TM 11-311

WAR DEPARTMENT TECHNICAL MANUAL

TEST EQUIPMENT 1E-17-E

WAR DEPARTMENT • *MAY 1943*

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WAR DEPARTMENT
Washington, May 7, 1943

TEST EQUIPMENT IE-17-E

CONTENTS

ILLUSTRATIONS

DESTRUCTION OF ABANDONED MATERIEL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

MEANS:

1. Explosives, when provided.
2. Hammers, axes, sledges, or whatever heavy objects are readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.

PROCEDURE:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connecting means and meters.
4. Rip out all wiring in electrical equipment. Smash water-cooling, gas and oil systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.

DISPOSAL:

1. Where possible, and when time permits, bury all debris or dispose of it in streams or other bodies of water.

SAFETY NOTICE

The voltages encountered when using this equipment are not high enough to be injurious.

Turn the MASTER SWITCH on the Test Unit to OFF before changing batteries or harness terminal board connections, when Test Unit is not in use and before starting any service work on the Test Unit.

Figure 1—Test Equipment IE-17-E, Components

Section I

DESCRIPTION

1. General.

a. Test Equipment IE-17-E is used for testing and alignment of Radio Receiver and Transmitter BC-611, testing of the receiver and transmitter crystals, and measurement of voltages of Batteries BA-37 and BA-38 used in Radio Receiver and Transmitter BC-611.

b. Components.—This equipment weighs 20 pounds minus batteries and consists of the following components:

Quantity	*Component*	*Dimensions (Inches)*			*Weight (Pounds)*
		Height	*Width*	*Depth*	
1	Antenna A-82-A (Artificial)	4½	6½	13 (Includes Antenna Capacitor Control)	1.4
1	Test Case CS-81-E	12¾	3¾	4⅜	1.8
2	Technical Manual TM 11-311	8½	5½		
1	Test Stand FT-252-E	13¼	7	7	3.1
1	Test Unit I-135-E	9¼	14⅝	6	13.7

c. Power Sources.—Test Equipment IE-17-E requires batteries for operation. The filament or A supply must be 1.5 volts. Use one Battery BA-23 or one Battery BA-35. The plate or B supply must be between 90 and 105 volts. Use two Batteries BA-26 or two Batteries BA-36 in series. See Figure 5. Batteries BA-37 and BA-38 may be used, but only for emergency service. (See Paragraph 13*e*.)

2. Description of Components.

a. Antenna A-82-A (Artificial).—This component consists of a bakelite panel which mounts antenna capacitor (C14), antenna current meter (M2), antenna switch (S4), operated by lever knob (103), fixed resistor (R9), terminal (108) and antenna connection (105) which provides a means for connecting to the antenna of Radio Receiver and Transmitter BC-611. The antenna capacitor coupling (107) has a flat thumb screw (106), to fasten the antenna capacitor control

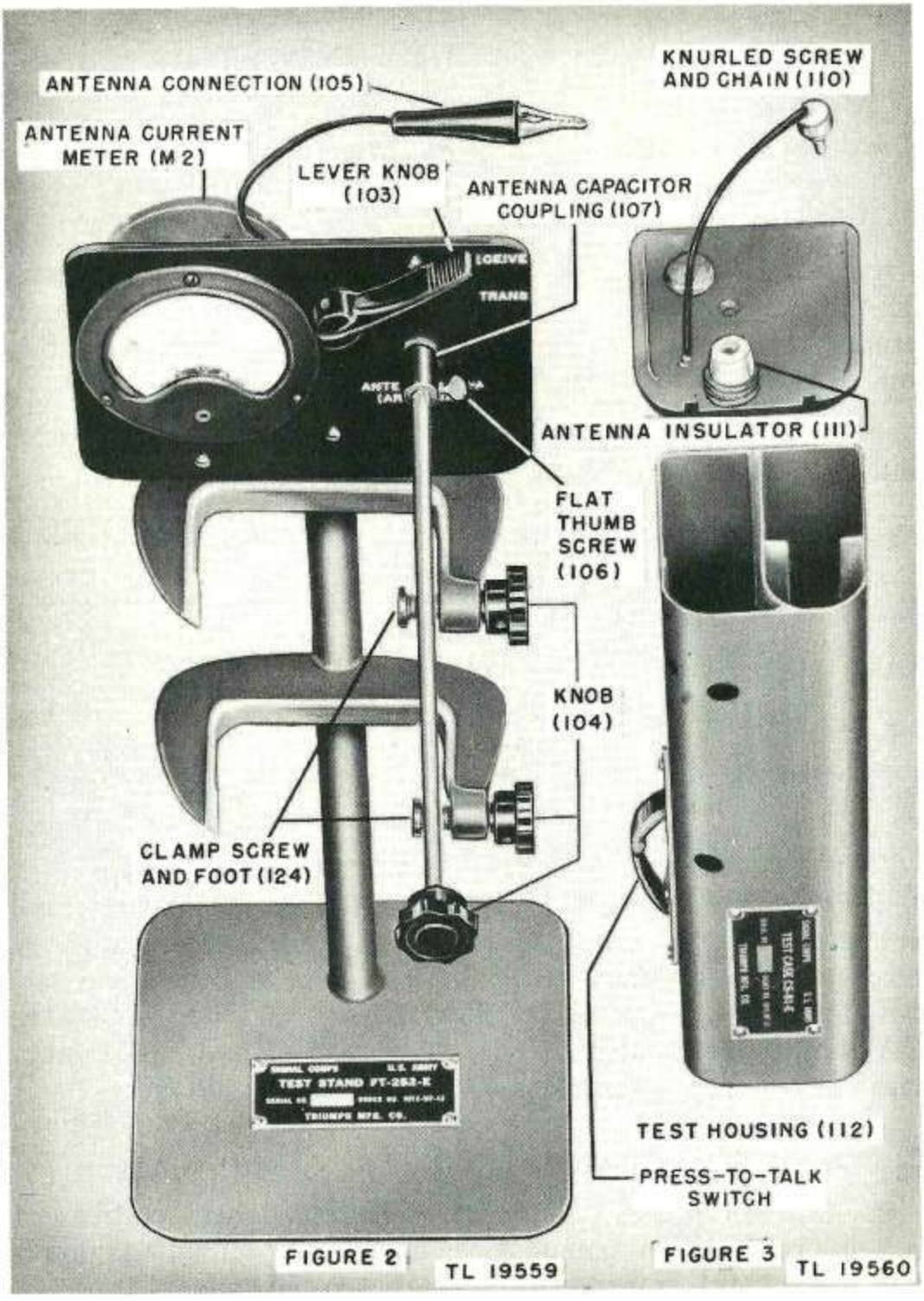

Figure 2—Antenna A-82-A (Artificial) mounted on Test Stand FT-252-E
Figure 3—Test Case CS-81-E

(102). Antenna A-82-A (Artificial), when in use, is mounted on Test Stand FT-252-E. See Figures 1, 2, 5 and 7.

b. Test Case CS-81-E.—There are two separate cast aluminum sections of this unit. They are a test housing (112) with a press-to-talk switch and test case cover (109) containing antenna insulator (111) and knurled screw and chain (110). The knurled screw fastens the radio set chassis in the test case. See Figures 1, 3 and 5. These two cast aluminum sections are similar to the housing and top cover of Radio Receiver and Transmitter BC-611.

c. Test Stand FT-252-E.—The stand provides a mounting for Antenna A-82-A (Artificial) and consists of a welded assembly comprising base, post and two C clamps with adjustable clamping screws. See Figures 1, 2 and 5.

d. Test Unit I-135-E.—This component consists of the test unit case with leather carrying handle and the removable test unit cover. A clip, which holds a screwdriver (159), and a dual clamp, which mounts the harness terminal board and an instruction book, are attached to the test unit cover (152). The test unit case mounts the test unit panel which contains a multirange meter (M1), switching facilities, Microphone (140), Receiver (139) (earphone), a radio frequency oscillator, an audio frequency oscillator, a crystal compartment with a slide cover and crystal test socket, pin jacks (141) for external battery connections, and a shielded multiwire cable terminated at the harness terminal board which is designed for attachment to the chassis terminal board of Radio Receiver and Transmitter BC-611. On the right hand side of the test unit case is the hinged battery compartment door (147) fastened with latching bolt (149). Behind this door, battery compartment (146) provides for the installation of Batteries BA-37 and BA-38. Four polarized battery wires (153-154-155 & 156) are used for connecting to external heavy duty batteries. See Figures 1, 4, 5, 6 and 11.

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Figure 4—Test Unit I-135-E, Panel View

Section II

INSTALLATION AND OPERATION

3. Initial Procedure.

Unpack this equipment carefully to prevent damage. Antenna A-82-A (Artificial) and Test Case CS-81-E are packed in individual cartons and are included in a large carton which also packs Test Stand FT-252-E. The Antenna Capacitor Control (102) for Antenna A-82-A (Artificial) is shipped in the hollow tube of the test stand. Test Unit I-135-E is packed in an individual carton.

4. Installation.

a. Assemble Antenna A-82-A (Artificial) to the brackets on Test Stand FT-252-E using the bolts, nuts and lockwashers provided. Insert the Antenna Capacitor Control (102) into the Antenna Capacitor coupling (107) and tighten the flat thumb screw (106). See Figure 2.

b. Test Case CS-81-E is ready for use immediately after unpacking.

c. Unfasten and remove the cover of Test Unit I-135-E. Release the harness terminal board held in the cover by a special clamp. Remove the screwdriver (159) mounted in the test unit cover. Insert the pin terminals of the four polarized battery wires (153, 154, 155 and 156), furnished with the test unit, into the proper pin jacks on the Test Unit panel.

d. Set up the equipment as shown in Figure 5, but do not mount Test Case CS-81-E in the test stand. The harness terminal board of Test Unit I-135-E is not connected.

