RESTRICTED

TM 11–233

WAR DEPARTMENT

TECHNICAL MANUAL

RADIO SET SCR–188–A

March 31, 1942

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WAR DEPARTMENT,
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RADIO SET SCR–188–A

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1. Use.—Radio set SCR–188–A is a large but transportable unit of equipment intended primarily for semifixed use inside buildings where commercial a-c power and suitable operating tables are available. Under emergency conditions, the entire equipment can be operated by means of a separate gasoline engine driven generator. Battery power cannot be used under any circumstances. The transmitting units are provided with rugged operating chests and can be erected out-of-doors, but the receiving units must be installed under adequate shelter.

Caution: *This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. When working on the equipment, always ground every part before touching it.*

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2. Frequency coverage.—The frequency coverage for transmission is 1,500 to 12,500 kilocycles; for reception 1,500 to 18,000 kilocycles. This radio set can be netted with others of corresponding frequency coverage, in accordance with figure 1, providing the various sets of the net are within satisfactory distance range of each other.

3. Channels.—*a.* The difference in frequency required between stations operating in different nets in the same vicinity depends upon several variable factors, such as—

(1) The distance between the transmitting and receiving stations.

(2) The selectivity of the receiver with which the transmitter is likely to interfere.

(3) The frequency and the mode of transmission.

(4) The skill of the operators.

b. In general, a separation equivalent to 1 percent of the highest frequency transmitted and never less than 20 kilocycles is practical, provided that sets adjacent in frequency are not closer than a few miles.

4. Distance ranges.—The maximum distance over which radio communication with any sets can be established depends upon many variable factors such as the frequency and the mode of operation used, the skill of the operators, the nature and strength of local electrical interference, and the configuration of the ground. Approximate estimates of the range in miles of the radio set SCR–188–A are: cw, 100; tone, 70; voice, 30.

5. Modes of operation.—Radio set SCR–188–A uses conventional amplitude type modulation, and transmits and receives the following:

a. Continuous-wave telegraph signals, known as "cw."

b. Tone-modulated, continuous-wave telegraph signals, known as "tone" or "icw."

c. Voice-modulated, continuous-wave telephone signals, known as "voice."

6. Major components.—*a.* Radio set SCR–188–A consists of the following major components (for detailed list, including dimensions and weights, see sec. V):

(1) Radio transmitter BC–191–C in chest CH–27–A.

(2) Six transmitter tuning units, TU–5–A up to and including TU–10–A in two chests CH–32–A.

(3) Rectifier RA–34–( )* in chest CH–57–( ).

(4) Radio receiver BC–342–C in chest CH–56.

*The parentheses ( ) following a type number indicate that several procurements have been made of identical or virtually identical units, and that any general instructions given herein apply equally to all units of a series, unless otherwise indicated.

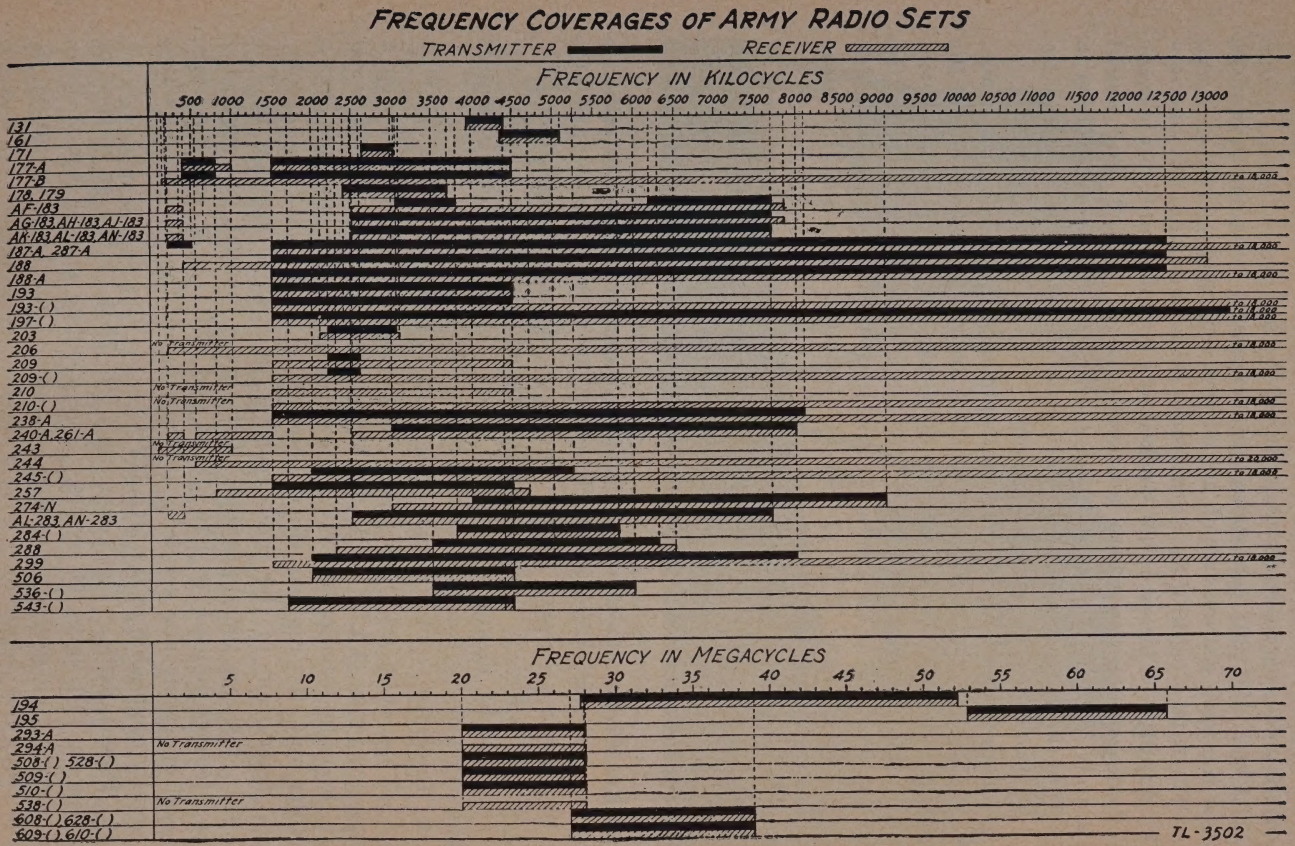


FIGURE 1.—Chart of overlapping frequency ranges of Army radio sets.

(5) Power unit PE–75–( ) together with its shipping crate.

(6) Remote control equipment RC–47–( ).

(7) Chest CH–30, containing all necessary antenna equipment except the mast sections which are carried separately.

b. The total weight of the entire radio set is approximately one ton.

7. Supply.—This set is not stocked as a complete unit but is made up from components which are requisitioned, stored, and issued separately. While the Signal Corps General Catalog is controlling in regard to these components, they are listed separately in section V for the information of using organizations.

8. Transmitter.—*a.* Radio transmitter BC–191–C and transmitter tuning units TU–5–A to TU–10–A are the principal items of the transmitting equipment of radio set SCR–188–A. A complete description of this transmitter is contained in TM 11–800. Pending the appearance of the latter manual, it is suggested that reference be made to TM 11–232 and TM 11–273 for technical data on the radio transmitter BC–191–( ).

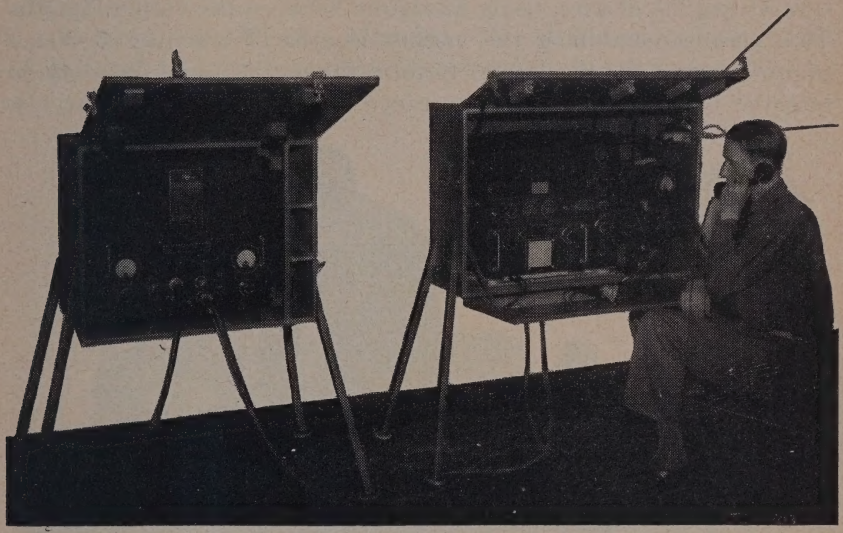
b. The radio transmitter BC–191–C is equipped with two sets of four sockets each for power and control cords. Only the set in the bottom of the cabinet is used when this transmitter is part of radio set SCR–188–A; the unused sockets on the side are covered by snap-on caps.

9. Rectifier.—Rectifier RA–34–( ), when connected to either a 110- or 220-volt, single-phase, 60-cycle, a-c power source, provides all the power necessary for the operation of radio transmitter BC–191–C. It is placed to the left of the transmitter and is quickly connected to it by means of prepared cords. Figure 2 shows a typical installation of the transmitter and the rectifier unit.

10. Receiver.—The radio receiver BC–342–C, which is used as part of the radio set SCR–188–A, is a superheterodyne covering a frequency range of 1,500 to 18,000 kilocycles. It is virtually identical with the radio receiver BC–312–C except that it is a-c operated from a rectifier unit that replaces the dynamotor of the BC–312–C. A complete description of the radio receiver BC–342–C appears in TM 11–850. Pending the appearance of the latter manual, it is suggested that reference be made to TM 11–232 and TM 11–273, which contain general operating and servicing information of the BC–312–C which is equally applicable to the BC–342–C.

11. Power unit.—The power unit PE–75–( ) has an output of 2½ kva at 110 volts, 60 cycles. The gasoline engine is a 2-cycle, 2-cyclinder, horizontally-opposed, air-cooled machine operating at 3,600 rpm, and is provided with a mechanical governor. A wooden

crate is furnished for transport and is designed to serve also as a baffle during operation to reduce engine noise. Figure 3 shows the unit set up in this manner. Complete instructions for this unit will be contained in TM 11-900.



① Rectifier RA-34-B. ② Radio transmitter BC-191-C.

FIGURE 2.—Transmitting elements of radio set SCR-188-A set up for operation. (Operator is using telephone connecting transmitter position to receiver position.)

12. Remote control.—Remote control equipment RC-47-( ) permits remote control of the transmitter from the receiver position over 5 miles of W-110-B field wire or over approximately 7½ miles of commercial open wire lines or cable. The equipment consists of two major items, control units RM-12-( ) which is mounted in the transmitter chest and RM-13-( ) which is used next to the receiver. The circuit arrangement includes facilities for a direct telephone connection between the receiving operator and the attendant at the transmitter. The control unit RM-13-( ) has plug and jack connections for three radio receivers, three microphones, and three keys, permitting reception to be accomplished simultaneously on three different frequencies. However, since only one transmitter is available, only one operator at a time can transmit. A selector switch on the control unit RM-13-( ) connects any of the three positions to the transmitter. The two extra receivers and one extra microphone T-32, if desired for a complete installation, must be requisitioned separately. Figure 4 shows a typical receiving position, including control unit, radio receiver, key, microphone, and operator.

13. Antennas.—*a. Transmitting.*—The antenna system provided with this set is of the inverted L type. It consists of one antenna assembly and one counterpoise assembly supported between two masts 85 feet apart. The antenna and the counterpoise are made by joining several lengths of wire, using insulators between the various lengths. This permits combining the various lengths of wire (by means of jumpers across the insulators) to form the antenna and counterpoise required to cover the frequency range of 1,500 to 12,500 kilocycles.

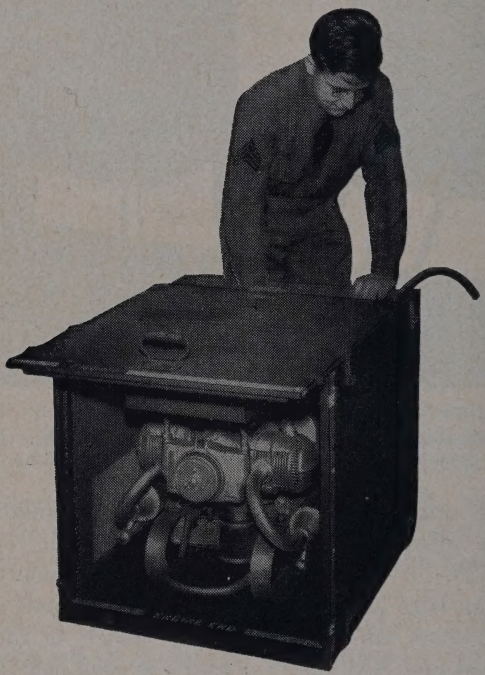


FIGURE 3.—Power unit PE-75-( ) set up for operation in its case. (Heavy cable emerging from rear is cord CD-415 which carries generator output to rectifier.)

Each of the two 30-foot masts which support this antenna is formed by fitting together six duralumin mast sections MS-44 each 5½ feet long. The masts are firmly guyed, and the wires of the antenna are fastened to pulleys at each end so that they can be raised and lowered conveniently.

(1) *Mast sections.*—The mast section MS-44 is a hollow duralumin tube 5 feet in length, with an inner sleeve of the same material which protrudes from one end making the total length 5½ feet. The diameter of the inner sleeve is such that it can be inserted readily into the center hole of the guy plates and into the opposite end of other mast sections

of the same type. The fitting on the mast base also fits into the opposite end of the bottom mast section. In addition to the 12 sections required for the masts two spare sections are provided. The sections are carried in two bundles of 7 each, held together by straps ST-18.

(2) *Mast base MP-19.*—Mast base MP-19 is a steel plate to which is fastened an aluminum-alloy hinged stub suitable for insertion into



FIGURE 4.—Control unit RM-13-( ) and radio receiver BC-342-C set up to form receiving position of radio set SCR-188-A.

the base end of MS-44. The steel plate has a hole at each end suitable for stakes GP-2.

(3) *Guy GY-21-A.*—Guy GY-21-A is a wire 12 inches long, to one end of which is attached a steel guy plate and to the other end, a harness strap.

(4) *Guy GY-22-A.*—Guy GY-22-A is an assembly of two guys fastened to a ring and a harness snap swivel. Each of the component guys consists of 65 feet of rope RP-3 on which slide two blocks FT-127. One block is fastened to the ring and harness snap swivel common to both component guys, and the other block is fastened to a ring

suitable for stake GP–2. One end of the rope terminates in a harness snap, and the other end is fastened by a fastener FT–9.

(5) *Guy GY–23–A.*—Guy GY–23–A is an assembly of two guys fastened to a harness snap. Each of the component guys consists of 11 feet of rope RP–3, the free end of which is terminated in a ring suitable for stake GP–2. One of the component guys has a woven-in marker 10 feet distant from the end for use in laying out the guying stakes.

(6) *Guy GY–24–A.*—Guy GY–24–A is composed of 50 feet of rope RP–3 on which slides a block FT–127. To the block is attached a ring and a harness snap. One end of the rope is terminated in a harness snap and the other end is free.

(7) *Guy GY–30.*—Guy GY–30 is a length of rope on which slides a block. To the block is attached a harness snap. One end of the rope is terminated in a ring and the other end in a fastener FT–9.

(8) *Stake GP–2.*—Stake GP–2 is ¾ inch in diameter and 16 inches long, with a head 1⅛ inches in diameter. It is made of galvanized iron.

(9) *Antenna AN–22–A.*—Antenna AN–22–A is 20 feet of wire W–29 on each end of which is connected a snap hook and leads 12 inches long. The end of the antenna intended to be nearest the transmitter is equipped with a fahnestock clip or equal. Latest procurements have screw type spade terminals on both ends.

(10) *Antenna AN–23–A.*—Antenna AN–23–A is similar to AN–22–A, except that it is 35 feet long.

(11) *Antenna AN–25.*—Antenna AN–25 is similar to AN–22–A, except that it is 5 feet long.

(12) *Antenna AN–26.*—Antenna AN–26 is similar to antenna AN–22–A, except that it is 25 feet long.

(13) *Antenna AN–27.*—Antenna AN–27 is similar to antenna AN–22–A except that it is 10 feet long.

(14) *Reel RL–3.*—Reel RL–3 is a rigid wire frame, essentially flat. To this frame is attached, at the approximate center of rotation, a handle so constructed that it can be gripped firmly and the reel can rotate in the handle. On the opposite side of the frame is a somewhat different handle which is used as a crank to cause the reel to rotate. The device is used to roll up guys, rope, and antenna sections in a manner suitable for storage in the chest CH–30, and at the same time to be ready for immediate paying out at an antenna site.

(15) *Insulator IN–86.*—Insulator IN–86 consists of an Isolantite body 2 inches long and ¾ inch in diameter, into which are screwed eyebolts. The Isolantite body can be replaced if broken and the eyebolts used again.

b. Receiving.—No prepared antenna is provided in this radio set for attachment to the receiver antenna post. It is intended that about 50 feet of insulated wire W–29, furnished with the set, be attached to the antenna binding posts and the far end hung over a tree or other convenient support.

14. Chests.—*a. CH–27–A.*—This is the transmitter chest. It is equipped with four removable legs and three hinged doors. The top front door opens upward and forms a rain shield, while the lower front door opens downward and forms an operating table. Be careful not to force these doors beyond their stops. The third door is a small one in the upper right hand side of the chest. It opens downward to admit the aerial and counterpoise wires. The transmitter and the control unit RM–12–( ) are mounted permanently in position as shown in figure 2. The small jack panel under the remote control unit is intended for use as part of radio set SCR–177–B and is not used as part of radio set SCR–188–A. The space next to it accommodates a key J–47 with cord CD–133–A and a microphone T–17. One of the six transmitter tuning units is always left in the transmitter.

b. CH–32–A.—Two of these chests are provided for the storage of the transmitter tuning units. One chest is fitted with three cases CS–48 each of which takes one tuning unit. The second chest is fitted with only two cases to take two more tuning units. The sixth tuning unit is kept in the transmitter itself. The extra space in the second chest is used for storage of miscellaneous items, such as the outlet box and the twistlock receptacle, the spare key J–47, and the microphone T–17. Placed near the rectifier and the transmitter, these chests make convenient stools for the operating personnel.

c. CH–57–( ).—The rectifier RA–34–( ) is mounted permanently in this chest. The one large front door opens upward to form a rain shield. Compartments on the right side hold the connecting cords CD–151, CD–152, and CD–370 when they are not in use. Four removable legs raise the chest to approximately the same height as that of the transmitter chest.

d. CH–56.—This chest holds the radio receiver BC–342–C, for transportation purposes only. The receiver is removed when the radio station is set up. The chest also has storage space for two headsets P–18, cord CD–370, and 10 spare tubes: 2 VT–65; 1 VT–66; 4 VT–86; 1 VT–87; 1 VT–88; and 1 VT–97.

e. CH–30.—This chest contains all the parts of the antenna system with the exception of the mast sections. It also contains the legs of chests CH–27–A and CH–57–( ). The following detailed list will be

useful for checking purposes when packing the parts after the antenna is taken down:

5 antenna AN–22–A.
1 antenna AN–23–A.
1 antenna AN–25.
2 antenna AN–26.
1 antenna AN–27.
2 block FT–127, spare.
6 fastener FT–9; 3 in use, 3 spare.
6 fitting FT–128; spare.
4 guy GY–21–A.
4 guy GY–22–A.
2 guy GY–23–A.
2-guy GY–24–A.
2 guy GY–30.
2 hammer HM–1.
20 insulator IN–86; 15 in use, 5 spare.
4 mast base MP–19; 2 in use, 2 spare.
4 reel RL–3.
50 feet rope RP–3; spare.
20 snap FT–126.
16 stake GP–2; 14 in use, 2 spare.
3 stake GP–8.
150 feet wire W–29.
15 feet wire W–128.
8 leg LG–10.

f. CH–54–( ).—This chest is for the remote control unit RM–13–( ). It also has space for three cords CD–366 and one cord CD–370. The control unit fits rather snugly, and care must be exercised in its removal and replacement. A web strap encircling the unit greatly facilitates these operations. Figure 5 shows the most convenient method of easing the control unit in or out of the chest.

g. CH–55–A.—This chest contains the various remote control accessories. The inside of the cover holds two microphones T–32, in padded clamps. (See fig. 6.) The chest proper has partitions for 6 headsets P–18, 3 keys J–47, 3 cords CD–133–A, 8 spare batteries BA–30, 1 spare tube VT–65, and 1 spare tube VT–126. Since a total of eight headsets is provided with radio set SCR–188–A but only a maximum of three can be used at any time, one or two pairs may be left out of this chest and the space used instead for the socket adapter.



FIGURE 5.—Method of removing remote control unit RM–13–( ) from or lowering into chest CH–54–( ).

h. Power unit.—The power unit PE–75–( ) is mounted in a collapsible crate, the sections of which are held together by locking clamps. The whole crate can be pulled apart or assembled in a few minutes without the use of tools.

i. Box BX–8.—This is a small box containing spare tubes for the transmitter (4 VT–4–C and 1 VT–25).

