

TM11-2043

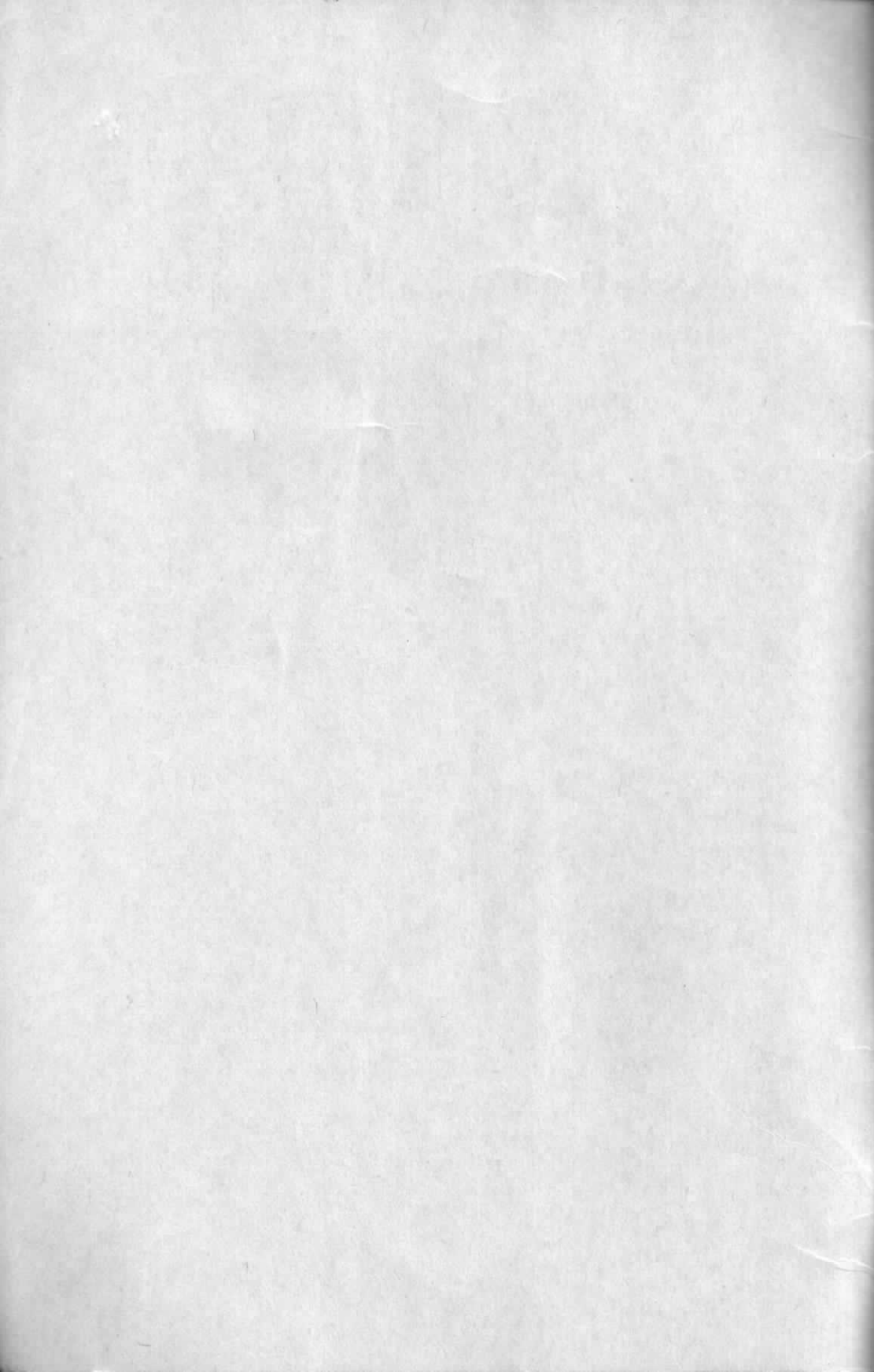
TO 16-40T-P3-5

WAR DEPARTMENT TECHNICAL MANUAL

TELEPHONE

TP-3

WAR DEPARTMENT • 30 AUGUST 1944



TECHNICAL MANUAL
TELEPHONE TP-3

CHANGES }
No. 1 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 9 June 1950