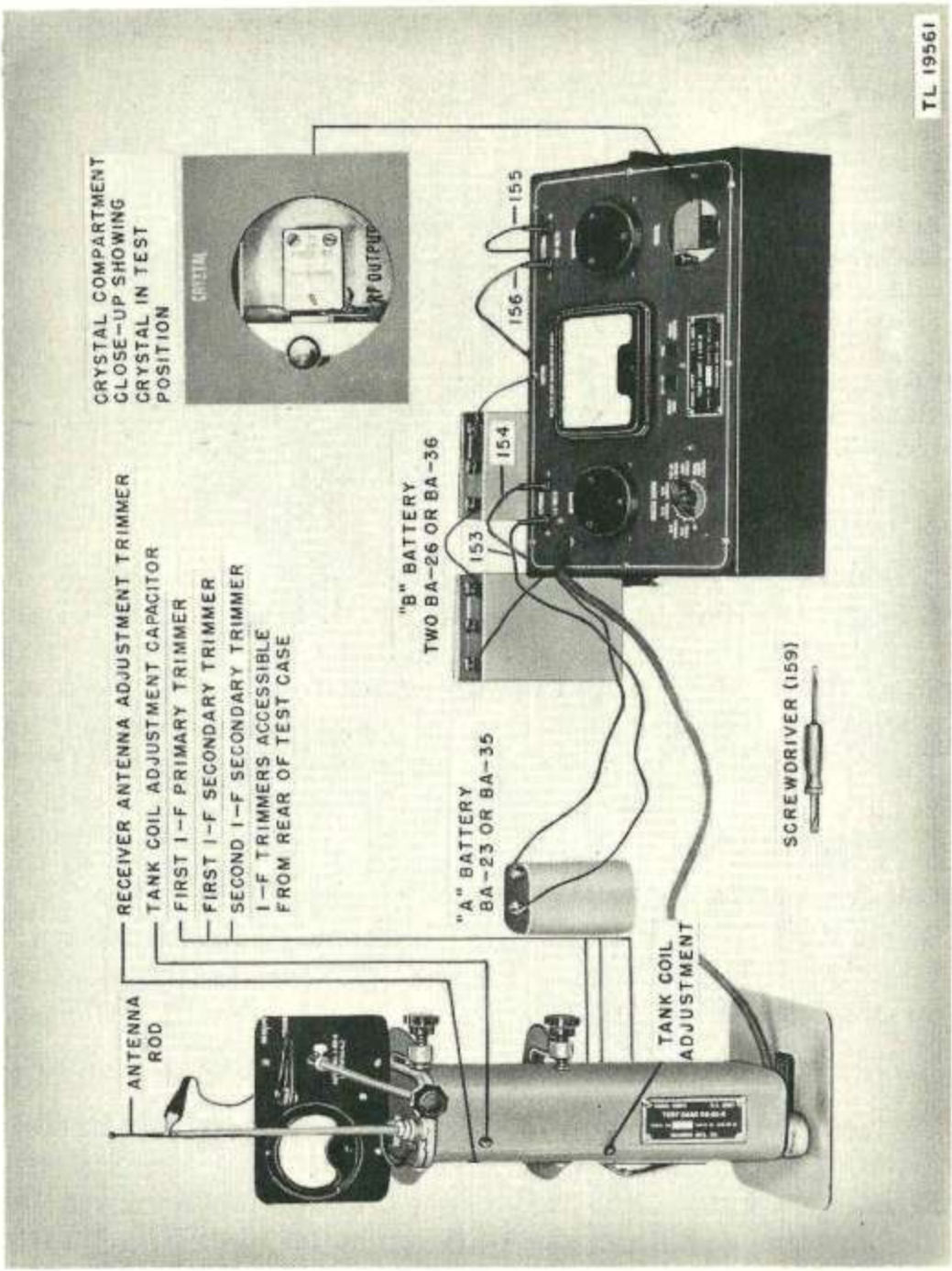

Figure 5—Test Equipment IE-17-E, Set up

5. Preparation for Use.

Turn the *MASTER SWITCH (S3)* on the test unit panel to *OFF*. Secure a heavy duty 1.5-volt battery (BA-23 or BA-35) and a heavy duty 90-volt battery (two BA-26 or two BA-36 connected in series). Connect these *EXTERNAL HEAVY DUTY BATTERIES* to the test unit with the four polarized battery wires (153, 154, 155 and 156). Be careful to observe polarity of pin jacks, battery wires and batteries. Check the two small pin terminals on the harness terminal board of the test unit. If they have been bent from a vertical position during unpacking, carefully straighten them. They must be parallel to each other and vertical to the terminal board to align with the respective terminals on the terminal board of Radio Receiver and Transmitter BC-611. See Figure 4.

6. Presetting Frequency With IE-17-E.

a. To preset the operating frequency of Radio Receiver and Transmitter BC-611, obtain a coil and crystal equipment of the desired frequency. The coil and crystal equipment comes in an individual carton marked with the frequency and contains the transmitter and receiver crystals, the antenna coil and the r-f tank coil.

b. The antenna coil is larger and of different shape than the r-f tank coil. Its base connections also differ, so it is impossible to put the coils in the wrong sockets. Both coils are of plug-in type.

c. Remove the chassis of Radio Receiver and Transmitter BC-611 from its housing. To do this, unlatch the bottom cover of the housing and remove the batteries. Place them aside for test. Disconnect the microphone and earphone plugs from the terminal board on the end of the chassis by gently lifting them up. Next remove the screw in the top cover of the housing; the chassis then will slide out of the bottom end of the housing.

7. Removal and Replacement of Coils and Crystals.

a. Antenna coil.—Remove the plug-in antenna coil by carefully lifting it out of its socket. In its place insert another coil of the desired frequency.

b. R-f tank coil.—To remove, loosen the screw holding down the coil retainer spring on top of the coil. Swing the spring free of the coil.

The coil then can be lifted out of the socket. When replacing with another coil of the desired frequency, carefully fit the coil over the two pins projecting up from the socket so that the pins fit into the holes in the coil form and the coil adjustment shaft fits into the hole in the socket. Gently press the coil into the socket, replace the coil retainer spring on top of the coil, and tighten the screw holding the spring.

c. Crystals.—The crystals are mounted in plug-in type holders. To remove a crystal, lift up the clamp located on top of the crystal holder. This clamp pivots on a stud fastened to the chassis. Place a small screwdriver between the crystal holder and the socket and gently pry it up. To remove the other crystal holder, the same procedure is followed. Select a transmitter and a receiver crystal holder of the desired frequency (the frequency of the transmitter crystal will be the same as that of the coils, while the receiver crystal will be 455 kc higher in frequency). Insert the receiver crystal holder in the crystal socket marked *REC*. It should be inserted so that the frequency printed on the metal side faces out and the arrow on the holder points in the same direction as the arrow on the socket. When the transmitter crystal is inserted, place it in the socket marked *TRAN*. in exactly the same way. The printed metal side of the holder should show through the opening in the chassis. *However, do not insert the transmitter crystal in the radio set at this time.* Instead, replace the metal clamp on the receiver crystal holder on the chassis and leave the transmitter crystal socket empty.

8. Preliminary Adjustments.

a. Place the chassis into Test Case CS-81-E housing. The chassis must be inserted into the test case through the bottom, as is done when inserting the chassis into its own housing. Take care that the chassis fits between the guides provided for it in the case. It should not be necessary to force the chassis. If force is necessary, withdraw the chassis and check to see that no parts are catching on the test case or that the chassis has not jumped the guides. Slip the top cover over the antenna rod and fasten the chassis to it with the knurled mounting screw. The chassis now will be held securely in the test case. *Now remove the plate current meter jumper from the terminal board at the bottom end of the chassis.*

CAUTION.—Do not misplace this jumper because it must be replaced after alignment tests.

b. Attach the terminal board of the I-135-E harness to the terminal board of the chassis so that the two small pins on the harness terminal board fit into the plate current meter jacks, and that the two large locking pins, one on each end of the terminal board, fit into the holes provided for them. Lock the two terminal boards together by a sideward movement of the levers attached to the locking pins.

c. Next, clamp Test Case CS-81-E into Test Stand FT-252-E with the antenna end up, and the housing in such position that the press-to-talk switch is opposite the left side of the operator as he faces the stand. The upper clamp should grip the housing on the edges of the top cover. Do not make the lower clamp too tight, as the pressure may crack the housing.

d. Make certain that the *MASTER SWITCH* of Test Unit I-135-E is at *OFF*. Place the transmitter crystal holder of the desired frequency in the crystal socket in the front panel compartment of Test Unit I-135-E. See Figure 5. Be sure the crystal is of the same frequency as the coils in the radio set and that its frequency is 455 kc *less* than the receiver crystal. Connect external 1.5-volt and 90-volt heavy duty batteries to the battery terminals marked *EXTERNAL 1.5 VOLTS* and *EXTERNAL 105 VOLTS* on the front of I-135-E.

9. Crystal Activity Test.

Be sure that the transmitter crystal has been properly placed in the crystal socket of the test unit. Place the *MODULATE TESTER* switch to *OFF*. Then turn the *MASTER SWITCH* to *CRYSTAL ACTIVITY*. The meter should read between .3 and .8 milliamperes. If it reads less than .3 milliamperes the crystal is defective and must be replaced. Before replacing a crystal for poor activity, be sure that the external battery voltages applied to Test Unit I-135-E are 1.5 and 90 volts with the test unit on. *The foregoing tests apply equally well to receiver crystals.* Turn in defective crystals for salvage. Leave a good transmitter crystal of the proper frequency in place in Test Unit I-135-E for receiver frequency presetting adjustments.

10. Presetting Receiver.

Use the following procedure:

a. Extend the radio set antenna rod to its full length, 39 inches above the top cover of Test Case CS-81-E. This will turn on the radio set. *Do not press the press-to-talk switch of the test case during the receiver presetting adjustments.*

b. Before proceeding with the necessary set adjustments, check operating voltages and currents, using the multirange meter of Test Unit I-135-E. The following voltage and current readings are normal:

MASTER SWITCH set at....	BA-37 0-3 V. D.C.	BA-37 0-600 MA. D.C.	BA-38 0-150 V. D.C.	BA-38 0-60 MA. D.C.
Meter should read..	1.35 (min)* to 1.5 V.	250 MA	85 V (min)*	5-11 MA

*Replace batteries if voltage is less than the minimum figures.

c. The receiver is now ready for presetting. Be sure that a good transmitter crystal of the proper frequency is in place in the test unit. The preceding activity check of the transmitter crystal will assure that a radio-frequency signal is being generated.

d. Set the *MODULATE TESTER* switch at *ON*. The 1000-cycles-per-second tone will now modulate the carrier signal.

e. Turn the *MASTER SWITCH* to *OUTPUT, 0-60 V.A.C.* A reading should now be indicated on the meter and a 1000-cycles-per-second tone should be heard in the earphone of the test unit.

NOTE.—The r-f signal for alignment is fed into the receiver by radiation from the compartment of the test unit in which the crystal is located. The slide cover of the crystal compartment acts as a radiation control preventing the signal from radiating when closed and allowing maximum radiation when open. If the set is badly out of alignment, the r-f signal picked up by the receiver may not be sufficient to give a reliable audio voltage reading on the meter (*OUTPUT 0-60 V.A.C.* position). For such a condition revolve the transmitter crystal 180 degrees so that the metal face of the crystal holder is on the bottom side. This will increase radiation. If signal strength is still too weak connect a short piece of wire to the spring clip terminal marked *R.F. OUTPUT*. This clip is located in the crystal compartment of the test unit. See Figure 5. The wire will act as an antenna and increase the radiation of the r-f signal. Varying the position of this wire with respect to the antenna of the radio set or varying the length of the wire will control the strength of the signal radiated. In extreme

cases of misalignment the wire connected to the *R-F OUTPUT* terminal may have to be wrapped a couple of turns around the radio set antenna.

f. Grasp the test case with one hand during the following alignment adjustments on the receiver.

g. The location of the receiver tuning adjustments on the radio chassis are shown in Figure 5. *With the insulated screwdriver,* turn the *receiver antenna adjustment trimmer* screw clockwise (to the right). Notice the effect of this adjustment on the output meter reading. If the meter reading *increases,* continue to tighten the screw until a maximum reading is obtained. If the reading *decreases,* turn the screw counterclockwise (to the left) until a maximum reading is obtained. Be careful not to tighten the screw after it begins to turn hard or the threaded base of the trimmer will be stripped. The setting of the trimmer screw for maximum output should fall somewhere between the point of hard turning and that of minimum pressure. If the maximum is not reached in these limits of the screw adjustment, try another antenna coil. *If the set appears to be badly out of alignment, proceed as indicated in paragraph 12 following.*

NOTE.—Be sure that the r-f signal is not strong enough to cause overloading of the receiver. If this condition exists, adjustment of the receiver antenna trimmer will have little or no effect on the output reading. Best results will be obtained if the r-f input is adjusted so that the meter reading on the 60-volt scale does not exceed 10 volts, although satisfactory results may be obtained with readings up to 20 volts.

h. Using the *insulated screwdriver,* turn the *receiver tank coil adjustment* screw for maximum output using the same method employed in step *g.*