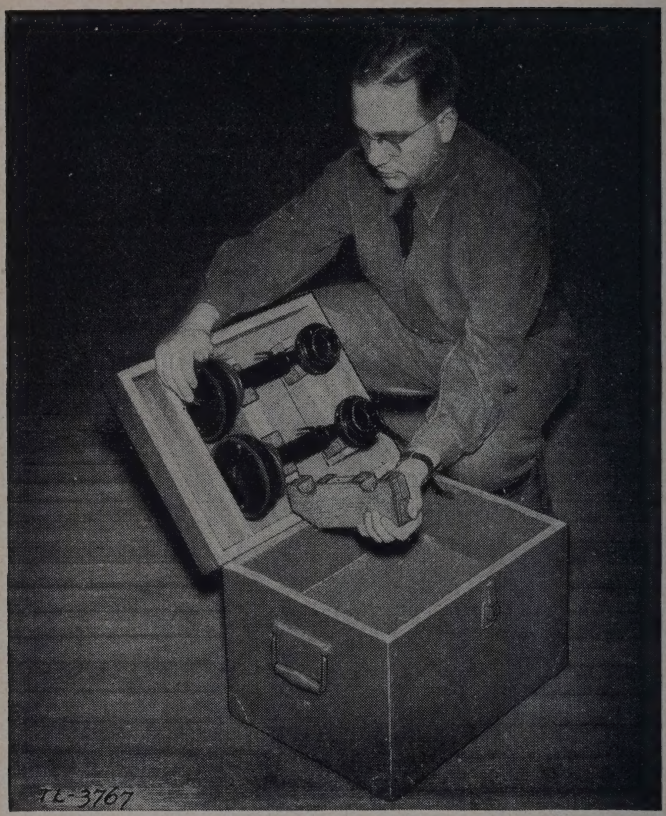


FIGURE 6.—Chest CH-55-A opened to show how microphones T-32 rest in cover.

SECTION II

EMPLOYMENT

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15. Preliminary caution.—Be particularly careful when unpacking or handling this equipment. When not protected by cabinets or shock mountings it may readily be damaged. Inspect the parts for damage when removing them from the shipping boxes. If necessary, clean with brush or blower before installation. A check of the items on hand against the items listed in section V will show whether or not the shipment is complete. A frequent inventory of the large number of items comprising this radio set will insure that the set is always ready for service. This is particularly necessary when operating in the field under adverse conditions, as at night.

16. Sequence of operations.—Because of the size of radio set SCR–188–A, several details of properly trained men are needed for its erection. If sufficient personnel is available four separate crews can work simultaneously; one putting up the antenna; the second assembling and connecting the transmitter, rectifier, and power unit; the third laying the wire lines for the remote-control circuits; and the fourth setting up the receiver position. All personnel should be able to work equally well in any of the crews.

17. Interconnection of units.—Figure 7 shows the complete cording of radio set SCR–188–A. It also includes a sketch of the antenna system and a chart of various combinations of aerial and counterpoise lengths for different frequency bands.

18. Location of components.—*a.* Since the transmitter is normally operated by remote control over distances up to 7½ miles, the locations of the transmitter and the receiver can be chosen to much greater technical and tactical advantage than would be possible if it were necessary to keep the entire radio set at the headquarters of the using organization. Under some circumstances it might be entirely feasible to leave the transmitter in one location while the receiver position moves to several different locations within the control range. Conversely, it might help to confuse enemy radio intelligence personnel if the transmitter alone is shifted.

b. Any radio antenna works best when it is free and clear in the open. However, the complete transmitter installation must be protected from enemy air observation. This requirement often necessitates a compromise in the selection of locations. An ideal spot is a clearing off the edge of woods; the antenna can be erected in the open and the transmitter components concealed under the trees or in an

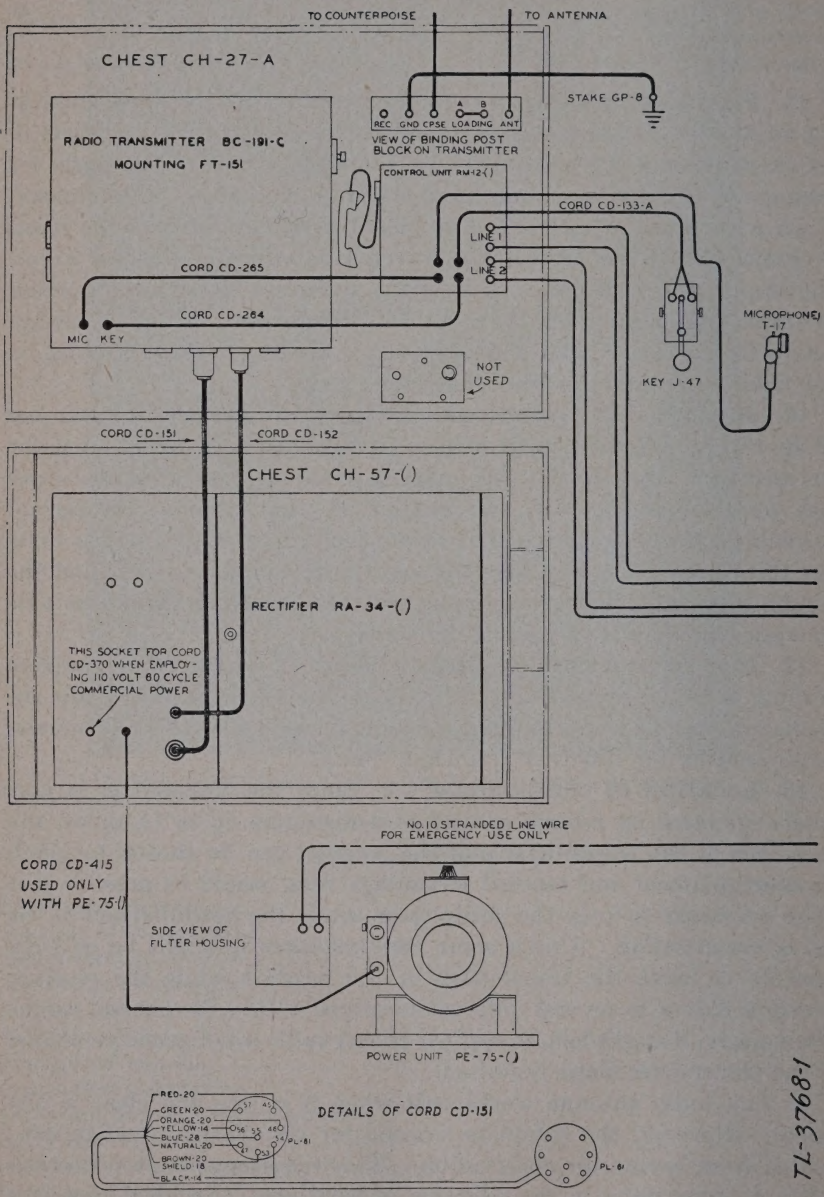
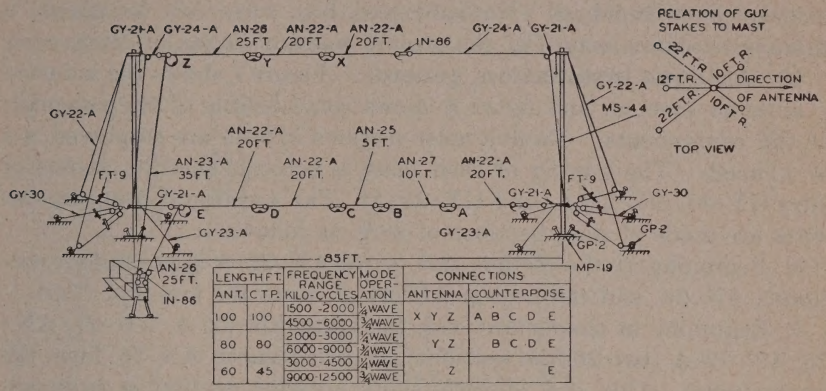
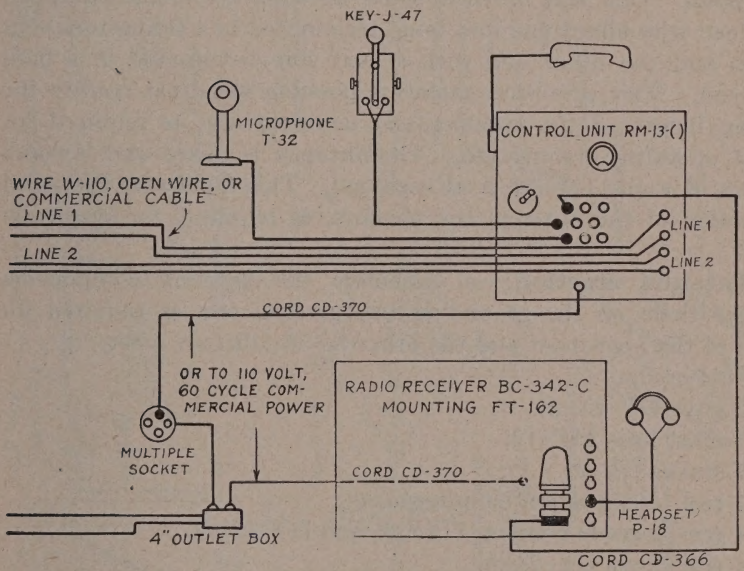


FIGURE 7.—Cording diagram



LENGTH FT.		FREQUENCY RANGE	MODE OPER-	CONNECTIONS	
ANT.	C.T.P.	KILO-CYCLES	ATION	ANTENNA	COUNTERPOISE
100	100	1500 -2000	¼ WAVE	X Y Z	A B C D E
		4500 -6000	¾ WAVE		
80	80	2000 -3000	¼ WAVE	Y Z	B C D E
		6000 -9000	⅝ WAVE		
60	45	3000 -4500	¼ WAVE	Z	E
		9000-12500	⅝ WAVE		



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of radio set SCR–188–A.

inconspicuous building. No hard and fast rules can be given; a thorough reconnaissance of the ground must be made in every case.

19. Antenna installation, general.—Figure 7 shows the inverted L antenna erected, and figure 8 shows some details of the assembly of the components. Twelve mast sections MS–44 are employed, six to a mast. The guying of each mast is accomplished by means of guys GY–30, GY–22–A, and GY–23–A. The aerial and counterpoise wires are made of short sections of wire, as follows:

a. Beginning at the distant end, wires AN–22–A (two 20-foot sections), AN–26, and the lead-in AN–23–A, form the antenna (top).

b. Beginning at the distant end, the wires AN–22–A, AN–27, AN–25, AN–22–A (two 20-foot sections), and the lead-in AN–26, form the counterpoise. One end of each short antenna section is equipped with a lead wire about one foot long, terminated in a fahnestock clip or equal and the other end with a lead wire terminated in a bare tinned end. This provision makes it possible to adjust readily the operating length of the antenna and counterpoise, as required for different operating frequencies. The antenna is raised and lowered by means of a guy GY–24–A at each end. This facilitates the rapid reconnection of the antenna components, as required, for frequency changes.

20. Antenna erection.—*a.* Assemble the antenna components and place them on the ground in two groups, one as required for erection of the near mast and the other for the distant mast.

(1) *First group.*
2 guys GY–21–A.
1 mast base MP–19.
7 stakes GP–2.
1 reel (antenna and counterpoise).
1 reel (guys GY–21–A, GY–30, and GY–23–A).
1 reel (guys GY–24–A).
6 mast sections MS–44.
1 hammer HM–1.

(2) *Second group.*
2 guys GY–21–A.
1 mast base MP–19.
6 mast sections MS–44.
1 reel (guys GY–21–A, GY–30, and GY–23–A).
7 stakes GP–2.
1 hammer HM–1.

Caution: *Operation at night will require the use of a fixed routine in connection with the erection of antennas, otherwise small items will be*

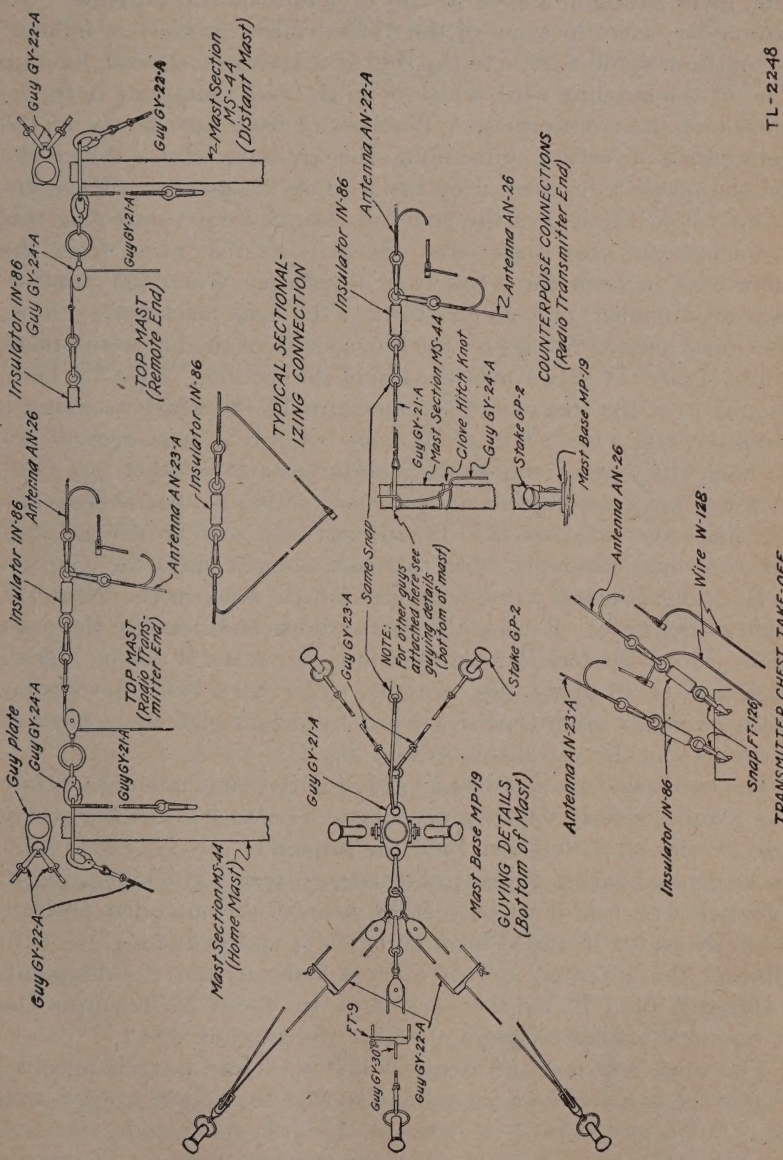


FIGURE 8.—Details of assembly of antenna components of radio set SCR-188-A.

misplaced and lost. During the progress of the work, place empty reels, hammers, stakes, and similar items near each mast base and count and check them frequently.

b. First determine the line of the antenna and the position of the near mast. Stake down the base for the latter, with the wings of the ground plate at right angles to the direction of the antenna. To determine the exact location of the distant mast, proceed as follows: Have one man stand a little to the side of the near mast base, holding the end of the antenna wire, which is on the reel containing both the antenna and the counterpoise. Walk away from him slowly in the predetermined direction, unwinding the antenna wire. When the end of the latter is reached, drop the wire on the ground. Have another man hold the end of the counterpoise, and start unreeling this back toward the near mast base. Step a few feet away from the antenna wire to keep the wires from tangling. When the counterpoise is all unreeled, pull its end toward the near mast base. Now, put one mast section MS–44 on the hinged stub of the latter and place the plate of guy GY–21–A over the top of the section. Snap the hook of the guy over the free eye of the insulator IN–86 which terminates the counterpoise wire. While one man holds this mast section upright, hook the distant end of the counterpoise to another guy GY–21–A which has been slipped over a mast section at the far location. Set the mast over the base MP–19, and have one man adjust the position of the whole assembly, with the mast upright, until the counterpoise is strung free and clear, with just a little slack in it. Note the position of the base. Release the counterpoise, and remove the mast section. Move the base out another foot and stake it down. Drive all stakes in at an angle, not straight. The extra foot allows some adjustment of the counterpoise tension by means of a short piece of rope connecting the end insulator and guy GY–21–A.

c. The two masts are erected and guyed in the same manner. Study figures 8 and 9 closely before proceeding. Locate the forward stakes C′ and D′ (fig. 9) as follows: Find the branch of guy GY–23–A that has a woven-in marker thread indicating 10 feet. Hook the ring of this branch over the mast-base stake nearest the intended position of C′ or D′, swing it out to form an angle of approximately 45° with the line of the antenna, and drive in a stake at the 10-foot point. The stakes A′ and B′ for the back guys are about 22 feet from the mast base and also at an angle of 45° to the antenna line.

d. The mast sections are identical and therefore interchangeable. Assemble the two masts on the ground so that they point toward each other. Put a guy GY–21–A between the first and second sections, and another GY–21–A over the sixth or topmost section. No use is made of the short piece of wire (with a snap hook) on the top guy GY–21–A. Attach a guy GY–24–A to the guy plate at the top of

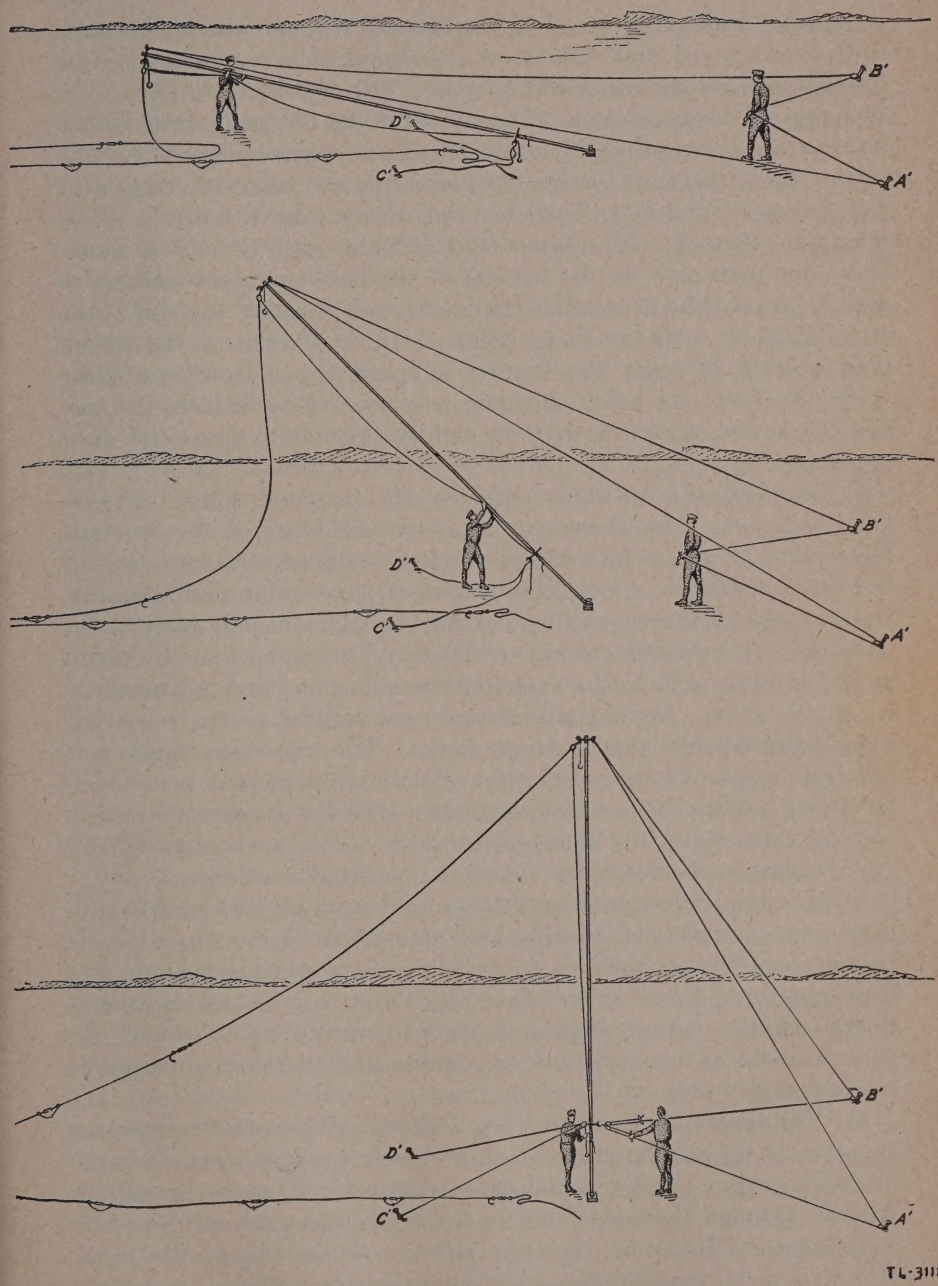


FIGURE 9.—Three steps in erection of mast for radio set SCR-188-A.

the mast. Pull the free end of the halyard through one of the holes in the bottom guy plate GY–21–A, tie a loop in its end, and snap the harness hook at the other end over it. This will keep the rope from swinging while the mast is going up. Fit the bottom section of the mast assembly over the stub on the mast base. Attach a guy GY–22–A to the top of the mast, loosen the long rope, and place the rings over the stakes A′ and B′. Two men can easily raise a mast in a few minutes. (See fig. 9.) Leave the forward guy GY–23–A loose. Have one man pick up the far end of the pole and start walking in with it, toward the base, while the other man, grasping the end of the guy GY–22–A, walks in also. When the mast is vertical, the second man quickly attaches the harness snap to the bottom guy plate while the first one holds the pole in place. Now attach the guy GY–23–A and adjust both guys tightly enough to keep the mast upright.

e. To raise the antenna, unfasten the lanyard snaps of guys GY–24–A, and close them over the end insulators of the antenna. Determine, from the chart in figure 7, the combination of wires for the frequency band in which the transmitter is to operate initially. Open or close the necessary connecting jumpers and pull away at the halyards. Tie the bottom ends of the latter to the bottom guy plates on the masts. Attach the counterpoise and make final adjustments on all the guys. Do not pull them in too tightly, as the ropes will tend to shrink when they become damp. The important thing is to have the masts standing perfectly vertical. Station one man about 50 feet off, so that he can view each mast with the proper perspective, and let him direct the final adjustments. The back guys GY–30 may or may not be necessary, depending on wind conditions.

f. Since the counterpoise and the ground guys are just head height, they are a source of considerable danger to passers-by. Under training conditions, it is advisable to tie short white streamers (cut from rags) every 6 or 8 feet along the wires, to attract attention to them. Under real or simulated combat conditions, however, the wires must be as inconspicuous as possible, and therefore must not be marked in any way.