TM 11-2043, 30 August 1944, is changed as follows:

7.1 (Added.) Operation in Arctic Winter Temperatures

a. EFFECT OF WINTER CONDITIONS IN ARCTIC ON EQUIPMENT. In the Arctic it is often essential to operate Telephone TP-3 in temperatures as low as -60° F. Under conditions of extremely low temperature combined with the effects of ice, snow, rain, fog, frost, or moisture caused by temperature changes condensed on the equipment, the efficiency of the telephone can be affected severely. Moisture condenses and freezes on the transmitter diaphragm and, in addition, the generator shaft and gears may freeze.

b. OPERATION IN ARCTIC WINTER TEMPERATURES. To insure the satisfactory performance of Telephone TP-3 in temperatures as low as -60° F. when operation of this equipment is essential, proceed as follows:

- (1) Protect the handset transmitter and receiver with Microphone Cover CW-111/U (Signal Corps stock No. 2B250-111) to prevent the accumulation of frost on the transmitter diaphragm and to prevent frostbite when the operator's ear comes in contact with the cold receiver cap.
- (2) Remove the lubricant from Generator GN-38-B, using Solvent, dry-cleaning (SD) (Federal spec. P-S-661a, Quartermaster Supply No. 51-5-4385) and a small, stiff bristle brush. Relubricate sparingly with Oil, lubricating, aircraft instrument (Army-Navy spec. AN-0-11, Quartermaster Supply No. 14-0-1341). Be especially careful not to overlubricate and be sure that the lubricant does not touch electrical contact parts. If electrical contact parts have been touched with oil, be sure that no oil remains on any contact surfaces. During other seasons of the year when weather in the Arctic becomes milder, relubricate the generator with temperate zone lubricants.

14.1 (Added.) Preventive Maintenance Techniques in the Arctic

a. **ARCTIC WINTER CONDITIONS.** Because of extremely low temperatures, often as low as -60° F., adverse weather conditions, and the bulky protective clothing worn by operating personnel, preventive maintenance techniques that can be performed by using organizations in the open or in unheated shelters are limited to those operations which must be performed to keep a system functioning and which can be performed when the operator's hands are protected by gloves. Wherever possible, except for replacing the handset, the handset cord, or the transmitter or receiver units of Handset TS-10-() (par. 16*a*) or replacing the neon lamp (par. 16*j*), perform all other maintenance operations in a heated shelter.

b. **OTHER ARCTIC CONDITIONS.** During other seasons of the year, temperature and weather conditions in the Arctic range from very low temperatures with ice and snow to mild weather such as is found in temperate climates. Therefore, preventive maintenance operations by using personnel will vary from those given in *a* above to normal temperate zone operations during the season of the year when the weather is not severe.

c. **TOOLS AND MATERIALS.** The following tools and materials are required for organizational maintenance and repair of Telephone TP-3 in Arctic winter temperatures:

Signal Corps stock No.	Name of item and description	Used to
NSNA	BRUSH: stiff bristles; round; $\frac{3}{4}$ " diam; bristles approx 2" lg; WECO #KS-3093.	Remove dust and dirt.
6Z2056	CLOTH: lint-free; twill jean textile.	Clean various parts of equipment.
6R40848/1	SCREW DRIVER, cabinet: $\frac{3}{4}$ " x $2\frac{1}{2}$ " blade; $6\frac{1}{4}$ " lg.	Tighten assembly and mounting screws.

15. Trouble Location

Localize the trouble * * * clean and tight.

* * * * *

b. **REPAIRS BY MAINTENANCE PERSONNEL.**

* * * * *

(2) *Signalling circuit.* Test as described * * * wires and connections.

* * * * *

(c) If no signalling * * * in paragraph 17b.

Note (added). When making the tests and repairs described in b above, in Arctic winter temperature, perform the work in a heated shelter. Tools and materials necessary for Arctic maintenance and repair are given in paragraph 14.1.

