

# INSTRUCTION BOOK

FOR

## RADIO SET SCR-194

## RADIO SET SCR-195

# RESTRICTED

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# INSTRUCTION BOOK FOR RADIO SETS SCR-194 AND SCR-195

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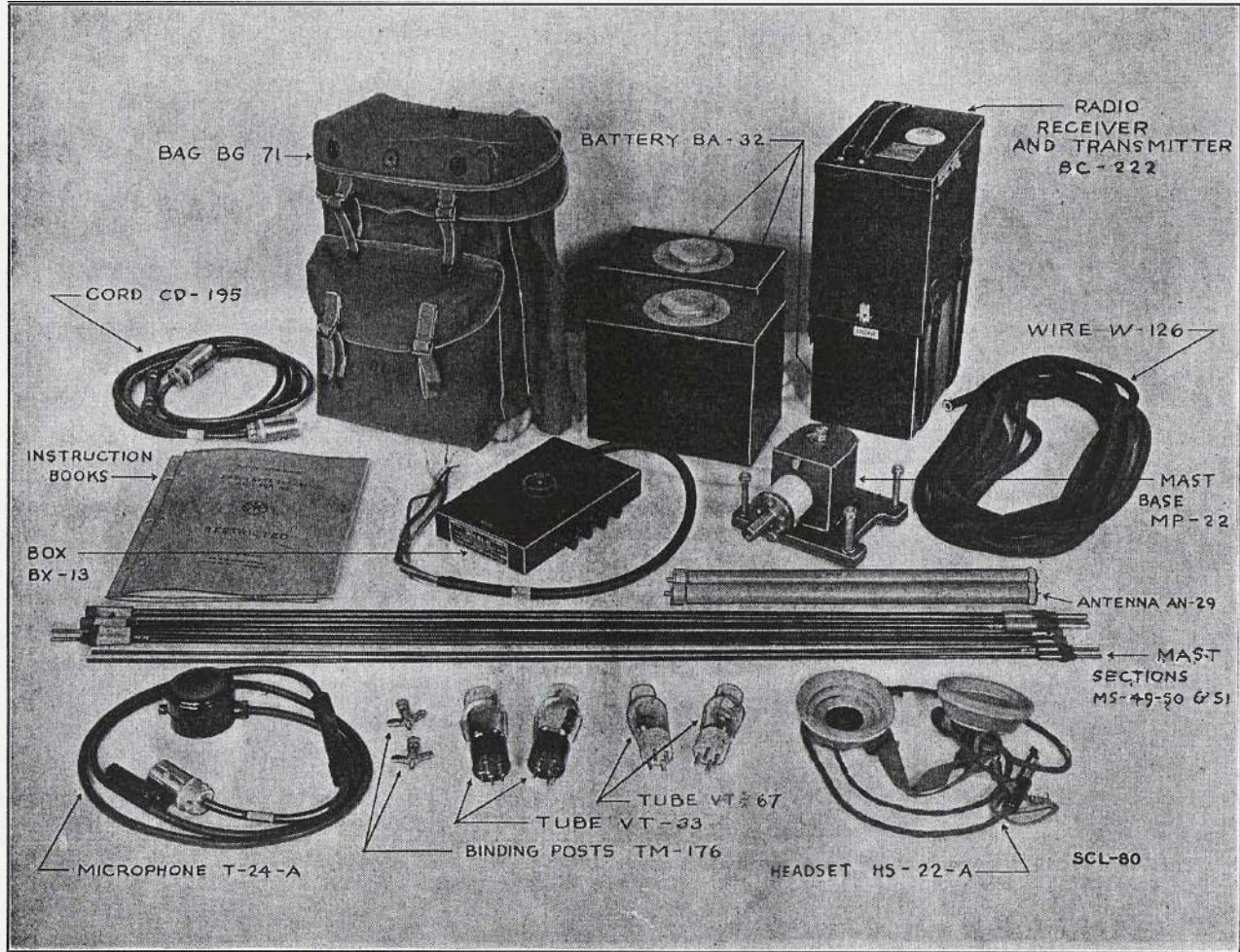


Figure 1—Radio Set SCR-194, Components (except Chest CH-33).

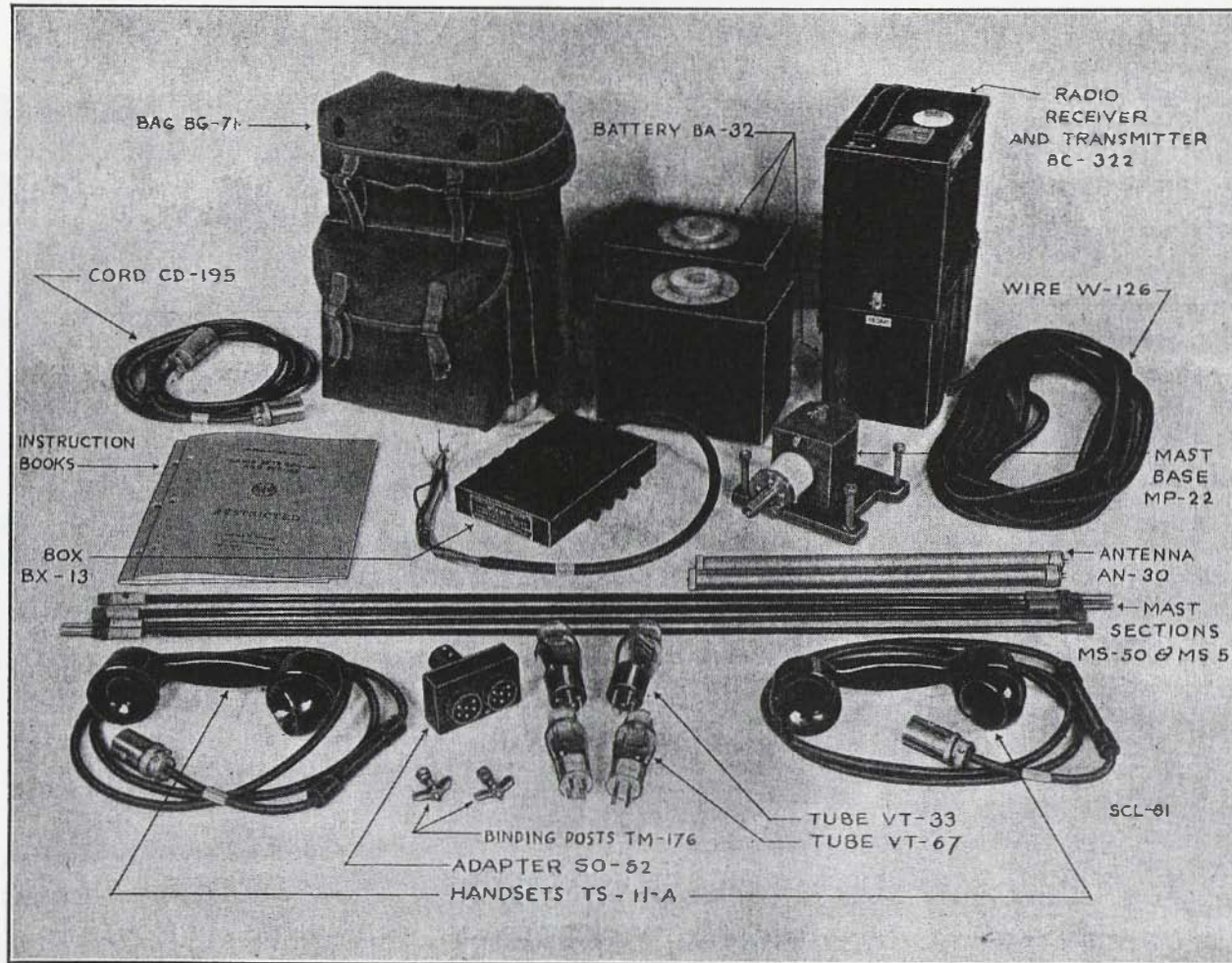


Figure 2—Radio Set SCR-195, Components (except Chest CH-33).

