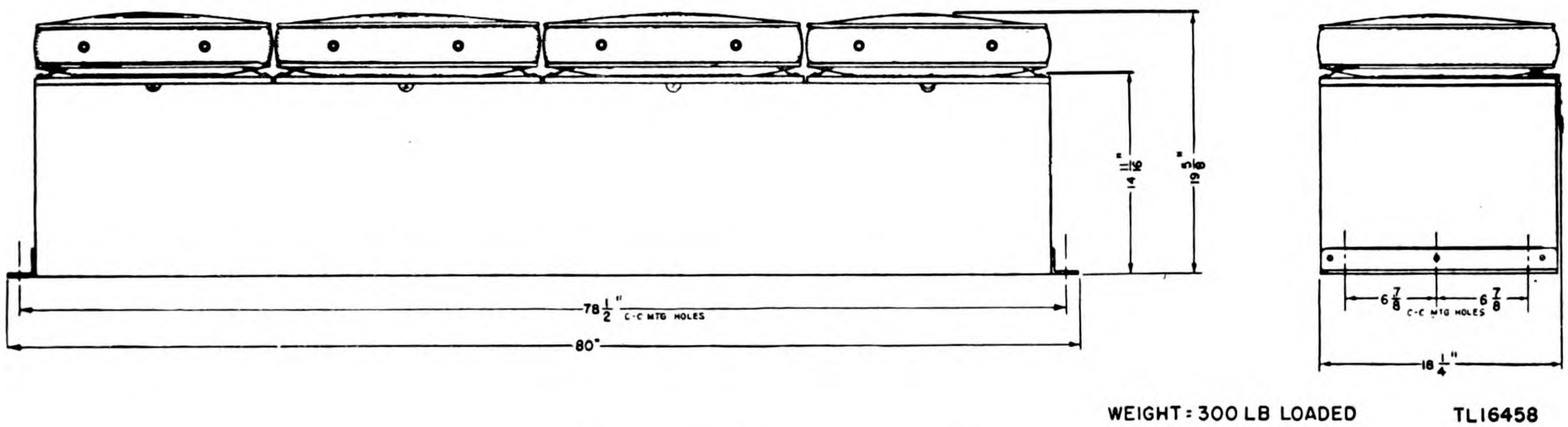
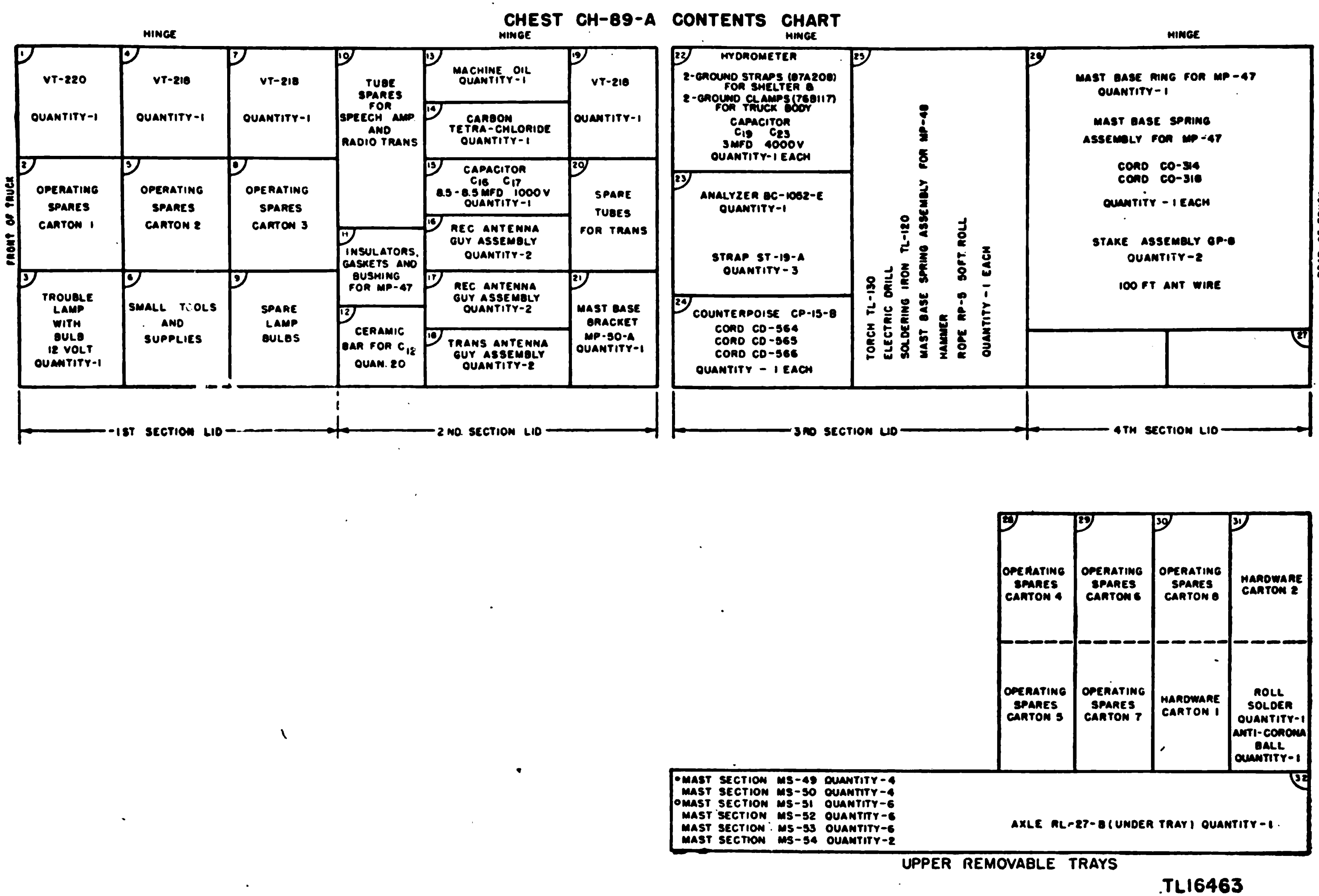


Figure 139. Chest CH–89–A—dimensional outline



• 1 WITH ANTI-CORONA BALL ASSEMBLED
° 2 WITH "S" HOOKS

Figure 140. Chest CH—89–A—lay-out of contents.

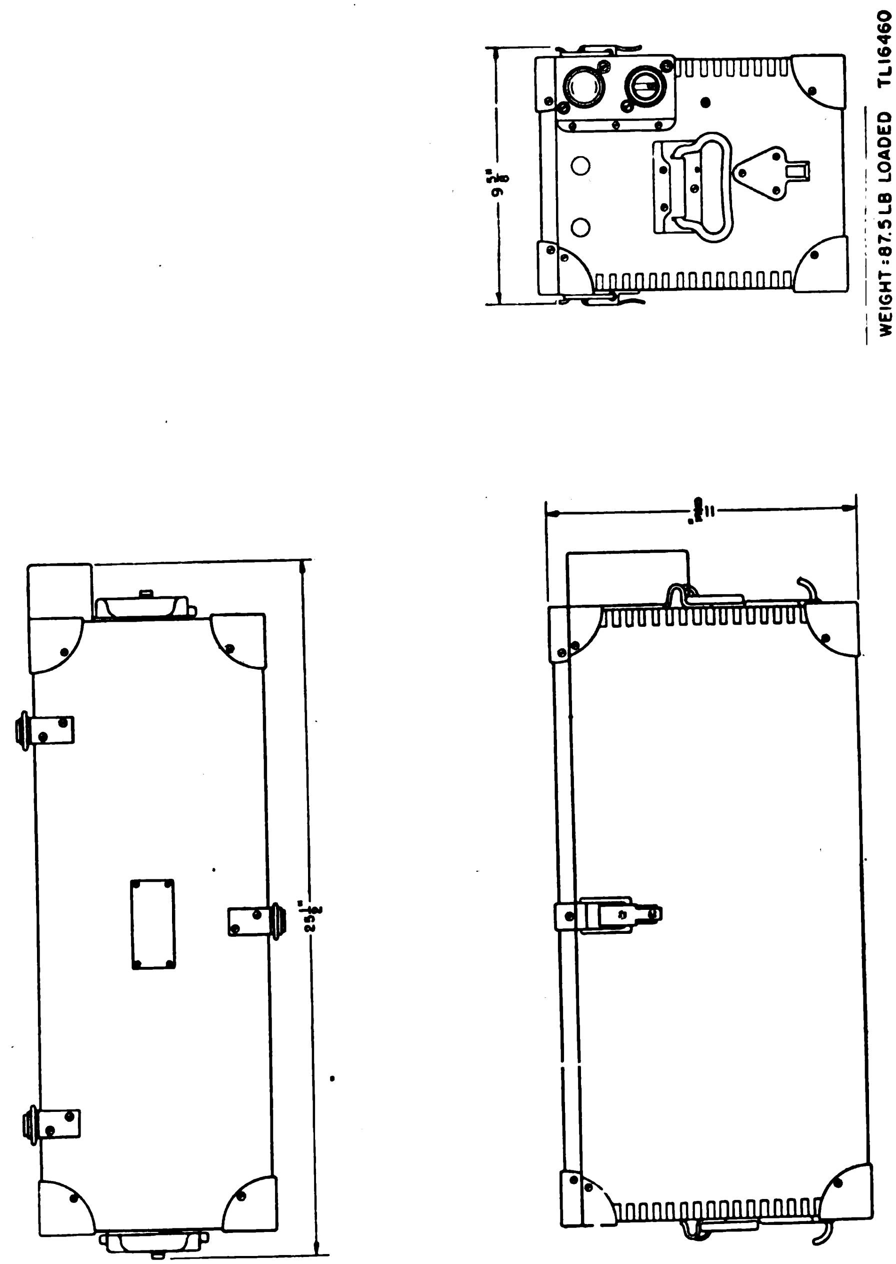


Figure 141. Chest CH-109-A—dimensional outline sketch.