16. Replacement of Parts

* * * * *

l. BINDING POST TM-214. Remove the crank-well * * * in the case.

NOTE (added).—When replacing parts under Arctic winter conditions, perform all operations in paragraph 16 (except those described in a and j.) in a heated shelter.

17.1 (Added.) Weatherproofing

Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

18. Tropical Maintenance for Telephone TP-3

a. GENERAL. Rescinded.

b. TREATMENT. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, and TB SIG 72, Tropical Maintenance of ground signal equipment.

* * * * *

18.1 (Added.) Winter Maintenance

a. GENERAL. Special precautions necessary to make equipment perform satisfactorily and to prevent total operational failure in extremely low temperatures are explained fully in TB SIG 66, Winter Maintenance of Signal Equipment, and TB SIG 219, Operation of Signal Equipment at Low Temperatures.

b. TELEPHONE TP-3. Telephone TP-3 will give satisfactory performance in temperatures as low as -60° F. provided additional

maintenance is performed and precautions are taken to prevent equipment failure. When the telephone is used under conditions such as prevail in the Arctic during the winter, the following problems may be encountered:

- (1) The shock-resistant characteristics of material change at very low temperatures, and steel shrinks and becomes brittle. Handle the equipment with reasonable care.
- (2) Canvas will freeze and lose its pliability. Handle the case of the telephone carefully to avoid cracking the canvas.
- (3) Extreme cold will cause cords and wiring to become brittle. Handle handset cords and wiring carefully.
- (4) Frost which forms from the breath in the holes of the handset transmitter affects transmission. Place a protective cover (par. 7.1b) over the transmitter before placing the equipment in operation, and have a spare transmitter unit available in case the one in use fails to function properly.
- (5) Water in the receiver will freeze and impede the action of the diaphragm, and a receiver exposed to very low temperatures may freeze the operator's ear if he uses the receiver in contact with his ear. Place a protective cover (par. 7.1b) over the handset receiver before using the equipment, and have a spare receiver unit available in case the one in use fails to function properly.
- (6) The shafts and gears of the hand generator will be difficult to turn if these parts are not lubricated properly for cold weather operation. Lubricate for Arctic winter operation according to instructions in paragraph 7.1b.

18.2 (Added.) Desert Maintenance

a. GENERAL. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained fully in TB SIG 75, Desert Maintenance of Ground Signal Equipment.

b. TELEPHONE TP-3. Special dustproofing treatment is not necessary for Telephone TP-3. Take all possible precautions to keep dust, dirt, and sand from getting on lubricated parts. Daily inspection and cleaning of the equipment are recommended. Instead of merely adding new lubricants to the generator, clean and relubricate the equipment whenever practicable.

18.3 (Added.) Lubrication Under Extreme Temperature Conditions

The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69, Lubrication of Ground Signal Equipment. Observe all precautions and pay strict attention to all lubrication instructions when operating equipment under conditions of extreme cold or heat.

[AG 300.7 (9 May 50)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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The Adjutant General

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Chief of Staff, United States Army

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For explanation of distribution formula, see SR 310-90-1.

TELEPHONE

TP-3



WAR DEPARTMENT

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30 AUGUST 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 30 August, 1944.

TM 11-2043, Telephone TP-3, is published for the information and guidance of all concerned.

[A. G. 300.7 (31 Aug 44).]

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11-587; 11-592; 11-597.

For explanation of symbols, see FM 21-6.

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DESTRUCTION NOTICE

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

WHEN —When ordered by your commander.

HOW —1. Smash —Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut —Use axes, handaxes, machetes.

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

4. Explosives —Use firearms, grenades, TNT.

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

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT —1. Smash —Handset, body of telephone.

2. Cut —Cord, wiring, case.

3. Burn —Case, handset, wiring.

4. Bend —All metal parts.

5. Bury or scatter — All of the above parts after destroying.

DESTROY EVERYTHING



TL51627

Figure 1. Telephone TP-3.