INSTRUCTION BOOK  
FOR  
RADIO SET SCR-194  
RADIO SET SCR-195

SECTION I  
DESCRIPTION

1. **General.**—Radio Sets SCR-194 and SCR-195 are designed to provide means of voice communication over relatively short distances, nominally up to 5 miles. All equipment required for transmission and reception is carried on the back of the operator in a canvas bag. This consists of the Radio Receiver and Transmitter

BC-222 (or BC-322) containing two tubes, the Battery BA-32, an Antenna AN-29 (or AN-30), and a Headset HS-22 with a Microphone T-24 (or 2 Handsets TS-11 and Adapter SO-52).

For vehicular operation, steel mast sections and a mast base are provided. These articles together with spares, are carried in a Chest CH-33.

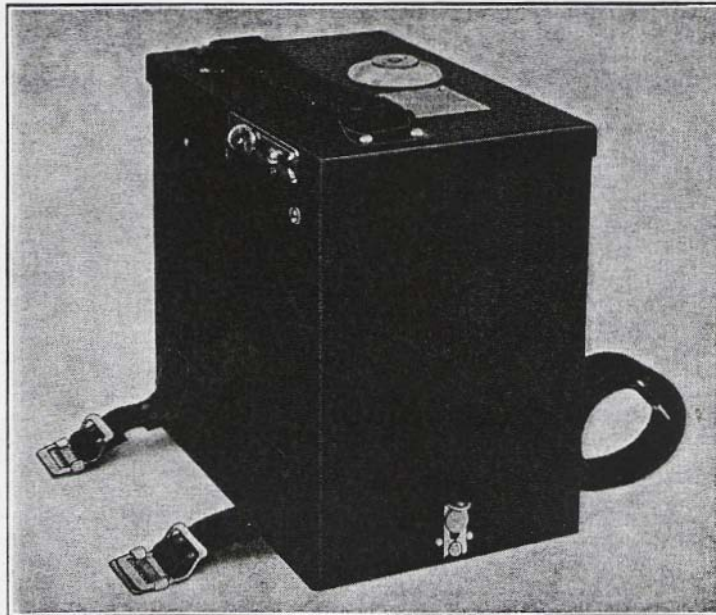


Figure 3--Radio Receiver and Transmitter BC-222 (or BC-322), External View showing carrying and battery straps and antenna mounting (on top of case).

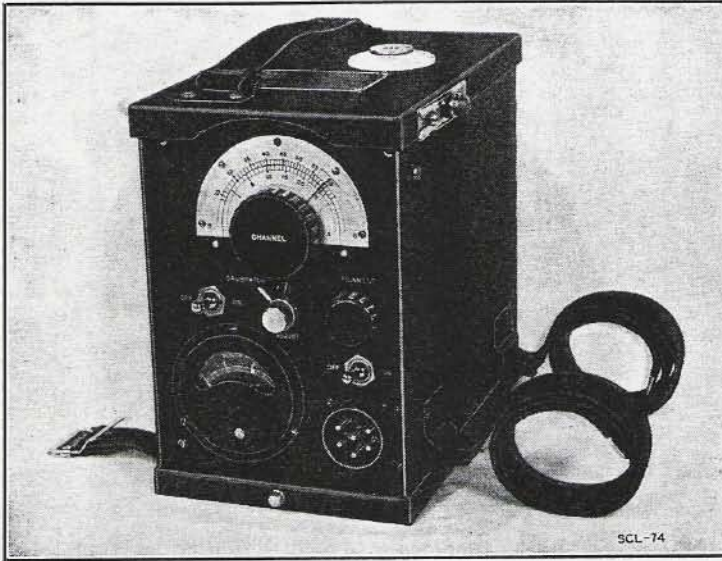


Figure 4—Radio Receiver and Transmitter BC-222, with front cover removed showing dial with 500-kc subdivisions.

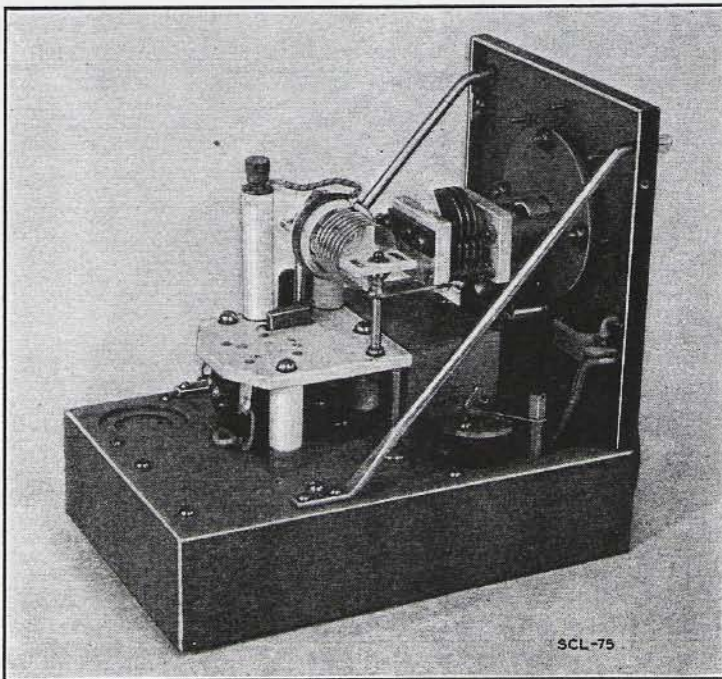


Figure 5—Radio Receiver and Transmitter BC-222, left side of chassis

**2. List of Equipment—Radio Set SCR-194.—**

*a. For Portable Use Only—Carried in Bag BG-71.—*

Quantity	Nomenclature	Weight in Pounds
1	Antenna AN-29.....	0.50
1	Bag BG-71.....	2.50
1	Battery BA-32.....	12.00
1	Headset HS-22.....	.40
1	Microphone T-24.....	1.50
1	Radio Receiver and Transmitter BC-222.....	8.00
1	Tube VT-33.....	.10
1	Tube VT-67.....	.10
Total.....		25.10

*b. Auxiliary Equipment—Carried in Chest CH-33.—*

Quantity	Nomenclature	Weight in Pounds
1	Antenna AN-29 (spare).....	.50
2	Battery BA-32 (spare).....	24.00
2	Binding Post TM-176.....	.04
1	Box BX-13.....	1.60
1	Chest CH-33.....	28.50
1	Cord CD-195.....	.80
2	Instruction Book for Radio Sets SCR-194 and SCR-195.....	.60
1	Mast Base MP-22.....	6.50

Quantity	Nomenclature	Weight in Pounds
2	Mast Section MS-49.....	.24
2	Mast Section MS-50.....	.50
2	Mast Section MS-51.....	1.00
2	Tube VT-33 (spare).....	.20
2	Tube VT-67 (spare).....	.20
	25 ft. Wire W-126 (or W-9).....	.30
Total.....		64.98

The only operating difference between the SCR-194 and SCR-195 sets is in frequency range; the SCR-194 covers the 27.7 to 52.2 megacycle band, while the SCR-195 covers the 52.8 to 65.8 megacycle band. The former includes Radio Receiver and Transmitter BC-222 and the latter includes Radio Receiver and Transmitter BC-322. The general design, construction, and operation are otherwise identical. The frequency band in the BC-222 is covered by two interchangeable coils, while that in the BC-322 is covered by a single coil. Two Handsets TS-11 are provided in the Radio Set SCR-195, whereas Radio Set SCR-194 is provided with Microphone T-24 and Headset HS-22.

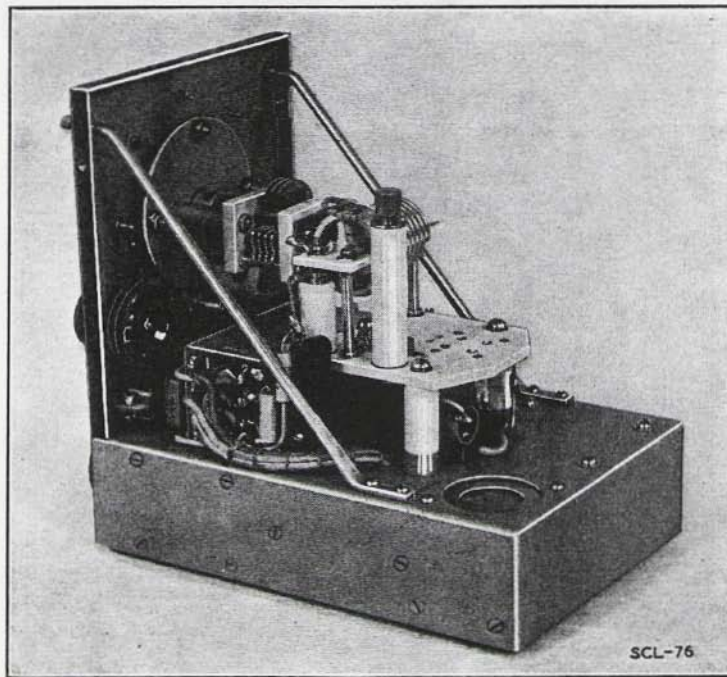


Figure 6—Radio Receiver and Transmitter BC-222, right side of chassis.