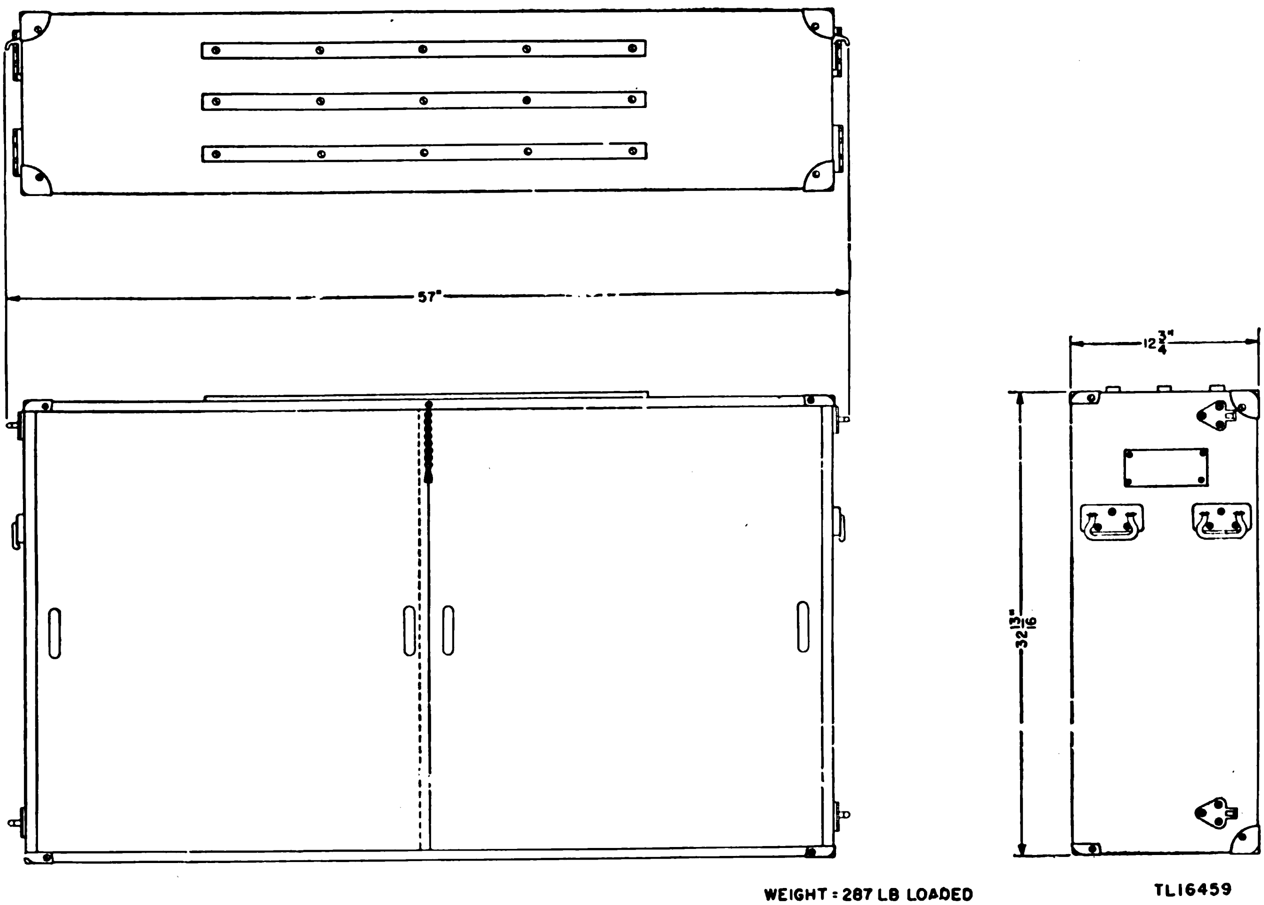


Figure 142. Chest CH-119-( )—dimensional outline sketch.

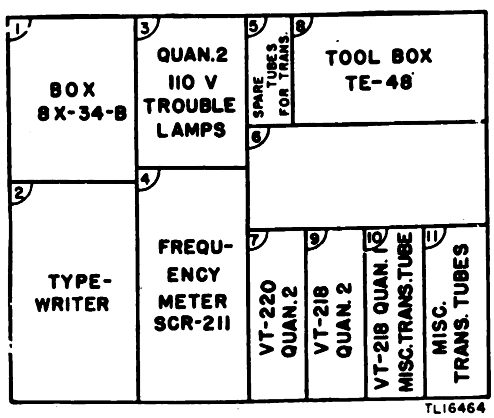


Figure 143. Chest CH-119-( )—lay-out of contents.

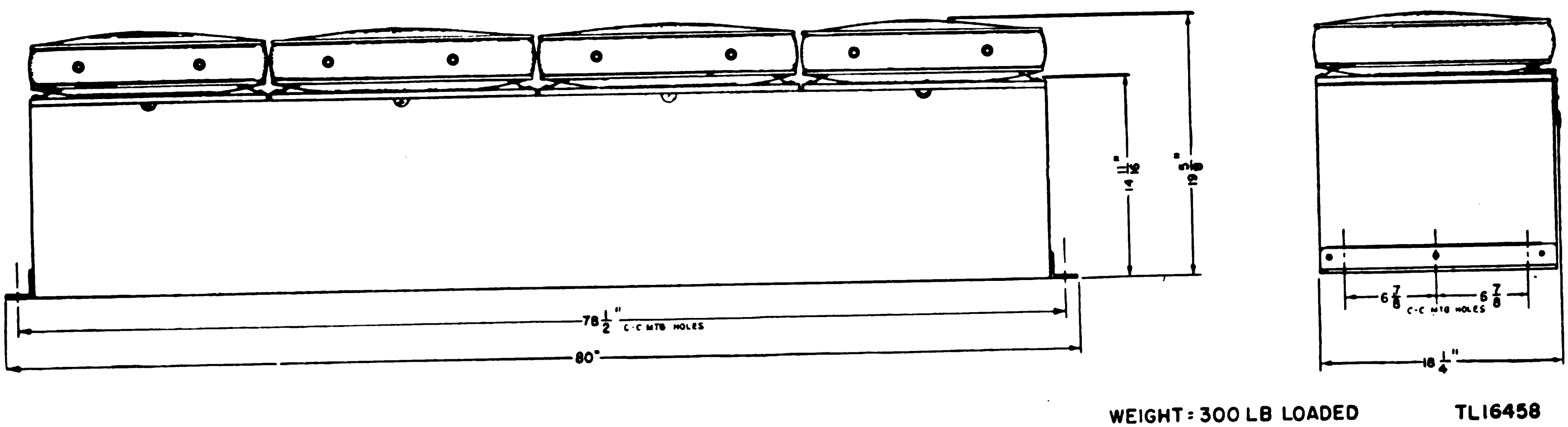


Figure 139. Chest CH–89–A—dimensional outline

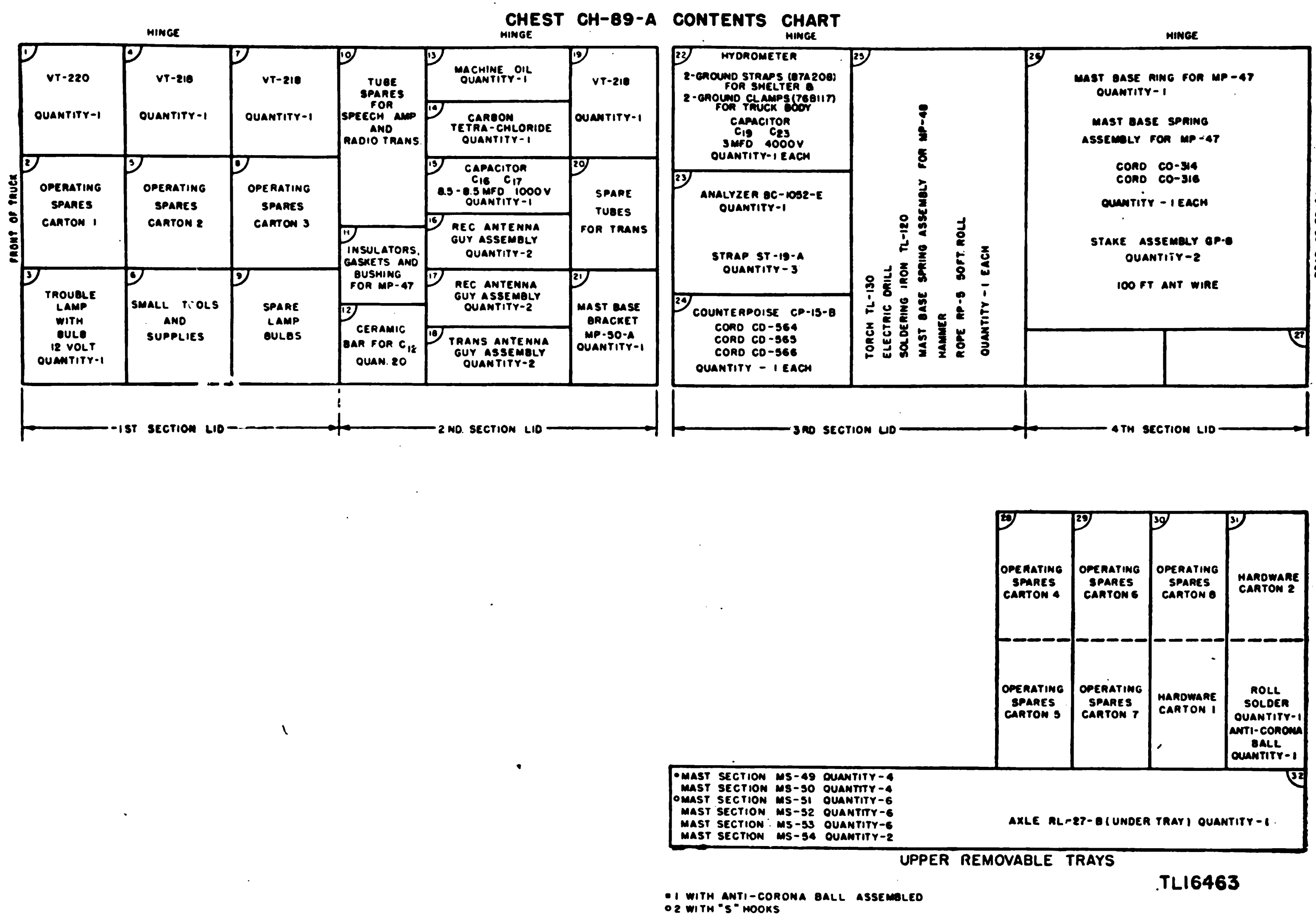


Figure 140. Chest CH—89-A—lay-out of contents.