SECTION I

DESCRIPTION

1. GENERAL.

Telephone TP-3 (fig. 1) is a self-contained unit used for two-way signalling and voice communication. It is a sound-powered magneto telephone which requires no batteries or external source of power. It may be used on metallic or grounded circuits composed of field wire, open-wire lines, or cable, and **with** the following types of circuits and equipment:

Sound-powered telephones.

Local-battery (magneto) telephones.

Local-battery (magneto) switchboards.

Two-way ring-down trunk circuits of common battery switchboards.

Common battery line circuits of common battery switchboards. (See subparagraph 6b for limitations on this use.)

2. DIMENSIONS AND WEIGHT.

Telephone TP-3 is 8¼ inches wide, 4¼ inches deep, and 10 inches high, and weighs approximately 10½ pounds.

3. DESCRIPTION.

a. **General.** (1) Telephone TP-3 is a portable unit. Its signalling range is comparable to that of other telephones but the talking range is considerably less. The talking and signalling range of a telephone varies with weather conditions and types of line construction.

(2) The telephone consists of the body assembly which is fastened into the right-hand side of the fabric case, and sound-powered Handset TS-10-() connected to the body assembly by a cord and carried in the left-hand portion of the case.

b. **Case.** Telephone TP-3 is contained in a treated waterproof fabric case provided with an adjustable carrying strap (fig. 2). The inner cover of the case is hinged at the left and is fastened to the right side of the case with a snap fastener. The outer cover is hinged at the back, overlaps the inner cover, and is fastened at the front with a snap fastener. A metal-faced opening for the crank handle is located on the right side of the case.

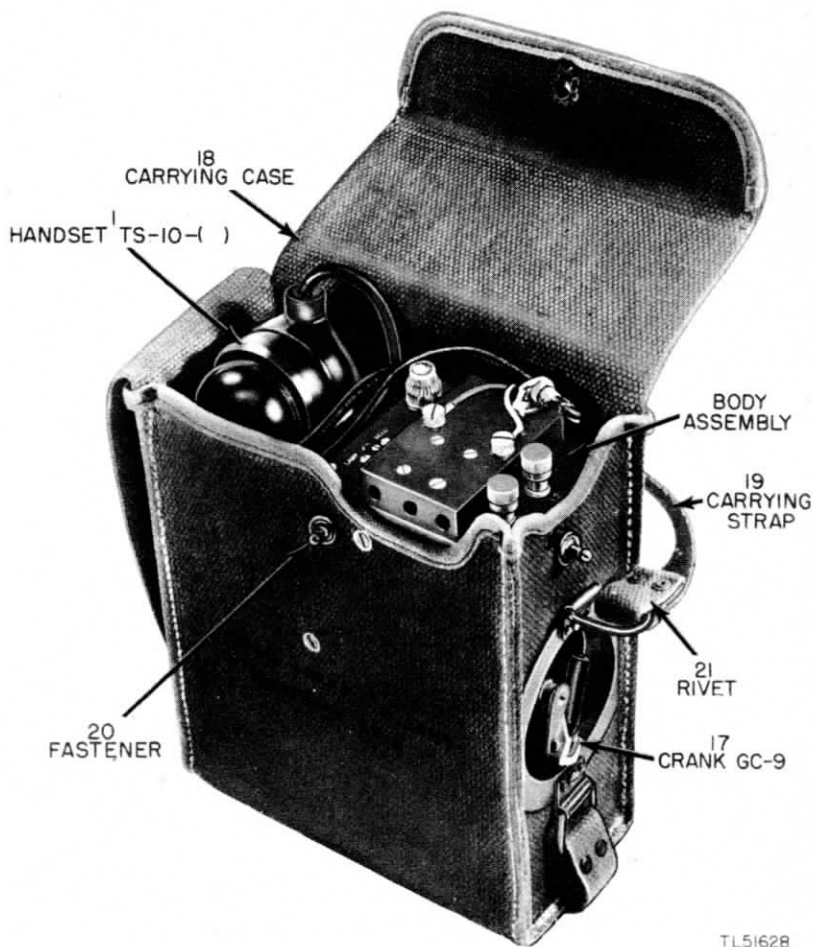


Figure 2. Telephone TP-3, top cover open.

c. Handset and Cord. Handset TS-10() used in Telephone TP-3 is a sound-powered handset similar in appearance to the present commercial-type handset (fig. 3).