**3. List of Equipment—Radio Set SCR-195.—**

*b. Auxiliary Equipment—Carried in Chest CH-33.—*

*a. For Portable Use Only—Carried in Bag BG-71.—*

Quantity	Nomenclature	Weight in Pounds
1	Adapter SO-52.....	.65
1	Antenna AN-30.....	.50
1	Bag BG-71.....	2.50
1	Battery BA-32.....	12.00
2	Handset TS-11.....	3.00
1	Radio Receiver and Transmitter BC-322.....	8.00
1	Tube VT-33.....	.10
1	Tube VT-67.....	.10
Total.....		26.85

Quantity	Nomenclature	Weight in Pounds
1	Antenna AN-30 (spare).....	.50
2	Battery BA-32 (spare).....	24.00
2	Binding Post TM-176.....	.04
1	Box BX-13.....	1.60
1	Chest CH-33.....	28.50
1	Cord CD-195.....	.80
2	Instruction Book for Radio Sets SCR-194 and SCR-195.....	.60
1	Mast Base MP-22.....	6.50
2	Mast Section MS-50.....	.50
2	Mast Section MS-51.....	1.00
2	Tube VT-33 (spare).....	.20
2	Tube VT-67 (spare).....	.20
25 ft.	Wire W-126 (or W-9).....	.30
Total.....		64.74

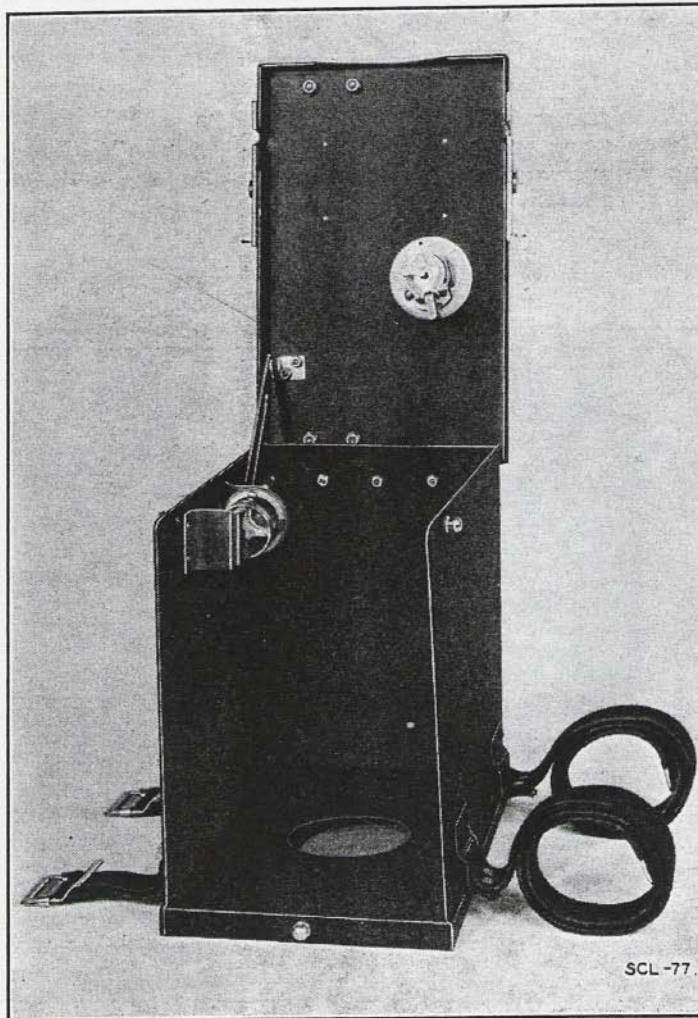


Figure 7—Radio Receiver and Transmitter BC-222, case only, showing position of alternate coil and location of antenna trimmer capacitor on under side of raised cover.

**4. Radio Receivers and Transmitters BC-222 and BC-322.**—See Figures 3 to 11. All elements of the receiver and transmitter are chassis mounted and contained in an aluminum-alloy case. This unit is designed to fit directly on top of the battery from which it derives its

power. The case is fitted with a carrying strap, an antenna mounting, and two straps serving to hold the battery in place. Connection to the battery is effected through a plug in the bottom of the chassis and a socket in the top of the battery. Access to the top of the chassis may be

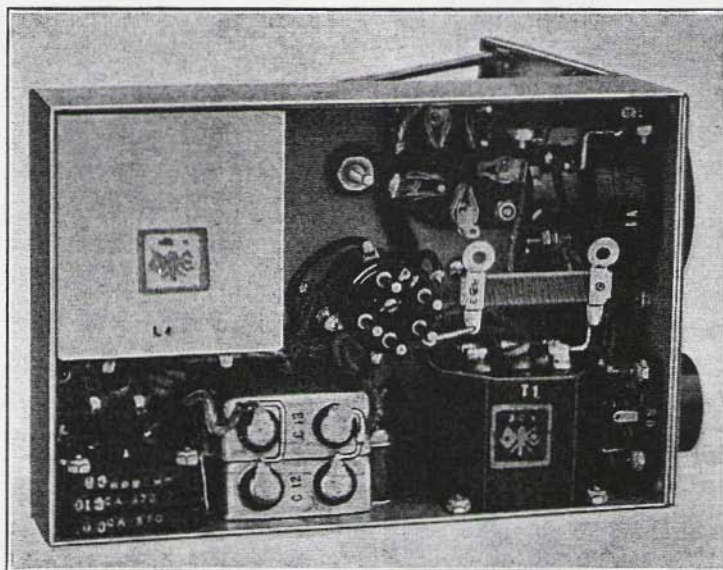


Figure 8—Radio Receiver and Transmitter BC-222, under side of chassis showing plug which fits into socket on Battery BA-32.

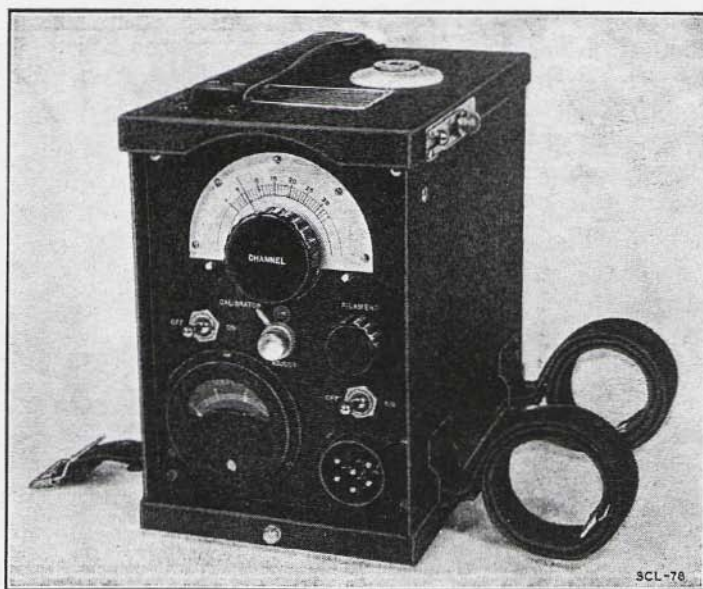


Figure 9—Radio Receiver and Transmitter BC-322, with front cover removed.