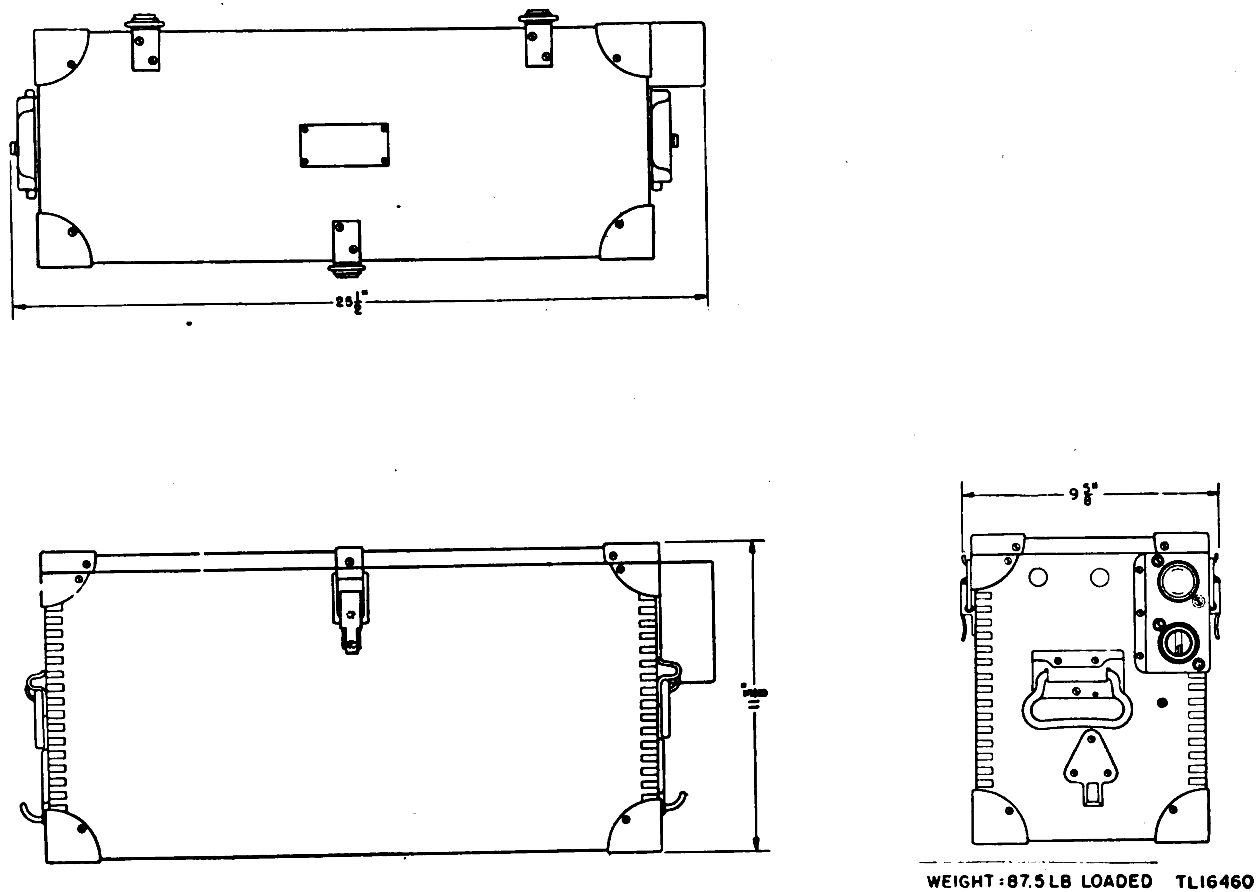


Figure 141. Chest CH-109-A—dimensional outline sketch.

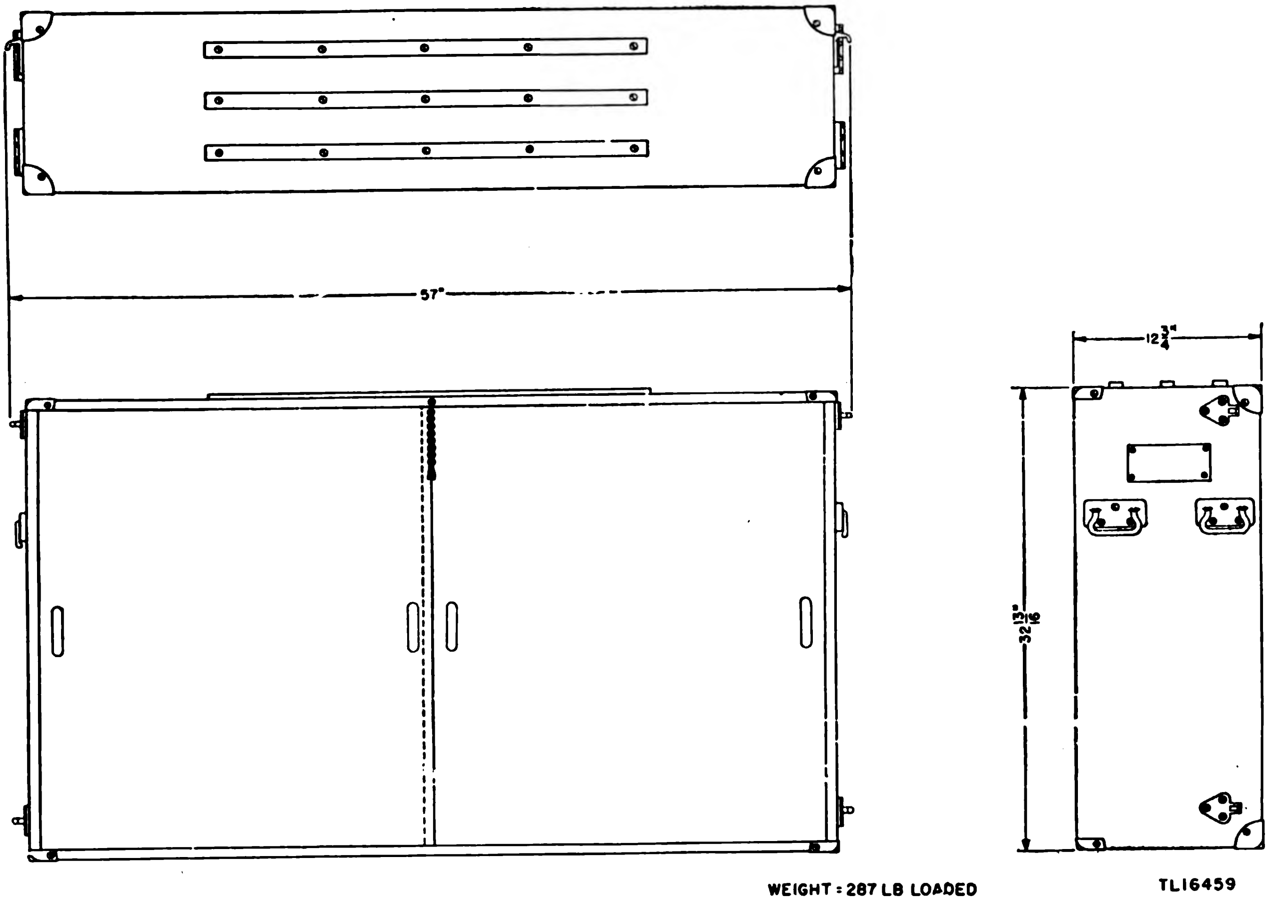


Figure 142. Chest CH–119–( )—dimensional outline sketch.

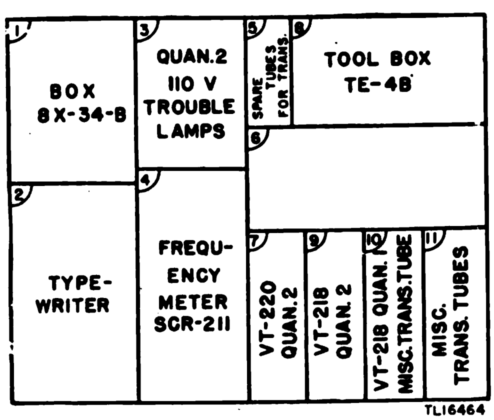


Figure 143. Chest CH–119–( )—lay-out of contents.

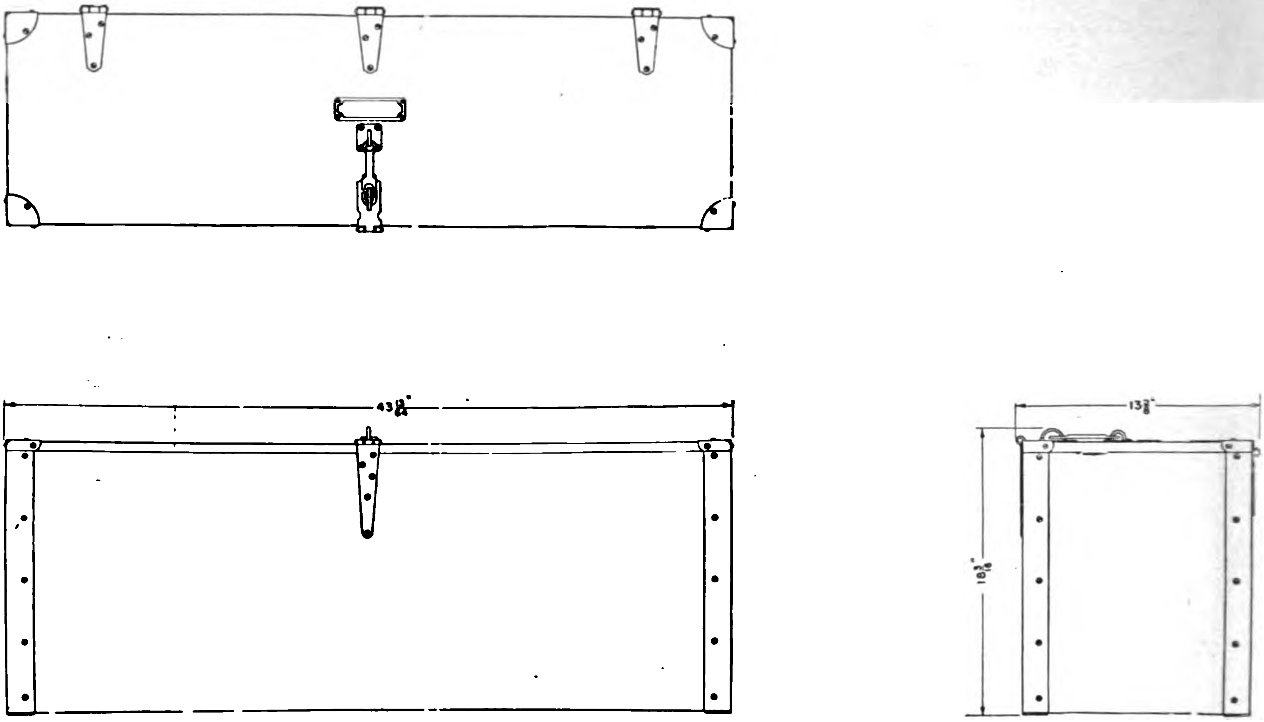


Figure 144. Chest CH-112-( )—dimensional outline sketch.

CHEST CH-112-B CONTENTS CHART

CORD	CD-659	(OPERATING)	QUANTITY-1
CORD	CO-335	(OPERATING)	QUANTITY-1
CORD	CO-652	(SPARE)	QUANTITY-1
CORD	CO-313	(SPARE)	QUANTITY-1

TL16465

Figure 145. Chest CH-112-B—contents chart.