21. Transmitter location.—*a. Indoors.*—When the transmitter is to be set up in a building, store, etc., select a spot near a window or door, so that the aerial and counterpoise wires can be brought in directly through the small door in the upper right side of the transmitter chest CH–27–A. Put the rectifier to the left of the transmitter, so as to leave the lead-in wires in the clear. This is important because the latter wires are part of the actual radiating system. The

transmitter and rectifier chests can be placed on tables, if available, or on their own mounting legs.

b. Outdoors.—Mount the chests on their own legs and place the transmitter about 15 feet from the near mast along a line approximately at right angles to the direction of the antenna. This will minimize absorption of the radiated energy by the metal mast.

22. Transmitter installation.—Before opening any part of this equipment, carefully read TM 11–800, which fully describes the radio transmitters of the BC–191–( ) series.

a. Tubes.—Remove the tube compartment shield, which is the upper left-hand part of the front panel, secured by two snap-slide catches. Install four tubes VT–4–C and one tube VT–25 in sockets marked with the respective type numbers.

b. Fuses.—Inspect the three transmitter fuses, one active and two spare. This is accomplished by removing the transmitter tuning unit and inspecting the active fuse FU–12 located in the lower portion of the transmitter above the tuning unit compartment. The spare fuses FU–12 are located in the transmitter below the tuning unit compartment near the front panel of the transmitter.

c. Pilot lamp.—If necessary, place a pilot lamp LM–27 in the socket behind the ruby reflector located between the filament voltmeter and the total plate current meter on the front panel. This is accomplished by removing the tuning unit from the transmitter.

d. Terminal strip.—The output terminal strip should be installed in the row of jacks located in the upper portion of the right-hand *side* of the transmitter cabinet. There are two such rows of jacks, the other being located in the right-hand portion of the *top* of the cabinet. If the transmitter is received with the terminal strip installed in the upper row of jacks, remove it by pulling straight upward. Remove the shield M–191 from the right-hand row of jacks and use it to cover the upper jacks, fastening it in place with the same screws which held it to the side of the cabinet. Place the terminal strip so that the "front" mark is toward the front of the cabinet, and install it in the jacks by pushing all the way in.

e. Mounting.—Mount the transmitter in the chest CH–27–A by means of the mounting FT–151–A.

f. Filament adjustment and tuning.—After adjusting the rectifier RA–34–( ) for 12 volts, as described in paragraph 25, adjust the filament resistors in the transmitter as described in TM 11–800. After adjusting the rectifier for plate voltage, as described in paragraph 26, tune the transmitter as prescribed in TM 11–800.

g. Control unit RM–12–( ).—(1) Although this is not part of the

transmitter BC–191–C, it is kept permanently with it in the same chest. Mount it by means of the four screws provided, in the position shown in figure 2. Pull out the handset plug and remove the chassis part only by loosening the knurled captive thumbscrews around the edge of the front panel. Install two batteries BA–30 in the telephone instrument chassis. The latter is a standard EE–8–A field telephone unit (see TM 11–333 for complete data). Replace the assembly in its cabinet and tighten the thumbscrews.

(2) Two cords are permanently attached to this unit. One terminates in a plug PL–55 for insertion into the KEY jack of the transmitter, and the other terminates in a plug PL–68 for insertion into the MIC jack of the transmitter. These jacks are located below the front panel of the transmitter on the left-hand side. For convenience, the two cords may be passed below the operating shelf by running them through the space between the shelf and the chest.

(3) Two jacks on the front panel marked MIC and KEY are for the plugs of microphone T–17 and cord CD–133 of key J–47, respectively. At the right and below the jacks is the LOCAL–REMOTE switch. When this switch is set at LOCAL, the key and microphone plugged into the jacks are in the transmitter circuit.

(4) Along the right-hand side of the front panel are four binding posts, the upper pair marked LINE 1 and the lower pair LINE 2. To these binding posts are connected the two pairs of telephone wires which go to the remote control position.

23. Aerial and counterpoise connections.—The 12-inch ends of the aerial and counterpoise lead-in wires are too short to reach directly to the ANT and CPSE posts on the transmitter. Prepare two 15-inch lengths of wire W–128 (or equivalent), tin their ends to prevent fraying, and use these as jumpers. To make the connections attach an insulator IN–86 to each of the hooks inside the transmitter chest, and then snap on the end of the antenna wire to the inner insulator and the end of the counterpoise to the outer insulator. Move the transmitter chest around to put a slight tension on the lead-in wires. Also, make sure that the 15-inch jumper wires do not touch the handset of the control unit RM–12–( ). Before connecting any other wires or cords drive a ground rod GP–8 into the ground directly near the right-hand end of the chest and connect it to the GND terminal; the latter is located on the output terminal strip. Indoors, an excellent ground connection is afforded by any nearby water pipe.

24. Rectifier installation.—Rectifiers RA–34–A and RA–34–B differ in dimensions and appearance but their purpose and cording requirements are identical.

a. The location selected for the rectifier must be within the length of cords CD–151 and CD–152 from the transmitter. (See fig. 2.) Set the rectifier chest on its legs and open the door.

Caution: Do not attempt to open the door beyond the position allowed by the bracket on the left-hand side. If the door is laid back on the top of the chest, the hinges will be strained excessively and it will be difficult or impossible to close the door thereafter.

b. Turn the LINE switch OFF and insert cord CD–151 in the receptacle on the front panel marked PL–S61. Connect the other end of this cord to the corresponding socket on the underside of the transmitter.

Caution: *Do not at this time insert plug PL–S59 of cord CD–152, since adjustments are to be made in the transmitter before high voltage is applied thereto.*

c. Open the hinged door in the front panel by turning the locking handle. In the RA–34–A (see figs. 10 and 11), the door swings to the right; in the RA–34–B it swings downward. The rectifier is normally supplied with all tubes already installed. Inspect them for good contact. On the inside of each door is mounted a large diagram of the equipment with a complete parts list. This is very convenient for quick reference and for identification of the various parts which are all numbered.

d. Inspect the plug-in capacitors to see that good contact is made at the sockets.

e. Check the supply-voltage link located in the lower right-hand corner directly over the relays in rectifier RA–34–A or on the bakelite panel in upper right-hand corner in rectifier RA–34–B. See that this link is in the proper position for operation on 105 to 125 or 210 to 250 volts.

25. Rectifier adjustment for filament voltage.—If commercial power is available connect the rectifier to it by cord CD–370. If no commercial power is available start the power unit PE–75–( ) as described in TM 11–900, and after it has warmed up and is running smoothly, set the voltage-regulating rheostat to the middle of its range. To adjust the filament voltage, proceed as follows:

a. Rectifier RA–34–A.—Turn the line switch OFF and the plate and filament circuit breakers ON. Close and lock the door and if power unit PE–75–( ) is used, see that the ground connection through cord CD–415 is secure. Turn the line switch ON. The green light on the control panel should light, showing that voltage is present on the primaries of the filament and plate transformers and that the control rectifier is in operation. Filament voltage for the transmitter

is immediately available and is indicated by the filament voltmeter on the control panel. This voltage is controlled by the knob in the center of the control panel of the rectifier and should be adjusted to 12 volts as indicated by the instrument. If the filaments fail to light

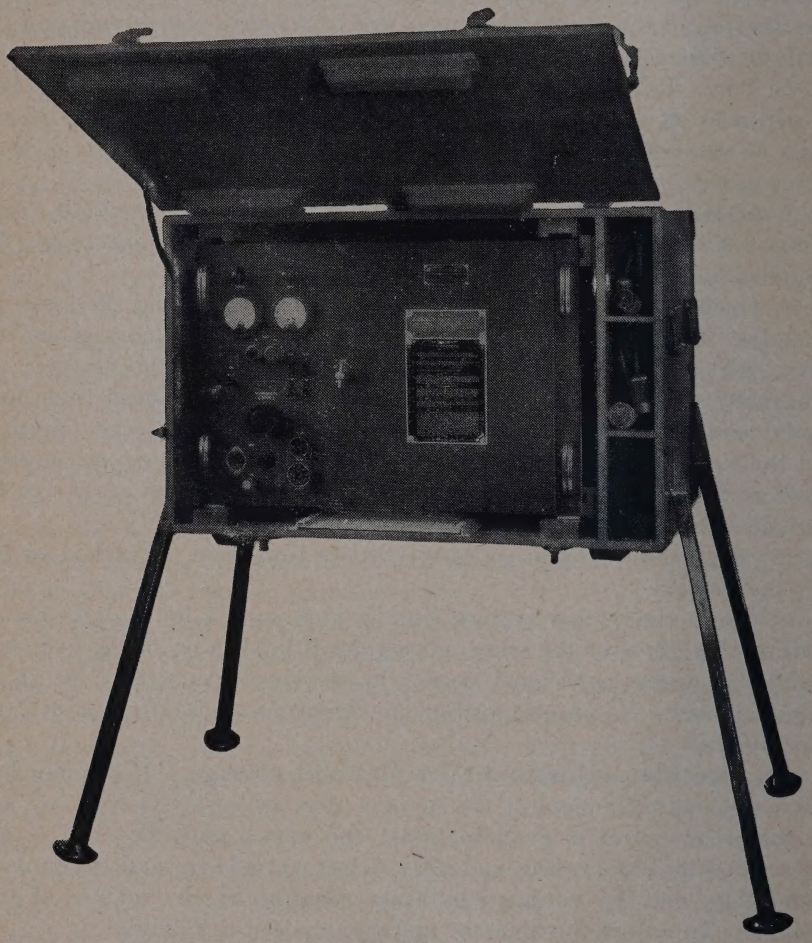


FIGURE 10.—Rectifier RA–34–A in chest CH–57–A.

and the FIL circuit breaker snaps OFF, check the AC–DC switch in the tube compartment of the transmitter. The AC–DC switch must be turned to AC for operation with the rectifier.

b. Rectifier RA–34–B.—Push the OFF button of the switch and turn the TRANS FIL circuit breaker ON. Close and lock the door and push the ON button of the line switch. The green light on the

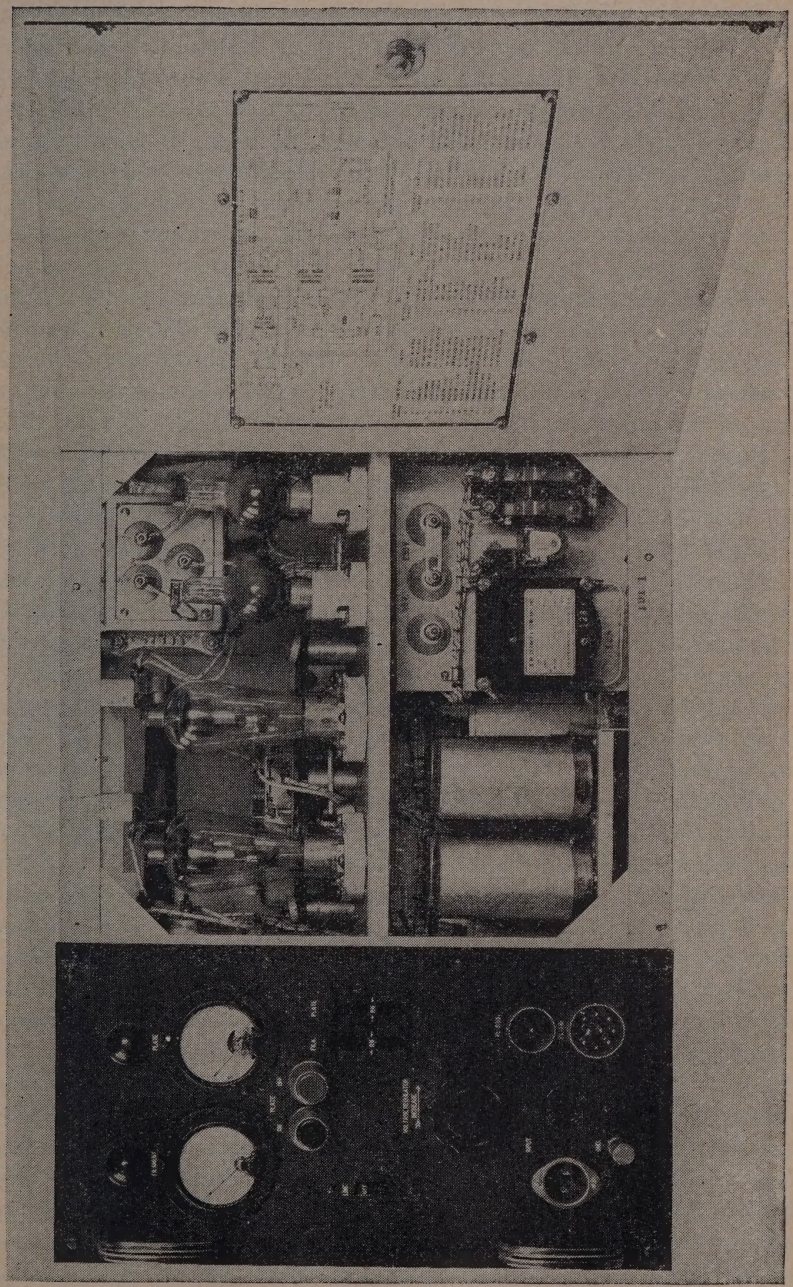


FIGURE 11.—Rectifier RA-34-A with front door swung open.

control panel should light, showing that line voltage is applied to the unit. Filament voltage for the transmitter is immediately available and is indicated by the meter on the left-hand side of the control panel. Turn the filament-voltage control located directly under the filament voltmeter until the meter indicates 12 volts. If the filaments fail to light and the TRANS FIL circuit breaker snaps OFF, check the AC–DC switch in the tube compartment of the transmitter. The AC–DC switch must be turned to the AC position for operation with the rectifier.

26. Rectifier adjustment for plate voltage.—*a.* Turn the LINE switch of rectifier RA–34–A to OFF (or push the OFF button of the POWER switch of rectifier RA–34–B) and connect cord CD–152 between one socket marked PL–59 on the transmitter and the similar socket on the rectifier.

b. Push all circuit breakers to ON. Rectifier RA–34–A has 2 (marked FIL and PLATE); rectifier RA–34–B has 4 (marked TRANS FIL, RECT FIL, CONTROL RECT, and TRANS PLATE).

c. Turn the transmitter OFF–ON switch to ON.

d. Turn the LINE switch to ON (or push the ON button of the POWER switch of rectifier RA–34–B). Filament and control voltages are immediately available from either rectifier and the transmitter filaments will light.

e. (1) After a period of about 1 minute push the ON button of the PLATE switch. If the time-delay switch in the primary of the plate transformer has completed its cycle, the red light on the control panel will light and the PLATE (plate voltage) meter will give an indication of the plate voltage. If the light does not light, allow a little more time and push the ON button again.

Caution: *A dangerous voltage of approximately 1,000 volts now exists at the high-voltage socket marked PL–59 on the rectifier panel and at various points in the transmitter. Do not attempt to make any adjustments in the transmitter or rectifier with the plate voltage on. Do not move either plug of cord CD–152 from the rectifier or the transmitter with the high-voltage supply in operation.*

(2) It is not necessary to shut down the entire rectifier to make adjustments; the plate voltage can be removed by pushing the OFF button of the PLATE switch or turning the transmitter OFF–ON switch to OFF. If the line voltage is removed from the rectifier either by opening the line switch or opening the door on the front panel, which is equipped with a safety interlock which removes all voltage from the rectifier when the door is opened, it will be necessary

to wait for the plate time-delay switch to pass through another cycle before plate voltage will be available again.

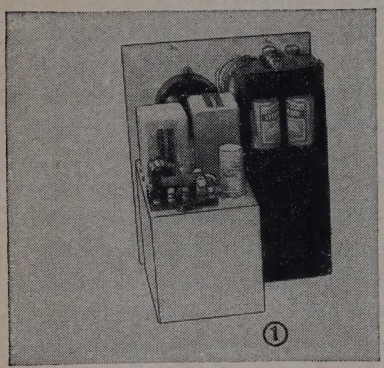
f. The plate voltage delivered by the rectifier RA–34–A is fixed when the VOLTAGE REGULATOR is adjusted for a filament voltage of 12 volts. The plate voltage delivered by rectifier RA–34–B is adjustable in steps by the PLATE VOLTAGE control in the lower right-hand corner of the panel. Turn the PLATE VOLTAGE control to the position which gives an indication of 1,000 volts or slightly higher on the PLATE VOLTAGE meter.

27. Receiver installation.—Personnel not already familiar with the receiver BC–342–C should read TM 11–850 which describes it in detail. The instrument normally is furnished only for 110–120-volt operation, with tubes, fuses, and pilot lamps in place. Connect the cord CD–370 to the receptacle on the back of the cabinet and plug the other end into any 110-volt a-c outlet capable of supplying 70 to 85 watts. For an antenna, use about 50 feet of wire W–29 or equivalent, hung from any convenient tree, pole, etc. Make a ground connection to a ground stake or to a nearby water pipe. When it is necessary to operate the receiver on 220-volt a-c lines, satisfactory results can be obtained by inserting a dropping resistor in series with the power cord CD–370. A convenient item for this purpose is a standard 0–250-ohm adjustable resistor of the vitreous enameled type, rated at 200 watts. Start with the full resistance in the circuit and move the slider gradually until an a-c voltmeter connected across the receiver cord reads either 110 or 120 volts, depending upon the setting of the power-transformer primary in the rectifier RA–20 which is part of the receiver proper. Keep the resistor in the open where it has free ventilation. If two BC–342–C receivers are available, simply connect them in series to the power source. A slight difference in voltage between the two receivers may exist, but this is of no consequence.

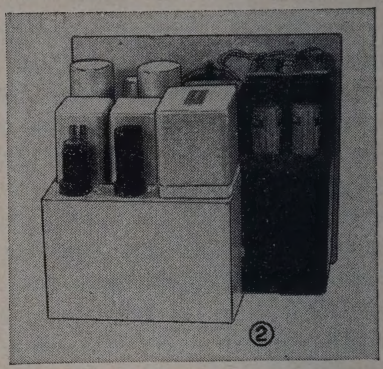
28. Control unit installation.—*a.* Install two batteries BA–30 in the control unit RM–13–( ) in the same manner described for the RM–12–( ). (See par. 22*g*.) Also install tubes VT–65 and VT–126 in the sockets so marked. Figure 12 shows inside and outside views of these two control units.

b. Three sets of three jacks each are located centrally on the front panel. These are intended for plugs of three receiver-disabling cords CD–366, three keys J–47 (with cords CD–133–A), and three microphones T–32. Each set of three jacks, consisting of a REC jack, a KEY jack, and a MIC jack, is independent, the set in use being selected by the position selector switch (marked 1 2 3) in the lower right-hand corner. For purposes of clarity, it will be assumed that

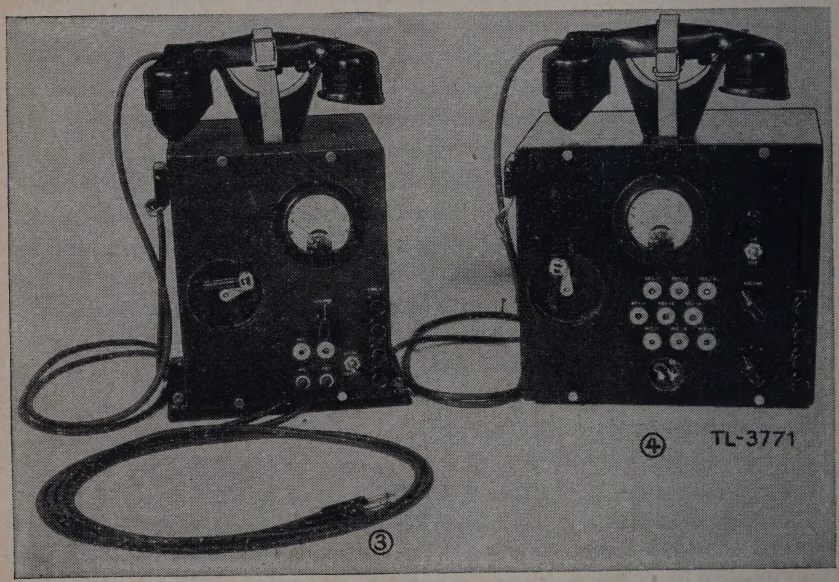
only one receiver, one key, and one microphone are used. Insert the plug of receiver-disabling cord CD–366 into the REC 1 jack, the plug of key cord CD–133–A into the KEY 1 jack, and the plug of micro-



① Control unit RM–12–( ), inside chassis view.



② Control unit RM–13–( ), inside chassis view.