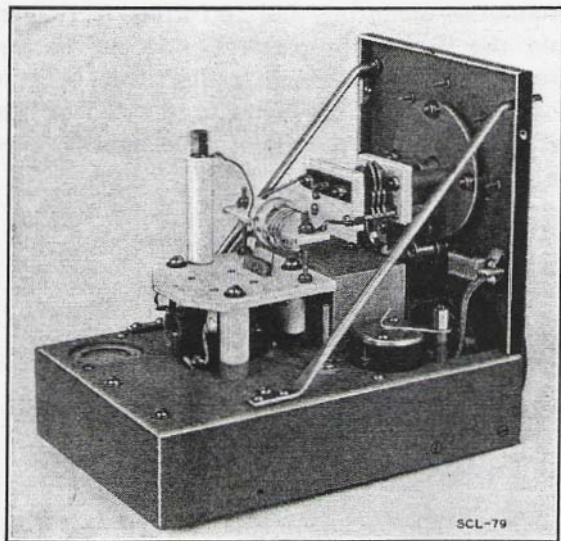


Figure 10—Radio Receiver and Transmitter BC-322, left side of chassis.

gained by releasing the snapslides at the sides and opening the cover. Tubes and the tuning coils may thus be interchanged. The chassis may easily be removed to facilitate inspection or repair by opening the cover and taking out three screws, one at either side of the case and one in the rear. The receiver and transmitter (sometimes referred to as a transceiver), employs the same elements for both receiving and transmitting. The operation of various elements is changed from receiving to transmitting by alternate connections effected by the relay which is in turn controlled by the switch on the handset. The set uses a superregenerative detector and radio-frequency oscillator in a modified form of Hartley circuit. Five controls are provided as follows: (1) Channel or frequency adjustment, (2) Calibration switch, (3) Calibration adjustor, (4) Filament rheostat, and (5) Filament switch. The meter on the left side of the panel indicates voltage on the filaments and the socket at the right serves to connect the handset or headset and microphone.

Radio Receivers and Transmitters BC-222 and BC-322 are each provided with two dial scale plates, one marked off in 500-kilocycle subdivisions and the other in 400-kilocycle subdivisions. These scales are printed on metal

plates which are secured to the front of the panel, one over the other, by means of five machine screws. To interchange the dial scale plates it is necessary to remove the five screws, interchange the plates and then replace the screws. Scales of frequency and dial divisions are given in Section V.

The 400-kc scale is provided for experimental purposes in order to determine the feasibility of operating on this channel width with this type of equipment. For ordinary use it is recommended that the 500-kc scale be employed.

**5. Antennas AN-29 and AN-30.**—Antennas AN-29 and AN-30 each consist of an assembly of telescoping, aluminum-alloy tubes which may be screwed into place on the insulated antenna mounting on top of the case. See that either antenna is extended to its proper length before attempting to operate. The SCR-194 is operated with all twelve sections of AN-29 drawn out using Coil C-174, marked A, with the ten largest or lower sections using Coil C-175, marked B. The SCR-195 is operated with all eight sections of AN-30 drawn out.

*Note:* The calibration of either set will not be correct unless the antennas are extended to the proper lengths at all times or operated complete-

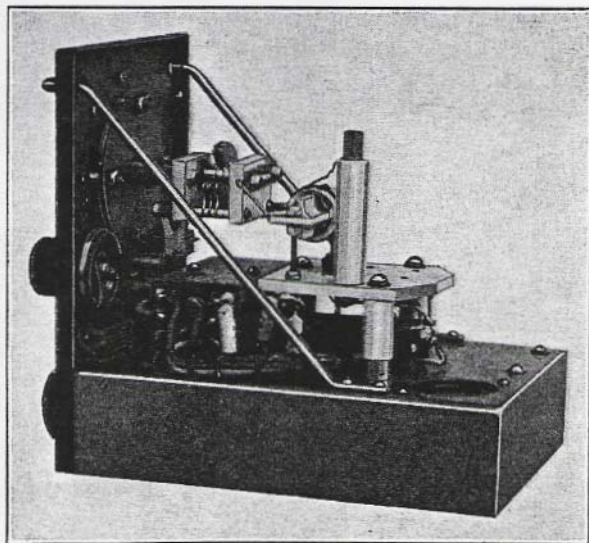


Figure 11—Radio Receiver and Transmitter BC-322, right side of chassis.

ly telescoped with only one section in use as described under paragraph 13—*Portable Operation*.

**6. Mast Sections MS-49, MS-50, and MS-51.**—The mast sections are made of high tensile strength steel. Mast Sections MS-50 and MS-51 are fitted with a split shank and screw at one end and a socket sleeve and thread at the other. Mast Section MS-49 terminates in a blunt point at the upper end. Ends which are joined in assembling have enameled marks of the same color. The body of each section is enameled black and bears the type number near the lower end. The overall length of the assembled Mast Sections MS-49, MS-50, and MS-51 from the top to the bottom of the shoulder of the low end

is 9 feet, 4-11/16 inches. The length of Mast Sections MS-50 and MS-51 similarly measured is 6 feet, 3-7/16 inches.

**7. Box BX-13.**—This article is illustrated in Fig. 13. It consists of a flat rectangular aluminum-alloy box provided with a socket which fits the plug at the bottom of the Radio Receiver and Transmitter BC-222 (or BC-322), several binding posts, and a battery cable. It is designed to provide means of connecting separate standard Signal Corps batteries to the set in the event that the Battery BA-32, which was designed especially for use with this set, is not available and to facilitate the insertion of meters in the several circuits. The batteries are connected by means of the cable, all leads of which are identi-

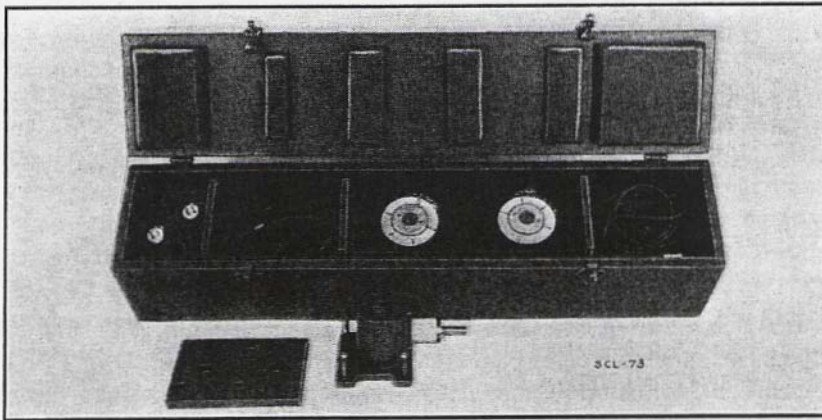


Figure 12—Chest CH-33, showing interior.

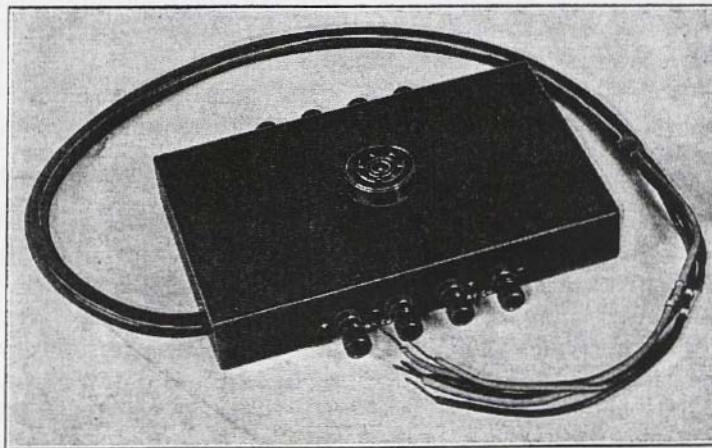


Figure 13—Box BX-13.

fied by stamped metal markers. The binding posts, four on either side, serve to provide ready connection of meters to indicate Microphone Current, Relay Current, Plate Current, and Plate Voltage.

*Important:* If it is desired to use this box without simultaneously connecting meters in circuit, each of the three pairs of binding posts marked MICRO. CUR., RELAY CUR., and PLATE CUR., must be connected with a jumper wire; otherwise there will be three open circuits.