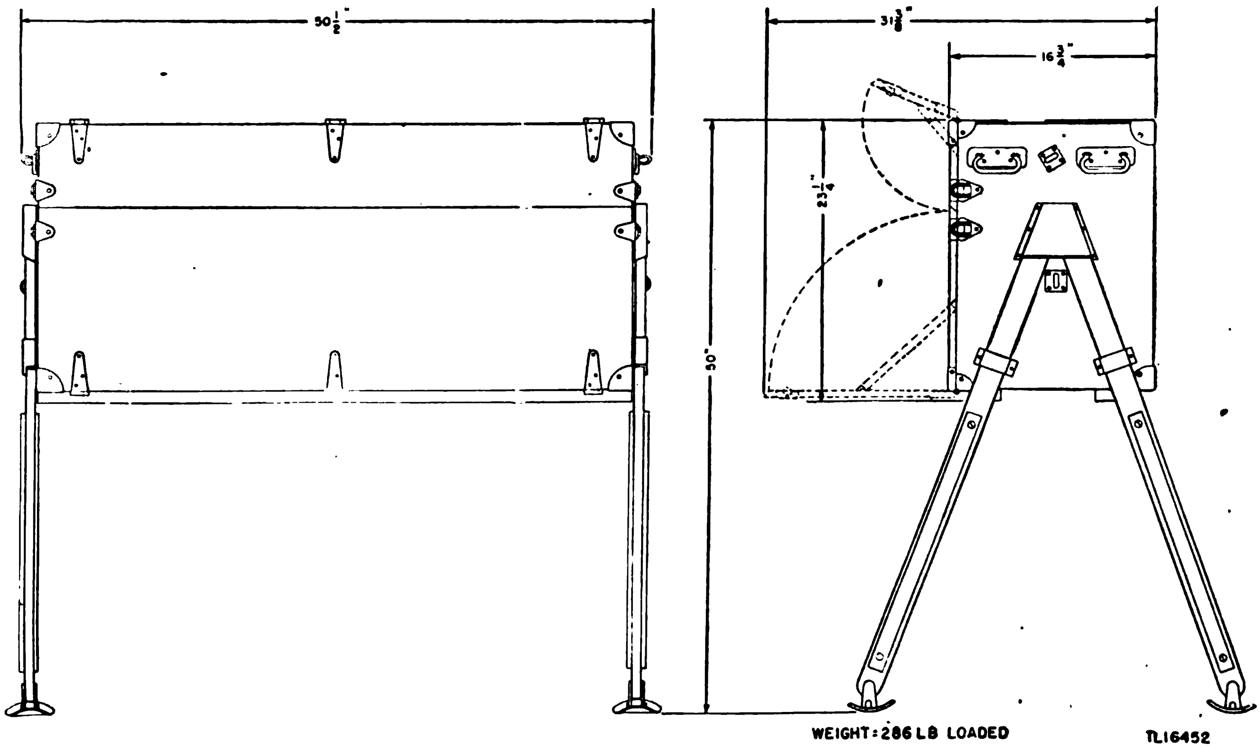


Figure 146. Chest CH–120–A—dimensional outline sketch.

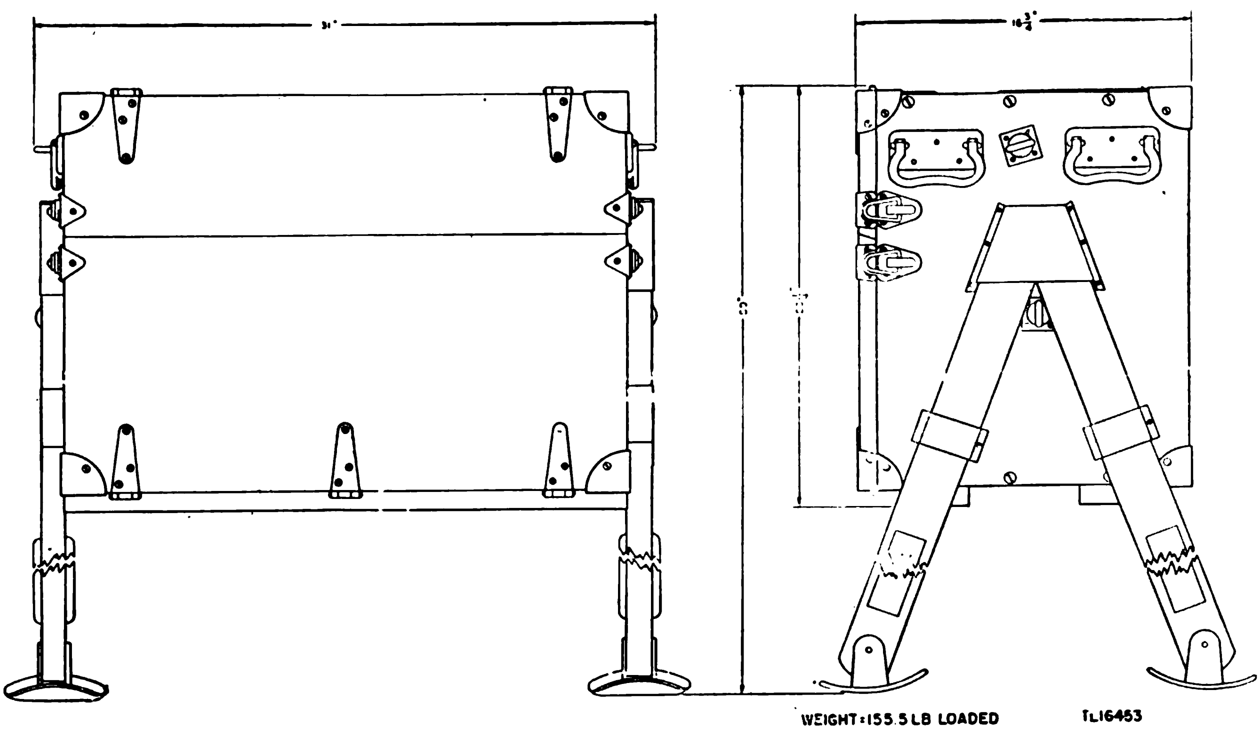


Figure 147. Chest CH–121–A—dimensional outline sketch.

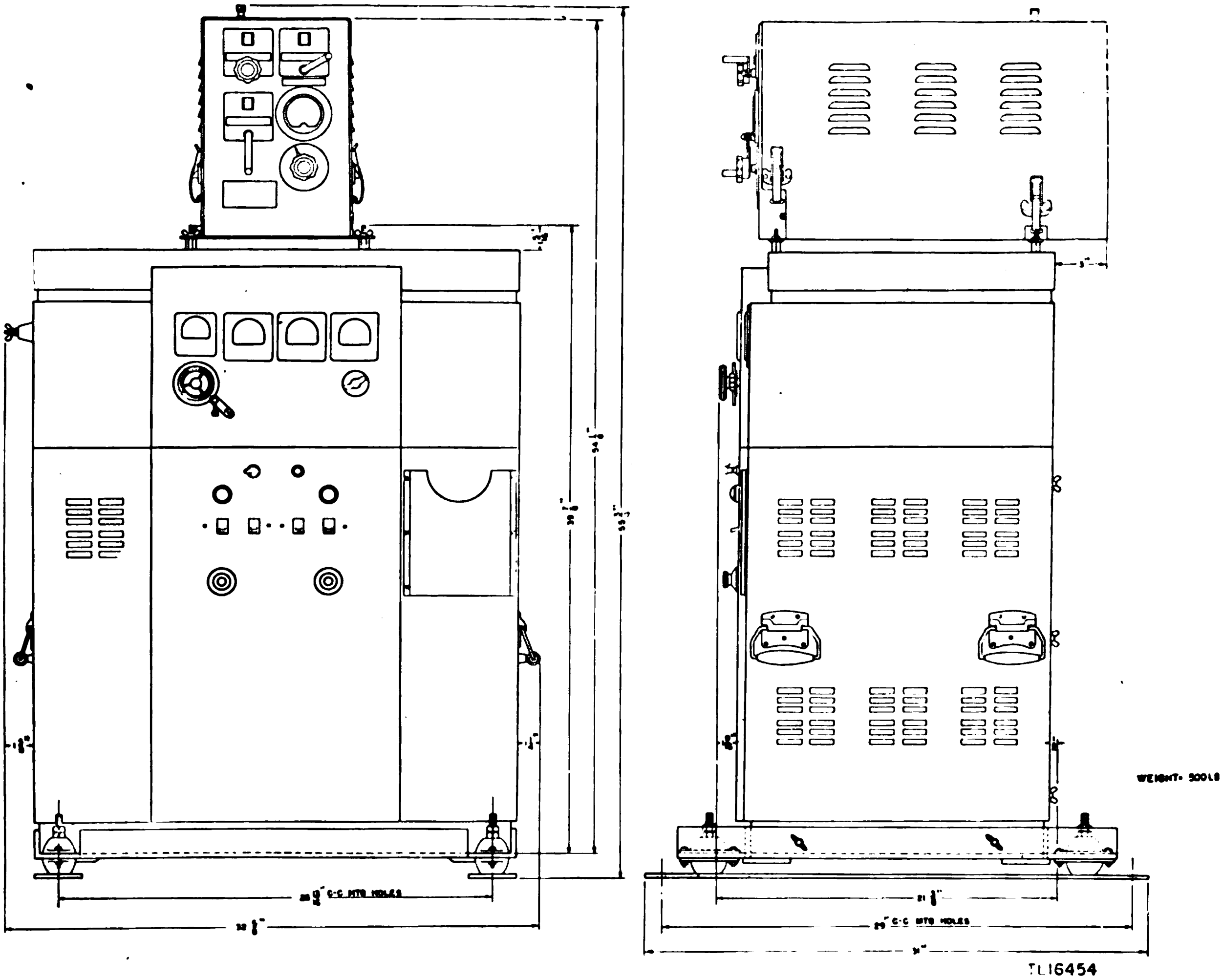


Figure 148. Radio Transmitter BC–610–E with Antenna Tuning Unit BC–939–A in position—dimensional outline sketch.