NOTE.—This screw, which is made of bakelite, fits into a powdered iron core which is threaded. The movement of the screw changes the position of the core in the coil. If the screw is turned too far clockwise (to the right), the core will ride up against the screw head, and the threads in the core will be stripped. If the screw is turned too far counterclockwise (to the left), the core will come in contact with the coil socket, and further turning will again strip the core threads. The screw setting for maximum output should fall

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somewhere between these two limits of adjustment. If it does not, a wrong tank coil may be in the set.

i. Turn the *MASTER SWITCH* to *OFF*. Remove the transmitter crystal from Test Unit I-135-E. Telescope the rod antenna and remove the test harness and the knurled fastening screw from the chassis in the test case. Then slide the chassis out of the test case and remove the receiver crystal and install it in Test Unit I-135-E. Insert the transmitter crystal in its proper socket in the radio set, making sure it is properly installed, and put the chassis back in the test case. Attach top cover and the harness terminal board. Put test case in place on the test stand. Then test the receiver crystal for activity in the same manner as for the transmitter crystal. *Leave a good receiver crystal in place in the test unit while presetting the transmitter portion of the radio set.*

11. Presetting Transmitter.

a. Grasp the test case and depress the press-to-talk switch with one hand during all following presetting adjustments of the transmitter. The *MODULATE TESTER* switch should be *OFF* unless otherwise specified. Use only external heavy duty batteries.

b. Extend the antenna of the radio set to its full length. This will operate the power switch in the radio set chassis.

c. Before proceeding with the necessary set adjustments, check operating voltages and currents, using the multirange meter of Test Unit I-135-E. The following voltage and current readings should be obtained with press-to-talk switch on the radio set depressed:

MASTER SWITCH set at....	BA-37 0-3 V. D.C.	BA-37 0-600 MA. D.C.	BA-38 0-150 V. D.C.	BA-38 0-60 MA. D.C.
Meter should read..	1.35 (min)* to 1.5 V.	275-300 MA	75 V (min)*	26-30 MA

*Replace batteries if voltage is less than the minimum figure.

d. The transmitter is now ready for presetting. Turn the *MASTER SWITCH ON TEST UNIT TO PWR. AMP.* position. Adjust the *transmitter tank coil adjustment capacitor* screw for minimum current reading on the meter in the test unit. The normal reading in this position is approximately 7 milliamperes. See Figure 5 for location of

transmitter tank coil adjustment capacitor. Be sure to depress the press-to-talk switch with one hand during this operation.

e. Telescope the upper three sections of the antenna rod, leaving only the bottom or fourth section fully extended from the housing. Clip the *dummy antenna connection* to the upper part of the antenna rod. See Figure 5. Set the *antenna switch* of Antenna A-82-A to *TRANS*, and then, still grasping the test case and press-to-talk switch, use the *Antenna Capacitor Control* to adjust the *Antenna Capacitor* for *minimum current reading on the meter in Test Unit I-135-E* (approximately 7½ ma in *PWR. AMP.* position). This adjustment of the dummy antenna capacitance for minimum power amplifier plate current is necessary to compensate for the change in antenna capacitance due to telescoping the upper three sections of the antenna rod. Observe the reading of the *antenna current meter* on Test Stand FT-252-E. This should be from 15-24 milliamperes and represents the unmodulated antenna current.

f. Place the *MODULATE TESTER* switch to *ON* and press the *MODULATE TRANSMITTER* button on the test unit. This modulates the transmitter by applying a .1-volt, 1000-cycles-per-second audio signal across the microphone terminals. Note the rise in the *antenna current meter* reading when the modulated signal is applied. This rise should be at least 6 percent over the unmodulated current reading. A 6-percent increase in antenna current indicates 50 percent modulation. For example, assume that the unmodulated antenna current is 20 milliamperes and that the modulated current is 22 millamperes:

The increase in current is then
22-20 = 2 millamperes;

The percentage increase will be
2/20 x 100 = 10 percent.

Another method is to divide the antenna current obtained with modulation by the antenna current without modulation; the answer should be greater than 1.06. For example, take the values of current previously given. Dividing the modulated current by the unmodulated current gives 22/20 = 1.10.

NOTE.—Further checks on modulation may be made by whistling into the microphone or holding a sustained note. The modu-

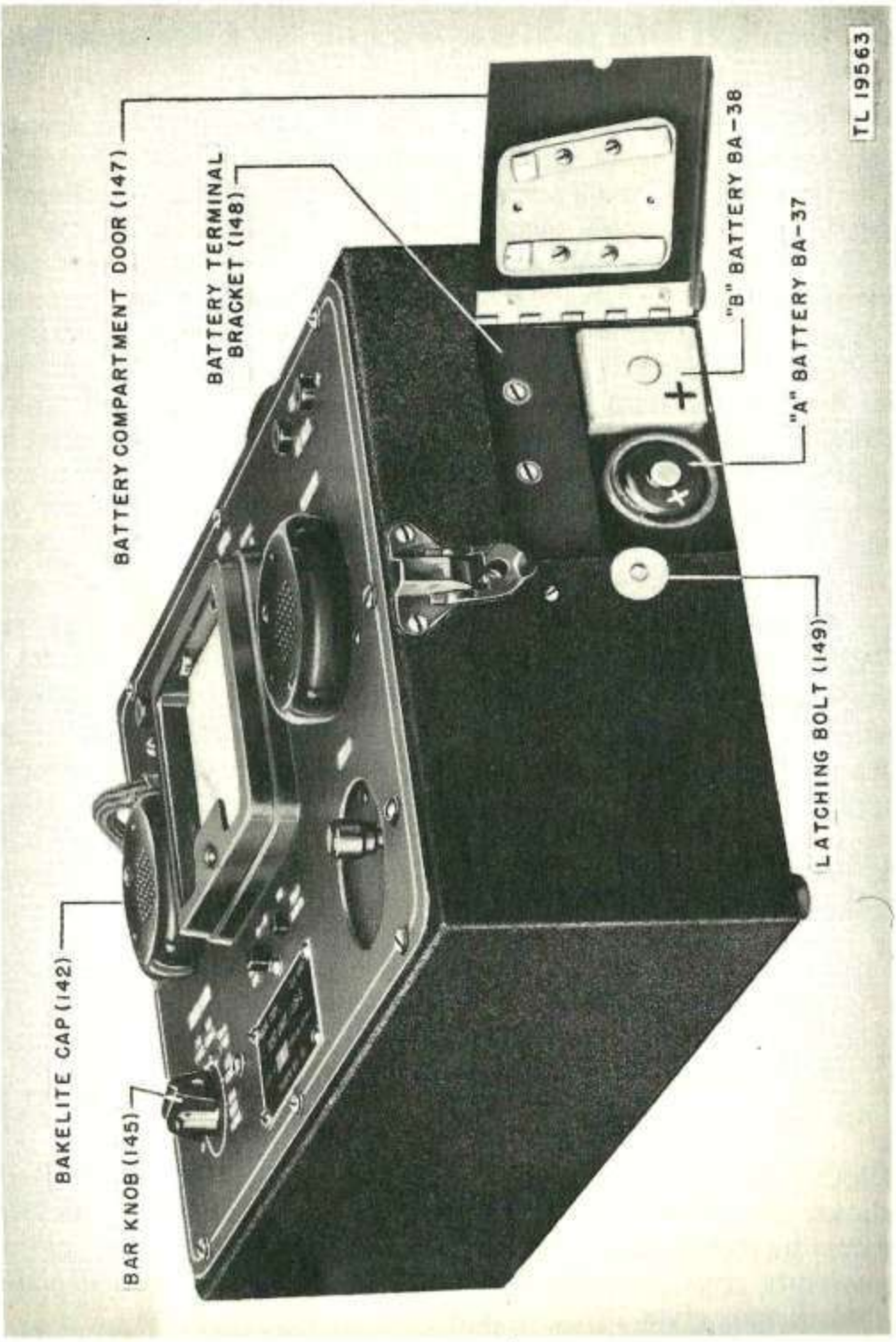

Figure 6—Test Unit I-135-E, Right Side View

lation rise should be substantially greater. *MODULATE TRANSMITTER* button must not be pressed when using the microphone method.

g. This completes normal frequency presetting adjustments. After all tests and alignment the radio set chassis is ready for reassembly into its own housing. *BE SURE THAT THE RECEIVER AND TRANSMITTER CRYSTALS ARE IN THEIR RESPECTIVE CHASSIS SOCKETS, THAT PLATE CURRENT JUMPER HAS BEEN PUT IN PLACE ON CHASSIS TERMINAL BOARD, AND THAT ALL COILS ARE IN PROPER PLACE.* Use guides in housing to slide chassis into place. *Never force chassis into housing.* Secure top cover of housing to chassis with proper screw. Insert Batteries BA-37 and BA-38, which have been tested and are known to be satisfactory, into proper compartments. See Paragraph 13. The positive (+) terminals of both batteries must be out. Place microphone and earphone plugs in proper jacks. Arrange the microphone and earphone leads so they will not be cut by the bottom cover, when it is latched into position. The cover is closed by pressing it against the housing with one hand, while the other hand moves the latching bolt into the slot in the cover and tightens the knurled nut by turning it clockwise (to the right). *THE COVER MUST THEN BE PRESSED AGAINST A SOLID OBJECT AND THE KNURLED NUT TIGHTENED UNTIL IT TURNS WITH GREAT DIFFICULTY.* Check radio set as a portable unit after completion of assembly into housing.

12. I-F Alignment.

a. If the i-f transformers are badly out of alignment, it may be impossible to get a carrier-frequency signal through the receiver. For such a condition, the i-f transformers must be realigned. Be sure that the frequency of the REC (receiver) crystal is 455 kc higher than that of the *TRANS.* (transmitter) crystal. The chassis may be left in the test case. The receiver crystal must be installed in the chassis and the transmitter crystal in Test Unit I-135-E.

b. If the presetting receiver procedure described in paragraph 10 has been followed, and no readable audio voltage has been obtained on the *OUTPUT 0-60 V. A. C.* position of the test unit meter, first make sure that a maximum r-f signal is being radiated. This can be assured by connecting a short length of wire to the *R.F. OUTPUT*

terminal of the test unit and placing the wire close to the receiver antenna.

c. With the *MASTER SWITCH* of the test unit on *OUTPUT-60 V. A. C.* (modulate tester switch *ON*), adjust the second i-f secondary trimmer for maximum output, next the first i-f secondary trimmer, and the first i-f primary trimmer last. See Figure 5. All i-f trimmers are adjusted for peak output meter reading. As the i-f trimmers are aligned, loosen the signal coupling to the receiver antenna so the maximum audio output reading of the meter is not over 10 volts. This is necessary to prevent overloading the receiver and consequent poor alignment of the i-f circuits. The above alignment adjustments must be performed very carefully for good results. Go over them a second time.

d. After the i-f adjustments have been made, complete the procedure by adjusting the receiver antenna adjustment screw and the receiver tank adjustment as described in paragraph 10.