(1) The handset consists of a transmitter unit, a receiver unit, and a plastic handle containing the necessary connections. The units are keyed so that they can be assembled only in the proper position. Each unit is held in place by a plastic cap and a locking ring.

(2) The 6-foot connecting cord consists of two rubber-covered stranded copper wire conductors which are twisted together and covered with a rubber jacket. The conductors terminate in spade-type terminals for fastening to binding screws. A built-in stay cord anchors the connecting cord in place, and thus prevents any pull strain from being applied to the copper conductors.

d. Body. All elements of the telephone, except the handset, are mounted on a metal chassis which is fastened to the carrying case by seven machine screws. This assembly of the chassis with the elements mounted on it is called the body, (fig. 4).

(1) The terminal block forms the top of the body (fig. 5). Mounted on the terminal block are the neon signalling lamp, screw switch, jack, and two Binding Posts TM-214. All external line connections and most of the internal connections are made to this terminal block.

(a) The neon lamp in its mounting is located on the left-hand side of the terminal block toward the rear (fig. 5). The lamp is protected by a transparent plastic cover projecting above the plate. The mounting extends about $1\frac{1}{2}$ inches below the plate, providing two terminals for connecting the wire leads. A 200,000-ohm resistor is mounted in the base of the mounting and connected in series with the lamp.

(b) The screw switch is located in front of the lamp and is marked with an arrow pointing clockwise to BELL and counterclockwise to LAMP (fig. 5).

(c) A jack mounted at the center of the terminal block is provided so that sound-powered head and chest sets may be connected to the telephone (fig. 5). (Do not attempt to use Chest Set TD-3, Microphone T-30, or Microphone T-45 with Telephone TP-3.) The jack has three openings suitable for accommodating Plug PL-58; the center opening is not equipped with contacts. Mounted on the jack terminal block are: two terminals for the handset connecting cord; four studs for separating the conductors of that cord when connected to the terminals; and a screw eye for anchoring the stay cord.

(d) Two Binding Posts TM-214 are mounted at the right-hand side of the terminal block (fig. 5); they are designated L1 and L2. Below the mounting plate, soldering lugs are mounted on the binding posts for making internal connections.

(2) Capacitor CA-177-A is mounted directly below the terminal block on



Figure 3. Handset TS-10-().

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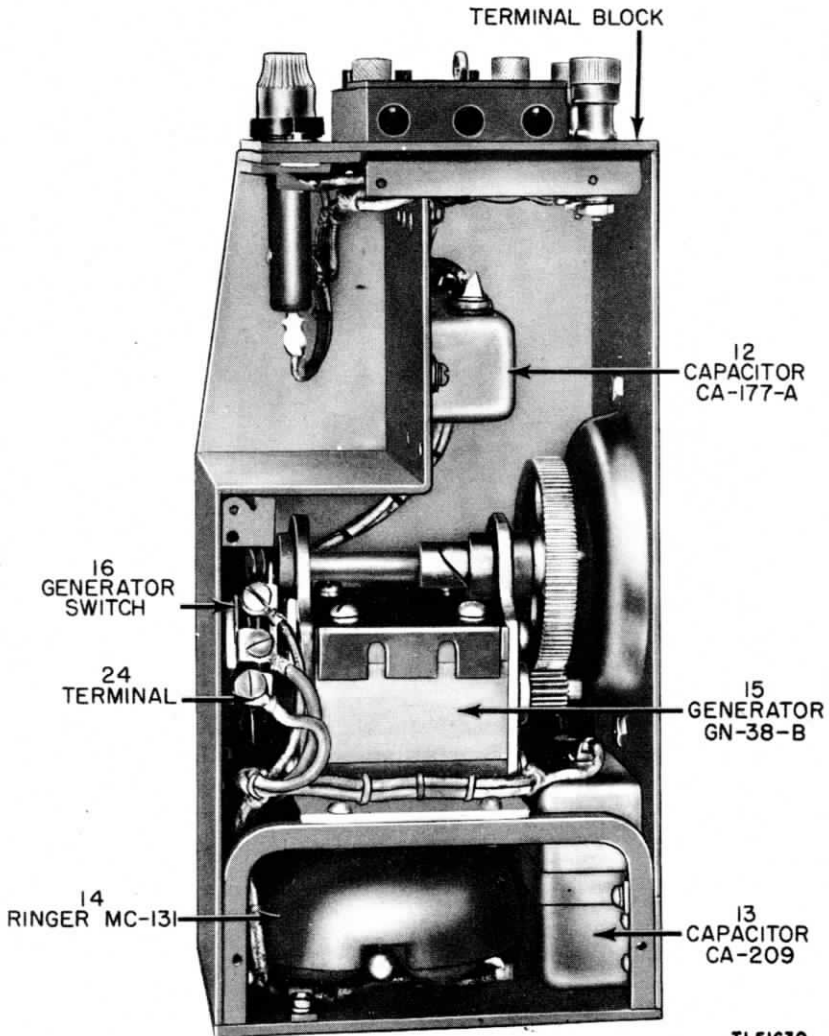