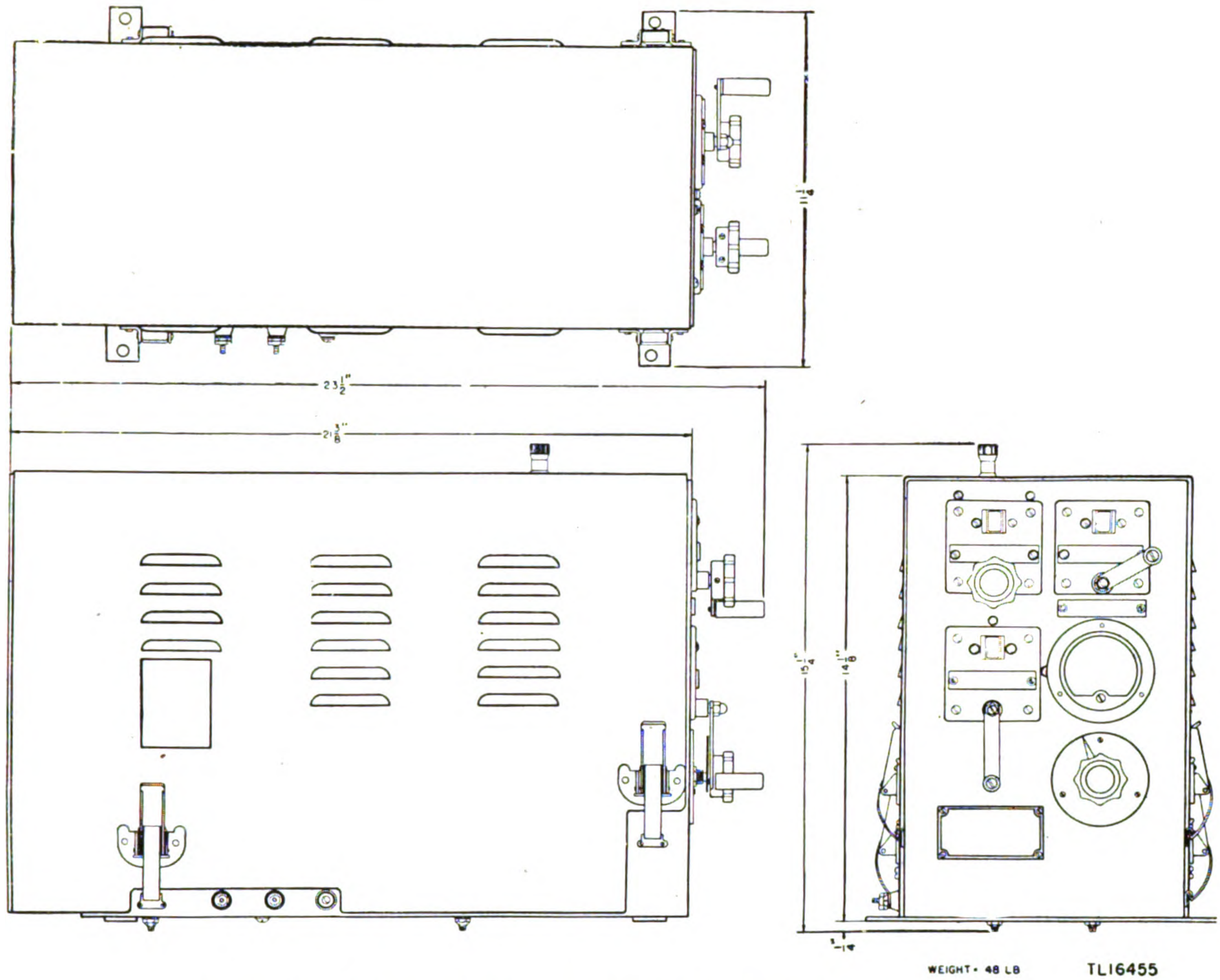


Figure 149. Antenna Tuning Unit BC–939–A—dimensional outline sketch.

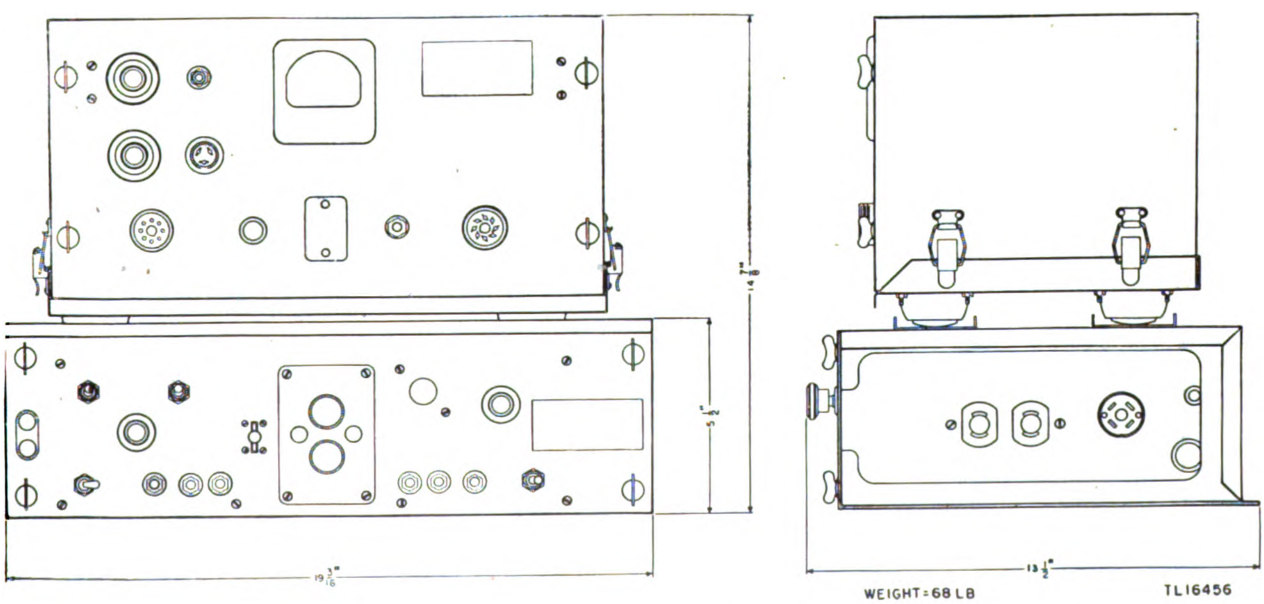


***Figure** 150. Junction Box JB–70–A with Speech Amplifier BC–614–E in position—dimensional outline sketch.*

WAR DEPARTMENT

UNSATISFACTORY EQUIPMENT REPORT

FOR (Technical service) Signal Corps MATÉRIEL DATE 15 March 44

FROM (Organization) 579 Sig. Repair Co. (Station) APO 101 San Francisco, Cal.

TO (Next superior headquarters) Signal Officer IX Army (Station) (Technical service)

COMPLETE MAJOR ITEM

NOMENCLATURE Radio Transmitter BC-610-E TYPE Ground, vehicular

MODEL E MANUFACTURER The Hallicrafters Company

U. S. A. REG. NO. Order No. 14153-Phila-43-07 SERIAL NO. 628 DATE RECEIVED 2 Feb 44

EQUIPMENT WITH WHICH USED (IF APPLICABLE) Radio Set SCR-399-( ) in House HO-17

NOMENCLATURE OF DEFECTIVE COMPONENT

PART NO. S.C. Stock No. 3D88-34 TYPE Capacitor (ref. symbol C20) fixed, 8 mf. -10+80%, 600 v.d.c. electrolytic

MANUFACTURER The Hallicrafters Company DATE INSTALLED 14 Feb 44

LENGTH OF SERVICE

DATE OF INITIAL TROUBLE 20 Feb 44

TOTAL TIME INSTALLED: YEARS 0 MONTHS 0 DAYS 6

TOTAL PERIOD OF OPERATION BEFORE FAILURE (FILL IN WHERE APPLICABLE)

YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
—	—	—	40	—	—

DESCRIPTION OF TROUBLE AND PROBABLE CAUSE

GIVE TYPE OF FAILURE. MECHANICAL. ELECTRICAL. WORKMANSHIP. MATERIAL. DESIGN

Capacitor C20 shorts out because of humid operating conditions

UNUSUAL SERVICE CONDITIONS

GIVE BRIEF DESCRIPTION

Operation in tropics

TRAINING OR SKILL OF USING PERSONNEL (CHECK ONE) POOR FAIR GOOD ✓

DESCRIPTION OF ANY REMEDIAL ACTION TAKEN

Radio set given moistureproofing and fungiproofing treatment. 2 Mar 44

RECOMMENDATIONS

Substitution of capacitor designed for tropical operation

1ST IND.

OFFICE STATION DATE

TO CHIEF (Technical service) Signal Officer, Washington 25, D.C.

NAME

STATION RANK

ORIGINATING OFFICER

SIGNATURE E. A. Wilson

NAME E. A. WILSON

RANK AND TITLE Capt., Sig. C.

ORGANIZATION 579 Sig. Repair Co.

INSTRUCTIONS

1. It is imperative that the Chief of Technical Service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in matériel. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.

2. This form will be used for reporting manufacturing, design or operational defects in matériel with a view to improving and correcting such defects, and for use in recommending modifications of matériel.

3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair, or the issue of parts and equipment. It does not replace currently authorized operational or performance records.

4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR [illegible]-10 (Change No. 3).

5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches or other illustrative material are highly desirable.

6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.

7. This form will be made out by using or service organizations and forwarded in duplicate through command channels to the chief of technical service. The office of the chief of technical service receiving the report will forward an information copy to the Commanding General, Army Ground Forces or Army Air Forces, whichever is applicable, and to the Commanding General, Army Service Forces.

8. Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No. 468
1 December 1943

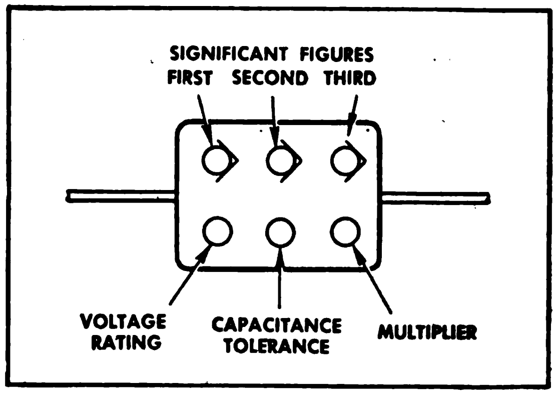
16—37786-1 U. S. GOVERNMENT PRINTING OFFICE

TL15340

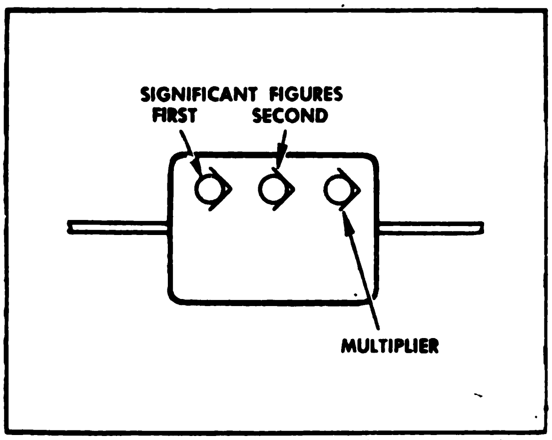
Figure 151. WD AGO Form 468.

CAPACITOR COLOR CODES

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

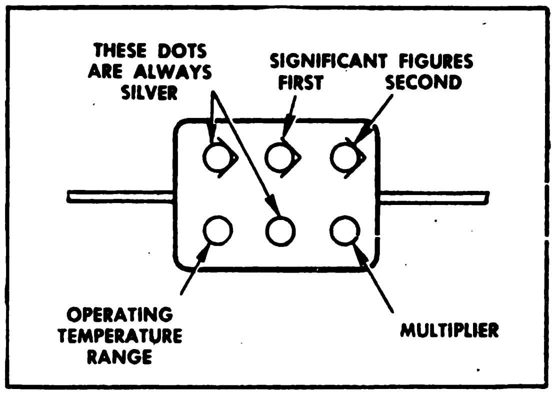


RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts.