③ Control unit RM–12–( ), complete.

④ Control unit RM–13–( ), complete.

FIGURE 12.

phone T–32 into the MIC 1 jack. Insert and lock the other end of the disabling cord CD–366 in the socket in the lower right corner of the receiver.

c. Along the lower right-hand side of the front panel are four

binding posts, the upper pair marked LINE 1 and the lower pair LINE 2. The telephone wires from control unit RM–12–( ) are connected to these binding posts, and it is necessary that each pair be connected to the same numbered pair of binding posts on both units, although the polarity of each pair is immaterial.

d. Insert the female plug of cord CD–370 into the receptacle in the lower center of the panel. Insert the plug on the other end of the cord into any 110-volt, 60-cycle supply capable of supplying 33 watts.

e. Insert the plug PL–58 of the handset TS–9–( ) into the socket in the left side of the cabinet.

f. The "disabling" cord CD–366 does not actually effect complete disabling of the receiver. The connections between the control unit and the receiver are such that when the transmitter is operated (by either microphone or key), the antenna short-circuting relay in the receiver is energized. This prevents excessive thumping in the headset when the receiver is tuned to the frequency of the transmitter, as it would be in normal net operation.

g. The power transformer of the RM–13–( ) has a double primary with all four leads brought out to terminals on the under side of the chassis. In the control unit as it is normally supplied for 110-volt operation, these primaries are connected in parallel. If it is necessary to use this equipment on 220 volts, the leads must be unsoldered and new connections made. (See fig. 13.)

29. Control equipment adjustment.—*a. Directions for receiver operator.*—Turn on the receiver BC–342–C and the control unit RM–13–( ) and allow them to warm up for a few minutes. Assuming that the receiver, key, and microphone are in the No. 1 jacks, turn the selector switch to 1. Turn the VOLUME knob all the way around counterclockwise. Press the PUSH-TO-TALK switch on the left side of the handle of the microphone T–32 and speak into the latter in a normal tone of voice. While talking, slowly turn up the VOLUME knob until the meter on the front panel reads midscale, or zero decibels, on peak swings. Now ring the transmitter operator, tell him that you will talk steadily for a few minutes into the microphone T–32, and direct him to make the necessary adjustments at his end.

b. Directions for transmitter operator.—While the receiver operator is talking, adjust the VOLUME knob on the control unit RM–12–( ) until the meter reads midscale, or zero decibels, on peak swings. Ring back on the telephone line and notify the other operator when you have completed this adjustment.

30. Power unit installation.—*a.* See TM 11–900 for full instruc-

tions regarding the starting, servicing, etc., of the power unit PE–75–( ).

b. Select a level location in the open on firm ground as far as practicable from the transmitter chest. To disassemble the crate proceed as follows:

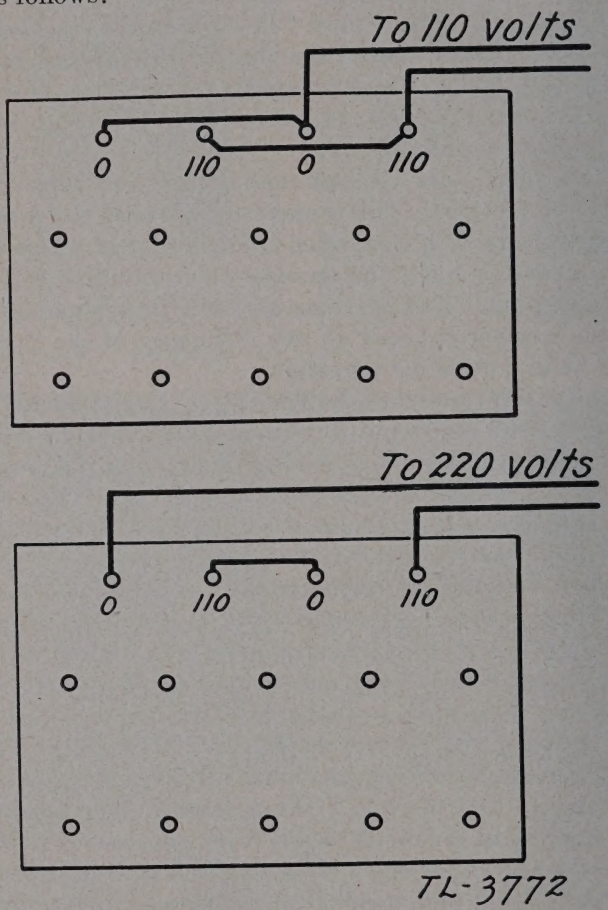


FIGURE 13.—Power transformer primary hook-up for control unit RM–13–( ).

(1) Release the six catches holding the top in place and lift it off. This is rather heavy as it holds the power cord CD–415 and a tool case.

(2) Release the two catches holding the front (marked by white stripes around the edge) to the bottom and remove the front by sliding it upward.

(3) Remove the back in the same manner as the front.

(4) Remove the sides by releasing the two catches along the bottom edge of each.

(5) The frame of the power unit is fastened to the bottom of the crate by heavy bolts and wing nuts. Normally, the unit is operated on this base but it can be removed quickly if desired.

c. The power unit can be operated with the case on or off. Figure 3 shows the case in the open position. Note that the front has been removed and the top pushed forward. This arrangement is sometimes desirable in rainy weather. Normally, operation without the case is desirable because the engine is a high-speed machine of the air-cooled type and requires good circulation on all sides.

d. The cord CD-415 permits quick connection of the power unit to the rectifier over distances of 50 feet or less. If greater separation is necessary, use a line consisting of two lengths of the No. 10 AWG flexible wire provided with the transmitter. Connect one end of this line to the heavy binding posts under the cover on the side of the filter case on the power unit. (See fig. 14.) Connect the other end to the duplex twistlock receptacle installed in a 4-inch outlet box. Connect the rectifier to the latter by means of the cord CD-415.

e. Drive a ground stake GP-8 into the ground near the power unit and connect it to the ground binding post on the latter. Connect the loose pigtail lead on each end of the cord CD-415 to the ground binding post on each unit.

f. To engage the twistlock plugs of cord CD-415 properly, push them all the way into the outlets and then turn one-quarter turn to the right.

g. When it is desired to operate the receiver and the control unit RM-13-( ) at the transmitter location, connect the male plug of the multiple socket to the second outlet of the 4-inch outlet box and then connect the plugs of the receiver and control unit to the multiple socket. Although the plug of the multiple socket cord is not of the twistlock type, it will fit satisfactorily if it is pushed straight into the twistlock receptacle of the 4-inch outlet box.

Caution: *Do not attempt to connect or disconnect any wires to the power unit PE-75-( ) while it is running. Play safe; shut the machine down before touching the electrical terminals.*

31. General operation.—*a. Local.*—The attendant at the transmitting position has little to do most of the time as all two-way communication is handled at the receiver position. He will not make changes or adjustments on the transmitter without the knowledge or previous permission of the receiver operator. When he must make

adjustments he will throw the LOCAL–REMOTE switch on the control unit RM–12–( ) to the LOCAL position and use the local key or microphone.

b. Remote.—The receiver operator will call the transmitter attendant on the telephone and direct him to set the transmitter to the desired

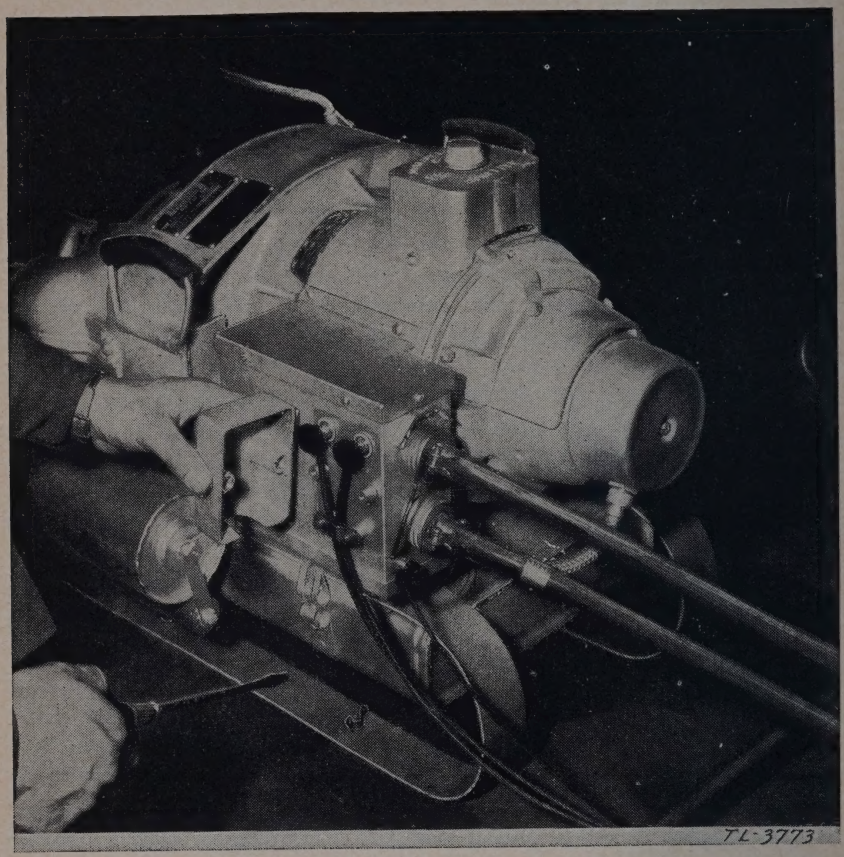


FIGURE 14.—Close-up of power unit PE–75–( ), showing connections to binding posts and twistlock receptacles.

frequency and mode of transmission. He will also remind him to put the LOCAL–REMOTE switch to the REMOTE position.

c. Shut-downs.—From the standpoint of frequency stability it is desirable to keep the transmitter running, ready for instant keying (or voice modulation) from the control position. This is entirely practicable when the equipment is operated from commercial power lines. However, occasional shut-downs will be necessary when the

power unit PE-75-( ) is used to permit inspection of the machine, minor adjustments, etc.

32. Removal from service.—*a. General.*—Note any operating difficulties, failure of functions, broken or damaged parts, and make the inspections noted in section IV. See that provision is made to inform the repair personnel of the using organization of needed maintenance.

b. Procedure.—Proceed to remove the radio set from service as follows:

(1) Set all switches to the OFF position.

(2) Stop the gasoline engine of power unit PE-75-( ). This is accomplished by pressing the stopping button located just above the starter pulley and holding until the engine comes to rest. Close the fuel-supply valve. The engine will be very hot; handle it with great care to avoid burns.

(3) Disconnect all cording from all components. Disconnect antenna, counterpoise, ground, and control wires.

(4) Unstep the legs from the transmitter and rectifier chests and store them in the bottom of chest CH-30.

(5) Dismantle the antenna in the reverse order to that of erection.

Caution: *"Walk" the masts down carefully. Do not allow them to fall to the ground. In many cases the impact would damage the mast sections.*

(6) Load the reels with the guys and antenna components in the reverse order to "paying out."

(7) Recover the field wire, if any, which was used to connect the control equipment and rewind it on the reels DR-4.

(8) Having assembled the items to be stored for transport in front of the chests, check the items on hand against the chest lists given in paragraph 14.

(9) Pack the chests for transport.

(10) Replace and fasten the case of power unit PE-75-( ).

SECTION III

DETAILED FUNCTIONING OF PARTS

	Paragraph
Radio transmitter BC-191-C	33
Rectifier RA-34-A	34
Rectifier RA-34-B	35
Radio receiver BC-342-C	36
Power unit PE-75-( )	37
Control unit RM-13-( )	38
Control unit RM-12-( )	39
Microphone T-32	40
Remote control equipment RC-47-( )	41

33. Radio transmitter BC–191–C.—For complete information on this equipment see TM 11–800.

34. Rectifier RA–34–A.—*a. Input power.*—The input is normally obtained through cord CD–370 which is equipped with a male plug on the input and a female plug on the output. The rectifier is furnished with a flush male receptacle 119 for the input and an alternative female twistlock receptacle 120. (See fig. 15.) The two are connected in parallel so that either may be used. The input line is then interlocked through two door switches 101–1 and 101–2. These switches are positioned to remove the voltage from all circuits if the door is opened. A toggle switch 121 is employed to provide an ON–OFF control for the whole device. A voltage regulator 102 is provided with an autotransformer winding and the input line is connected by a link 138 which permits operation from either a 115- or 230-volt supply. The output of the voltage regulator is provided with a continuously-variable adjustment to deliver 115 volts with a range of input voltage of 105 to 125 volts or 210 to 250 volts. It is therefore possible by adjusting the regulator to obtain the proper primary voltage for the rectifier with input voltages varying within the above ranges.

b. Circuit breaker for low-voltage supply.—The inputs of the low-voltage rectifier transformer 103, filament transformer 104, and time-delay relay 128 are fed through a circuit breaker 130. This breaker is so designed that an overload of dangerous magnitude on any of the above circuits will cause it to trip out. Since the plate supply is inoperative until the time-delay relay has functioned, this breaker will also prevent application of the high voltage until the trouble is cleared. A green pilot light 114 is connected across the primary of the filament transformer 104 and will therefore extinguish if the circuit breaker trips out.

c. Low-voltage rectifier and filter.—The low-voltage rectifier plate and filament windings are on a common transformer 103, since the tubes 112–1 and 112–2 do not require preheating. These tubes are of the half-wave, argon-filled type and are connected in a single-phase, full-wave rectifier circuit. The output of the rectifier is filtered through a two-section filter, consisting of 0.04-henry reactors 107–1 and 107–2, and 4000-μf capacitors 110–1 and 110–2. The remote-control relay 125 is permanently connected to the positive side of the output, and the negative or ground side of the relay is connected to the transmitter through cord CD–152. The negative side of the rectifier is permanently grounded.

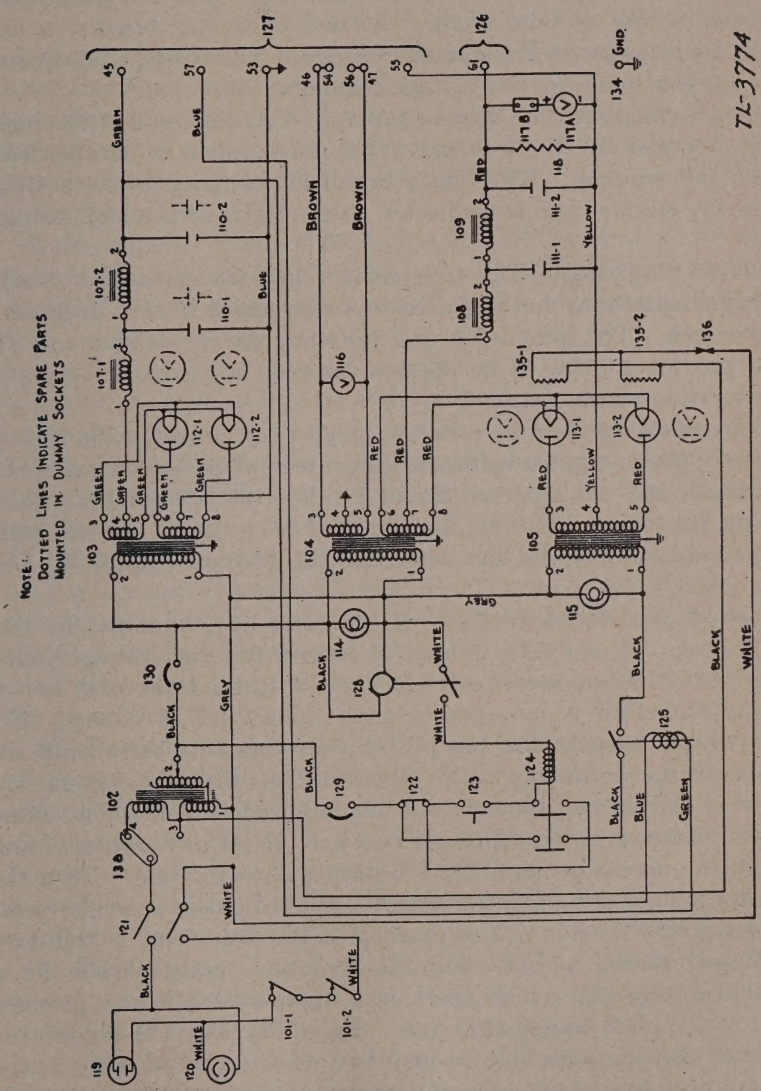


FIGURE 15.—Schematic diagram of rectifier RA-34-A. (Parts are numbered to correspond with parts list in sec. V.)

d. Transmitter filament supply.—Filament voltages for the transmitter and for the high-voltage rectifier are obtained from two separate windings on the same transformer 104. The 12-volt supply for the transmitter is provided with a center tap which is permanently grounded to the rectifier frame. An a-c voltmeter 116 across the output leads indicates the filament voltage. This voltage is adjusted to the proper value by the voltage regulator 102.

e. High-voltage rectifier filament supply.—The filaments of the high-voltage rectifier tubes 113–1 and 113–2 are supplied in parallel from the 2.5-volt winding. The center tap of this winding is the positive side of the rectifier and is connected to the input of the high-voltage filter.

f. Time-delay relay.—The time-delay relay 128 consists of a self-starting synchronous motor geared to a cam which in turn operates a micro-switch. The gear ratio and the cam are adjustable and are set to provide a delay of 30 seconds between starting of the motor and operation of the switch.

g. Circuit breaker for high-voltage supply.—The output of the voltage regulator 102 also supplies voltage to the primary of the high-voltage plate transformer 105. A separate circuit breaker 129 is employed, which will trip the plate circuit in the event of an overload on the high-voltage rectifier but will not interrupt the filament supply or low-voltage rectifier.

h. On-off push-button control.—A contactor 124, operated by two push buttons 122 and 123, is used to control the high-voltage transformer 105. The contactor coil is in series with the time-delay switch 128 and therefore is inoperative until the switch is closed. The circuit design is such that the push-button contacts carry only the current of the contactor coil. Operation of the ON button 123 completes the circuit through the contactor coil 124 which closes and establishes a circuit through one pair of its own contacts and through the normally-closed OFF button 122 to the line. Thus the contactor is locked in until the circuit is opened either through operation of the OFF button 122 or opening of the time-delay switch 128.

i. Remote control circuit.—Remote control is accomplished by a 12-volt d-c relay 125 which operates a micro-switch in the primary circuit of the plate transformer 105. Since this relay 125 follows the contactor 124, the high voltage may be turned on or off without the necessity of resetting the contactor or time-delay relay 128.

j. Pilot light.—A red pilot light 115 across the primary of the plate transformer 105 indicates the presence of high voltage which is also indicated on the 1.5-kilovolt d-c instrument 117–A.

k. High-voltage rectifier.—The high-voltage rectifier consists of 2 half-wave, mercury-vapor rectifier tubes 113–1 and 113–2 used in a single-phase, full-wave circuit. Due to characteristics peculiar to this type of tube, it is necessary to heat the envelopes of the tubes to a temperature of at least 77° F. before the tubes will operate properly. The heater rings 135–1 and 135–2 around the tube sockets serve this function and are energized from the input side of the voltage regulator 102 through a thermostat 136 whenever the temperature falls below the above value. The thermostat 136 removes the heaters 135 from the circuit as soon as the temperature reaches a satisfactory operating value.

l. High-voltage filter.—The high-voltage filter consists of two sections. The input section consists of a swinging reactor 108 which is designed to offer a high inductance at small loads, and which diminishes with increased load. Reactor 108 is followed by a 5-μf capacitor 111–1. The second section consists of a smoothing reactor 109 which has a substantially constant inductance for all values of current up to full load. This reactor is also followed by a 5-μf capacitor 111–2. A bleeder resistor 118 of 25,000 ohms is connected across the output to insure discharge of the capacitors 111–1 and 111–2 when not in use. A d-c voltmeter 117–A with its associated multiplier 117–B is also connected across the output. The high-voltage positive lead is connected to the transmitter through cord CD–151 while the negative lead is connected through cord CD–152 together with the filament and low-voltage d-c connections.

m. Grounding post.—A binding post 134 is provided on the panel for grounding the frame.

35. Rectifier RA–34–B.—*a. General.*—The general performance characteristics of the rectifiers RA–34–B and RA–34–A are identical, the two units being perfectly interchangeable. However, because the circuits of the RA–34–B are slightly more complicated, they are broken down in this paragraph in a little more detail. Figure 16 is a complete schematic wiring diagram of the RA–34–B with the parts numbered to correspond with the parts list in section V.

b. Transmitter filament supply circuit.—The transmitter filament transformer 236 supplies 12 volts at 14.25 amperes to terminals 46–54 and 47–56 of socket SO–41 (pt. 203). (See figs. 16 and 17.) Connected across the output of this transformer is filament voltmeter IS–161. The center tap of this transformer is grounded. The primary of the transformer is connected through circuit breaker 217 to the output of the variac 235. This variac permits adjustment of the transformer voltage so that it may be set to 12 volts, independently of variations in line voltage or load.