13. Testing Batteries BA-37 and BA-38.

a. Use Test Equipment IE-17-E for this test, but be sure that the external heavy-duty batteries are *disconnected.* The radio set chassis *with both crystals in place* is mounted in the test case, connected to the test unit, and then placed in the test stand with antenna rod extended. The *MASTER SWITCH* of the test unit should be *OFF.* The press-to-talk switch must be *in transmit position.* Place radio set batteries BA-37 and BA-38 in the compartment of the test unit. Close and secure the compartment cover. See Figure 6. *MODULATE TESTER* switch must be *OFF.*

b. Place the *MASTER SWITCH* on the test unit in BA-37, O-3 V. D.C. position and observe the meter reading. Normal readings will be between 1.35 and 1.5 volts. If the voltage is less than 1.25 volts, the battery should be discarded and replaced with a new one.

c. Place the *MASTER SWITCH* on the test unit in BA-38, 0-150 V. D.C. position and observe the meter reading. *Be sure the set is in transmit position.* The normal meter readings will be between 75 and 103.5 volts. If the voltage is below 70 volts, the battery should be discarded and replaced with a new one.

d. When it becomes necessary to discard Battery BA-37 or Battery BA-38 because of low voltage, both batteries in the radio set should be

replaced at the same time. Batteries which are near the lower voltage limit may be used, but they will reduce the overall performance of the radio set.

e. Batteries BA-37 and BA-38 may be used in emergencies for presetting and alignment, but work must be done quickly because the combined drain of the radio set and test equipment will quickly exhaust them.

14. Precautions During Operation.

a. The press-to-talk switch on Test Case CS-81-E must be *OUT* for all receiver tests and must be held *IN* with one hand, during all transmitter tests.

b. The test case must be grasped with one hand during all receiver alignment procedure.

c. The *MASTER SWITCH* must be turned *OFF* before changing batteries or harness terminal board connections and when test unit is not in use. Test unit is *ON* when *MASTER SWITCH* is in any other position.

d. When testing Batteries BA-37 and BA-38 disconnect the external battery wires from the pin jacks on the test unit. After this test, remove the batteries, close and fasten the battery compartment door with the latching bolt.

e. After connecting external batteries, check battery types and connection polarities carefully before turning the *MASTER SWITCH* from OFF.

f. Do not permit Batteries BA-37 and BA-38 to remain in the battery compartment for any extended period of time.

g. The *MODULATE TESTER* switch must be *ON* when operating the *PRESS* to *MODULATE TRANSMITTER* switch.

h. The *MODULATE TESTER* switch must be *OFF* when checking crystal activity.

i. Always keep the crystal compartment cover closed, unless instructed otherwise during test procedure.

j. Antenna current meter (M2) and the test unit meter (M1) are sensitive instruments. Do not abuse them mechanically or electrically.

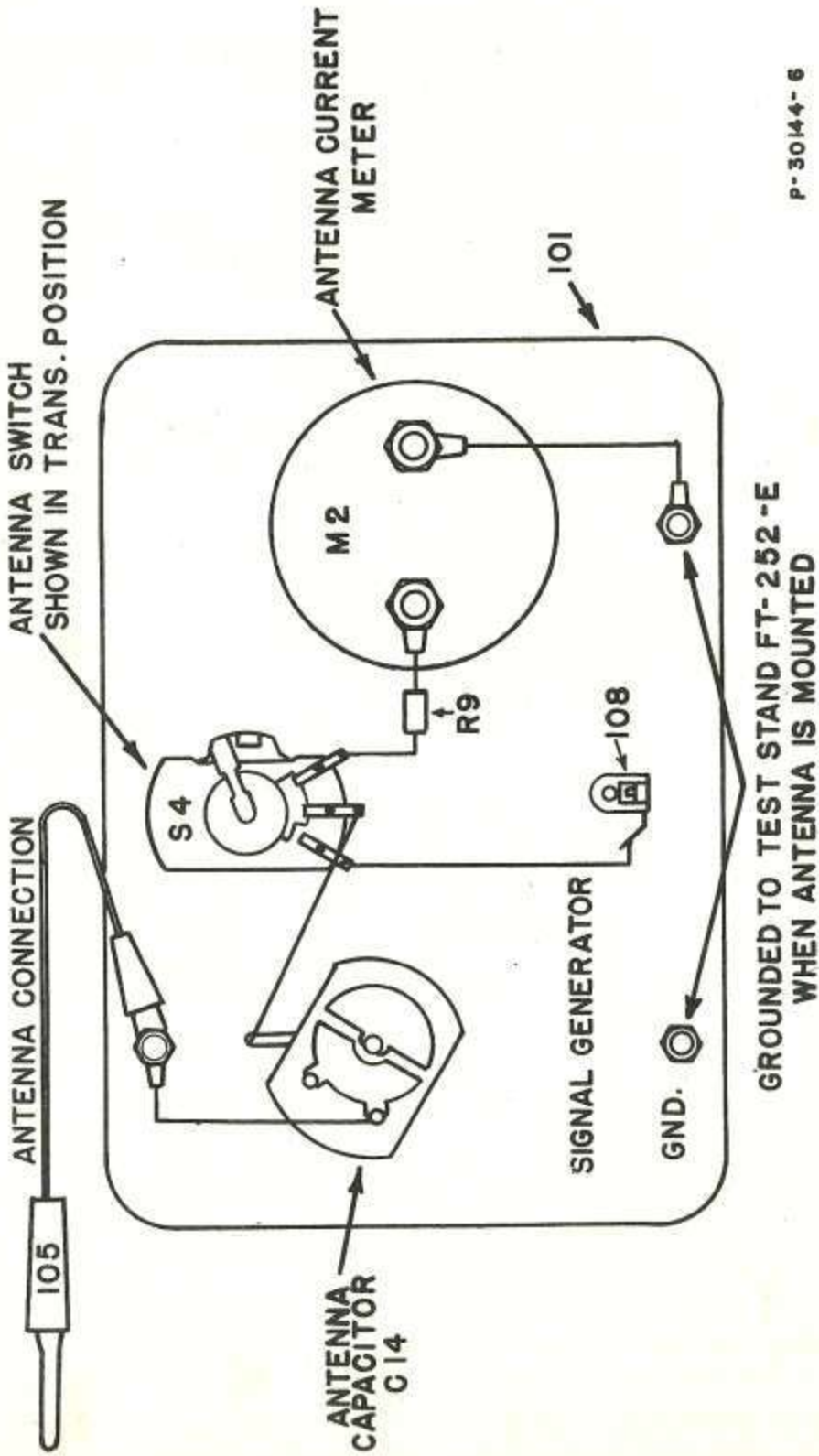

Figure 7—Antenna A-82-A (Artificial) Practical Wiring Diagram

k. Do not abuse the test unit harness terminal board. The special contacts and latching pins are accurately aligned to fit the contacts and latching receptacles on the terminal board of the radio set chassis.

l. When Test Equipment IE-17-E is not in use, remove the antenna capacitor control (102) from the antenna and insert it into the hollow tube of the test stand. Also mount the harness terminal board and screwdriver (159) in the receptacles provided in the test unit cover (152). Coil up the polarized battery wires (153, 154, 155 and 156) and place them on the test unit panel. Put the test unit cover on the test unit and fasten in place.

m. DURING THE TESTING AND ALIGNMENT OF RADIO RECEIVER AND TRANSMITTER BC-611, THE STEPS AND PROCEDURE OUTLINED IN PARAGRAPHS 8 THROUGH 13 MUST BE CAREFULLY FOLLOWED FOR SATISFACTORY OPERATION OF TEST EQUIPMENT IE-17-E.

Section III

FUNCTIONING OF PARTS

15. Test Equipment IE-17-E.

a. Antenna A-82-A (Artificial).—As explained in Paragraph *2a.*, the antenna is mounted on Test Stand FT-252-E when in use. See Figure 2. It serves as a dummy or artificial antenna for Radio Receiver and Transmitter BC-611, during test and alignment procedure on the radio set. The antenna connection (105) provides for connection to the antenna rod of Radio Receiver and Transmitter BC-611. The antenna current meter (M2) indicates transmitter antenna current, both unmodulated and modulated, when the antenna switch (S4) operated by lever knob (103), is in the *TRANS.* position and after the antenna circuit has been resonated by adjustment of antenna capacitor (C14). The antenna capacitor control (102) must be used to adjust the antenna capacitor (C14), to eliminate hand capacity to the radio set antenna rod. Fixed resistor (R9) acts as a load on the radio set antenna circuit. See Figures 2 and 7. The *RECEIVE* position of antenna switch (S4) and the terminals

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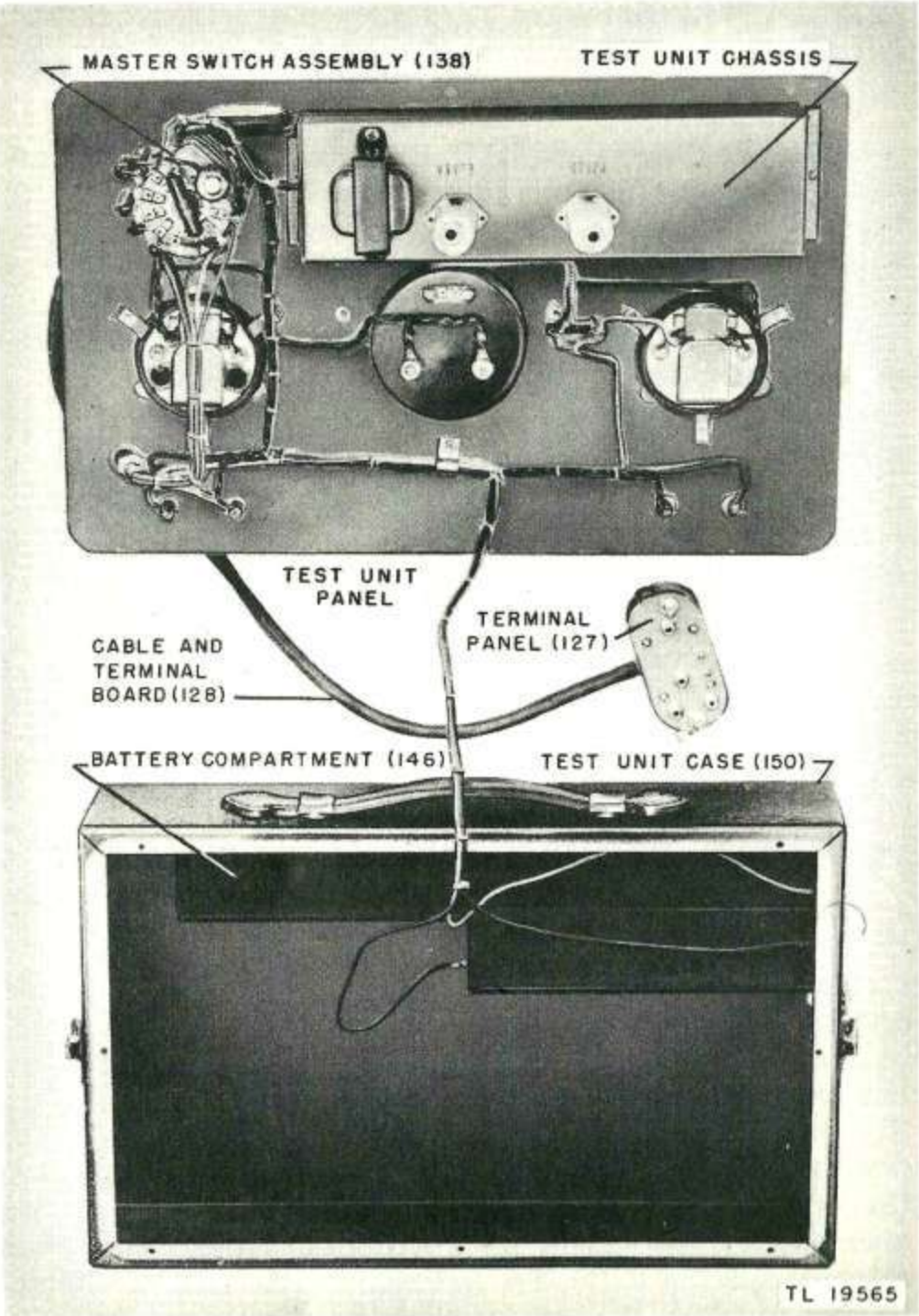