AWS 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS

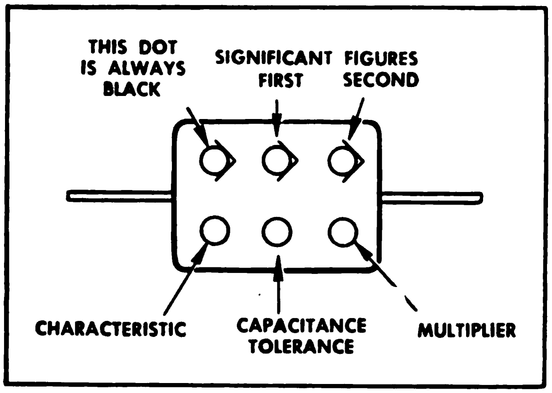


The silver dots serve to identify this marking. The sixth dot shows whether the capacitor has a maximum operating temperature of 167°F (black) or 185°F (brown)

COLOR	SIGNIFICANT FIGURE	MULTIPLIER		VOLTAGE RATING (VOLTS)	CHARACTERISTIC (AWS MICA-DIELECTRIC)
		RMA MICA- AND CERAMIC-DIELECTRIC AWS MICA- AND PAPER-DIELECTRIC	AWS CERAMIC-DIELECTRIC		
BLACK	0	1	1		A
BROWN	1	10	10	100	B
RED	2	100	100	200	C
ORANGE	3	1000	1000	300	D
YELLOW	4	10,000		400	E
GREEN	5	100,000		500	F
BLUE	6	1,000,000		600	G
VIOLET	7	10,000,000		700	
GRAY	8	100,000,000	0.01	800	
WHITE	9	1,000,000,000	0.1	900	
GOLD		0 1		1000	
SILVER		0.01		2000	
NO COLOR				500	TL13417-1

Figure 152. Capacitor color codes.

AWS 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

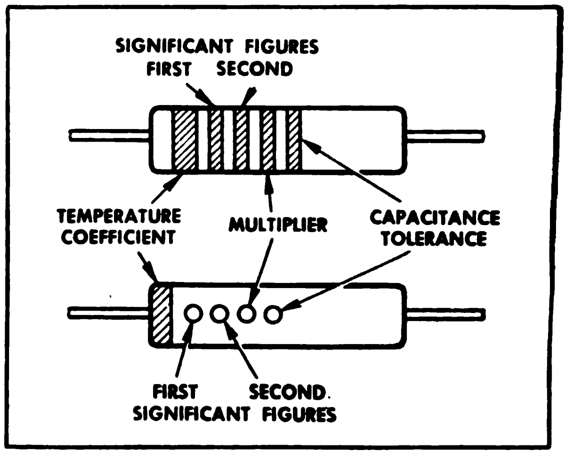


The black dot serves to identify the AWS marking. Capacitors marked with this code are rated at 500 volts, except the following AWS type CM35 capacitors with capacitances of 6,800, 7,500, and 8,200 micromicrofarads, and AWS type CM40 capacitors with capacitances of 9,100 and 10,000 micromicrofarads are rated at 300 volts.

RMA: *Radio Manufacturers Association*
AWS: *American War Standard (American Standards Association)*

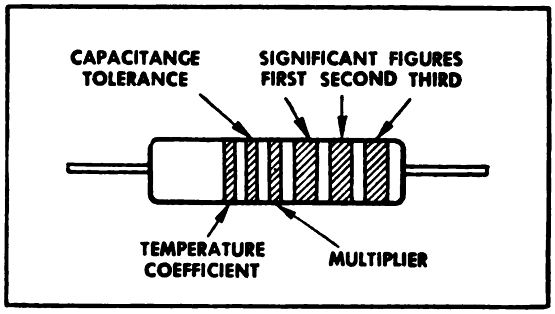
NOTE: These color codes give all capacitances in *micromicrofarads*.

AWS COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts.

RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



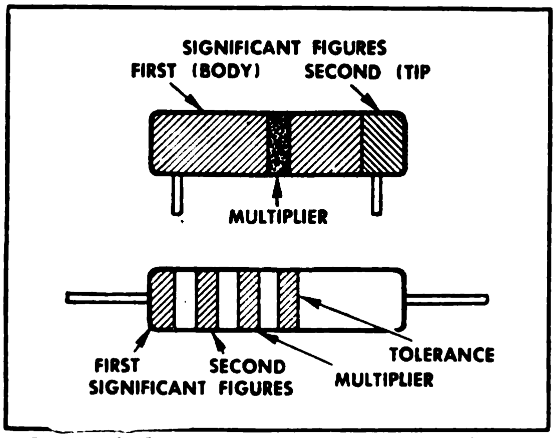
Capacitors marked with this code have a voltage rating of 500 volts.

CAPACITANCE TOLERANCE				TEMPERATURE COEFFICIENT OF CAPACITANCE $\times 10^{-6}$ MMF/MMF/°C
RMA & AWS MICA- AND PAPER-DIELECTRIC (PERCENT)	RMA CERAMIC-DIELECTRIC (PERCENT)	AWS CERAMIC-DIELECTRIC GREATER THAN 10 MMF (PERCENT)	AWS CERAMIC-DIELECTRIC LESS THAN 10 MMF (MMF)	
20	20	20	2.0	0
1	1	1		− 30
2	2	2		− 80
3	3	2.5	0.25	−150
4	4			−220
5	5	5	0.5	−330
6	6			−470
7	7			−750
8	2.5			+ 30
9	10	10	1.0	Not specified
5				
10				
20				TL1347-2

Figure 153. Capacitor color codes.

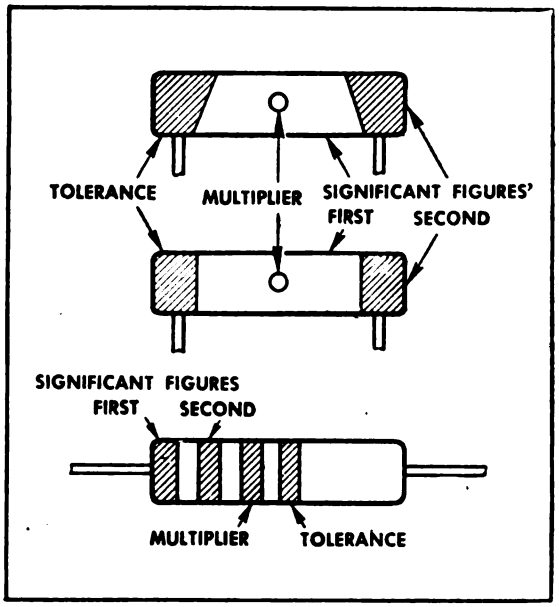
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color Non-insulated fixed composition resistors with axial leads are designated by a black background color

AWS COLOR CODE FOR FIXED COMPOSITION RESISTORS



The exterior body color of insulated resistors may be any color except black. The usual color is natural tan. The exterior body color of uninsulated resistors with axial leads may be either black or white. The exterior body color of uninsulated resistors with radial leads may be black or it may be the color of the first significant figure of the resistance value.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0 1	5
SILVER		0.01	10
NO COLOR			20

RMA: *Radio Manufacturers Association*
AWS *American War Standard (American Standards Association)*

[illegible] 3418

Figure 154. Resistor color codes.

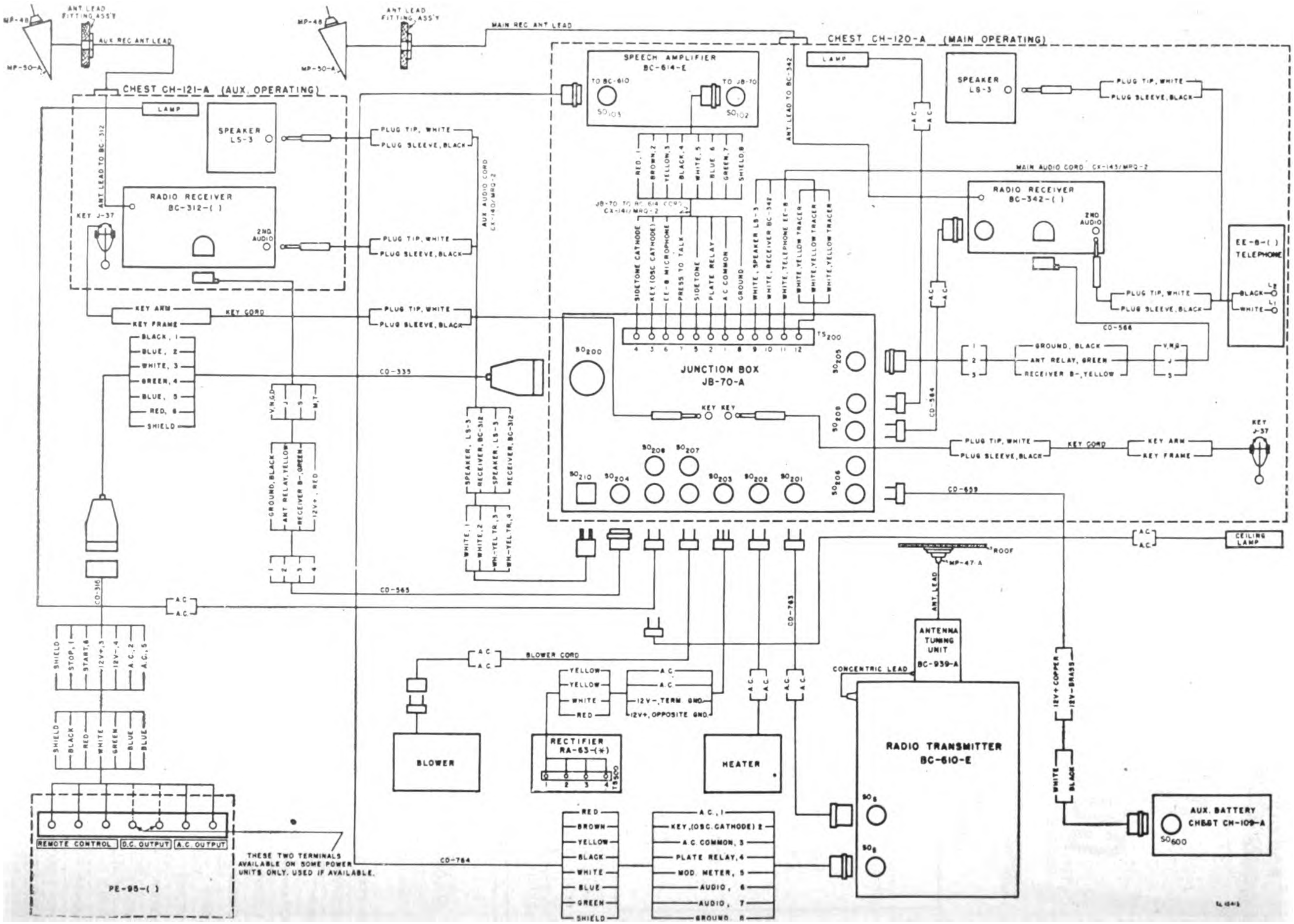


Figure 155. Radio Sets SCR-399-A and SCR-499-A-cording diagram.