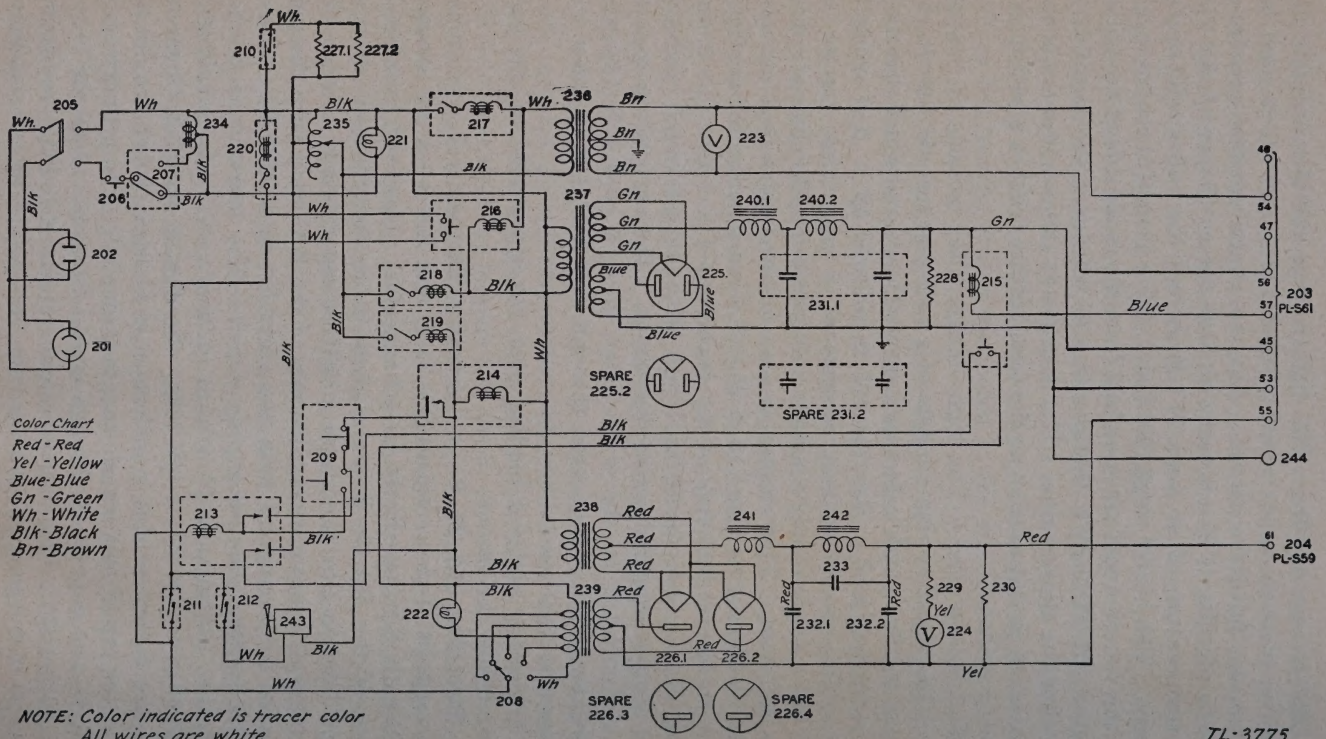


FIGURE 16.—Complete schematic diagram of rectifier RA-34-B.

c. Control rectifier circuit.—This rectifier utilizes a type 199698 tungar tube 225.1 in a full-wave rectifier circuit with a two-section, choke-input filter. (See fig. 18.) The output is 12 volts direct current at 2.4 amperes. Transformer 237 supplies both plate and filament voltage for the tungar tube. Its primary is connected through circuit breaker 218 to the output of the variac 235. The output of the rectifier

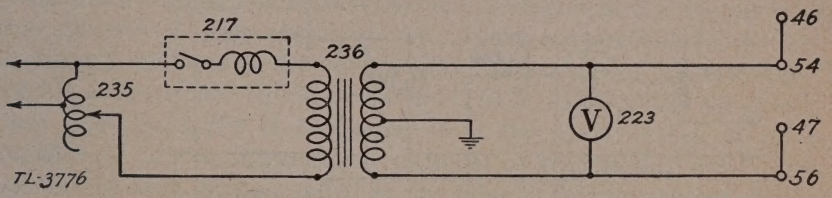


FIGURE 17.—Transmitter filament circuit of rectifier RA–34–B.

is filtered by reactors 240.1 and 240.2 and a two-section electrolytic capacitor 231.1. A bleeder resistor 228 is provided. The negative side of the output is connected to ground binding posts 244 and terminal 53 of socket SO–41 (pt. 203). The positive side of the output is connected to terminal 45 of socket SO–41 (pt. 203). Connected from the positive side of the output to terminal 57 of socket SO–41 (pt. 203)

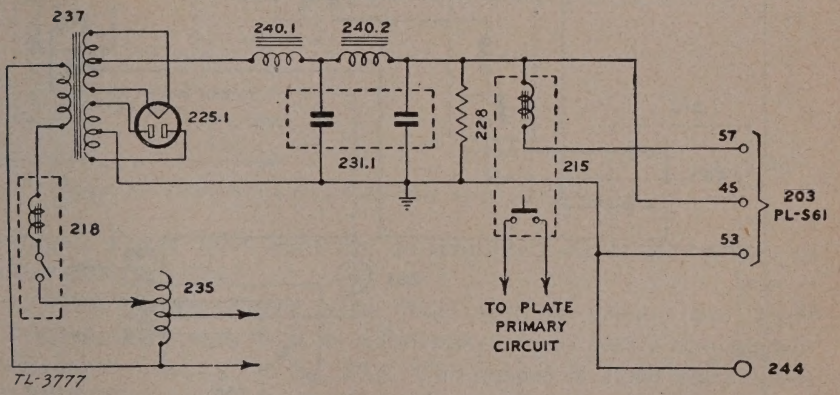


FIGURE 18.—Functional diagram of control rectifier circuit of RA–34–B.

is the coil of plate control relay 215. When a ground is applied to terminal 57 of socket SO–41 (pt. 203) at the transmitter through the cord CD–152, the coil of relay 215 is energized, closing its contacts which are in series with the primary circuit of the plate transformer. This provides remote control of the plate voltage and if all other switches and relay contacts in the plate primary circuit are closed, will turn the high-voltage plate on or off.

d. Plate transformer primary circuit.—The primary of plate transformer 239 is connected through plate voltage adjusting switch 208, plate thermostat 211, contacts on plate interlock relay 216, and circuit breaker 220 to one side of the output of autotransformer 234. (See fig. 19.) The other side of the plate transformer 239 is connected

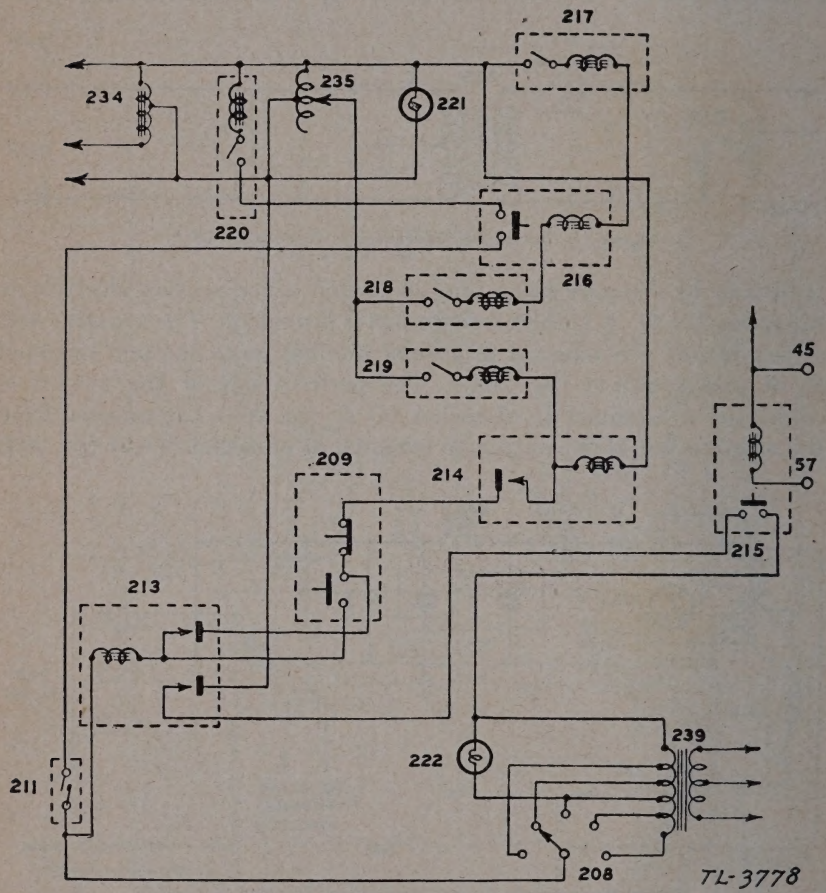


FIGURE 19.—Functional diagram of high-voltage rectifier primary circuit of RA-34-B.

through contacts of plate control relay 215 and contacts of plate contactor 213 to the opposite side of the output of autotransformer 234. Plate interlock relay 216 is connected across the load side of transmitter filament circuit breaker 217 and control rectifier circuit breaker 218. In the event that either of these circuit breakers opens, plate interlock relay 216 will open, removing plate voltage. Plate

contactor 213 has its coil connected from the load side of plate thermostat 211, through plate start-stop switch and contacts on time-delay relay 214 to the load side of rectifier filament circuit breaker 219. In the event that rectifier filament circuit breaker 219 opens, voltage will be removed from the coil of plate contactor 213, opening the circuit to plate transformer 239. In the event that plate thermostat 211 opens, plate voltage will be removed and voltage will also be removed from the coil of plate contactor 213. Plate contactor 213 can only be closed if contacts on time-delay relay 214 are closed, plate thermostat 211 is closed, and circuit breakers 217, 218, 219, and 220 are closed. Plate pilot light 222 is connected from the 115-volt tap of plate transformer 239 to the common terminal of transformer 239. This insures 115 volts being applied to the pilot light independent of line

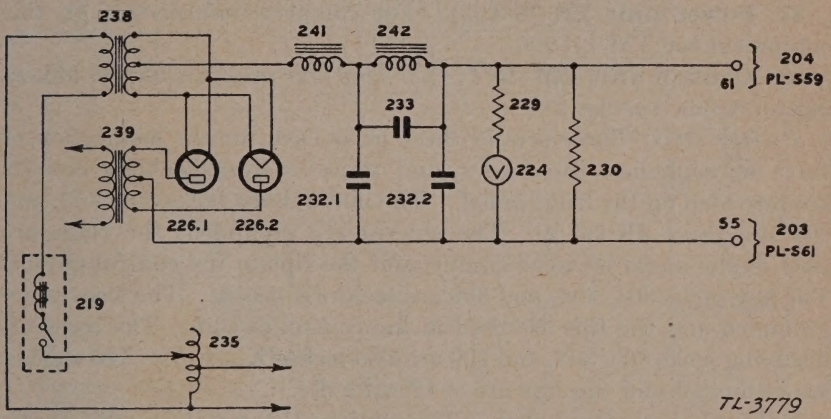


FIGURE 20.—Functional diagram of high-voltage rectifier secondary circuit of RA–34–B.

voltage. Power pilot light 221 is connected across the output of autotransformer 234.

e. Plate rectifier circuit.—The plate rectifier utilizes two tubes VT–46–A, 226.1 and 226.2, in a full-wave circuit with a two-section, choke-input filter. (See fig. 20.) The output is 1,000 volts direct current at 350 milliamperes. Transformer 238 provides 10 amperes at 2½ volts for the filaments of these tubes. Its primary is connected through circuit breaker 219 to the output of variac 235. Transformer 239 provides the high voltage for the plates of the tubes. Transformer 239 has primary tape to permit adjustment of the d-c voltage from the rectifier. The output of the rectifier is filtered by swinging reactor 241, capacitor 232.1, reactor 242, tuned by capacitor 233, and followed by capacitor 232.2. Connected across the output of this rectifier is bleeder resistor 230 and meter multiplier resistor 229, in series with

plate voltmeter IS–168 (pt. 224). This voltmeter is actually a millimeter of 24 milliamperes full-scale range, having a scale marked 0 to 1,200 volts, in series with a ± 1 percent, 50,000-ohm resistor 229. The positive output of this rectifier is connected to terminal 61, socket SO–39 (pt. 204). The negative output of the rectifier is connected to terminal 55, socket SO–41 (pt. 203).

f. Heaters and blower.—The heaters 227.1 and 227.2, controlled by the thermostat 210, bring the rectifier tubes 226.1 and 226.2 to proper operating temperature before plate voltage is applied. In addition, there is a blower fan 243, controlled by the thermostat 212, which prevents the inside of the rectifier cabinet from overheating.

36. Radio receiver BC–342–C.—For complete information on this receiver see TM 11–850.

37. Power unit PE–75–( ).—For complete information on this equipment see TM 11–900.

38. Control unit RM–13–( ).—This unit provides for the following functions (see fig. 21):

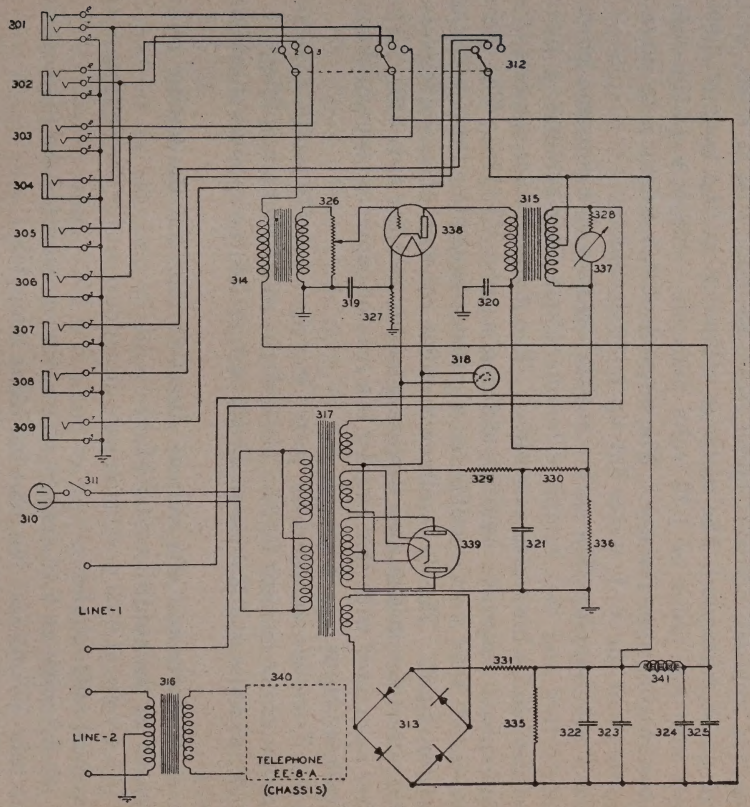
a. Jack sets.—Three sets of three jacks each for the connection of three microphones, three keys, and three receiver-disabling circuits are provided on the front panel. The microphone jacks 301, 302, and 303 are jacks JK–33–A. The sleeves are grounded, the rings are used in the audio or voice circuit, and the tips in the control circuit. The key jacks 304, 305, and 306 are jacks JK–34–A. The sleeves are grounded and the tips are used in the control circuit. The receiver-disabling jacks 307, 308, and 309 are also jacks JK–34–A. The sleeves are grounded and the tips are +12 volts d-c.

b. Position selection switch.—This switch, 312, is a three-pole, three-position, break-before-make rotary switch. Its function is to provide a means for the selection of any one of the three jack positions.

c. Microphone amplifier.—The purpose of this amplifier is to replace the loss or attenuation introduced by the line connecting the control unit RM–13–( ) to the control unit RM–12–( ). This amplifier consists of one stage of class "A" amplification using transformer coupled input and output. The over-all gain is approximately 17.5 decibels. The following is a list of the components of this amplifier, their primary function, and their chief electrical characteristics:

(1) 314, microphone to grid transformer, for matching the low impedance microphone to the grid of the tube VT–65 (338). Impedance ratio 40 ohms to 75,000 ohms. Voltage step-up ratio

$$\sqrt{\frac{75{,}000}{40}} = 43.3.$$



CONTROL UNIT RM-13-A CIRCUIT LEGEND		
CIRCUIT DESIGNATION	ITEM	DESCRIPTION
301	JACK JK-33-A (MICROPHONE)	REMOTE MIC INPUT
302	JACK JK-33-A (MICROPHONE)	" " "
303	JACK JK-33-A (MICROPHONE)	" " "
304	JACK JK-34-A (KEY)	REMOTE KEY INPUT
305	JACK JK-34-A (KEY)	" " "
306	JACK JK-34-A (KEY)	" " "
307	JACK JK-34-A (RECEIVER)	RECEIVER DISABLING
308	JACK JK-34-A (RECEIVER)	" "
309	JACK JK-34-A (RECEIVER)	" "
310	PLUG	POWER INPUT
311	SWITCH SPST	POWER SWITCH
312	SWITCH 3 POLE 3 POS	POSITION SELECTOR
313	RECTIFIER	LV SELENIUM TYPE
314	TRANSFORMER	GRID INPUT TRANS
315	TRANSFORMER	PLATE TO LINE TRANS
316	TRANSFORMER	RINGING
317	TRANSFORMER	POWER
318	LAMP 6.3V - .15AMP	INDICATOR LAMP
319	CAPACITOR 2MFD 25V SEC-1	BIAS BYPASS SEC 1 OF 3
320	CAPACITOR 10 MFD 450V SEC-2	PLATE BYPASS SEC 2 OF 3
321	CAPACITOR 10 MFD 450V SEC-3	HV FILTER SEC 3 OF 3
322	CAPACITOR 1200 MFD 50V SEC-1	LV FILTER SEC 1 OF 2
323	CAPACITOR 1200 MFD 50V SEC-2	LV FILTER SEC 2 OF 2
324	CAPACITOR 1200 MFD 50V SEC-1	LV FILTER SEC 1 OF 2
325	CAPACITOR 1200 MFD 50V SEC-2	LV FILTER SEC 2 OF 2
326	POT 75000 Ω TAPER	VOLUME CONTROL POT
327	RESISTOR 1000 Ω 1/2 WATT	BIAS RESISTOR
328	RESISTOR 13,500 Ω 1/2 WATT	METER MULT
329	RESISTOR 5,000 Ω 10 WATT	HV FILTER RESISTOR
330	RESISTOR 3000 Ω 10 WATT	HV FILTER RESISTOR
331	RESISTOR 24 Ω 25 WATT	LV FILTER RESISTOR
335	RESISTOR 50 Ω 25 WATT	LV FILTER RESISTOR
336	RESISTOR 65,000 Ω 1/2 WATT	HV FILTER RESISTOR
337	METER	VOLUME INDICATOR
338	VT-65	AUDIO AMP
339	VT-126	RECTIFIER
340	TELEPHONE EE-8-A CHASSIS	LOCAL BAT CHANNEL
341	CHOKE 8HY 100 Ω	LV FILTER

TL-3780

FIGURE 21.—Schematic diagram of control unit RM-13-( ).

(2) 326, volume control for loading secondary of 314, and providing means of adjusting amplifier gain. This is a 75,000-ohm tapered, variable potential divider.

(3) 327, cathode resistor for providing bias voltage to tube VT–65 (338). This is a 1,000-ohm, ½-watt resistor.

(4) 319, by-pass capacitor for 327. This is used to reduce regeneration. Capacitance, 2 μf.

(5) 320, plate by-pass and filter capacitor. Capacity 10 μf.

(6) 312, plate to line transformer; for matching plate of tube VT–65 (338) to 500-ohm line. Impedance ratio 15,000 to 500. Voltage step-down ratio $\sqrt{\frac{15{,}000}{500}}=5.48$.

(7) 338, tube VT–65.

d. Volume indicator meter.—The purpose of this meter is to indicate the audio level being transmitted over the modulator line. 337 is a standard volume indicator meter, scale reading —10 to 6 db, with zero db at midscale. The meter is calibrated on the basis of 0.006 watt into 500 ohms or 1.73 volts midscale. 328 is a 13,500-ohm, ½-watt carbon type resistor. The purpose of this resistor is to extend the range of the V. I. meter 337 up to 10 decibels.

e. Power supply.—The power supply consists of a common power transformer and two complete rectifiers and filter systems, a plate rectifier, and a low-voltage rectifier. The plate rectifier consists of a single-phase full-wave rectifier utilizing a tube VT–126. The filter associated with this rectifier is a resistor-capacitor type utilizing resistor input. The low-voltage rectifier consists of a single-phase bridge rectifier utilizing an 8-plate selenium rectifier (pt. 313). The filter associated with this rectifier is a reactor-capacitor type, utilizing a resistor input.

(1) *Potentials supplied by power supply.*—(*a*) 170 volts at 0.005 ampere direct current for the plate of the microphone amplifier.

(*b*) 12 volts at 0.2 ampere direct current for the receiver-disabling relay.

(*c*) 12 volts at 0.005 ampere direct current for the keying relay located in the control unit RM–12–( ).

(*d*) 4 volts at 0.03 to 0.06 ampere direct current for the excitation of the local microphones.

(*e*) 6.3 volts at 0.45 ampere alternating current for the filament of the tube VT–65 and the pilot indicator lamp 318.

(2) *Function of components.*—The following is a list of the com-

ponents of this power supply, their function, and chief electrical characteristics:

(*a*) 310, power input plug for power cord.

(*b*) 311, power switch. This is a single-pole, toggle switch.

(*c*) 317, power transformer. Primary 110–220 volts; secondary windings 6.3 volts 0.45 ampere, 6.3 volts 0.6 ampere, 500 volts 0.007 ampere, and 30 volts 0.5 ampere.

(*d*) 329 and 330 are 5,000-ohm, 5-watt filter resistors used as the series mesh of the high-voltage filter.

(*e*) 321 is a 10 μf capacitor used as the shunt mesh of the high-voltage filter.