**8. Adapter SO-52.**—This article consists of a small aluminum-alloy case provided with a plug similar to Plug PL-65 on one side and two sockets similar to Sockets SO-45 on the other. The case and the sockets are finished in black enamel. All wiring is within the case. The unit serves to enable the two Handsets TS-11

provided with the Radio Set SCR-195 to be connected simultaneously. The plug of the adapter fits into the socket on the BC-222 or BC-322 and the two sockets of the adapter accommodate the plugs on the end of the handset cords. This is illustrated in Fig. 14.

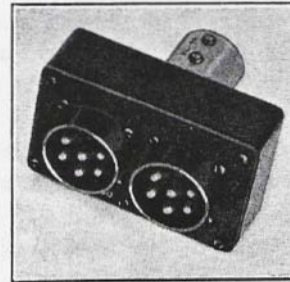


Figure 14—Adapter SO-52.

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## SECTION II

### OPERATION

**9. Location and Selection of Frequency.**—The most suitable location within any given area for operation of this set will be determined by military requirements and kind of terrain in the area between transmitting and receiving points. In general, elevated positions with line of sight between points are advantageous. This is especially true with operating frequencies of 30 megacycles and higher, as at these levels the field strength of the signal is affected considerably by ground elevations, ridges, and structures and by the distance between transmitting and receiving points. With ranges of 3 to 5 miles (or greater) the frequency or channel chosen should be as low as permissible. This is particularly true if irregular terrain, ridges, or hills lie between points. If a signal seems abnormally weak in any one location, relocation to another spot a few steps removed may be sufficient to eliminate the difficulty. (At frequencies in the order of those in use with these sets, various phenomena which are negligible with low frequencies assume considerable importance. Propagation of signals

appears to assume the characteristics of light, travelling in straight lines from point to point and incurring reflections from conducting objects such as smokestacks, water towers, buildings, and ground elevations, hills, or ridges.) If satisfactory communication cannot be established at one location, removal to another location a short distance away may suffice to reduce or eliminate the difficulty. If change of location is not sufficient, a change of channel may be required in order to establish satisfactory communication.

**10. Transmitting and Receiving.**—

*a. Setting Up the Equipment.*—Place the BC-222 or BC-322 on the top of the battery so that the marking FRONT is at the front of the set. This insures the battery plug being properly inserted in the battery socket. Secure the battery to the case by fastening the two straps which pass underneath and around the battery. Insert Tubes VT-33 and VT-67 in their respective sockets and place the desired coil on the terminal posts provided. The frequency band in the BC-

222 is covered by two interchangeable plug-in coils, while that in the BC-322 is covered by a single integral coil. The two plug-in coils are designated as Coil C-174 and Coil C-175 and are furnished as a part of the Radio Receiver and Transmitter BC-222. Coil C-174 covers the frequencies from 27.7 to 38.5 mc and Coil C-175 covers the frequencies from 36.9 to 52.2 mc. The coil in the BC-322 covers frequencies from 52.8 to 65.8 mc. Connect the antenna lead of the coil to the antenna terminal post in the BC-222. This lead is already attached in the BC-322. Close the cover and secure it with snapslides. Antenna AN-29 is for use with the BC-222 and Antenna AN-30 is for use with the BC-322. Extend Antenna AN-29 to its full length when using Coil C-174 and reduce it by two sections when using Coil C-175. Screw the antenna into the insulated mounting provided. Connect the headset and microphone or the handset by means of the socket on the panel beneath the filament control.

*b. Operation.*—Switch on the filaments by turning the toggle switch over the socket to ●N. Turn up the filament rheostat until the meter reads 2 volts. A hissing or rush noise should be heard in the earphone immediately, indicating that the set is operating as a receiver. Turn the switch on the microphone or handset. This should operate the relay and transform the set into a transmitter. Speak or whistle into the transmitter of the microphone or the handset and see that this can be heard in the receiver. Refer to Tables I, II, III, and IV, paragraphs 19 to 22, to determine the setting of the tuning control marked CHANNEL. The calibration adjustment should be checked at frequent intervals to ensure on-frequency operation.

**11. Adjustment of Calibration.**—The tuning dial is calibrated so that its readings of frequency channels may be easily and readily checked. Slight variations in the inductance or capacity of the set occasioned by (1) change of relative position of the elements or of the wiring circuit itself, or, (2) differences introduced by changed tubes or variation in antenna capacity caused by changes in location, will cause the calibration to be inaccurate. The small adjusting

or trimmer capacitor is used to compensate for these differences. This trimmer is adjusted and set by the small knurled thumbscrews marked ADJUST.

To check this adjustment, turn the switch over the meter marked CALIBRATOR to ●N. Turn the tuning control back and forth through one of the red lines on the dial. As the control is turned through the line, there should be a marked decrease in the rushing sound produced in the receiver of the handset or headset. If this null point coincides exactly with the line the adjustment or calibration is correct. If it does not coincide exactly, readjust the calibrator until it does. In making the adjustment use the red line nearest the right hand or upper range of the dial.

**12. Operating Technique.**—These sets incorporate a superregenerative detector which radiates a considerable amount of energy both on the frequency to which it is tuned and in side bands differing from this frequency by the frequency of the superregenerative quenching. For this reason it is not easy to operate more than two sets on the same frequency unless they are separated by a distance almost as great as the operating range. The operating frequency or channel will, in general, be assigned. By referring to Tables I, II, III, and IV, paragraphs 19 to 22, each set may be tuned to this frequency. If the sets are calibrated accurately there should be very little, if any, readjustment of the tuning control required in order to receive signals clearly. When operating well within the distance range, tuning is effected by noting the decrease in the rushing sound as a signal is received. Signals will be received with greatest clarity when the receiving set is tuned so as to decrease the rushing noise to a minimum. After making final adjustments, check the operating frequency. If it is found that the sets are tuned to a frequency which differs from that assigned by an appreciable amount retuning should be effected in order to reduce the probability of interfering with communication on other channels.

The design of this equipment does not permit "break-in" operation; i.e., starting transmission while the other station is also transmitting, but if the other station is standing by, it is possible

to "tune in" upon it by listening for the receiver squeal and then transmitting. To attract the attention of the operator, the switch on the handset or microphone is opened and closed a few times, thus producing interruptions in the squeal.

At longer ranges where the signal strength is not high enough to cause a decrease in the rushing sound, more accurate tuning is necessary. In this case the time at which communication is to begin should be agreed upon beforehand, if possible, thus eliminating doubt of the other set being in operation. It is well also to prearrange which station is to transmit and which is to receive when first attempting to establish contact.

If voice communication cannot be carried on intelligibly, messages in code may be whistled into the transmitter or microphone.

**13. Portable Operation.**—If desired, communication may be established between individual personnel by assembling the items listed under 2a or 3a "For Portable Use Only" and then carrying the equipment on the back as a knapsack. See Fig. 15. The Antenna AN-29 (or AN-30) may be operated completely extended if conditions permit but as this is not usually the case, only one section is generally employed. Two sections may sometimes be used to advantage and three sections occasionally. The calibration is adjusted for use only with the normal antenna and for use with a single section.

To secure operation on an assigned or predetermined channel with two or more sets, begin by first tuning one set accurately to the desired channel with the antenna extended to its normal length as defined in paragraph 10a. Then extend the antenna of the other set or sets



Figure 15—Bag BG-71.

to the required length and tune each one to the first set.

Another, but somewhat less accurate method, is to adjust the calibration at the calibrator point nearest the assigned channel and then set the tuning control to the channel as indicated by the dial markings.

With either method, if these adjustments are made with the equipment on the ground, a slight readjustment is usually necessary when the equipment is placed on the back of the operator.

It will be found that the range is not reduced so much by one set operating on the back if the other set is operated on the ground with the normal antenna.

If one operator is to remain at any one point with the set on the ground this operator should make whatever adjustments may be necessary, without changing the channel, in order to maintain communication.

**14. Vehicular Operation.**—This set may be operated in a vehicle. In this instance steel antenna mast sections are used in conjunction with Mast Base MP-22. This base should first

be secured within two or three feet of the position to be occupied by the set while keeping the antenna and the lead-in wire as far from metallic body panels and other large metallic objects as possible. Three mast sections, MS-49, MS-50, and MS-51, are used with the BC-222 and two mast sections, MS-50 and MS-51, with the BC-322. Screw all mast sections together and into the mast base making sure that all joints are tight. Screw the Binding Post TM-176 into the insulated mounting provided. The wire used to connect the antenna with the set should be straight and should be secured to the binding post on the antenna and to the Binding Post TM-176 on the set. The set-up must be checked to determine that the wire is of the right length. With the set in operation turn the tuning control throughout the entire range. If the receiver tends to howl at low frequencies or channels, the lead is probably too short, and if the howl occurs at the high-frequency or upper-channel end of the band, the lead is probably too long. The set should be fastened securely in a manner serving to protect it against shocks and vibration after its correct location has been determined.