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-47

Frequency Range 2.0-2.5 MC

APPROXIMATE DIAL SETTINGS

NOTE Use V C 50
On 2-2.5 MC

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M O	DOUB	INT AMP.		BAND SWITCH POSITION	COUPLING	LOADING
2000	2000	C-387-D	11	2.4	4.7	20	2-10	4.9	4.6
2050	2050	C-387-D	22	3.2	5.2	30	2-10	4.9	7.1
2100	2100	C-387-D	32	3.8	5.5	39	2-10	5.1	9.4
2150	2150	C-387-D	41	4.3	5.9	47.5	2-10	4.9	11.4
2200	2200	C-387-D	49	4.8	6.3	56.5	2-10	4.8	13.3
2250	2250	C-387-D	57	5.2	6.7	63.5	2-10	4.7	15.1
2300	2300	C-387 D	63	5.6	7.0	70	2-10	4.6	16.8
2350	2350	C-387-D	69	6.0	7.4	77	2-10	4.5	18.3
2400	2400	C-387-D	75	6.3	7.7	83	2-10	4.5	19.8
2450	2450	C-387-D	81	6.7	8.0	88	2-10	4.6	21.3
2500	2500	C-387-D	85	7.0	8.2	94	2-10	4.6	22.6

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 92B105

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-48

Frequency Range 2.5-3.2 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M.O.	DOUB.	INT AMP.		BAND SWITCH POSITION	COUPLING	LOADING
2500	2500	C-387-D	10	0.7	2.8	7	2-10	4.3	22.6
2550	2550	C-387-D	18	1.7	3.4	12.5	2-10	4.3	23.9
2600	2600	C-387-D	26	2.4	3.9	17	2-10	4.3	25.0
2650	2650	C-387-D	33	3.1	4.4	21.5	2-10	4.2	26.2
2700	2700	C-387-D	40	3.7	4.9	25.5	2-10	4.2	27.3
2750	2750	C-387-D	46	4.1	5.3	29.0	2-10	4.2	28.3
2800	2800	C-387-D	52	4.5	5.8	33.0	2-10	4.2	29.3
2850	2850	C-387-D	58	4.9	6.1	36.5	2-10	4.2	30.2
2900	2900	C-387-D	63	5.2	6.5	40.5	2-10	4.5	31.0
2950	2950	C-387-D	68	5.6	6.8	43.5	2-10	4.1	32.0
3000	3000	C-387-D	73	5.9	7.2	47.0	2-10	4.1	32.7
3050	3050	C-387-D	78	6.1	7.4	50.0	2-10	4.1	33.5
3100	3100	C-387-D	82	6.4	7.7	53.0	2-10	4.1	34.2
3150	3150	C-387-D	87	6.6	7.9	55.5	2-10	4.2	35.0
3200	3200	C-387-D	90	6.8	8.0	58.5	2-10	4.2	35.6

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 92B105

NOTE: VIEW ABOVE SHOWS BOTH FACES OF CHART. FACES COMBINE BACK TO BACK TO MAKE ONE CHART.

TL 16681

Figure 156. Tuning chart, Tuning Units TU–47 and TU–48.

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-49

Frequency Range 3.2-4.0 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M.O.	DOUB.	INT AMP.		BAND SWITCH POSITION	COUPLING	LOADING
3200	3200	C-387-D	25	3.4	5.8	58.5	2-10	4.2	35.6
3250	3250	C-387-D	30	3.8	6.1	61.0	2-10	4.3	36.3
3300	3300	C-387-D	35	4.2	6.3	63.0	2-10	4.3	37.0
3350	3350	C-387-D	40	4.6	6.5	65.5	2-10	4.5	37.5
3400	3400	C-387-D	45	4.9	6.7	67.0	2-10	4.6	38.2
3450	3450	C-387-D	50	5.3	6.9	69.5	2-10	4.7	38.7
3500	3500	C-387-D	55	5.6	7.1	71.5	2-10	5.1	39.3
3500	3500	C-388-D	55	5.6	7.1	21	2-10	3.4	38.9
3550	3550	C-388-C	59	5.9	7.3	23.5	2-10	3.5	39.5
3600	3600	C-388-C	64	6.1	7.5	26.5	2-10	3.5	39.9
3650	3650	C-388-C	68	6.4	7.7	29.5	2-10	3.6	40.4
3700	3700	C-388-C	72	6.6	7.9	32	2-10	3.7	40.9
3750	3750	C-388-C	75	6.8	8.1	35	2-10	3.8	41.3
3800	3800	C-388-C	79	7.0	8.3	37.5	2-10	3.9	41.7
3850	3850	C-388-C	82	7.2	8.5	40.5	2-10	3.9	42.2
3900	3900	C-388-C	85	7.4	8.7	43	2-10	4.0	42.5
3950	3950	C-388-C	88	7.6	8.8	45	2-10	4.0	42.9
4000	4000	C-388-C	91	7.8	8.9	48	2-10	4.0	43.2

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 928106

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-50

Frequency Range 4.0-5.0 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC 939 A		
			M.O.	DOUB.	INT AMP		BAND SWITCH POSITION	COUPLING	LOADING
4000	2000	C-388-C	7	2.2	3.5	48	2-10	4.0	43.2
4050	2025	C-388-C	13	2.5	3.9	50	2-10	4.0	43.7
4100	2050	C-388-C	19	2.9	4.3	52	2-10	4.0	44.0
4150	2075	C-388-C	24	3.2	4.6	54.5	2-10	3.9	44.3
4200	2100	C-388-C	29	3.5	5.0	56.5	2-10	3.9	44.6
4250	2125	C-388-C	34	3.8	5.3	58.5	2-10	3.9	44.9
4300	2150	C-388-C	39	4.1	5.6	60.5	2-10	4.0	45.2
4350	2175	C-388-C	44	4.4	5.9	62.5	2-10	4.0	45.5
4400	2200	C-388-C	48	4.6	6.1	63.5	2-10	4.0	45.8
4450	2225	C-388-C	52	4.8	6.4	65.5	2-10	4.0	46.1
4500	2250	C-388-C	56	5.1	6.6	67	2-10	4.0	46.3
4500	2250	C-389-C	56	5.1	6.6	12.5	2-10	2.8	46.2
4550	2275	C-389-C	60	5.3	6.8	15	2-10	2.8	46.4
4600	2300	C-389-C	64	5.6	7.0	17.5	2-10	2.9	46.7
4650	2325	C-389-C	67	5.8	7.2	20	2-10	2.9	46.9
4700	2350	C-389-C	71	6.0	7.3	22	2-10	2.8	47.2
4750	2375	C-389-C	74	6.2	7.5	24.5	2-10	2.9	47.4
4800	2400	C-389-C	78	6.4	7.7	26.5	2-10	2.9	47.6
4850	2425	C-389-C	81	6.6	7.8	29	2-10	2.9	47.9
4900	2450	C-389-C	84	6.8	8.0	31	2-10	2.9	48.1
4950	2475	C-389-C	88	7.0	8.2	33	2-10	2.8	48.3
5000	2500	C-389-C	91	7.1	8.4	35.5	2-10	2.8	48.5

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 928106

NOTE: VIEW ABOVE SHOWS BOTH FACES OF CHART. FACES COMBINE BACK TO BACK TO MAKE ONE CHART.

TL 15950

Figure 157. Tuning chart, Tuning Units TU-49 and TU-50.

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-51

Frequency Range 5-6.35 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P.A. PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M.O.	DOUB.	INT. AMP.		BAND SWITCH POSITION	COUPLING	LOADING
5000	2500	C-389-C	5	2.5	4.0	35.5	2-10	2.8	48.5
5050	2525	C-389-C	10	2.8	4.3	37.5	2-10	2.8	48.7
5100	2550	C-389-C	15	3.1	4.6	39.5	2-10	2.8	48.9
5150	2575	C-389-C	19	3.4	4.8	41.5	2-10	2.8	49.1
5200	2600	C-389-C	23	3.7	5.1	43	2-10	2.8	49.3
5250	2625	C-389-C	27	3.9	5.3	45	2-10	2.8	49.5
5300	2650	C-389-C	31	4.2	5.6	47	2-10	2.8	49.6
5350	2675	C-389-C	34	4.4	5.8	48.5	2-10	2.8	49.8
5400	2700	C-389-C	38	4.6	6.0	50.5	2-10	2.8	50.0
5450	2725	C-389-C	41	4.8	6.2	52	2-10	2.8	50.1
5500	2750	C-389-C	44	5.0	6.4	54	2-10	2.8	50.4
5550	2775	C-389-C	48	5.2	6.6	55.5	2-10	2.8	50.5
5600	2800	C-389-C	51	5.4	6.7	57	2-10	2.8	50.7
5650	2825	C-389-C	55	5.5	6.9	58.5	2-10	2.8	50.9
5700	2850	C-389-C	58	5.7	7.1	60	2-10	2.8	51.0
5700	2850	C-390-C	58	5.7	7.1	21	2-10	2.2	50.9
5750	2875	C-390-C	61	5.9	7.2	23	2-10	2.2	51.0
5800	2900	C-390-C	64	6.1	7.4	25	2-10	2.3	51.2
5850	2925	C-390-C	66	6.2	7.5	26.5	2-10	2.2	51.3
5900	2950	C-390-C	69	6.4	7.7	28.5	2-10	2.2	51.4
5950	2975	C-390-C	72	6.5	7.8	29.5	2-10	2.3	51.5
6000	3000	C-390-C	74	6.7	8.0	31.5	2-10	2.3	51.7
6050	3025	C-390-C	77	6.8	8.1	33.5	2-10	2.3	51.9
6100	3050	C-390-C	79	7.0	8.2	35	2-10	2.3	51.9
6150	3075	C-390-C	82	7.1	8.4	36.6	2-10	2.3	52.0
6200	3100	C-390-C	84	7.2	8.5	38.5	2-10	2.3	52.2
6250	3125	C-390-C	87	7.3	8.7	40	2-10	2.3	52.3
6300	3150	C-390-C	89	7.5	8.8	41.5	2-10	2.3	52.5
6350	3175	C-390-C	90	7.5	8.9	43.5	2-10	2.3	52.5

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 920107

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-52

Frequency Range 6.35-8.0 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P.A. PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M.O.	DOUB.	INT. AMP		BAND SWITCH POSITION	COUPLING	LOADING
6350	3175	C-390-C	8	4.4	2.8	43.5	2-10	2.3	52.5
6400	3200	C-390-C	10	4.6	3.3	45	2-10	2.2	52.7
6500	3250	C-390-C	17	5.0	3.8	47.5	2-10	2.2	53.0
6600	3300	C-390-C	23	5.4	4.2	50.5	2-10	2.2	53.1
6700	3350	C-390-C	29	5.8	4.7	53	2-10	2.2	53.4
6800	3400	C-390-C	35	6.1	5.1	55	2-10	2.2	53.6
6900	3450	C-390-C	41	6.4	5.6	58	2-10	2.2	53.7
7000	3500	C-390-C	47	6.6	6.0	60.5	2-10	2.2	54.0
7100	3550	C-390-C	52	6.9	6.4	63	2-10	2.2	54.2
7200	3600	C-390-C	57	7.1	6.8	65	2-10	2.2	54.4
7300	3650	C-390-C	62	7.3	7.1	67	2-10	2.2	54.5
7400	3700	C-390-C	67	7.5	7.4	69	2-10	2.2	54.7
7500	3750	C-390-C	71	7.7	7.7	71	2-10	2.2	54.9
7600	3800	C-390-C	75	7.9	8.0	72.5	2-10	2.2	55.1
7700	3850	C-390-C	79	8.1	8.2	74.5	2-10	2.2	55.2
7800	3900	C-390-C	83	8.3	8.4	76	2-10	2.1	55.4
7900	3950	C-390-C	87	8.4	8.6	77.5	2-10	2.1	55.5
8000	4000	C-390-C	91	8.5	8.8	78.5	2-10	2.1	55.7

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

PART NO. 920107

NOTE: VIEW ABOVE SHOWS BOTH FACES OF CHART. FACES COMBINE BACK TO BACK TO MAKE ONE CHART.