(*f*) 336 is a 65,000-ohm bleeder resistor.

(*g*) 313 is the low-voltage rectifier. This is an 8-plate selenium rectifier, coated for tropical service.

(*h*) 331 is a 24-ohm, 25-watt resistor used as part of the low-voltage filter network.

(*i*) 341 is an 8-henry reactor having a d-c resistance of 100 ohms. This unit is used as the series mesh and d-c dropping resistor of the low-voltage filter.

(*j*) 322, 323, and 324 are each 1,200 μf capacitors used as the shunt meshes of the low-voltage filter.

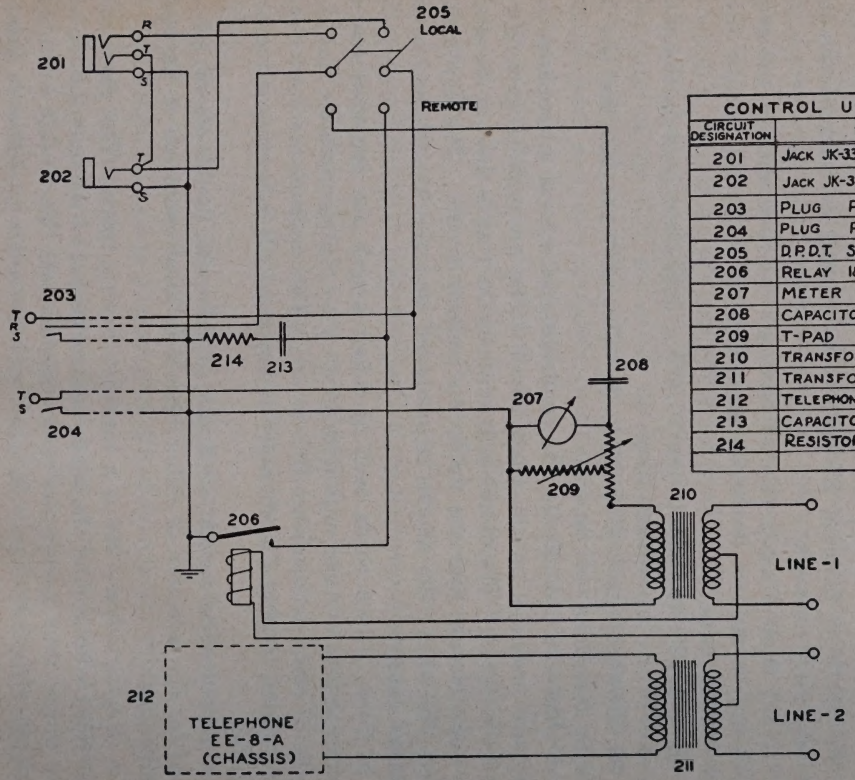
39. Control unit RM–12–( ).—This unit provides for the following functions (see fig. 22):

a. Jack sets.—Jacks for the connection of a local microphone and key are provided on the front panel. The microphone jack 201 is jack JK–33–A. The sleeve is grounded, the ring is used in the audio or voice circuit, and the tip in the control circuit. The key jack is jack JK–34–A; the sleeve is grounded and the tip is used in the control circuit.

b. Cords.—Two cords each of 5-foot length are provided for the connection of control unit RM–12–( ) to the microphone and key jacks of radio transmitter BC–191–C. The microphone cord 203 is terminated in plug PL–68, and the key cord 204 is terminated in plug PL–55.

c. Remote–local switch.—205 is a double-pole, double-throw switch used for the selection of either remote or local operation of the radio transmitter.

d. Keying relay.—206 is a sensitive keying relay. The purpose of this relay is to ground the tip or control circuit of the microphone and key plugs, thus keying the radio transmitter. This relay has a coil resistance of 1,800 ohms. In series with the coil is a 1,500-ohm resistor to reduce the internal impedance variations.



CONTROL UNIT RM-12-A CIRCUIT LEGEND		
CIRCUIT DESIGNATION	ITEM	DESCRIPTION
201	JACK JK-33-A (MICROPHONE)	LOCAL MICROPHONE INPUT
202	JACK JK-34-A (KEY)	LOCAL KEY INPUT
203	PLUG PL-68	TRANSMITTER MIC. INPUT
204	PLUG PL-55	TRANSMITTER KEY INPUT
205	D.P.D.T. SWITCH	REMOTE & LOCAL SWITCH
206	RELAY 1800 Ω	KEYING RELAY
207	METER	VOLUME INDICATOR
208	CAPACITOR 10 MFD. 25 V. DC	BLOCKING CAPACITOR
209	T-PAD 200 Ω	VOLUME CONTROL
210	TRANSFORMER	LINE TO BC-191-A ( )
211	TRANSFORMER	RINGING TRANSFORMER
212	TELEPHONE EE-8-A (CHASSIS)	LOCAL BATTERY CHANNEL
213	CAPACITOR 8 MFD, 250 V., DC	KEY CAPACITOR
214	RESISTOR 40 OHM .5 W	SURGE RESISTOR

FIGURE 22.—Schematic diagram of control unit RM-12-( ).

e. Volume indicator meter.—The purpose of this meter 207 is to indicate the audio level received over the modulator line. 207 is a standard volume indicator meter, scale reading —10 to 6 db, with zero level at midscale.

f. Blocking capacitor.—208 is a 10 μf capacitor used to isolate the microphone voltage supplied from radio transmitter BC–191–C from the meter 207.

g. Volume control.—209 is a continuously variable 200-ohm "T" type attenuator. Its function is to control the volume of the audio signal received from control unit RM–13–( ).

h. Line matching transformer.—210 is a 500-ohm primary, 150-ohm secondary line matching transformer. Its purpose is to match the

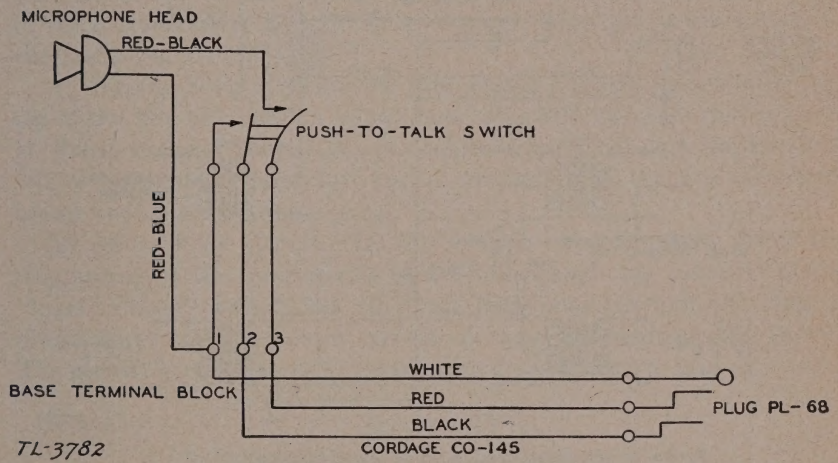


FIGURE 23.—Simplified schematic diagram of microphone T–32.

modulator input impedance of the radio transmitter to the 500-ohm line. On the line side, a center tap is provided for phantom keying.

i. Ringing transformer.—211 is a 500-ohm repeat coil. Its purpose is to isolate the telephone EE–8–A from the line. On the line side a center tap is provided for phantom keying.

j. Key capacitor and surge resistor.—The function of key capacitor 213 and surge resistor 214 is to reduce the sparking on the contacts of 206 and eliminate the possibility of contacts sticking. 213 is an 8-μf capacitor. 214 is a 40-ohm, ½-watt resistor.

40. Microphone T–32.—This unit comprises a single button carbon granule type transmitter head, mounted on a desk stand, equipped with a "push-to-talk" switch (fig. 23). The d-c resistance of this microphone varies between 30 and 70 ohms, depending upon

the position of the head and the pressure applied to the diaphragm. The purpose of the "push-to-talk" switch is to operate the keying relay in radio transmitter BC–191–C or control unit RM–12–( ) and to connect the microphone head in the circuit.

41. Remote control equipment RC–47–( ).—This consists of control units RM–13–( ) and RM–12–( ), which are described in paragraphs 39 and 40, respectively. The functioning of the complete equipment is as follows:

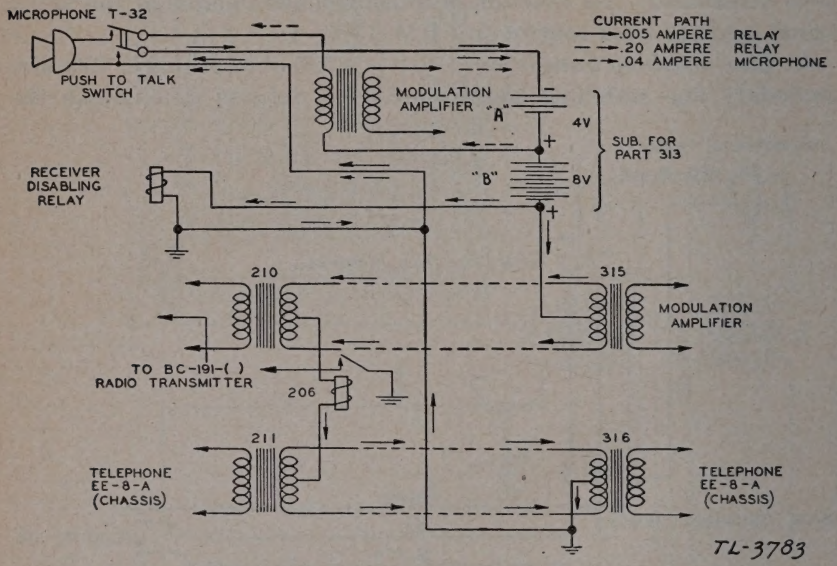


FIGURE 24.—Simplified circuit of remote control equipment RC–47–( ).

a. Remote operation from control unit RM–13–( ).—The source of low voltage used for relay control and microphone excitation in control unit RM–13–( ) is obtained from the bridge type rectifier 313. Figure 24 shows a simplified circuit of the control circuit. The rectifier is replaced by the batteries "A" and "B" for circuit simplification. When the microphone switch on microphone T–32 or key J–47 is depressed, the negative side of the low-voltage supply is grounded, completing the following three circuits:

(1) *Keying relay circuit.*—In this circuit current passes from the +12 volts through the center tap on the output transformer 315 on the modulation amplifier, over the microphone modulator line, through the center tap on the line transformer 210 in the control unit RM–12–( ), through the keying relay 206, through the center tap of the ringing transformer 211, back over the local battery telephone line,

and to ground through the ringing transformer 316 in the control unit RM-13-( ). From this point the current passes through the ground in the microphone switch circuit back over the return line to the −12 volts.

(2) *Receiver-disabling relay circuit.*—In this circuit current passes from the +12 volts through the receiver-disabling relay to ground. From this point the current passes through the ground in the microphone switch circuit back over the return line to the −12 volts.

(3) *Microphone circuit.*—In this circuit current passes from +4 volts, through the "microphone to grid" transformer 314 primary, through the microphone button, over the return line to the −12 volts.

b. Local operation from control unit RM-12-( ).—In local operation the source of low voltage for microphone excitation and keying of radio transmitter BC-191-C is obtained from the power supply of the radio transmitter.

(1) *Keying relay circuit.*—In this circuit current passes from the tip of the key plug 204 on microphone plug 203, through the contacts of "local-remote" switch 205 (in local position), through the key jack 202 or microphone jack 201, and to ground when the key on microphone switch is operated.

(2) *Microphone circuit.*—In this circuit current passes from the ring spring of the microphone jack 201, through the contacts of the "local-remote" switch 205 (in local position), through the ring of plug 203 to the modulator circuit of radio transmitter BC-191-C. The circuit is completed by means of a ground return.

Section IV

SERVICING AND REPAIR

	Paragraph
General	42
Procedure in case of set failure	43
Radio transmitter BC-191-C	44
Rectifier RA-34-( )	45
Radio receiver BC-342-C	46
Power unit PE-75-( )	47
Remote control equipment RC-47-( )	48

42. General.—The time to make inspections, adjustments, and repairs is during idle periods. Before packing away a set, make certain that all the parts have been accounted for, and that all tubes and cords are in good condition. Pay particular attention to the cords and their plugs. They are most likely to develop trouble at the point where the wires enter the plug itself. Roll up the cords in long loops, and try to avoid sharp bends. Compressed pin springs which have

taken a permanent set can usually be restored by light hammer blows on their ends. In the field, a convenient tool for cleaning off dust and dirt is an unused paint brush, 1 inch wide, with long bristles. In depots or other semipermanent repair establishments, an air hose or bellows is quicker and more convenient. Servicing other than routine inspections should be undertaken only by properly trained personnel with suitable test equipment. The components of the radio set SCR–188–A are quite intricate and can easily be damaged by inexperienced operators.

43. Procedure in case of set failure.—Initially, check the power source and all cords and circuits associated with it. Make sure the control switches and circuit breakers are actually in the "on" position and that fuses are good and making contact in their clips. Examine all tubes and replace those that do not light. In the case of metal tubes, temporarily substitute new tubes for suspected ones. The meters in the transmitter and the rectifier are valuable in indicating the presence or absence of filament and plate voltages. If these quick tests do not reveal the source of the trouble, it will be necessary to investigate each piece of equipment individually.

44. Radio transmitter BC–191–C.—See TM 11–800.

45. Rectifier RA–34–( ).—Since the rectifiers RA–34–A and RA–34–B have identical performance characteristics and use similar circuits, the same routine maintenance procedure can be followed for both units. This is given in *a* below. Specific tests and measurements to be made on the individual rectifiers are given in *b* and *c* below. Read this entire paragraph before attempting repairs on either rectifier.

a. Routine checks.—(1) Remove the pilot light caps and tighten the pilot lights in their sockets.

(2) With all power off, inspect the a-c and d-c voltmeters and if necessary bring the pointers to zero by means of the small adjusting screws on the fronts of the cases.

(3) Check the line switches and circuit breakers for freedom of movement. If any tendency to bind is noticed, replace the entire unit.

(4) Tighten the control knobs on their shafts.

(5) Inspect all plugs and receptacles for dirty or bent contacts and clean or straighten if necessary.

(6) Check the remote control relay by operating the armature by hand.

(7) See that the tubes are seated firmly in their sockets and all grid clips in place. Remove the tubes occasionally and push them in

and out two or three times to renew the contact surfaces of the pins.

(8) Inspect the various thermostats for burning or pitting of the contents.

b. Rectifier RA-34-A.—(1) *Trouble chart.*

Indication of trouble	Probable cause
(*a*) Green pilot light and filament voltage fail to appear with line switch and filament circuit breaker at ON.	(*a*) Safety interlock open. Defective line switch or circuit breaker. Link not in place.
(*b*) Filament voltmeter indicates but green light does not.	(*b*) *1.* Defective lamp. *2.* Poor contact.
(*c*) Plate voltmeter fails to indicate when plate ON button is pressed 30 seconds after filaments are energized.	(*c*) *1.* If contactor is not heard to function: (a) Time-delay relay defective. (b) Push-button contacts dirty. (c) Contactor open. *2.* If contactor is heard to function, remote-control relay fails to operate due to— (a) Defective relay. (b) Lack of control voltage.
(*d*) Plate voltmeter indicates but red light does not.	(*d*) *1.* Defective lamp. *2.* Poor contact.
(*e*) Red light indicates but plate voltmeter does not.	(*e*) Defective rectifier tubes or temperature too low.
(*f*) Control voltage not available when green light is on.	(*f*) Defective rectifier tubes.
(*g*) Filament circuit breaker trips when line switch is operated.	(*g*) Electrolytic capacitor short-circuited.
(*h*) Plate circuit breaker trips when ON button is pressed.	(*h*) Defective socket. Defective capacitor. Grounded wiring.

(2) *Continuity test.*

Terminal designation	Control position	Correct ohmmeter reading (resistance)	Probable cause of incorrect reading
Between prongs of receptacle 119 or 120.	"Line" switch ON.	2 ohms to zero	Open door switch.
Either prong to ground, receptacle 119 or 120.	All	Open circuit	Wiring grounded.
61 to 55	"Line" switch OFF.	25,000	Low-shorted capacitor. High-open bleeder.
46 or 54 to 47 or 56	do	Zero	High-open winding.
46, 47, 54 or 56 to ground.	do	do	High-ungrounded center tap.
53 to ground	do	do	High-ungrounded terminal.
45 to ground	do	do	High-open wiring.
57 to 45	do	200 ohms	Low-shorted relay (125). High-open relay (125).
55 to ground	do	Open circuit	Low-grounded wiring.

(3) *Typical voltages.*

Terminal	To terminal	Control position	Voltage	Permissible range
47 and 56	46 and 54	Line switch (121) ON. Filament circuit breaker (130) ON.	12 v a-c	Adjust with voltage regulator (102).
45	53	Line switch (121) ON. Filament circuit breaker (130) ON.	12 v a-c	11 v to 15 v.
45	57	Remote control OFF	0	None.
61	55	Line switch (121) ON. Filament circuit breaker (130) ON. Plate circuit breaker (129) ON.	1,000 v a-c	950 v to 1,050 v.

(4) *Transformer and reactor characteristics.*

Item	Part	Apply 115 volts 60 cycles to winding	Amperes exciting current	Watts core loss	Voltage on winding	Ohms d-c resistance ±15 percent
102	Voltage regulator	1–3	0. 2	6. 0	1–2=115±10 percent.	1–3=0. 49. 1–4=0. 90.
103	Low-voltage	1–2	0. 25	4. 1	3–5= 2. 28 4–5= 1. 14 6–8=39. 5	1–2=1. 6. 3–5=0. 004. 6–8=0. 38.
104	Filament transformer	1–2	0. 3	6. 0	3–5=12. 7 4–5= 6. 35 6–8= 2. 71 7–8= 1. 35	1–2=1. 2. 3–5=0. 02. 6–8=0. 01.
105	Plate transformer	1–2	1. 0	13. 0	3–5=2400 4–5=1200	1–2=0. 35. 3–5=90. 0.
		Inductance @ amperes d-c				D-c resistance
107	Reactor	0.04 henrys @ 2.4				0. 25±15 percent.
108	do	3.5/14.0 henrys @ 0.4/0.04				60. 0±15 percent.
109	do	7.0 henrys @ 0.4				60. 0±15 percent.

c. Rectifier RA-34-B.—(1) *Trouble chart.*—For information on the operation of the pilot lights and the voltmeters, study the trouble chart for the rectifier RA-34-B in *b* above.

Indication of trouble	Probable cause
(*a*) Transmitter filament circuit breaker opens with transmitter connected.	(*a*) Short circuit in filament circuit of transmitter or in connecting cord.
(*b*) Transmitter filament circuit breaker opens with transmitter disconnected.	(*b*) *1.* Short circuit in primary or secondary of transformer 236. *2.* Short circuit in the coil of relay 216. *3.* Short circuit in the cord.
(*c*) Control-rectifier circuit breaker opens with transmitter connected.	(*c*) Short circuit in control circuits of transmitter, or in connecting cord.
(*d*) Control rectifier circuit breaker opens with transmitter disconnected.	(*d*) *1.* Short circuit in cord. *2.* Faulty rectifier tube 225.1. *3.* Short circuit to ground in reactor 240.1 or 240.2, capacitor 231.1, resistor 228, or relay 215.
(*e*) Rectifier filament circuit breaker opens.	(*e*) *1.* Short-circuited filaments in rectifier tube 226.1 or 226.2. *2.* Short circuit in transformer 238, motor of relay 214, coil of relay 213, or blower 243.
(*f*) Plate circuit breaker opens with transmitter connected, but not when disconnected.	(*f*) Short circuit in cord or in transmitter.
(*g*) Plate circuit breaker opens with transmitter and cord disconnected.	(*g*) *1.* Short circuit in rectifier tube 226.1 or 226.2. *2.* Short circuit in ground in any part of high-voltage filter system.
(*h*) Control rectifier output voltage too high.	(*h*) *1.* Open bleeder resistor 228. *2.* Short circuit in reactor 240.1 or 240.2. With new rectifier tube, output voltage may be higher or lower than normal. Adjust by means of taps on primary of transformer 237.
(*i*) Plate voltage too high.	(*i*) Open bleeder resistor 230.

(2) *Continuity test for plug receptacles.*—Normal position; all circuit breakers off; main power switch off.

Reference No.	Terminal designation	Control position if not normal	Wire tracer color	Ohms	Connects to*	Probable cause of incorrect reading
201	Upper	Power switch closed	Black	0	206 lower	Open wire.
201	Lower	do	White	0	234–0	Do.
202	Left	do	Black	0	206 lower	Do.
202	Right	do	White	0	234–0	Do.
203	45		Green	0	228 rear 240.2 rear 215 lower left	Do.
203	46 and 54		Brown	0	223 left 236 front left	Do.
203	47 and 56		do	0	223 right 236 front right	Do.
203	53		Blue	0	Ground	Do.
203	56		Yellow	0	224 meg 239 left CT 230 front 232.1 left 232.2 right	Do.
203	57		Blue	0	215 lower right	Do.
204	61		Red	0	230 rear 229 rear 242 right	Do.

*All terminal locations are described from a position facing the front of the rectifier.

(3) *Typical voltages and currents.*—All measurements are made with no loads on rectifier.