Figure 8—Test Unit I-135-E, Interior View

marked *SIGNAL GENERATOR* and *GND.* in Figure 7, are used during special laboratory tests on Radio Receiver and Transmitter BC-611. These tests are not covered in this manual.

b. Test Case CS-81-E is similar to the radio set chassis housing, except that holes have been provided to permit access to the alignment adjustments. This case permits tuning the radio set under conditions identical to those in normal operation. Do not make tuning adjustments on the radio set outside the test case, because the additional capacity introduced, when the chassis is inserted into the housing, will detune the antenna and the r-f circuits. The knurled screw, attached to the test case cover (109), fastens the radio set chassis in the test case. The press-to-talk switch operates the receive-transmit change-over switch on the radio set chassis. See Figure 3.

c. Test Stand FT-252-E provides a mounting for Antenna A-82-A (Artificial). After a radio set chassis has been fastened in Test Case CS-81-E, the stand serves as a mounting. See Figure 5. *CAUTION: Do not turn the clamp screws too tight, because the pressure may crack the housing.* See Figures 1 and 2.

d. (1) Test Unit I-135-E is used for the measurement of battery voltages, battery currents, power amplifier plate current, audio output voltage of receiver and crystal activity. It is also used to produce a modulated radio frequency signal source for the alignment of the receiver. A 1000 c.p.s. audio frequency source is available and is used for determining the modulation capability of the transmitter. The chassis of the test unit contains the a-f and r-f oscillators, the *MODULATE TESTER* and *MODULATE TRANSMITTER* switches, and the crystal test socket. See Figures 4, 5, 8 and 10.

(2) The radio frequency signal source is a Pierce crystal oscillator and makes use of the transmitter crystal, contained in the Radio Receiver and Transmitter BC-611 (or a spare crystal of the same frequency), to generate a signal of the carrier frequency. This radio frequency oscillator is also used to check the activity of both the receiver and transmitter crystals by measuring the oscillator grid current. This measurement is made with *MASTER SWITCH* (S3) turned to *CRYSTAL ACTIVITY, 0-1.5 MA. D.C.* In Figures 8 and 9, VT-174(V1) is the r-f oscillator tube.

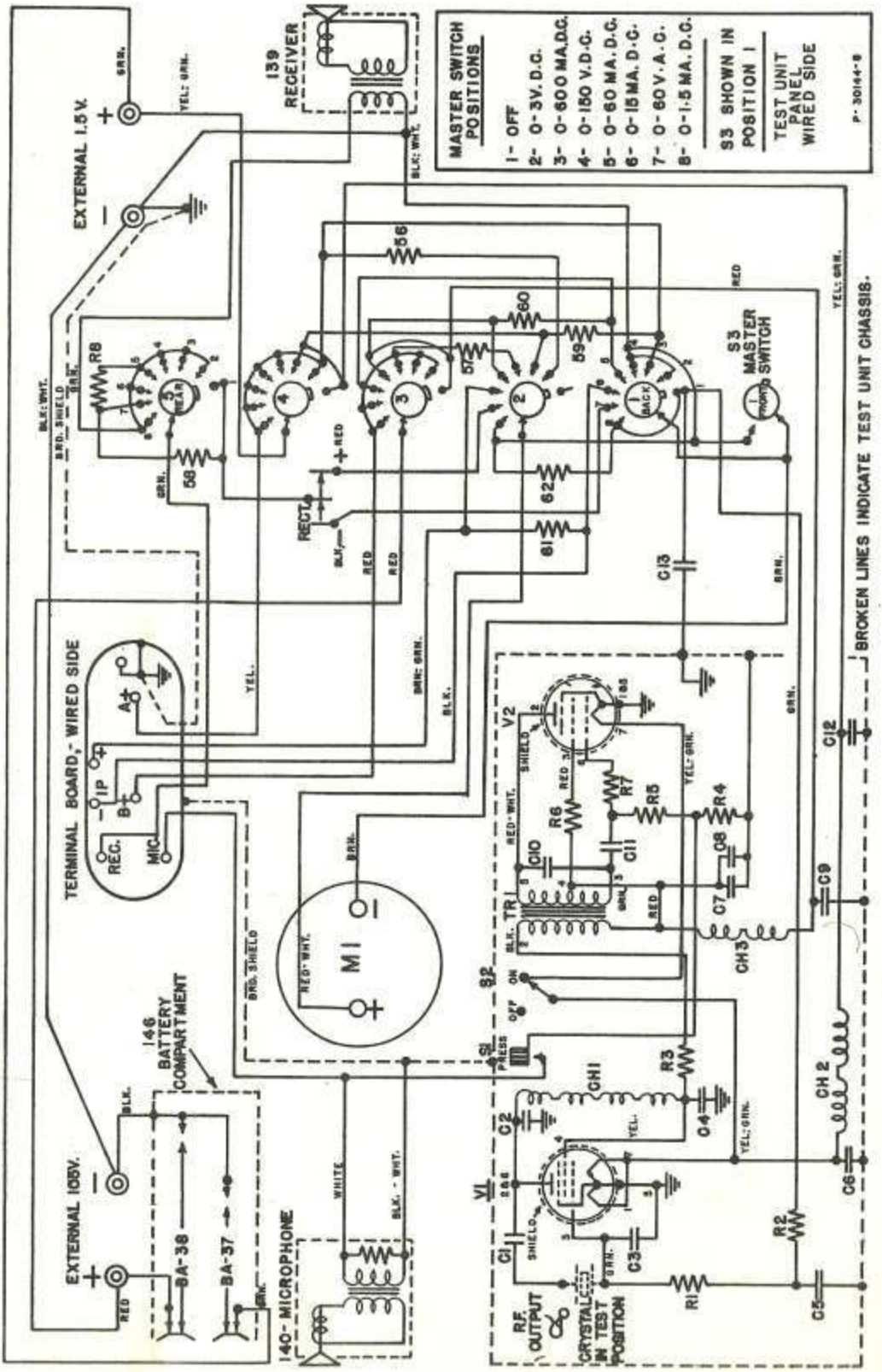

Figure 9—Test Unit I-135-E, Schematic Diagram

(3) The audio frequency signal source is an oscillator generating a signal tone of 1000 cycles per second. This tone is used to modulate the radio frequency oscillator and also can be applied to the microphone input terminals of the transmitter. In Figures 8 and 9, VT-173(V2) is the a-f oscillator tube.

(4) Batteries BA-37 and BA-38 may be tested by inserting them into their respective compartments. Be sure to tighten the battery compartment door latching bolt after inserting the batteries. See Figure 6. Do not use these batteries during the testing and alignment of the radio set. See Paragraph 13*e*. The four polarized battery wires provide connections between the pin jacks on the test unit and external heavy duty A and B batteries. See Figure 5. *CAUTION: Do not permit Batteries BA-37 and BA-38 to remain in the battery compartment for any extended period of time.*

(5) When the harness terminal board of Test Unit I-135-E is connected to the chassis of Radio Receiver and Transmitter BC-611, the functions of the various positions of the *MASTER SWITCH* are as follows: See Figure 4.

(a) *OFF* disconnects A and B batteries from the chassis of Radio Receiver and Transmitter BC-611, and from the radio frequency and audio frequency oscillators in the test unit. The radio set chassis and test unit oscillators are *ON* in all other positions of the *MASTER SWITCH.*

(b) *BA-37, 0-3 V.D.C.*—In this position the meter reads the A battery or BA-37 voltage in either the receive or transmit position of the radio set. Take reading on the *0 to 3 D.C. VOLTS* scale of the meter.

(c) *BA-37, 0-600 MA. D.C.*—In this position the meter reads the A battery or BA-37 current drain of the radio set, in either the receive or transmit position. Take reading on the *0 to 60 D.C. MILLIAMPERES* scale of the meter and multiply the reading by 10.

(d) *BA-38, 0-150 V.D.C.*—In this position the meter reads the B battery or BA-38 voltage in either receive or transmit position of the radio set. Take reading on the *0 to 15 D.C. VOLTS* scale of the meter and multiply the reading by 10.

(e) *BA-38, 0-60 MA. D.C.*—In this position the meter reads the B battery or BA-38 current drain of the radio set, in either the

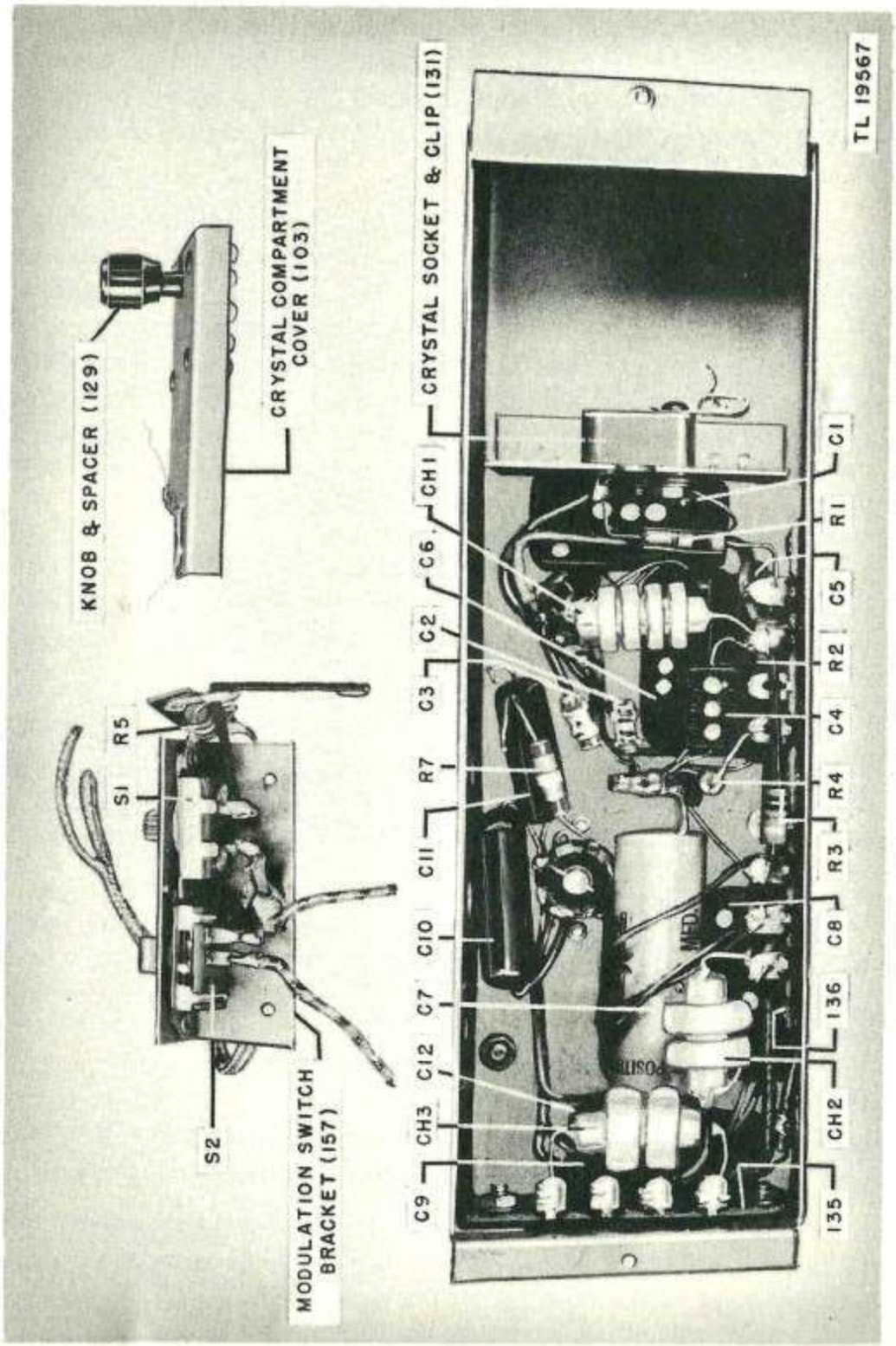

Figure 10—Test Unit I-135-E, Chassis Disassembled

receive or transmit position. Take reading on the *0 to 60 D.C. MILLIAMPERES* scale of the meter.