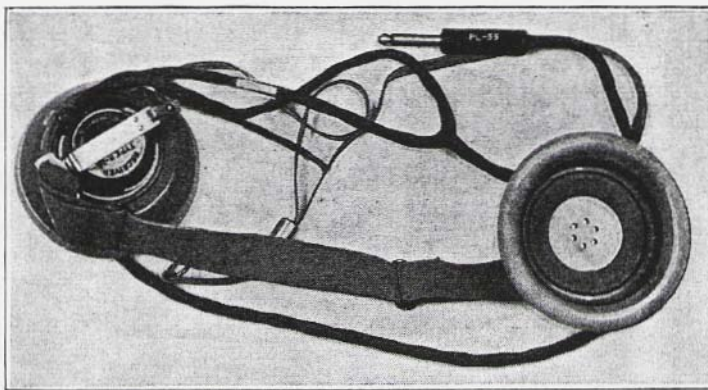


Figure 16—Headset HS-22-A.

### SECTION III

#### FUNCTION OF PARTS

#### 15. Radio Receiver and Transmitter BC-222.—

*a. Transmitting.*—Refer to Figures 19 and 21. When transmitting, the relay actuates the con-

tacts which enable the set to function as a transmitter. The Tube VT-67 serves as the oscillator and the Tube VT-33 as the modulator. The oscillator circuit is of the Hartley type,



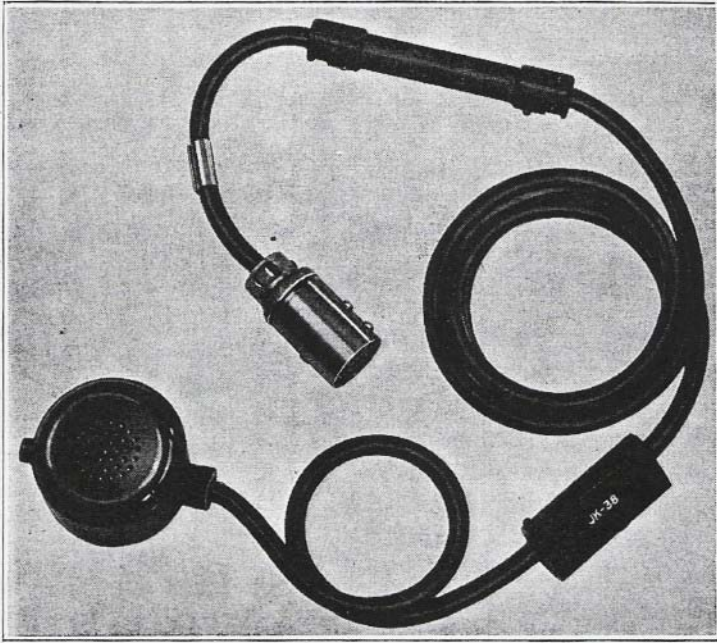


Figure 17—Microphone T-24-A.



Figure 18—Handset TS-11-A.

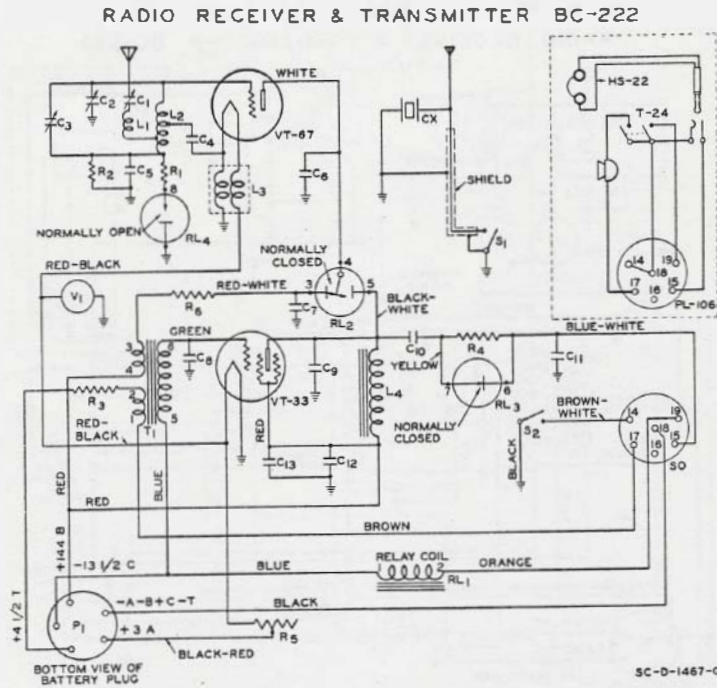


Figure 19--Radio Receiver and Transmitter BC-222--Schematic Diagram

CIRCUIT ELEMENTS

- $C_1$  Capacitor CA-272—10  $\mu \mu f$
- $C_2$  Capacitor—Trimmer
- $C_3$  Capacitor CA-265—6-32  $\mu \mu f$
- $C_4$  Capacitor CA-266—100  $\mu \mu f$
- $C_5$  Capacitor CA-270—.001  $\mu f$
- $C_6$  Capacitor CA-271—.003  $\mu f$
- $C_7$  Capacitor CA-211—.002  $\mu f$
- $C_8$  Capacitor CA-269—250  $\mu \mu f$
- $C_9$  Capacitor CA-270—.001  $\mu f$
- $C_{10}$  Capacitor CA-271—.003  $\mu f$
- $C_{11}$  Capacitor CA-183—.01  $\mu f$
- $C_{12}$  Capacitor CA-177-A—.5  $\mu f$
- $C_{13}$  Capacitor CA-177-A—.5  $\mu f$
- $CX$  Crystal MC-4—3500 kc
- $L_1$  } Coil—C-174 or C-175 (Tuning)
- $L_2$  }

- $L_3$  Coil—Filament Choke
- $L_4$  Coil C-165
- $P_1$  Plug, Battery
- $R_1$  Resistor RS-128—5,000 ohms
- $R_2$  Resistor RS-140—30,000 ohms
- $R_3$  Resistor RS-158—40 ohms
- $R_4$  Resistor RS-148—200,000 ohms
- $R_5$  Rheostat RS-154—10 ohms
- $R_6$  Resistor RS-130—20,000 ohms
- $RL_1$ — $RL_2$ — $RL_3$ — $RL_4$  Relay BK-10
- $S_1$  Switch SW-105
- $S_2$  Switch SW-105
- $SO$  Socket SO-45
- $T_1$  Transformer C-159
- $V_1$  Voltmeter IS-121