Transmitter filament voltage	12. 0 volts a-c.
Control rectifier filament voltage	1. 98 volts.
Control rectifier plate to ground voltage	21 volts a-c.
Voltage across 240.1	5.9 volts a-c.[1]
Voltage across 240.2	less than 0.01 volt a-c.[1]
Control rectifier output	13. 5 volts d-c.
Current through 228	0. 265 ampere d-c.
Rectifier filament voltage	2. 4 volts a-c.
Rectifier plate to CT	1,265 volts a-c.
Voltage across 241	520 volts a-c.[2]
Voltage across 242	2 volts a-c.[2]
Plate output voltage	1,127 volts d-c. Using prod with resistor.
Current in 229	0. 021 ampere d-c.
Current in 230	0. 022 ampere d-c.
Current in 215	0. 160 ampere.

[1] Using series capacitor in meter.
[2] Using series capacitor.

46. Radio receiver BC–342–C.—See TM 11–850.

47. Power unit PE–75–( ).—See TM 11–900.

48. Remote control equipment RC–47–( ).—If this equipment does not appear to be operating properly, see that tested tubes are in the sockets, fresh batteries in the EE–8–A chassis, and all plugs in the proper jacks. If the trouble continues, study the following tables and use them as a guide in tracking it down.

a. Point-to-point voltage measurements, control unit RM–13–( ).— (Switch 311 in ON position.)

From	Part	To	Part	Voltage	Remarks
Term. No. 1	310	Term. No. 2	310	110 v a-c	
Term. -0	317	Term. 110	317	110 v a-c	
Term. 6.3–.6	317	Term. 6.3–.6	317	6.3 v a-c	Plus or minus 5 percent.
Term. 6.3–.45	317	Term. 6.3–.45	317	6.3 v a-c	Do.
Term. 30	317	Term. 30	317	30 v a-c	Do.
Term. GND	317	Term. 500	317	250 v a-c	Do.
Term. Lug No. 1	338	Ground	Chassis	0	
Term. Lug No. 2	338	Term. No. 7	338	6.3 v a-c	Do.
Term. Lug No. 3	338	Ground	Chassis	170 v d-c	Plus or minus 20 percent.
Term. Lug No. 4	338	Not used			
Term. Lug No. 5	338	Ground	Chassis	0	
Term. Lug No. 6	338	Not used			
Term. Lug No. 7	338	Term. No. 2	339	6.3 v a-c	Plus or minus 5 percent.
Term. Lug No. 8	338	Ground	Chassis	4.5 v	Plus or minus 20 percent.
Term. Lug No. 1	339	Not used			
Term. Lug No. 2	339	Term. No. 7	339	6.3 v a-c	Plus or minus 5 percent.
Term. Lug No. 3	339	Term. No. 5	339	500 v a-c	Do.
Term. Lug No. 4	339	Not used			
Term. Lug No. 5	339	Ground	Chassis	500 v a-c	Do.
Term. Lug No. 6	339	Not used			
Term. Lug No. 7	339	Term. No. 2	339	6.3 v a-c	Do.
Term. Lug No. 8	339	Ground	Chassis	265 v d-c	Plus or minus 20 percent.
+Term. rect	313	—Term. rect	313	23.5 v d-c	Do.
					Mic. switch depressed.
+Term. rect	313	Top of res	331	13.6 v d-c	Do.
+Term. cap	332	—Term. cap	332	12 v d-c	Do.
	333		333		
+Term. cap	324	do	324	4 v d-c	Plus or minus 40 percent.
	325		325		
+Term. cap	322	do	322	18 v d-c	Mic. switch depressed.
	323		323		
Bottom resistor	336	Ground	Chassis	170 v d-c	
Top resistor	330	do	do	220 v d-c	

b. Point-to-point resistance measurements, control unit RM–13–( ).

From	Part	To	Part	Control and position	Resistance
R. H. term. of	310	L. H. term. of	310	Switch part 311 OFF	Infinite.
R. H. term. of	310	do	310	Switch part 311 ON	8.65.
R. H. term. of	310	Ground	Chassis	do	Infinite.
Top term. Line–1	Post	Bottom term. Line–1	Post	No plugs in jacks	39.9
Top term. Line–1	do	Ground	Chassis	do	Infinite.
Top term. Line–2	do	Bottom term. Line–2	Post		126.0.

From	Part	To	Part	Control and position	Resistance
Top term. Line-2	Post	Ground	Chassis		60.0.
Bottom term. Line-2	do	do	do		60.0.
Tip of mic.-1	301	—of 1-v rect	313	Switch 312 in pos. 1	0.
Tip of mic.-1	301	Ground	Chassis	Switch 312 in any pos	Infinite.
Ring of mic.-1	301	Bottom term. of	341	Switch 312 in pos. 1	16.4.
Ring of mic.-1	301	Top term. of	341	Switch 312 in pos. 1	116.4.
Ring of mic.-1	301	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of mic.-2	302	—of 1-v rect	313	Switch 312 in pos. 2	0.
Tip of mic.-2	302	Ground	Chassis	Switch 312 in any pos	Infinite.
Ring of mic.-2	302	Bottom term. of	341	Switch 312 in pos. 2	16.4.
Ring of mic.-2	302	Top term. of	341	do	116.4.
Ring of mic.-2	302	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of mic.-3	303	—of 1-v rect	313	Switch 312 in pos. 3	0.
Tip of mic.-3	303	Ground	Chassis	Switch 312 in any pos	Infinite.
Ring of mic.-3	303	Bottom term. of	341	Switch 312 in pos. 3	16.4.
Ring of mic.-3	303	Top term. of	341	do	116.4.
Ring of mic.-3	303	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of key-1	304	—of 1-v rect	313	Switch 312 in pos. 1	0.
Tip of key-1	304	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of key-2	304	—of 1-v rect	313	Switch 312 in pos. 2	0.
Tip of key-2	305	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of key-3	306	—of 1-v rect	313	Switch 312 in pos. 3	0.
Tip of key-3	306	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of rec.-1	307	Terminal of	322-323	Switch 312 in pos. 1	0.
Tip of rec.-1	307	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of rec.-2	308	Terminal of	322-323	Switch 312 in pos. 2	0.
Tip of rec.-2	308	Ground	Chassis	Switch 312 in any pos	Infinite.
Tip of rec.-3	309	Terminal of	322-323	Switch 312 in pos. 3	0.
Tip of rec.-3	309	Ground	Chassis	Switch 312 in any pos	Infinite.
G. term. of	314	do	do		3380.
F. term. of	315	do	do		0.
P. term. of	315	B Terminal of	315		1670.
P. term. of	315	Ground	Chassis		67000.
6.3—.6 term. of	317	do	do		Infinite.
6.3—.45 term. of	317	do	do		0.
30 v term. of	317	do	do		Infinite.
500 v ct term. of	317	do	do		0.
500 v term	317	do	do		650.
Socket term. No. 1 of	338	do	do		0.
Socket term. No. 2 of	338	do	do		0.
Socket term. No. 3 of	338	do	do		66500.
Socket term. No. 4 of	338	do	do		Infinite.
Socket term. No. 5 of	338	do	do	With 326 in extreme ON pos.	5460.
Socket term. No. 6 of	338	do	do		Infinite.
Socket term. No. 7 of	338	do	do		0.
Socket term. No. 8 of	338	do	do		1,000.
Socket term. No. 1 of	339	do	do		Infinite.
Socket term. No. 2 of	339	do	do		Do.
Socket term. No. 3 of	339	do	do		650.
Socket term. No. 4 of	339	do	do		Infinite.
Socket term. No. 5 of	339	do	do		650.
Socket term. No. 6 of	339	do	do		Infinite.
Socket term. No. 7 of	339	do	do		Do.
Socket term. No. 8 of	339	do	do		66500.

c. Trouble location and remedy chart control unit RM-13-( ).

Indication	Probable source of trouble	Suggested test	Remedy
(1) Pilot bulb 318 does not light.	Power cord 365 not properly inserted.	----------	Plug into 110 v.
	Power cord 365 open	Check for continuity	Replace cord.
	Pilot light bulb 318 filament open.	------do----------	Replace 318.
	Power switch 311 open.	Short terminals	Replace 311.
	Power transformer 317 defective.	Measure term. voltages	Replace 317.
(2) V. I. meter 337 fails to indicate when microphone T-32 is operated in any position of selector switch.	Microphone T-32 defective.	Check from tip to sleeve and ring to sleeve. Should be open.	Substitute a new T-32.
	Mic. jacks defective—301, 302, 303.	Check from ring to GND. Should be open. Check from tip to GND. Should be open.	Replace jack.
	Open on switch 312 (white coded lead).	Push switch contact down with pencil.	Replace 312 if contact cannot be adjusted.
	Open on switch 312 (No. 12 black lead).	Push switch contact down with pencil.	Do.
	Key plug placed in rec. jack 307, 308, 309.	----------	Interchange plugs.
	No microphone voltage.	Across 335 voltage should be 12 volts push-to-talk mic. sw. operated.	Check 331 for open.
		Cross 325 voltage should be 4 volts push-to-talk mic. sw. operated.	Check 313 for d-c output. Check 324, 325 for short.
	No plate voltage on 338.	From 338 socket contact No. 3 to GND. Voltage should be 170 v.	Check 341 for open. Check 320 for short.
		From—side of 321 to GND voltage should be 210 v.	Check 321 for short.
		From 339 socket contact No. 8 to GND. Voltage should be 240 v.	Replace tube 339.
		From 500-500 term. on 317 voltage should be 500 v. a-c.	Replace 317 if pri. volts are 110 and no sec. voltage.
(3) V. I. meter 337 fails to indicate when microphone T-32 is operated in one or two switch positions but functions satisfactorily in remaining positions.	One or two mic. jacks defective 301, 302, 313.	Check from ring to GND. Should be open.	Replace jack.
		Check from tip to GND. Should be open.	Do.
	Open ON switch 312 (green coded leads).	Push switch contact down with pencil.	Replace 312 if contact cannot be adjusted.
	Open ON switch No. 312 (blue coded leads).	------do----------	Do.

Indication	Probable source of trouble	Suggested test	Remedy
(4) V. I. meter 337 indicates up scale with no audio input and volume control 326 does not change meter reading.	Ground on one side of 1 line.	Check continuity between case and line 1. Should be open.	Disconnect external line. If meter returns to normal, ground is on line. If meter does not return to normal, ground is in control unit RM-13-( ). Check circuit.
	Poor contact on mic. plug.	Check jack springs on 301, 302, and 303 for tension.	Clean plug, adjust jack springs.
(5) V. I. meter 337 indicates irregularly when volume control 326 is operated.	Defective volume control.	Irregular output on meter 337.	Replace 326.
(6) V. I. meter 337 swings violently when key is operated.	Ground on one side of line 1.	Check continuity between case and line 1. Should be open.	Disconnect external line. If meter returns to normal, ground is on line. If meter does not return to normal, ground is in control unit RM-13-( ). Check circuit.
(7) Resistor 331 overheats.	Key plug placed in rec. jack 307, 308, 309.	----------	Interchange plugs.
	Capacitor 322, 323 defective.	Check continuity across capacitors. Should be 43 ohms.	Replace 324, 325.
(8) If rec.-disabling relay voltage does not appear at any jack tip terminals of 307, 308, 309 when microphone T-32 is operated.	Open on switch 312 (brown coded lead). No rec.-disabling voltage across 335. Voltage should be 12-18 volts d-c.	Push sw. contact down with pencil.	Replace 312 if it cannot be adjusted.
		Check 322, 323 for short. Should be 43 ohms.	Replace 322, 323.
	331 open----------	Check IR drop across resistor. Should be 12 volts.	Replace 331.
	313 defective----------	Check a-c input volts to 313. If 30 volts a-c and no d-c output.	Replace 313.
	Receiver jacks 307, 308, 309 defective.	Check continuity to GND.	Replace jacks 307, 308, 309.
(9) If rec.-disabling relay voltage does not appear at one or two jack tip terminals 307, 308, 309 but is normal on other positions.	Open on switch 312 (yellow coded leads).	Push sw. contact down with pencil.	Replace 312 if it cannot be adjusted.
	Receiver-disabling jacks 307, 308, or 309 defective.	Check tip jack springs to ground. Should be open circuit.	Replace jacks 307, 308, 309.

d. Point-to-point resistance measurements, control unit RM-12-( ).

From	Part	To	Part	Control and position	Resistance
Top term. Line-1	Post	Bottom term. Line-1	Post		15.8.
Top term. Line-1	do	Ground	Chassis		Infinite.
Top term. Line-2	do	Bottom term. Line-2	Post		125.
Top term. Line-2	do	Ground	Chassis		Infinite.
Top term. Line-1	do	Top term. Line-2	Post		3550.
Tip of mic. jack	201	Tip of plugs	203-204	Switch 205 in local pos	0.
Tip of mic. jack	201	Ring of plug	203	do	0.
Tip of key jack	202	Tip of plugs	203-204	do	0.
Ring of mic. jack	201	do	203-204	Switch 204 in remote pos	Infinite.
Ring of mic. jack	201	Ring of plug	203	do	Do.
Tip of key jack	201	Tip of plugs	203-204	do	Do.
Tip of plugs	203, 204	Ground	Chassis	Switch 205 in remote; Relay part 206 open	Infinite.
Tip of plugs	203, 204	do	do	Switch 205 in remote; Relay part 206 closed.	0.
Ring of plug	203	-Term. of cap	208	Switch in remote pos	Infinite.
-Term. of cap	213	Ground	Chassis		40.
-Term. of cap	213	do	do	Relay 206 open	Infinite.
-Term. of cap	213	do	do	Relay 206 closed	0.
-Term. of cap	208	do	do	Vol. control 209 full on	7.7.

NOTE.—No circuit to ground from ring or tip springs of jacks in any switch position.

e. Trouble location and remedy chart, control unit RM-12-( ).

Indication	Probable source of trouble	Suggested test	Remedy
(1) Armature on relay 206 operated from control unit RM-13-( ) but does not key radio transmitter BC-191-C.	Plug 203 or 204 dirty or not properly inserted.		Clean plugs and properly insert.
	Contacts on relay 206 dirty.	Short across relay contacts. If radio transmitter functions the relay contacts are dirty.	
	Switch 205 in local position.		Throw switch to remote position.
	Switch 205 defective	Short from center to bottom terminals of 205. If radio transmitter functions the switch is defective.	Replace switch 205.
(2) Armature on relay 206 does not operate when control unit RM-13-( ) is keyed.	Contacts on relay 206 adjusted too close.	Back off on stationary contact adjustment screw.	Readjust relay 206 contacts.
	Line 1 and line 2 not connected or open.		Connect tested lines.
(3) Excessive sparking and burning on contacts of relay 206.	Keying capacitor 213 defective.	Check capacitance	Replace 213.
	Surge resistor 214 open	Check resistance	Replace 214.

Indication	Probable source of trouble	Suggested test	Remedy
(4) V. I. meter 207 indicates but radio transmitter is not modulated.	Switch 205 in local position.	----------	Throw switch.
	Switch 205 defective	Short from center to bottom terminals of 205. If radio transmitter functions the switch is defective.	Replace switch 205.
	Plug 203 dirty or not properly inserted.	----------	Clean and properly insert.
(5) V. I. meter 207 does not function when control unit RM-13-( ) is operated.	Open modulator line 1	Check line 1	Repair line.
	Defective volume control 209.	Operate 209 over complete travel and check for open winding.	Replace 209.
	Short between ring and ground in plug 203 or radio transmitter.	Remove plugs from radio transmitter. If meter functions then ground is in transmitter.	
		If meter fails to function when plug 203 is removed failure is in control unit RM-12-( ).	Check ring circuit for ground.
	Defective meter 207	Substitute new meter	Replace 207.
(6) V. I. meter 207 indicates off scale with no incoming signal from control unit RM-13-( ).	Capacitor 208 shorted and d-c mic. supply from radio transmitter is leaking across 207.	Check for d-c resistance of 208. Should be open with 205 in local position.	Replace 208 if defective.
	Radio transmitter BC-191-C incorrectly placed on "tone" instead of voice.	----------	Change radio transmitter modulation switch.
(7) V. I. meter 207 cannot be correctly "tracked" with V. I. meter in control unit RM-13-( ).	Loss too high in modulation line.	----------	Reduce loss.
	Input impedance to modulator of radio transmitter too low.	----------	Check radio transmitter.
(8) Radio transmitter cannot be modulated or keyed in local position of 205.	Plug 203 or 204 dirty or not properly inserted.	----------	Clean and properly insert.
	Defective jacks 201 or 202.	Check d-c resistance from tip and ring springs to ground with switch 205 in remote position and plugs 201 and 202. Circuit should be open.	Replace jack.
	Switch 205 defective	Short from center to top terminals. If radio transmitter functions the switch is defective.	Replace 205.

f. Resistance measurements, transformer windings.

Reference No.	Name of part	Winding	From terminal	To terminal	Resistance	
					High	Low
210	Transformer	Primary	500 left	Center tap	9.3	7.7
		do	500 right	do	8.4	6.8
		Secondary	150 right	150 left	7.8	6.4
211	Transformer (repeat coil).	Primary	500 left	Center tap	73.1	59.9
		do	500 right	do	66.0	54.0
		Secondary	500 left	500 right	110	90
314	Transformer	Primary	Pri. left	Pri. right	13.1	10.7
		Secondary	G	F	3850	3150
315	do	Primary	P	B	1740	1420
		Secondary	500 left	Center tap	19.1	16.2
		do	500 right	do	22.0	18.0
316	Transformer (repeat coil).	Interchangeable with part 211 above. For resistance data see part No. 211.				
317	Transformer (power).	Primary	0	110	18.5	15.1
		Secondary	6.3-.45 left	6.3-.45 right	.62	.50
		do	6.3-.6 left	6.3-.6 right	.62	.50
		do	500 left	Center tap	715	585
		do	500 right	do	720	600
		do	30 left	30 right	2.7	2.3
341	Reactor		Left term	Right term	110	90

SECTION V

LIST OF PARTS

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49. Radio set SCR-188-A.—In the following lists, weights and dimensions when inappreciable are omitted.

a. Radio set SCR-188-A, less remote control equipment RC-47-( ).

Quantity	Article	Dimensions (inches)*				Unit weight (pounds)
		Height	Length	Width	Depth	
1	Adapter, socket (table tap) with 5-foot cord and plug, Hubbell No. 7900, or equal.					0.6
5	Antenna AN-22-A		20 ft.			.56
1	Antenna AN-23-A		35 ft.			.74
1	Antenna AN-25		5 ft.			.37

*Dimensions in inches except where shown otherwise.

Quantity	Article	Dimensions (inches)				Unit weight (pounds)
		Height	Length	Width	Depth	
2	Antenna AN–26		25 ft.			0.62
1	Antenna AN–27		10 ft.			.44
2	Block FT–127; spare					.16
1	Box BX–8 (for BC–191–C spare tubes)	9⅞		8⅜	7⅞	6.25
1	Box, outlet 4-inch G. E. No. SP5415½					.75
5	Case CS–48 (for transmitter tuning units)	7⅞		16¾	8	4.25
1	Chest CH–27–A (for BC–191–C)	29½		42⅜	16¼	59
1	Chest CH–30 (for antenna parts)	16		46	12	68
2	Chest CH–32–A (for CS–48)	19		30	11½	30
1	Chest CH–56 (for BC–342–C)	12		24	12	25
1	Chest CH–57–( ) (for RA–34–( ))	22		35⅝	22	75
4	Cord CD–133–A; 2 in use, 2 spare (connects J–47).		16			.09
1	Cord CD–151 (connects RA–34–A to BC–191–C).					2
1	Cord CD–152 (connects RA–34–A to BC–191–C).					2
2	Cord CD–370 (connects RA–34–A and BC–342–C to power).					1
1	Cord CD–415 (connects PE–75–A to RA–34–A).					8
6	Fastener FT–9; 3 in use, 3 spare					.08
6	Fitting FT–128; spare					.01
6	Fuse FU–12–A (or FU–12); spare					.04
2	Fuse FU–21–A; spare					.04
3	Fuse FU–27; spare					
4	Guy GY–21–A					.31
4	Guy GY–22–A					2.72
2	Guy GY–23–A					2.09
2	Guy GY–24–A					1.59
2	Guy GY–30					2.09
2	Hammer HM–1					2.00
2	Headset P–18; 1 in use, 1 spare					1.13
20	Insulator IN–86; 15 in use, 5 spare					.17
2	Key J–47; 1 in use, 1 spare					.5
5	Lamp LM–27; spare					.04
8	Leg LG–10		31½	3 in. dia.		2.00
4	Mast base MP–19; 2 in use, 2 spare					1.15
14	Mast section MS–44; 12 in use, 2 spare		66			4.18
2	Microphone T–17; 1 in use, 1 spare					.87
1	Power unit PE–75–( )					310.00
1	Radio receiver BC–342–C; includes 1 Rectifier RA–20. 3 Fuses FU–21–A (10-amp.); 2 in use, 1 spare. 1 Fuse FU–27 (2-amp.). 2 Lamps LM–27 (dial). 1 Mounting FT–162.					47.5

Quantity	Article	Dimensions (inches)				Unit weight (pounds)
		Height	Length	Width	Depth	
1	Radio transmitter BC-191-C; includes 3 Fuses FU-12-A (.5-amp.); 1 in use, 2 spare. 1 Lamp LM-27 (pilot). 1 Mounting FT-151-A. 1 Socket cap M-163-A. 1 Socket cap M-164-A. 1 Socket cap M-165-A. 2 Wrenches (set-screw).					52.0
1	Receptacle, duplex convenience outlet with 4-inch box cover Hubbell No. 9206.					.3
1	Rectifier RA-34-( )					240.0
4	Reel RL-3; spare					1.0
50 ft	Rope RP-3; spare					.6
20	Snap FT-126; spare					.06
1	Socket cap M-163-A (additional for BC-191-C).					.04
1	Socket cap M-165-A (additional for BC-191-C).					.04
16	Stake GP-2; 14 in use, 2 spare		16			1.25
3	Stake GP-8		18			1.0
4	Strap ST-18		44			.40
1	Transmitter tuning unit TU-5-A (1500-3000 kc).	7⅝		16¾	8¾	14.50
1	Transmitter tuning unit TU-6-A (3000-4500 kc).	7⅝		16¾	8¾	12.50
1	Transmitter tuning unit TU-7-A (4500-6200 kc).	7⅝		16¾	8¾	10.5
1	Transmitter tuning unit TU-8-A (6200-7700 kc).	7⅝		16¾	8¾	10.5
1	Transmitter tuning unit TU-9-A (7700-10000 kc).	7⅝		16¾	8¾	10.5
1	Transmitter tuning unit TU-10-A (10000-12500 kc).	7⅝		16¾	8¾	10.5
2 sets	Tubes, for rectifier RA-34-A	7⅝		16¾	8¾	2.0
8	Tube VT-4-C; 4 in use, 4 spare (transmitter)					.47
2	Tube VT-25; 1 in use, 1 spare (transmitter)					.37
4	Tube VT-65; 2 in use, 2 spare (receiver)					.10
2	Tube VT-66; 1 in use, 1 spare (receiver)					.10
8	Tube VT-86; 4 in use, 4 spare (receiver)					.10
2	Tube VT-87; 1 in use, 1 spare (receiver)					.10
2	Tube-VT-88; 1 in use, 1 spare (receiver)					.10
2	Tube VT-97; 1 in use, 1 spare (receiver)					.10
150 ft	Wire W-29					2.1
15 ft	Wire W-128					1.5
2 lengths	Wire, copper, No. 10 AWG, stranded, medium-drawn, weatherproof braid; G. E. Co. line wire, or equal, 1,500 feet long on standard commercial metal reel.					200

b. Components of remote control equipment RC-47-( ).