(f) *PWR. AMP., 0-15 MA. D.C.*—In this position the meter reads the current drawn by the plate circuit of the radio set power amplifier, in either receive or transmit operation. Take reading on the *0 to 15 D.C. MILLIAMPERES* scale of the meter.

(g) *OUTPUT, 0-60 V.A.C.*—In this position the meter reads the audio output voltage of the radio receiver and is connected across the Receiver (139) (earphone) in the test unit. *Take reading on the 0 to 60 A.C. VOLTS* scale of the meter.

(h) *CRYSTAL ACTIVITY, 0-1.5 MA. D.C.*—In this position the meter reads the grid current of the test unit radio frequency oscillator, when a crystal is inserted into the crystal socket of the test unit. See Figure 5. During this test, the *MODULATE TESTER* switch must be *OFF*. Take reading on the *0 to 15 D.C. MILLIAMPERES* scale of the meter and multiply the reading by 0.1.

(6) The slide switch (S2) marked *MODULATE TESTER*, provides 1000 cycles tone modulation for the test unit radio frequency oscillator carrier, when at ON. When at OFF, the filament circuit of the test unit audio oscillator tube (V2) is turned off.

(7) The *PRESS* to *MODULATE TRANSMITTER* switch (S1) applies a 0.1 volt 1000 cycle tone to the microphone input circuit of the transmitter, so that the modulation capability may be determined. The *MODULATE TESTER* switch must be *ON* for this test.

(8) An earphone and microphone, marked Receiver (139) and Microphone (140), are provided in the test unit. These can be used to listen to the audio output of the receiver or to modulate the transmitter by speaking into the microphone. See Figure 4.

(9) The crystal compartment cover of the test unit slides open and closed. It permits radiation control of the radio frequency oscillator carrier during receiver alignment. Radiation is minimum when the cover is closed and maximum when open. The crystal must be inserted into the two lower socket contacts. The spring clip terminal, mounted on the crystal socket and marked *RF OUTPUT*, is to be used to hold a short length of wire when a greater signal must be radiated. See Figure 5.

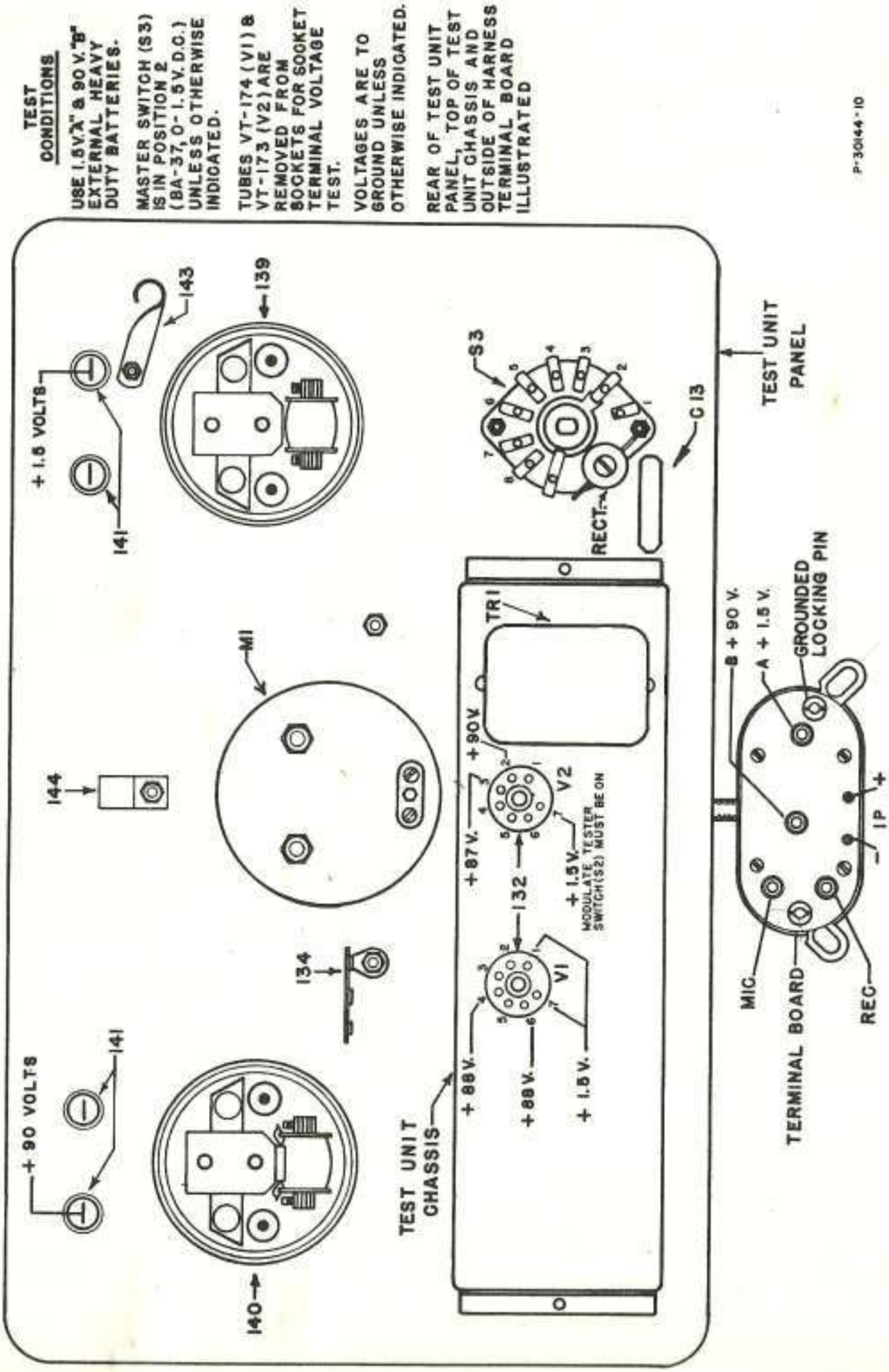

Figure 11—Test Unit I-135-E, Location and Voltage Diagram

(10) The harness terminal board provides facilities for attaching and fastening to the terminal board on the chassis of Radio Receiver and Transmitter BC-611. It completes all the necessary circuits between the radio set and the test unit, required for the testing and alignment of the radio set. See Figures 4 and 5.

(11) The removable test unit cover (152) has receptacles for the harness terminal board, screwdriver (159) and an instruction book. Replace these items in the cover and fasten the cover to the test unit when the equipment is not in use.

(12) The narrow blade of screwdriver (159) is used for alignment adjustments and the wide blade to release the screw in the top cover of the radio set housing.

Section IV

MAINTENANCE

16. Servicing.

a. Caution.—Use care in servicing this equipment. Using personnel will make only such repairs as are of a mechanical nature. Servicing, which requires circuit analysis, and replacement of electrical parts, should be attempted only by competent personnel supplied with adequate equipment. *An inexperienced operator, in attempting to locate and repair a minor trouble which a competent man could service in a few moments, may damage the equipment to such an extent as to require its shipment to a depot for repair.*

b. Signal Corps standard Test Set I-56-D or equal shall be employed to test tubes, circuit currents, resistances and voltages. (Current, resistance and voltage values given herein are nominal and will vary slightly with different units and different measuring equipment.)

c. When parts are to be disassembled, always place all screws, washers, lock washers and small parts removed in a suitable container, so that they will not become lost before reassembly takes place. (The cover of Test Unit I-135-E is a suitable container.)

17. Procedure in Case of Equipment Failure.

a. Refer to Figure 12, Trouble Location and Remedy Chart. Failure to obtain nominal readings in *MASTER SWITCH* positions 7 and/or 8 may be due to defective filaments in tubes (V1) or (V2). This defect is checked by connecting the 250 MA range of the Combination Tester of Test Set I-56 in series with the +EXTERNAL 1.5 V. A battery lead, observing the proper polarity of the test leads of the combination Tester. For this test, disconnect the harness terminal board from the radio set. With the *MASTER SWITCH* in Position 2 and *MODULATE TESTER SWITCH ON*, total current of 150 MA indicates that the filaments of both tubes are intact. With *MODULATE TESTER SWITCH OFF*, total current of 104 MA is nominal and is the filament current of the r-f oscillator tube (V1). Do not make any other test for tube filament continuity, because of the danger of burning out the tubes.

b. Remove the panel of Test Unit I-135-E by releasing the eight retaining screws around the edges. Lift out the panel and place it with respect to the case as illustrated in Figure 8. Remove tubes VT-174 and VT-173 before making point-to-point voltage tests given in Figure 13. The tube shields are removed by making a one-quarter turn and pulling straight out. The tubes come straight out and their withdrawal from the sockets may be aided by a slight rocking motion.

c. The terminals of meter (M1) must be shorted as described in the test conditions, prior to making point-to-point resistance tests given in Figure 14. It is necessary to short the terminals because all standard ohmmeters pass more current than may be safely passed through the meter (M1). Do not turn or adjust the round head machine screws on the back of Meter (M1), because these act as a magnetic shunt on the meter movement and are permanently adjusted at the factory for the basic meter sensitivity.

18. Replacement of Parts.

a. Harness.—If the terminal panel alone is damaged beyond repair replace with terminal panel (127). The small pins (IP) on the terminal panel must be vertical to the panel. If accidently bent, they may be straightened with pliers. If the cable has been damaged beyond repair, release cable clamp (143) in Figure 11 and pry open the part holding the cable. Identify on the schematic diagram (Figure 9) each wire from the cable, noting particularly how the

braided shield is grounded through a soldering lug and to the −1.5 volt external battery pin-jack. The microphone shielded braid is also grounded at terminal panel (134) in Figure 11. The cable wires and braided shield are to be unsoldered and withdrawn from the panel. Install a new cable and terminal board (128). Before attaching cable clamp (143), wind not less than two layers of friction tape on the part of the cable which will be held by the cable clamp (143). Squeeze the clamp snug around the cable with pliers but do not crush the cable. Remount the clamp, using the soldering lug of the ground connection for the braided shield as a lock washer. Recheck the cable connections to *MASTER SWITCH* (S3), short meter (M1) and make point-to-point resistance tests in accordance with Figure 14.

b. Microphone or Receiver. (*Note: These units are not interchangeable.*) Unsolder the connections. Pivot one spring retaining clip 90° on its axis. Remove microphone (149) or receiver (139) and replace with a duplicate unit. Be sure the unit is held firmly in place by the spring retaining clips.

c. Removal of chassis. Unsolder capacitor (C13) from grounding lug on end of chassis toward *MASTER SWITCH* (S3). See Figure 11. The crystal compartment cover must be half way open. Release the three screws which hold the chassis to the panel. There is sufficient flexibility in the wiring from the chassis to the test unit panel so that minor repairs can be made without unsoldering these wires. See Figure 10 for locations of parts.

d. Modulation Switch Bracket (157) is attached to the chassis with two machine screws. To remove the switch bracket, release these screws and unsolder the connecting wires. When the switch bracket is replaced and the chassis is attached to the panel, test switches (S1) and (S2) for freedom of movement and electrical operation. Two slots in the chassis allow alignment of switches (S1) and (S2) with the panel openings. If repair of the chassis has necessitated removal of the chassis wiring to *MASTER SWITCH* (S3), recheck the color coding of the wires to the terminals on the *MASTER SWITCH* and make point-to-point resistance tests described in Figure 14 before attaching batteries or installing tubes (V1) and (V2).

e. The markings on tubes (V1) and (V2) must agree with the tube type nomenclature stamped on the chassis adjacent to each respective tube socket.