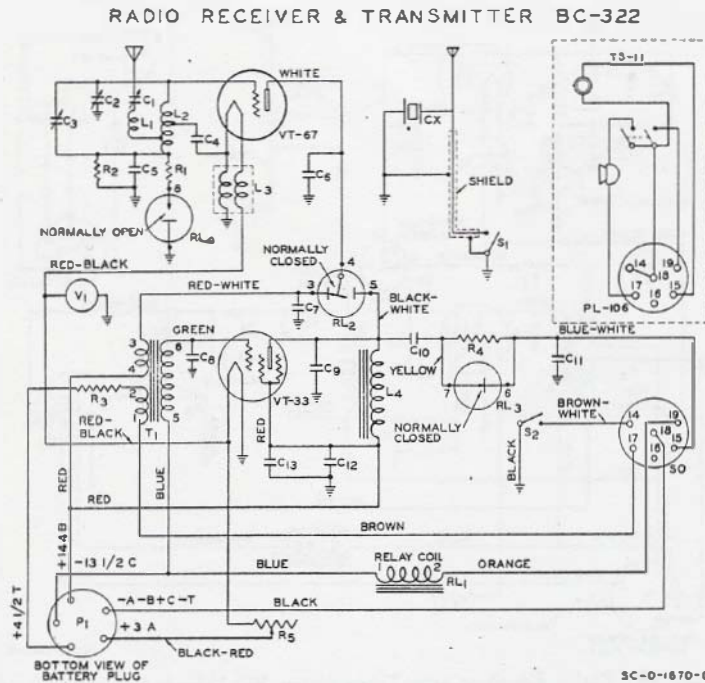
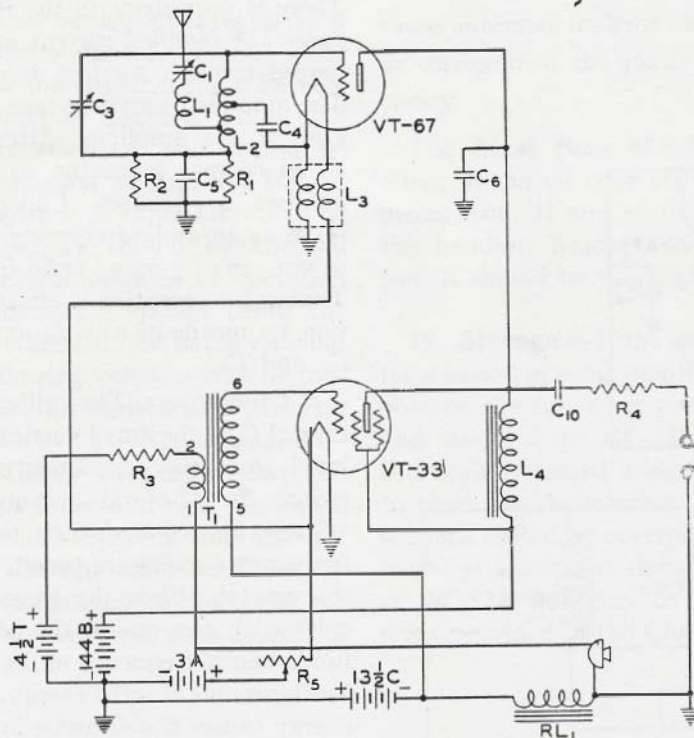


Figure 20—Radio Receiver and Transmitter BC-322—Schematic Diagram.

CIRCUIT ELEMENTS

- |          |                               |                       |                              |
|----------|-------------------------------|-----------------------|------------------------------|
| $C_1$    | Capacitor CA-272—10 $\mu$ f   | $L_3$                 | Coil—Filament Choke          |
| $C_2$    | Capacitor—Trimmer             | $L_4$                 | Coil C-165                   |
| $C_3$    | Capacitor CA-288—5-21 $\mu$ f | $P_1$                 | Plug, Battery                |
| $C_4$    | Capacitor CA-287—50 $\mu$ f   | $R_1$                 | Resistor RS-128—5,000 ohms   |
| $C_5$    | Capacitor CA-213—.001 $\mu$ f | $R_2$                 | Resistor RS-140—30,000 ohms  |
| $C_6$    | Capacitor CA-271—.003 $\mu$ f | $R_3$                 | Resistor RS-158—40 ohms      |
| $C_7$    | Capacitor CA-211—.002 $\mu$ f | $R_4$                 | Resistor RS-148—200,000 ohms |
| $C_8$    | Capacitor CA-269—250 $\mu$ f  | $R_5$                 | Rheostat RS-154—10 ohms      |
| $C_9$    | Capacitor CA-270—.001 $\mu$ f | $RL_1-RL_2-RL_3-RL_4$ | Relay BK-10                  |
| $C_{10}$ | Capacitor CA-270—.001 $\mu$ f | $S_1$                 | Switch SW-105                |
| $C_{11}$ | Capacitor CA-183—.01 $\mu$ f  | $S_2$                 | Switch SW-105                |
| $C_{12}$ | Capacitor CA-177-A—.5 $\mu$ f | $SO$                  | Socket SO-45                 |
| $C_{13}$ | Capacitor CA-177-A—.5 $\mu$ f | $T_1$                 | Transformer C-159            |
| $CX$     | Crystal DC-5—5000 kc          | $V_1$                 | Voltmeter IS-121             |
| $L_1$    | Coil—Tuning                   |                       |                              |
| $L_2$    |                               |                       |                              |



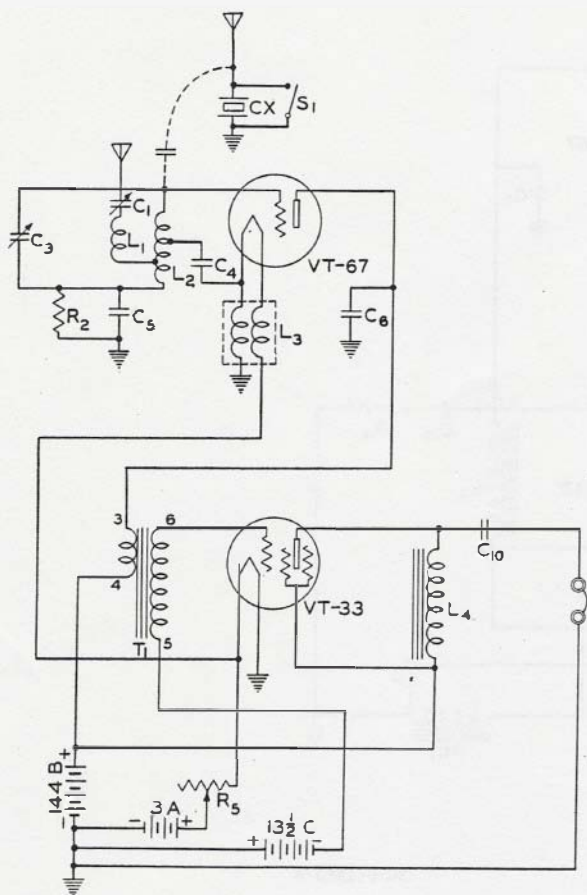
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Figure 21—Functional Diagram—Transmission

modified so that the plate is maintained at radio-frequency ground potential. The tuning inductance is  $L_2$ .  $C_2$  is the tuning capacitor and  $C_3$  serves as the trimmer or calibration adjuster.  $R_1$  and  $R_2$  are the transmitting grid leaks.  $C_5$  is the grid-blocking condenser and  $C_6$  serves to bypass radio-frequency currents in the plate circuit.  $C_4$  acts as a coupling condenser connecting the filament to the radio-frequency potential of the center of the coil.  $L_3$  is the radio-frequency choke carrying direct current to the filament and isolating the filament which is at radio-frequency potential, from the ground.  $L_1$  and  $C_1$  provide inductive and capacitive feed to the antenna, a half-wave voltage-fed system. The antenna is not tuned or resonated at each operating frequency but is tuned to a point within the normal range of the coil. The feed circuit provides fairly efficient coupling throughout the range of the coil set.

The Heising (constant current) system of modulation is employed.  $L_4$  is the modulation reactor.  $T_1$  is the input transformer. Voice currents set up in the microphone circuit are passed through winding 1-2 and the stepped-up voltages on winding 5-6 are impressed on the grid of the tube.  $R_3$  serves to reduce the microphone current to the proper value.  $C_8$ ,  $C_9$ ,  $C_{12}$ , and  $C_{13}$  are by-pass capacitors.  $R_4$  acts to reduce the side-tone current and  $C_{10}$  and  $C_{11}$  constitute an audio-frequency filter serving to eliminate those frequencies contributing little to the intelligibility of the signal.

*b. Receiving.*—Refer to Figures 19 and 22. When receiving, the relay contacts are in position to permit the set to function as a receiver. The Tube VT-67 acts as a detector and the Tube VT-33 as the amplifier. The detector operates in



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Figure 22—Functional Diagram—Reception.

a superregenerative circuit,  $R_2$  and  $C_5$  being of the proper value to cause blocking of the grid at approximately 20,000 cycles a second.  $R_6$  in the BC-222 serves to reduce plate voltage on the detector in order to minimize receiver radiation.

There is no resistor in the BC-322 for this purpose. The rectified current in the plate circuit is passed through winding 3-4 of Transformer  $T_1$ . The amplified signal voltage is impressed on the grid of the amplifier. After amplification the signal current passes on to the receiver of the handset or headset. Capacitors  $C_{10}$  and  $C_{11}$  serve as an audio-frequency filter. Capacitor  $C_7$  serves to by-pass radio-frequency currents. Tuning for reception is effected as for transmission by means of coils  $L_1$  and  $L_2$ , capacitors  $C_1$ ,  $C_2$ , and  $C_3$ .