Quantity	Article	Dimensions (inches)			Unit weight (pounds)
		Height	Width	Depth	
1	Axle RL-27-A				6
12	Battery BA-30; 4 in use, 8 spare				.25
1	Chest CH-54-A (empty)	13	18	13⅝	19
1	Chest CH-55-A (empty)	13	18	13⅝	25
1	Control unit RM-12-( )				22
1	Control unit RM-13-( )				30.5
3	Cord CD-133-A				.09
3	Cord CD-366				
6	Headset P-18				1.13
3	Key J-47				.5
2	Microphone T-32				2.5
2	Tube VT-65; 1 in use, 1 spare				.10
2	Tube VT-126; 1 in use, 1 spare				.10
4,000 ft	Wire W-110-B on 2 reels DR-4				72

50. Radio transmitter BC-191-C, replaceable parts.—See TM 11-800.

51. Rectifier RA-34-A, replaceable parts.

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer*
101		Switch	Micro switch type G-RS			
			Ref. No. 101-1	Safety interlock		14
			Ref. No. 101-2	do		
102		Transtat	Spec. 28367	Voltage regulator		1
103		Transformer	Spec. 28369	Low-voltage plate and fil.		1
104		do	Spec. 28368	Fil. a-c and high-volt. rect.		1
105		do	Spec. 28371	High-voltage plate		1
106						
107		Reactor	Spec. 28370			
			Ref. No. 107-1	Low-voltage input		1
			Ref. No. 107-2	Low-voltage filter		
108		do	Spec. 28372	High-voltage input		1
109		do	Spec. 28373	High-voltage filter		1
110		Capacitor	Solar S-9183; 4000-μf, 35 wv.			15
			Ref. No. 110-1	Low-voltage filter		
			Ref. No. 110-2	do		
111		do	No. XLUNW-20-5 5 μf, 2000 wv.			15
			Ref. No. 111-1	High-voltage filter		
			Ref. No. 111-2	do		
112		Rectigon	No. 289415			16
			Ref. No. 112-1	Low-voltage rectifier		
			Ref. No. 112-2	do		

*For identification of manufacturers see paragraph 56.

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer
113		Tube VT-46-A	Mercury vapor per U. S. Army Spec. 71-746 (equivalent of 866-A).			
			Ref. No. 113-1	High-voltage rectifier		
			Ref. No. 113-2	do		
114		Ind. lamp	No. 2243846 P-2	Fil. indicator		8
			No. 2280689 G-3			
116		Voltmeter IS-161	Mod. 476, 0-15 v, a-c	Fil. voltage		17
117A		Voltmeter IS-162	Mod. 301, 0-1.5 v, d-c	Plate voltage		17
117B		Resistor		Multiplier		
118		do	Type CHD 63220E; 25,000-ohm, 80-watt.	High-voltage bleeder		9
119		Receptacle	Type UR	Input line		3
120		do	Type TL 7210	do		3
121		Switch	4962-BL	do		3
122		Push button	4984157 G2	"Off" button		8
123		do	4984157 G1	"On" button		8
124		Relay	No. 1008539	Plate control		16
125		do	No. A-3296	Remote control		5
126		Socket SO-39	Plug receptacle	High-voltage output	SC-D-457	
127		Socket SO-41	do	Low-voltage output	SC-D-457	
128		Relay	No. TD2/303	Time delay		6
129		Circuit breaker	No. 04-11-6 Strato	Plate protection		10
130		do	No. 04-11-3 Strato	Fil. protection		10
131		Socket	No. 50715			8
			Ref. No. 131-1	Low-voltage rect		
			Ref. No. 131-2	do		
132		do	No. 209SB			12
			Ref. No. 132-1	High-voltage rect		
			Ref. No. 132-2	do		
133		Socket	No. RS-4			2
			Ref. No. 133-1	Low-voltage cap		
			Ref. No. 133-2	do		
134		Binding post	No. 15, finish per S-47593	Ground connection		7
135		Resistor	No. A-2; 230 v, 500 w			4
			Ref. No. 135-1	Heater for ref. No. 113-1.		
			Ref. No. 135-2	Heater for ref. No. 113-2.		
136		Thermostat		Control of ref. No. 135		
137		Bushing	No. S-26671-G1	Link connection		1
138		Link	No. S-47651-Pt-1	Link		1
139		Insulator	Type 348, 1½ inches long	Resistor support		11
140		Fuse clip	60-ampere, 600 v, finish per S-47593.	Resistor connection		13

52. Rectifier RA-34-B.

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer*
----	------	Cord CD-370	Power cord	Connection of input power.	SC-D-4195B	18
----	------	Cord CD-151	Low-voltage cable	Connects all low-voltage outputs of rectifier to transmitter.	SC-D-1341G	37
----	------	Cord CD-152	High-voltage cord	Connects high voltage to transmitter.	SC-D-1342K	37
201	------	Emergency socket	Type 7210	Power input socket	----------	26
202	------	Power socket	Type 6808	do	----------	26
203	------	Socket SO-41	Low-voltage receptacle.	Provides all low-voltage outputs.	SC-D-457I	37
204	------	Socket SO-39	High-voltage socket.	Provides high-voltage power connection.	SC-D-457I	37
205	------	Power switch	Type 8620	Controls all power input.	----------	20
206	------	Interlock switch	Micro switch YZRL-8.	Removes all power when door is open.	----------	14
207	------	Line voltage link	Link panel on bakelite plate.	To change from 105-125 to 210-250 volt input.	R. R. A-144-59	32
208	------	Plate voltage adjusting switch.	No. 111-5	To permit adjustment of plate voltage for variation in line voltage.	----------	30
209	------	Plate start-stop switch	Type 1615	Monitory push button, motor-starting type. To control application of plate voltage.	----------	20
210	------	Tube heater thermostat	Type C-4351-18, open 80°, closed 70°.	To control application of power to tube heaters.	----------	34
211	------	Plate thermostat	Type C-4351-18, open 55°, closed 65°.	To control application of plate power.	----------	34
212	------	Blower thermostat	Type C-4351-17, open 75°, closed 85°.	To control application of power to blower.	----------	34
213	------	Plate start-stop relay	Type 131-642 modified.	To control application of plate power.	R. R. Spec. 429-102.	32
214	------	Time-delay relay	Synchronous motor-driven timer.	To relay application of plate voltage until filaments are preheated.	R. R. Spec. 429-103.	32
215	------	Plate control relay	Type 106-311	To control application of plate voltage.	----------	39
216	------	Plate interlock relay	Type 106-612	To prevent application of plate voltage upon opening of 217 or 218.	----------	39

*For identification of manufacturers see paragraph 57.

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer
217	------	Transmitter filament circuit breaker.	Type 0111, 1.9-ampere stratosphere oil.	To protect transmitter filament circuit.	------	10
218	------	Control rectifier------	Type 0111, 1-ampere stratosphere oil.	To protect control rectifier circuit.	------	10
219	------	Rectifier filament circuit breaker.	Type 0111, 1.15-ampere stratosphere oil.	To protect rectifier filament circuit.	------	10
220	------	Plate circuit breaker---	Type 0111, 5.25-ampere stratosphere oil.	To protect plate circuit.	------	10
221	------	Power pilot------	Dial light model 100–S, green.	To indicate application of input power.	------	22
222	------	Plate pilot------	Dial light model 100–S, red.	To indicate application of plate power.	------	22
223	------	Filament voltmeter-----	Model 476, 15-volt full scale.	To meter filament voltage.	S. C. type IS–161	17
224	------	Plate voltmeter------	Model 301, 24 ma. full scale, scale reading 0–1200 volts.	To meter plate voltage.	S. C. type IS–168	17
225	------	Control rectifier tube---	Tungar, type 199698	To provide 12-volts d-c output.	------	24
226	------	High-voltage rectifier tube.	Tube VT–46–A---	To provide 1,000 volts d-c output.	------	31
227	------	Tube heater------	100-watt special---	To heat mercury tubes in low ambient temperatures.	R. R. drawing B–131–70A.	38
228	------	Control rectifier bleeder resistor.	50-ohm, 10-watt---	Bleeder on control rectifier.	Navy Spec. RE–13A–372J, style E, class 2 grade 1.	39
229	------	Plate voltmeter multiplier resistor.	50,000-ohm, 50-watt.	Bleeder and multiplier for plate voltmeter.	Navy Spec. RE–13A–372J, style B, class 2 grade 1,—1 percent.	----
230	------	Plate rectifier bleeder resistor.	------do------	Bleeder on high-voltage rectifier.	Navy Spec. RE–13A–372J, style B, class 2 grade 1.	39
231	------	Control rectifier filter capacitor.	Solar, dual, 3500-μf, plug-in electrolytic.	To provide filtering of control rectifier output.	------	15
232	------	Plate rectifier filter capacitor.	Solar, 6-μf, 2,000-volt.	To provide filtering of high-voltage rectifier output.	S. C. Spec. 71–516D.	15
233	------	Plate rectifier filter reactor tuning capacitor.	Solar, 1.02 μf±5 percent, 1,000-volt.	To tune reactor 242 to 120 cycles.	------do------	15
234	------	Autotransformer------	Type S–12936-----	To permit operation from 105–125 to 210–250 volts.	------	27

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer
235		Filament voltage control variac.	Type 200-CU	To permit adjustment of filament and control rectifier inputs to 115 volts.		25
236		Transmitter filament transformer.	Type S-12937	To provide 12-volt a-c output.		27
237		Control rectifier transformer.	Type S-13106	To provide 12-volt d-c output.		27
238		Plate rectifier filament transformer.	Type S-12938	To supply filaments of VT-46-A tubes.		27
239		Plate transformer	Type S-12941	To provide 1,000-volt d-c output.		27
240		Control rectifier filter reactor.	Type S-13184	To filter 12-volt d-c output.		27
241		Plate input filter reactor.	Type S-12942	To filter 1,000-volt, d-c output.		27
242		Plate output filter reactor.	Type S-12943	do		27
243		Blower	826-J	To provide forced ventilation.		33
244		Ground binding post		To provide a ground connection.		7
245		Air filter	9 x 9 x ¼, permanent type.	To prevent entrance of dust and dirt.		19, 32
246		Chest	Per R. R. Spec. 429-104.	To contain rectifier, cords, etc.		23, 35

THE FOLLOWING MATERIAL IS ALSO AVAILABLE FROM SPARE PARTS KITS PURCHASED ON CONTRACTS FOR THESE RECTIFIERS

		50-watt resistor mounting		To mount 229 and 230		32
		10-watt resistor mounting		To mount 228		32
		Insulator	Type No. 1086	To mount 229 and 230		18
		do	Type No. 1647	To mount 228		18
		Handles	Type No. 1205N5	Carrying handles for rectifier.		36
		do	A-144-48	Front panel handles		32
		Knobs	Type S311-3L	Variac knob and plate voltage adjusting switch knob.		28
		Pilot lamps	Type S-6	For 221 and 222		8
		Screws	A-3706-3	To mount 234, 239 and 241.		32
		do	A-3706-4	To mount panels and shields.		32
		Sockets	Type CIR-4	For tubes VT-46-A and plug-in electrolytics.		29
		do	Type No. 28795	Tungar sockets		20

53. Radio receiver BC–342–C.—See TM 11–850.

54. Power unit PE–75–( ).—See TM 11–900.

55. Remote control equipment RC–47–( ).—*a. Control unit RM–12–( ).*

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer*
201		Jack JK–33–A	3-conductor	Microphone jack	SC–D–2332–E	37
202		Jack JK–34–A	2-conductor	Key jack	SC–D–2339–E	37
203		Plug PL–68	Microphone	Connects control unit to transmitter.	SC–D–375–F	
204		Plug PL–55	Key	do	SC–D–339–H	
205		Switch	D.P.D.T. toggle, No. 209050.	Remote–local		
206		Relay	Keying relay No. 220C38	Keying	A–1323–1	
207		Volume indicator meter.	Type 22, model No. 301, 3½-inch, flush bakelite case.	Volume indicator		17
208		Capacitor	Type Dy., 10-μf, 25-v electrolytic.	D-c blocking		15
209		Volume control	200/200-ohm cont. variable, T-type.	Volume control		41
210		Transformer	Line-matching, No. 46797	Line trans		45
211		Transformer	Ringing, No. 47764	Repeat coil		45
212		Telephone	EE–8–A, chassis only	Local tel	SC–D–1783–D	
213		Capacitor	Type Dy., 8-μf, 250-v electrolytic.	Key capacitor		15
214		Resistor	Bw-½, 40-ohm	Surge resistor		41
252		Bushing	Mic. and key cord clamp	Cord clamp	A–1315–1	
255		Post	Line binding post admiral P–3.	Binding post		7
265		Strap	Strap for TS–9–( )	Strap	B–1322–1P1	
269		Thumbscrew	Panel thumbscrew	Thumbscrew	A–1314–1	
292		Knob control	Vol. control knob	Knob	A–1220–1P2	

*For identification of manufacturers see par. 56.

b. Control unit RM–13–( ).

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer*
301		Jack JK–33–A	3-conductor	Connects microphone to control unit.	SC–D–2332–E	37
302		do	do	do	SC–D–2332–E	37
303		do	do	do	SC–D–2332–E	37
304		Jack JK–34–A	2-conductor	Connects key to control unit.	SC–D–2339–E	37
305		do	do	do	SC–D–2339–E	37
306		do	do	do	SC–D–2339–E	37

*For identification of manufacturers see par. 56.

Reference No.	Stock No.	Name of part	Description	Function	Drawing No.	Manufacturer
307		Jack JK-34-A	2-conductor	Rec.-dis. jack	SC-D-2339-E	37
308		do	do	do	SC-D-2339-E	37
309		do	do	do	SC-D-2339-E	37
310		Plug	110-v, No. 6808	Power inlet		7
311		Switch	S.P.S.T. toggle, No. 20994-BQ.	Power switch		20
312		do	3-pole, 3-pos. BBM ceramic, No.18433-QHC.	Selector switch		43
313		Rectifier	8-plate selenium, 9D0191	L-v rect		42
314		Transformer	Mic. to grid, No. 46799	Input trans		45
315		do	Plate to line, No. 46800	Output		45
316		do	Ringing, No. 47764	Repeat coil		45
317		do	Power transformer, No. 46801.	Power trans		45
318		Pilot light	6.3-volt, 15-ampere min. base.	Indicator		40
319 320		Capacitor	Type Dy., 3-section electrolytic, 2 μf 25 v., 10-10 μf 450 v.	By-pass filter		15
321 322 323		do	2-section electrolytic, 1200-1200 μf 50 v.	L-v filter		15
324		do	2-section electrolytic, 1200-1200.	do		15
325			μf 50 v			
326		Volume control	Type CS, 75000 ohms	Audio volume		41
327		Resistor	Type BT-½, 1000 ohms	Cathode resistor		41
328		do	Type BT-½, 13500 ohms	Meter mult		41
329		do	Type AB, 5000 ohms	H-v filter		41
330		do	Type AB, 5000 ohms	do		41
331		do	Type DJ, 24 ohms	do		41
335		do	Type DJ, 50 ohms	do		41
336		do	Type BT-½, 65000 ohms	do		41
337		Volume indicator.	Type 20, model 301, 3½ flush bakelite case.	Volume indicator		17
338		Tube VT-65	Commercial type 6C5	Amplifier		31
339		Tube VT-126	Commercial type 6X5	Rectifier		31
340		Telephone EE-8-A.	Chassis only	Local tel	SC-D-1783-D	
341		Reactor	No. 49852	L-v reactor		45
350		Socket	MIP-8 special	VT-65 socket		2
351		Socket	do	VT-126 socket		2
353		Mtg. ring	Capacitor mounting ring.	Mtg. ring	A-1320-1	15
358		Jewel and bracket.	Pilot light mtg. type 510-F, red.	Indicator		44
365		Cord	Power cord	Power cord		21
369		Knob	Pos. switch knob	Knob	A-1220-1 P3	
381		Post	Line binding post admiral P-3.	Binding post		7
384		Strap	Strap for TS-9-( )	Strap	B-1322-1	
387		Thumbscrew	Panel thumbscrew	Thumb	A-1314-1	
404		Knob	Vol. control knob	Knob	A-1220-1 P2	

56. List of manufacturers.

No.	*Name and address*
1	American Transformer Co., 178 Emmet St., Newark, N. J.
2	American Phenolic Co., 1250 Van Buren St., Chicago, Ill.
3	Bryant Electric Co., 1421 State St., Bridgeport, Conn.
4	E. L. Weigand Co., 7544 Thomas Blvd., Pittsburgh, Pa.
5	C. P. Clare & Co., Lawrence & Lamon Aves., Chicago, Ill.
6	R. W. Cramer Co., Centerbrook, Conn.
7	Hugh H. Eby, Inc., 4700 Stenton Ave., Philadelphia, Pa.
8	General Electric Co., Dept. 166–EBR, Incandescent Lamp Dept., Nela Park, Cleveland, Ohio.
9	Hardwick-Hindle, Inc., 40 Hermon St., Newark, N. J.
10	Heineman Circuit Breaker Co., 98 Plum St., Trenton, N. J.
11	Isalantite, Inc., 343 Cortland St., Belleville, N. J.
12	E. F. Johnson Co., Waseca, Minn.
13	Lexington Electric Products Co., 12 Chapel St., Newark, N. J.
14	Micro Switch Corporation, Freeport, Ill.
15	Solar Manufacturing Corp., 586 Avenue A, Bayonne, N. J.
16	Westinghouse Electrical & Manufacturing Co., East Pittsburgh, Pa.
17	Weston Electrical Instrument Corp., 621 Frelinghuysen Ave., Newark, N. J.
18	American Lava Corp., Chattanooga, Tenn.
19	Amirton Co., 60 E. 42nd St., New York, N. Y.
20	Arrow, Hart & Hegeman Elect. Co., 103 Hawthorne St., Hartford, Conn.
21	Belden Manufacturing Co., 4647 W. Van Buren St., Chicago, Ill.
22	Dial Light Co. of America, 136 Liberty St., New York, N. Y.
23	H. Dietz Company, 45–47 Dobbin St., Brooklyn, N. Y.
24	General Electric Co., West Lynn, Mass.
25	General Radio Co., 30 State St., Cambridge, Mass.
26	Harvey Hubbell, Inc., Bridgeport, Conn.
27	Kenyon Transformer Co., Inc., 840 Barry St., New York, N. Y.
28	Kurz Kasch Company, 220 E. 23rd St., New York, N. Y.
29	National Company, Inc., 61 Sherman St., Malden, Mass.
30	Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago, Ill.
31	RCA Manufacturing Co., 415 S. 5th St., Harrison, N. J.
32	Radio Receptor Co., Inc., 251 W. 19th St., New York, N. Y.
33	F. A. Smith Mfg. Co., Inc., Rochester, N. Y.
34	Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.
35	Standard Arts, Inc., 543 Union St., Brooklyn, N. Y.
36	Stanley Works, New Britain, Conn.

No.	*Name and address*
37	A. J. Ulmer, 90 West Broadway, New York, N. Y.
38	Waage Electric Co., 125 Church St., New York, N. Y.
39	Ward Leonard Electric Co., Mount Vernon, N. Y.
40	General Electric Co., Schenectady, N. Y.
41	International Resistance Corp., Philadelphia, Pa.
42	International Telephone Development Co., Inc., 37 Varick St., New York, N. Y.
43	Oak Mfg. Co., 60 Clybourn Ave., Chicago, Ill.
44	Signal Indicator Corp., 140 Cedar St., New York, N. Y.
45	United Transformer Corp., 150 Varick St., New York, N. Y.

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

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