Test Unit I-135-E, Test Conditions

1. Set up Equipment IE-17-E according to Paragraph 4.
2. Follow instructions given in Paragraphs 5 and 8*a* through 8*c*.
3. Secure Radio Receiver and Transmitter BC-611 which is known to be in good operating condition.
4. Secure a good spare crystal of the transmitter crystal frequency and insert it into the test unit crystal socket.
5. Press-to-talk switch must be held *IN* for tests on MASTER SWITCH positions 1, 2, 3, 4, 5 and 6 and is *OUT* for positions 7 and 8.

MASTER SWITCH *Positions*	*Refer to Paragraphs*	*Nominal Reading (approximate)*	**Probable Faults: (Reading abnormal)*
1. OFF		0	D-S3
2. 0-3 V.D.C.	11*a*, 11*b* & 11*c*	1.35 to 1.5 V.	D-M1, D-S3, D-56
3. 0-600 MA. D.C.	11*c*	300 MA.	D-S3, D-59, D-127
4. 0-150 V. D.C.	11*c*	75 to 90 V.	D-S3, D-57
5. 0-60 MA. D.C.	11*c*	30 MA.	D-S3, D-60, D-127
6. 0-15 MA. D.C.	11*d*	7 MA.	D-S3, D-61, D-127
7. 0-60 V. A.C.	10*a*, *c*, *d*, *e* and 12*a* & *c*	40 V. MAX.	D-RECT, D-S3, D-V2, D-58, D-127
8. 0-1.5 MA. D.C.	9	0.3 to 0.8 MA.	C3, C5, C13, D-CH1, D-R1, D-R2, D-S3, D-V1, D-62.

Antenna A-82-A (Artificial), Test Conditions

Test Unit and radio set must be operating normally on Transmit. Follow instructions in Paragraph 11*e*. Antenna switch (S4) is in TRANS. position. Hold press-to-talk switch IN.

Symptom	**Probable Faults*
No reading on M2	C-14, D-M2, D-R9, D-S2, D-105
Abnormally low reading on M2	D-M2, D-R9, D-105
Abnormally high reading on M2	D-R9.

*Probable Faults: C (#) Shorted Capacitor. D-(Ref. No.) Defective part. A broken wire, a short circuit or ground are common faults for each test.

Figure 12—Test Equipment IE-17-E, Trouble Location and Remedy Chart.

Test Conditions:

1. D-C Voltage tests are made with the Volt-Ohm Tester of Test Set I-56. (Test battery voltages with Test Set I-56 before connecting to test unit. They must test 1.5 and 90 volts.)
2. Use external heavy duty 1.5-volt A and 90-volt B batteries. See Paragraphs 1*c* and 5.
3. Tubes (V1) and (V2) are removed for these tests.
4. MASTER SWITCH (S3) is turned to position 2, (0-3V. D.C.). MODULATE TESTER SWITCH (S2) must be *ON*.
5. All voltage tests are made from the point designated to ground. The positive "V+" test lead goes to the point of test. The negative "V—" test lead is grounded to the test unit chassis, panel or to the grounded locking pin of the terminal board. See Figures 9 and 11.
6. Immediately upon finding abnormally low or no voltage disconnect batteries and use Figure 14.

Designated point of Test	*Voltmeter Range*	*Nominal Volts*	**Probable Faults*
A+ Terminal Board	3 V	1.5	D-S3 (If less than 1.4 volts, disconnect battery)
B+ Terminal Board	300 V	90	(If less than 75 volts, disconnect batteries.)
Terminal 4 of Socket V1	300 V	88	C2, C4, C7, C8, C9, D-CH3, D-R3, D-S3; D-TR1, D-60
Terminal 6 of socket V1	300 V	88	D-CH1, if previous tests are normal.
Terminal 2 of socket V2	300 V	90	D-TR1, if previous tests are normal.
Terminal 3 of socket V2	300 V	87	D-R6, if previous tests are normal.
Terminals 1 & 7 of socket V1	3 V	1.5	C6, C12, D-CH2, D-59
Terminal 7 of socket V2	3 V	1.5	D-S2, if previous tests are normal

*Probable Faults: C(#) Shorted Capacitor. D-(Ref. No.) Defective part. A broken wire, a short circuit or ground are common faults for each test.

Figure 13—Test Unit I-135-E, Point-to-Point D-C Voltage Table.

Test Conditions:

1. Use VOLT-OHM Tester of Test Set I-56 and use range indicated in "Ohmmeter range" column.
2. Remove tubes (V1) and (V2). Disconnect batteries.
3. Short meter (M1) terminals with a length of bare wire during all resistance tests. (Be sure to remove this wire before remounting test unit panel in test unit case.)
4. Turn MASTER SWITCH (S3) to BA-37, 0-1.5 V. D.C. (Position 2). Slide MODULATE TESTER SWITCH (S2) to *ON*.
5. See Figures 9 and 11.

From	*To*	*Ohmmeter Range*	*Ohms Nominal*	**Probable Faults*
A+ Terminal Board	Ground	Rx1000	Infinite	C6, C12, D-S3
B+ Terminal Board	Ground	Rx1000	#	C2, C4, C7, C8, C9, D-S3
3 of socket V1	Ground	Rx1000	50,850	C3, C5, D-R1, D-R2, D-62
6 of socket V2	Ground	Rx1000	351,250	D-R4, D-R5, D-R7
—IP Terminal Board	Ground	Rx1000	Infinite	D-S3
+IP Terminal Board	Ground	Rx1000	Infinite	D-S3
2 of socket V2	3 of socket V2	Rx100	10,160	D-R6, D-TR1
4 of socket V1	B+ Terminal Board	Rx100	5,170	C2, C4, C7, C8, C9, D-CH3, D-TR1, D-R3, D-60
MIC Terminal Board	Ground	Rx100	3,500	D-S1
REC Terminal Board	Ground	Rx10	1,150	D-S3
2 of socket V2	4 of socket V2	Rx10	570	C-10, D-TR1
6 of socket V1	4 of socket V1	Rx1	35	D-CH1
7 of socket V1	7 of socket V2	Rx1	0	D-S2
7 of socket V1	A+ Terminal Board	Rx1	1	C6, C12, D-CH2, D-S3, D-59
—IP Terminal Board	+IP Terminal	Rx1	14	D-61

#Initial low resistance followed by a steady reading in excess of 35,000 ohms.
*Probable Faults: C(#) Shorted Capacitor. D-(Ref. No.) Defective Part. A broken wire, a short circuit or ground are common faults for each test.

Figure 14—Test Unit I-135-E, Point-to-Point Resistance Table.

Section V
SUPPLEMENTARY DATA

19. REPLACEABLE PARTS.—*a. Antenna A-82-A (Artificial).*—

Ref. No.	Sig. C. Stock No.	Name of Part and Description	Function	Mfr. Code	Contr's Dwg. or Part No.
IE-17	2A275-82A	Antenna A-82-A (Artificial), —Special	Antenna	TM	A-82-A
C14		Antenna Capacitor; variable air, 2.5-8 $\mu\mu$f. —Special	Tuning	OM	P30002
M2		Antenna Current Meter; 0-50 MA. r-f. —GE Type DO-44, WM Type VT-35	Current	GE WM	P30017
R9		Resistor, Fixed Carbon; 54 ohms ± 5%, ½ watt Insulated. —Type A½	Load	CC	P30005
S4		Antenna Switch; SPDT rotary. —Special	Output	OM	P30004
101		Antenna & Meter Panel; less meter (M2) —Special	Antenna	TM	G30008 (Less M2)
102		Antenna Capacitor Control; rod and knob (104) —Special	Tuning	TM	G30004
103		Lever Knob; black bakelite 2½" long. Type #2100	Operate S4	HD	P30008
104		Knob; black bakelite. —Type S-308-1BB	Grip	KK	P30009
105		Antenna Connection; flexible lead and clip. —Special	Jumper	TM	G30006
106		Flat Thumb Screw; 6/32 x ¼". —Type P	Set-Screw	PK	
107		Antenna Capacitor Coupling; with set screw and 106. —Special	Coupling	TM	G30005
108		Clip & Bracket; metal angle and spring clip. —Special	Terminal	TM	G30007

b. Test Case CS-81-E.–

1E-17	2C7981E	Test Case CS-81-E —Special	Housing	TM	CS-81-E
109		Test Case Cover; complete assembly includes 110 & 111. —Special	Top	TM	G30010
110		Knurled Screw & Chain. —Special	Fastener	TM	G30009
111		Antenna Insulator; ceramic. —Special	Spacer	AL	P30035
112		Test Housing; includes 113, 114, 115, 116, 117, 118, 2-119, 120, 121, 122 & 123. —Special	Housing with press-to-talk Switch	TM	G30011
113		Housing; cast aluminum 3″ x 3¼″ x 11¾″. —Special	Part of 112	TM	P30018
114		Long Switch Lever; metal 9/16″ wide x 2″ long. —Special	Part of 112	TM	P30027
115		Fulcrum Hinge; metal 5/16″ wide x ¾″ long. —Special	Part of 112	TM	P30028
116		Spring Cushion; metal 5/16″ wide x 13/16″ long. —Special	Part of 112	TM	P30029
117		Sliding Hinge; metal 7/16″ wide x 1½″ long. —Special	Part of 112	TM	P30030
118		Frame; metal 1⅞″ wide x 4″ long. —Special	Part of 112	TM	P30038
119		Hinge Pin; .062″ diam. x .672″ long. —Special	Part of 112	TM	P30039
120		Hinge Screw; 4-36 thread one end .125″ diameter x ½″ long. —Special	Part of 112	TM	P30040

The word Special *indicates part made for, or by the Contractor.*

b. Test Case CS-81-E (Cont'd.)