*c. Calibration.*—The calibrator consists of the crystal  $CX$ , the small vertical rod antenna insulated from the remainder of the set and the switch  $S_1$ . The rod antenna applies a small voltage, at the frequency to which the radio-frequency circuits are tuned, to the electrodes of the crystal. When the frequency applied coincides with any one of the odd multiples of the fundamental frequency of the crystal, the crystal oscillates and absorbs energy. This absorption of energy causes the decrease in rush noise. Switch  $S_1$  short-circuits the crystal electrodes and prevents the application of voltage to the crystal. The several harmonic points of the crystal are indicated on the dial in red lines. These points should each agree with the sharp decrease in the rush noise indicated in the earphone.

**16. Radio Receiver and Transmitter BC-322.**—Refer to Figures 20, 21, and 22. The function of this unit is identical with Radio Receiver and Transmitter BC-222. In only one particular is it different, i.e., the 20,000 ohm resistor ( $R_5$  in the BC-222) used to reduce plate voltage on the detector is not included in the BC-322 set, the same voltage being applied to both tubes.

## SECTION IV MAINTENANCE

**17. Service.**—The units of this radio set are designed for field use and with reasonable care in handling and operating will give satisfactory

service. Keep the equipment clean and check all mechanical fittings periodically to see that screws and nuts are tight and in place. Loose and broken

connections are the source of most operating troubles. The set must be inspected regularly if uninterrupted service is desired. If open leads are suspected, check the circuit using a battery and a small voltmeter or headset. Tubes will gradually lose their efficiency and should be tested with a test set such as Test Set I-56 or I-56-A or interchanged with tubes known to be satisfactory. The battery should be checked under load after several minutes of operation and if any part indicates a voltage below the ordinarily accepted standard, the battery should be replaced. The following voltages may be considered the minimum for satisfactory performance: 3.6 T, 2.0 A, 10.8 C, 115 B. Antennas AN-29 and AN-30 are likely to become corroded unless they are kept clean and dry. To clean, disassemble the sections by removing one nut and three screws. Use fine steel wool No. 0. *Do not use oil.* The inside may be cleaned in the same manner using a small swab such as used in

cleaning rifles. It is extremely important that these antennas be kept clean inside and outside as corrosion of the joints will reduce their efficiency.

The Mast Base MP-22 requires occasional oiling in the oil cups provided and on the cam mechanism. If any of the equipment including the handset, headset, or microphone becomes wet, it should be thoroughly dried.

**18. Storage.**—If the set is to be out of service for a period of some months or more, it is well to observe the following precautions. The outside and inside of the BC-222 or BC-322 should be thoroughly cleaned using an air hose if available to blow out the interior. The ends of steel mast sections should be covered with petrolatum. The batteries should be detached from the BC-222 or BC-322, but may be kept in the compartment provided in the Chest CH-33.

SECTION V

SUPPLEMENTARY DATA

**19. Table I—Radio Receiver and Transmitter BC-222—Frequencies and Dial Readings using scale with 500-kc subdivisions.—**

<i>a. With Coil C-174 (marked A).—</i>		<i>b. With Coil C-175 (marked B).—</i>	
<i>Channel Number</i>	<i>Frequency (mc)</i>	<i>Channel Number</i>	<i>Frequency (mc)</i>
1.....	27.70	20.....	37.20
2.....	28.20	21.....	37.70
3.....	28.70	22.....	38.20
4.....	29.20	23.....	38.70
5.....	29.70	24.....	39.20
6.....	30.20	25.....	39.70
7.....	30.70	26.....	40.20
8.....	31.20	27.....	40.70
9.....	31.70	28.....	41.20
10.....	32.20	29.....	41.70
11.....	32.70	30.....	42.20
		31.....	42.70
		32.....	43.20
		33.....	43.70
		34.....	44.20
		35.....	44.70
		36.....	45.20
		37.....	45.70
		38.....	46.20
		39.....	46.70
		40.....	47.20
		41.....	47.70
		42.....	48.20
		43.....	48.70
		44.....	49.20
		45.....	49.70
		46.....	50.20
		47.....	50.70
		48.....	51.20
		49.....	51.70
		50.....	52.20

**20. Table II—Radio Receiver and Transmitter BC-222—Frequencies and Dial Readings using scale with 400-kc subdivisions.—**

*a. With Coil C-174 (marked A).—*

Channel Number	Frequency (mc)	Channel Number	Frequency (mc)
1	27.70	15	33.30
2	28.10	16	33.70
3	28.50	17	34.10
4	28.90	18	34.50
5	29.30	19	34.90
6	29.70	20	35.30
7	30.10	21	35.70
8	30.50	22	36.10
9	30.90	23	36.50
10	31.30	24	36.90
11	31.70	25	37.30
12	32.10	26	37.70
13	32.50	27	38.10
14	32.90	28	38.50

*b. With Coil C-175 (marked B).—*

Channel Number	Frequency (mc)	Channel Number	Frequency (mc)
24	36.90	44	44.90
25	37.30	45	45.30
26	37.70	46	45.70
27	38.10	47	46.10
28	38.50	48	46.50
29	38.90	49	46.90
30	39.30	50	47.30
31	39.70	51	47.70
32	40.10	52	48.10
33	40.50	53	48.50
34	40.90	54	48.90
35	41.30	55	49.30
36	41.70	56	49.70
37	42.10	57	50.10
38	42.50	58	50.50
39	42.90	59	50.90
40	43.30	60	51.30
41	43.70	61	51.70
42	44.10	62	52.10
43	44.50		

**21. Table III—Radio Receiver and Transmitter BC-322—Frequencies and Dial Readings using scale with 500-kc subdivisions.—**

Channel Number	Frequency (mc)	Channel Number	Frequency (mc)
1	52.80	15	59.80
2	53.30	16	60.30
3	53.80	17	60.80
4	54.30	18	61.30
5	54.80	19	61.80
6	55.30	20	62.30
7	55.80	21	62.80
8	56.30	22	63.30
9	56.80	23	63.80
10	57.30	24	64.30
11	57.80	25	64.80
12	58.30	26	65.30
13	58.80	27	65.80
14	59.30		

**22. Table IV—Radio Receiver and Transmitter BC-322—Frequencies and Dial Readings using scale with 400-kc subdivisions.—**

Channel Number	Frequency (mc)	Channel Number	Frequency (mc)
1	52.9	18	59.7
2	53.3	19	60.1
3	53.7	20	60.5
4	54.1	21	60.9
5	54.5	22	61.3
6	54.9	23	61.7
7	55.3	24	62.1
8	55.7	25	62.5
9	56.1	26	62.9
10	56.5	27	63.3
11	56.9	28	63.7
12	57.3	29	64.1
13	57.7	30	64.5
14	58.1	31	64.9
15	58.5	32	65.3
16	58.9	33	65.7
17	59.3		

**23. Table V—List of Items—Radio Sets SCR-194 and SCR-195.—**

SCR-194	SCR-195	
-	1	Adapter SO-52
2	-	Antenna AN-29, 1 in use, 1 spare
-	2	Antenna AN-30, 1 in use, 1 spare
1	1	Bag BG-71
3	3	Battery BA-32, 1 in use, 2 spare
2	2	Binding Post TM-176, 1 in use, 1 spare
2	2	Book, Instruction, For Radio Sets SCR-194 and SCR-195
1	1	Box BX-13
1	1	Chest CH-33
1	1	Cord CD-195
-	2	Handset TS-11
1	-	Headset HS-22
1	1	Mast Base MP-22
2	-	Mast Section MS-49, 1 in use, 1 spare
2	2	Mast Section MS-50, 1 in use, 1 spare
2	2	Mast Section MS-51, 1 in use, 1 spare
1	-	Microphone T-24
1	-	Radio Receiver and Transmitter BC-222
-	1	Radio Receiver and Transmitter BC-322
3	3	Tube VT-33, 1 in use, 2 spare
3	3	Tube VT-67, 1 in use, 2 spare
25 ft	25 ft.	Wire W-126 or W-9