TL15948

Figure 158. Tuning chart, Tuning Units TU–51 and TU–52.

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-53

Frequency Range 8.0-12.0 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A. PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M O	DOUB	INT. AMP		BAND SWITCH POSITION	COUPLING	LOADING
8000	4000	C-447-B	6	1.5	1.5	20.5	2-10	1.5	55.5
8100	4050	C-447-B	9	1.8	1.8	23.5	2-10	1.5	55.7
8200	4100	C-447-B	13	2.0	2.0	26.	2-10	1.5	55.9
8300	4150	C-447-B	16	2.3	2.3	28.5	2-10	1.5	56.1
8400	4200	C-447-B	19	2.6	2.6	31	2-10	1.5	56.1
8500	4250	C-447-B	23	2.8	2.8	33.5	2-10	1.5	56.2
8600	4300	C-447-B	26	3.1	3.1	36	2-10	1.5	56.4
8700	4350	C-447-B	29	3.3	3.3	38.5	2-10	1.5	56.5
8800	4400	C-447-B	32	3.6	3.6	41	2-10	1.5	56.7
8900	4450	C-447-B	35	3.8	3.8	43	2-10	1.5	56.8
9000	4500	C-447-B	38	4.0	4.0	45.5	2-10	1.5	57.1
9100	4550	C-447-B	41	4.2	4.2	47.5	2-10	1.5	57.3
9200	4600	C-447-B	43	4.3	4.3	49.5	2-10	1.5	57.4
9300	4650	C-447-B	46	4.5	4.5	52	2-10	1.5	57.5
9400	4700	C-447-B	49	4.7	4.7	53.5	2-10	1.5	57.7
9500	4750	C-447-B	51	4.9	4.9	55.5	2-10	1.5	57.7
9600	4800	C-447-B	53	5.1	5.1	57.5	2-10	1.5	57.8
9700	4850	C-447-B	55	5.3	5.3	59	2-10	1.5	58.0
9800	4900	C-447-B	57	5.4	5.4	60.5	2-10	1.4	58.3
9900	4950	C-447-B	59	5.6	5.6	63	2-10	1.4	58.4
10,000	5000	C-447-B	61	5.7	5.7	64.5	2-10	1.4	58.5

NOTE – FOR EXACT M.O SETTING, USE FREQUENCY METER SET SCR-211-( )

(OVER) PART NO. 928108

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-53

Frequency Range 8.0-12.0 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A. PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M O	DOUB	INT AMP		BAND SWITCH POSITION	COUPLING	LOADING
10,000	5000	C-447-B	61	5.7	5.7	64.5	10-18	1.1	*2.5
10,100	5050	C-447-B	63	5.8	5.8	65.5	10-18	1.1	*2.7
10,200	5100	C-447-B	65	6.0	6.0	67	10-18	1.1	*3.0
10,300	5150	C-447-B	67	6.2	6.2	68.5	10-18	1.1	*3.4
10,400	5200	C-447-B	68	6.3	6.3	70	10-18	1.1	*3.7
10,500	5250	C-447-B	70	6.4	6.4	71.5	10-18	1.1	*4.0
10,600	5300	C-447-B	72	6.6	6.6	72.5	10-18	1.1	*4.5
10,700	5350	C-447-B	73	6.7	6.7	74	10-18	1.1	*4.7
10,800	5400	C-447-B	75	6.8	6.8	75	10-18	1.1	*5.0
10,900	5450	C-447-B	76	7.0	7.0	76.5	10-18	1.1	*5.3
11,000	5500	C-447-B	78	7.1	7.1	77.5	10-18	1.1	*5.7
11,000	5500	C-448-B	78	7.1	7.1	37	10-18	1.2	*5.6
11,100	5550	C-448-B	79	7.2	7.2	39	10-18	1.2	*5.8
11,200	5600	C-448-B	81	7.3	7.3	40.5	10-18	1.2	*6.1
11,300	5650	C-448-B	82	7.4	7.4	42.5	10-18	1.2	*6.5
11,400	5700	C-448-B	83	7.5	7.5	44.5	10-18	1.2	*6.7
11,500	5750	C-448-B	84	7.6	7.6	46	10-18	1.2	*7.0
11,600	5800	C-448-B	85	7.7	7.7	48	10-18	1.2	*7.1
11,700	5850	C-448-B	86	7.8	7.8	49.5	10-18	1.2	*7.4
11,800	5900	C-448-B	87	7.9	7.9	51	10-18	1.2	*7.7
11,900	5950	C-448-B	88	8.0	8.0	52.5	10-18	1.2	*7.9
12,000	6000	C-448-B	90	8.1	8.1	54.5	10-18	1.2	*8.1

NOTE — FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

*Set L.P. Loading Coil at 30

PART NO. 928108

NOTE: VIEW ABOVE SHOWS BOTH FACES OF CHART. FACES COMBINE BACK TO BACK TO MAKE ONE CHART

TL 16680

Figure 159. Tuning chart, Tuning Unit TU-53.

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-54

Frequency Range 12-18 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M O	DOUB	INT AMP		BAND SWITCH POSITION	COUPLING	LOADING
12,800	3000	C-448B	6	.3	1.1	54.5	10-18	1.2	*8.1
12,100	3025	C-448B	9	.4	1.4	55.5	10-18	1.2	*8.4
12,200	3050	C-448B	12	.6	1.6	57	10-18	1.1	*8.6
12,300	3075	C-448B	14	.8	1.8	58.5	10-18	1.1	*8.8
12,400	3100	C-448-B	17	1.0	2.1	60	10-18	1.1	*9.0
12,500	3125	C-448B	19	1.2	2.3	61	10-18	1.1	*9.2
12,600	3150	C-448B	21	1.4	2.5	62.5	10-18	1.1	*9.5
12,700	3175	C-448B	23	1.5	2.7	64	10-18	1.1	*9.8
12,800	3200	C-448B	25	1.7	2.9	65	10-18	1.1	*9.9
12,900	3225	C-448B	27	1.8	3.1	66.5	10-18	1.1	*10.0
13,000	3250	C-448B	29	1.9	3.2	67.5	10-18	1.1	*10.3
13,100	3275	C-448-B	31	2.1	3.3	69	10-18	1.1	*10.4
13,200	3300	C-448B	33	2.2	3.5	70	10-18	1.1	*10.7
13,300	3325	C-448B	35	2.4	3.7	71	10-18	1.1	*10.8
13,400	3350	C-448-B	37	2.5	3.8	72	10-18	1.1	*11.0
13,500	3375	C-448-B	38	2.6	4.0	73	10-18	1.1	*11.2
13,600	3400	C-448B	40	2.7	4.1	74.5	10-18	1.1	*11.3
13,700	3425	C-448B	41	2.8	4.3	75	10-18	1.1	*11.6
13,800	3450	C-448B	43	3.0	4.4	76.5	10-18	1.1	*11.6
13,900	3475	C-448B	45	3.1	4.5	77	10-18	1.0	*11.8
14,000	3500	C-448-B	46	3.2	4.6	78	10-18	1.0	*11.9

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

*Set L.F. Loading Coil at 30

(OVER) PART NO. 928109

TUNING CHART OF RADIO TRANSMITTER BC-610-E

for

Tuning Unit TU-54

Frequency Range 12-18 MC

APPROXIMATE DIAL SETTINGS

OPERATING FREQUENCY IN KILOCYCLES	CRYSTAL FREQUENCY IF USED	COIL UNIT	TUNING CONTROLS			P A PLATE TUNING	ANTENNA TUNING UNIT BC-939-A		
			M O	DOUB	INT AMP		BAND SWITCH POSITION	COUPLING	LOADING
14,000	3500	C-449B	46	3.2	4.6	37.5	10-18	1.1	*12.0
14,200	3550	C-449B	49	3.4	4.8	40.5	10-18	1.1	*12.3
14,400	3600	C-449-B	52	3.6	5.1	43	10-18	1.1	*12.4
14,600	3650	C-449B	55	3.8	5.3	46	10-18	1.1	*12.8
14,800	3700	C-449B	58	3.9	5.5	48.5	10-18	1.1	*13.0
15,000	3750	C-449-B	61	4.1	5.7	52.5	10-18	1.1	*13.2
15,200	3800	C-449-B	63	4.3	5.8	54.5	10-18	1.1	*13.6
15,400	3850	C-449-B	65	4.5	6.1	57	10-18	1.0	*13.8
15,600	3900	C-449B	68	4.7	6.2	59	10-18	1.0	*14.2
15,800	3950	C-449B	70	4.8	6.4	61.5	10-18	1.0	*14.2
16,000	4000	C-449B	72	5.0	6.6	63	10-18	1.0	*14.4
16,200	4050	C-449-B	74	5.2	6.7	65	10-18	1.0	*14.6
16,400	4100	C-449B	76	5.3	6.8	67	10-18	0.9	*14.7
16,600	4150	C-449B	78	5.5	6.9	69	10-18	0.9	*14.7
16,800	4200	C-449B	80	5.6	7.1	71	10-18	0.8	*14.9
17,000	4250	C-449B	82	5.7	7.2	73	10-18	0.8	*15.1
17,200	4300	C-449-B	84	5.8	7.4	75	10-18	0.8	*15.4
17,400	4350	C-449-B	85	5.9	7.5	76.5	10-18	0.7	*15.4
17,600	4400	C-449B	87	6.1	7.7	77	10-18	0.5	*15.6
17,800	4450	C-449-B	89	6.2	7.9	80	10-18	0.4	*16.0
18,000	4500	C-449B	91	6.3	8.1	82	10-18	0.4	*16.3

NOTE—FOR EXACT M.O. SETTING, USE FREQUENCY METER SET SCR-211-( )

*Set L.F. Loading Coil at 30

PART NO. 928109

NOTE: VIEW ABOVE SHOWS BOTH FACES OF CHART. FACES COMBINE BACK TO BACK TO MAKE ONE CHART.

TL15949

Figure 160. Tuning chart, Tuning Unit TU–54.