Ref. No.	Sig. C. Stock No.	Name of Part and Description	Function	Mfr. Code	Contr's Dwg. or Part No.
121		Short Switch Lever; metal 9/16" wide x 1 1/8" long. —Special	Part of 112	TM	P30041
122		Switch Lever Spring; stainless steel.—Special	Part of 112	TM	P30129
123		Switch Stop Bracket; metal 3/8" wide x 5/8" long. —Special	Part of 112	TM	P30130
c. Test Stand FT-252-E.—					
IE-17	3F3990E	Test Stand FT-252-E —Special	Mounting	TM	FT-252-E
104		Knob; black bakelite. Type #S-308-1BB	Grip	KK	P30009
124		Clamp Screw & Foot; metal screw with floating collar. —Special	Clamp	TM	G30002
125		Bracket; metal angle with two holes.—Special	Mounting	TM	P30007
126		Spring Clip Terminal; —Type #10	Terminal	FE	
d. Test Unit I-135-E.—					
IE-17	3F4470-135E	Test Unit I-135-E —Special	Tester	TM	I-135-E
C1		Capacitor; fixed paper, .01 μf ± 10%, 400 W-V. —Type #340-21	Blocking	MR	P30110
C2		Capacitor; fixed ceramic, 50 μμf ± 5%, 500 W-V. —Type D	Plate balancing r-f oscillator.	CL	P30081
C3		Capacitor; fixed ceramic, 30 μμf ± 5%, 500 W-V. —Type D	Grid balancing r-f oscillator.	CL	P30082
C4		Capacitor; fixed mica, 500 μμf ± 20%, 500 W-V. —Type 5W	R-f bypass	CD	P30057

C5	Capacitor; fixed paper, .05 μf ± 10%, 400 W-V. —Type #342-33	R-f bypass	MR	P30111
C6	Capacitor; fixed paper, .25 μf ± 20%, 200 W-V. —Type #345-20	R-f bypass	MR	P30113
C7	Capacitor; electrolytic, 20 μf ± 30%, 150 W-V. —Special	A-f bypass	IC	P8381
C8	Capacitor; fixed paper, .1 μf ± 10%, 400 W-V. —Type #345-21	R-f bypass	MR	P30112
C9	Capacitor; fixed paper, .1 μf ± 10%, 400 W-V. —Type #345-21	R-f bypass	MR	P30112
C10	Capacitor; fixed paper, .01 μf ± 5%, 400 W-V. —Type #340-21	A-f osc. tuning	MR	P30110-5
C11	Capacitor; fixed mica, .002 μf ± 20%, 500 W-V. —Type W	R-f bypass	MR	P30068
C12	Capacitor; fixed paper, .25 μf ± 20%, 200 W-V. —Type #345-20	R-f bypass	MR	P30113
C13	Capacitor; fixed paper, .05 μf ± 10%, 400 W-V. —Type #342-33	R-f bypass	MR	P30111
CH1	Choke; 2MH, D-C resistance 35 ohms. —Special	R-f osc. plate	TM	P30079
CH2	Choke; 0.1 MH, D-C resistance 0.7 ohm. —Special	R-f filter	TM	P30078
CH3	Choke; 0.1 MH, D-C resistance 0.7 ohm. —Special	R-f filter	TM	P30078

The word Special *indicates part made for, or by the Contractor.*

d. Test Unit I-135-E (Cont'd.)

Ref. No.	Sig. C. Stock No.	Name of Part and Description	Function	Mfr. Code	Contr's Dwg. or Part No.
M1		Meter; 425 microamperes D-C. —Special	Multirange meter	BE	P30033
R1		Resistor; fixed carbon, 50,000 ohms ± 5%, ½ watt insulated. —Type BT-½	R-f osc. grid	IR	P1086
R2		Resistor; fixed carbon, 850 ohms ± 10%, ½ watt insulated. —Type BT-½	R-f filter	IR	P1817
R3		Resistor; fixed carbon, 5000 ohms ± 5%, ½ watt insulated. —Type BT-½	Voltage dropping	IR	P1924
R4		Resistor; fixed carbon, 1250 ohms ± 5%, ½ watt insulated. —Type BT-½	Voltage divider	IR	P30136
R5		Resistor; fixed carbon, 100,000 ohms ± 5%, ½ watt insulated. —Type BT-½	A-f osc. grid	IR	P4435
R6		Resistor; fixed carbon, 10,000 ohms ± 5%, ½ watt insulated. —Type BT-½	Screen Series (V2)	IR	P7723
R7		Resistor; fixed carbon, 250,000 ohms ± 5%, ½ watt insulated. —Type BT-½	Grid Series (V2)	IR	P1333
R8		Resistor; fixed carbon, 250,000 ohms ± 5%, ½ watt insulated. —Type BT-½	Voltage divider	IR	P1333
RECT.		Rectifier; copper oxide type. —Special	A.C. voltage	SM	P3506
S1		Switch; single pole, press to operate, part of 157. —Special	Modulate transmitter	ST	P30069

S2	Switch; single pole, slide to operate, part of 157. —Special	ON-OFF (V2)	OM	P8377
S3	Master Switch; 5 pole, 8 position, rotary, part of 138. —Special	Circuit selector	OM	P30067
TR1	Modulation Transformer; 1 to 2, 175 ohms, 3 to 5, 545 ohms, D-C resistance. —Special	A-f osc. coil	EW	P30034
V1	Tube; VT-174 (3S4)	R-f osc. tube.		VT-174
V2	Tube; VT-173 (1T4)	A-f osc. tube		VT-173
56	Resistor; fixed carbon, 6,590 ohms ± 1%, ½ watt insulated. —Special	Mult., 3 V.D.C.	CC	P30059
57	Resistor; fixed carbon, 352,500 ohms ± 1%, ½ watt insulated. —Special	Mult., 150 V.D.C.	CC	P30060
58	Resistor; fixed carbon, 60,000 ohms ± 1%, ½ watt insulated. —Special	Mult., 60 V.A.C.	CC	P30061
59	Resistor; wire wound, 0.333 ohms ± 1%, 1 watt insulated. —Special	Shunt, 600 MA. D.C.	TM	P30070
60	Resistor; wire wound, 3.355 ohms ± 1%, 1 watt insulated. —Special	Shunt, 60 MA. D.C.	TM	P30071
61	Resistor; wire wound, 13.71 ohms ± 1%, 1 watt insulated. —Special	Shunt, 15 MA. D.C.	TM	P30072
62	Resistor; wire wound, 186 ohms ± 1%, 1 watt insulated. —Special	Shunt, 1.5 MA. D.C.	TM	P30073
127	Terminal Panel; bakelite with special contacts. —Special	Part of 128	TM	G30013

The word Special *indicates part made for, or by the Contractor.*

d. Test Unit I-135-E (Cont'd.)

Ref. No.	Sig. C. Stock No.	Name of Part and Description	Function	Mfr. Code	Contr's Dwg. or Part No.
128		Cable & Terminal Board; complete assembly includes 127. —Special	Harness	TM	G30016
129		Knob & Spacer; includes screw and lock-washer. —Special	Part of 130	TM	P30052
130		Crystal Compartment Cover; complete assembly includes 129. —Special	Cover	TM	G30021
131		Crystal Socket & Clip; complete assembly. —Special	Crystal testing	TM	G30022
132		Miniature Tube Socket; 7 contact. —Special	Socket for V1 & V2	CM	P30045
133		Tube Shield & Clip; includes two mounting eyelets.. —Special	Shield for V1 & V2	TM	G30023
134		3 Lug Panel; bakelite with 2 insulated and 1 ground lug. —Special	Terminal strip	CM	P1415
135		4 Lug Panel & Insulator; bakelite with 4 insulated lugs. —Special	Terminal strip	TM	P30056
136		8 Lug Panel & Insulator; bakelite with 8 insulated lugs. —Special	Terminal strip	TM	P8339
137		Rivet; steel 1/8" diameter x 3/16" long.	Used with 136	CR	
138		Master Switch Assembly; includes R8-RECT-S3-56-57-58-59-60-61-62 and 145. —Special	Range selector	TM	G30027

139	Receiver; dynamic type complete assembly. —Special	Earphone	TM	G30029
140	Microphone; dynamic type complete assembly. —Special	Modulation	TM	G30030
141	Pin Jack; black bakelite includes retainer. —Special	External battery connection	TM	P3559
142	Bakelite Cap; 2⅝" diameter. —Special	Cover	TM	P30064
143	Cable Clamp; metal with right angle twist. —Special	Cable anchor	TM	P30093-A
144	Clamp; metal ⅜" wide x ¾" long. —Special	Wire clamp	TM	P30137
145	Bar Knob; black bakelite 1¼" long. Type #2300A	Operates S3	HD	P3029
146	Battery Compartment; complete assembly. —Special	Housing	TM	G30034
147	Battery Compartment Door; complete assembly. —Special	Door	TM	G30035
148	Battery Terminal Bracket; complete assembly includes 149. —Special	Terminal strip	TM	G30036
149	Latching Bolt; includes knurled grip. —Special	Fastens 148	TM	G30083
150	Test Unit Case; includes 146-147-148 & 151. —Special	Housing	TM	G30037
151	Leather Handle & Clamps; includes mounting screws, nuts and lockwashers. —Special	Transportation	TM	P1854
152	Test Unit Cover; complete assembly.—Special	Cover	TM	G30039

The word Special *indicates part made for, or by the Contractor.*

d. Test Unit I-135-E (Cont'd.)

Ref. No.	Sig. C. Stock No.	Name of Part and Description	Function	Mfr. Code	Contr's Dwg. or Part No.
153		A+ Battery Wire; lead with pin terminal. —Special	Jumper	TM	G30040
154		A− Battery Wire; lead with pin terminal. —Special	Jumper	TM	G30041
155		B+ Battery Wire; lead with pin terminal. —Special	Jumper	TM	G30042
156		B− Battery Wire; lead with pin terminal. —Special	Jumper	TM	G30043
157		Modulation Switch Bracket; includes R5, S1, S2 and 134. —Special	Operates a-f osc.	TM	G30025
158		Riveting Anvil; tool. —Special	Curls rivets & eyelets.	TM	P30138
159		Screwdriver; double ended. —Special	Tool	VP	P30099

The word Special *indicates part made for, or by the Contractor.*

20. LIST OF MANUFACTURERS.—

Mfg. Code	Name	Address	
AL	American Lava Corp.		Chattanooga, Tenn.
BE	Beede Electrical Instr. Co.		Penacook, N. H.
CC	Continental Carbon, Inc.	13900 Lorain Ave.	Cleveland, Ohio
CD	Cornell-Dubilier Elec. Corp.	333 Hamilton Blvd	So. Plainfield, N. J.
CL	Centralab	900 E. Keefe Ave.	Milwaukee, Wis.
CM	Cinch Mfg. Co.	2335 W. Van Buren St.,	Chicago, Illinois
CR	Chicago Rivet and Machinery Co.	9600 Jackson Blvd.	Bellwood, Illinois
EW	Electrical Windings, Inc.	910 W. Lake St.	Chicago, Illinois
FE	Fahnestock Electric Co.	46-44 Eleventh St.	Long Island City, N. Y.
GE	General Electric Co.	840 So. Canal St.	Chicago, Illinois
HD	Harry Davies Molding Co.	1428 N. Wells St.	Chicago, Illinois
IC	Industrial Condenser Corp.	1725 North Ave.	Chicago, Illinois
IR	International Resistance Co.	401 N. Broad St.	Philadelphia, Pa.
KK	Kurz Kasch Inc.		Dayton, Ohio
MR	Micamold Radio Corp.	1087 Flushing Ave.	Brooklyn, N. Y.
OM	Oak Mfg. Co.	1260 Clybourn Ave.	Chicago, Illinois
PK	Parker Kalon Corp	200 Varick St.	New York, N. Y.
SM	Schauer Machine Co.	2060 Reading Road.	Cincinnati, Ohio
ST	Stackpole Carbon Co.		St. Marys, Pa.
TM	Triumph Mfg. Co	913-21 W. Van Buren St.	Chicago, Illinois
VP	Vaco Products Co.	317 E. Ontario St.	Chicago, Illinois
WM	Westinghouse Electric & Mfg. Co.	95 Orange St.	Newark, N. J.

[A. G. 062.11 (11-6-42).]

By order of the Secretary of War:

G. C. MARSHALL,
Chief of Staff

Official:
J. A. ULIO,
Major General
The Adjutant General.

Distribution:—IBn and H 7 (3); IC4, 7, 11 (5).

(For explanation of symbols see FM 21-6)

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