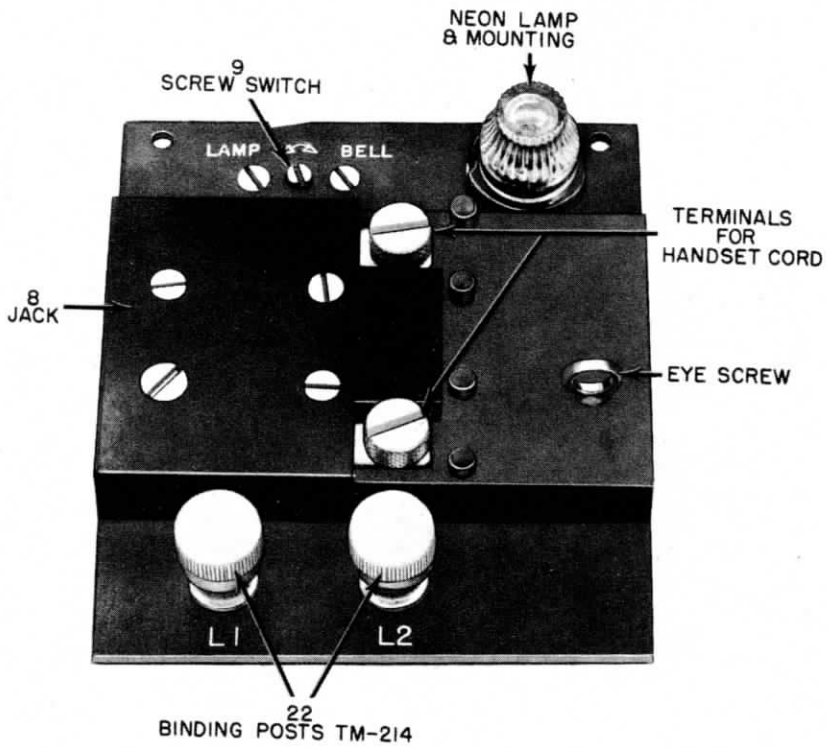
Figure 4. Telephone TP-3, body with front wall and lamp guard plate removed.

clinch nuts spun into the side wall (fig. 6). Capacitor CA-209 is mounted at the bottom right-hand side of the body and is held in place by a steel strap. Both are oil-filled paper capacitors.

(3) Ringer MC-131 is mounted on the floor of the body to the left of the Capacitor CA-209 (fig. 6). It consists of two coils, an armature, and a clapper mounted on a magnetic frame within a single gong.

(4) Generator GN-38-B is mounted above the ringer on a supporting base (fig. 6). It consists of an armature mounted by brass shafts and completely enclosed by alnico magnets on either side, magnetic iron field poles at the top and bottom and bearing plates at either end. The armature shafts ride in steel bearings with a nonfluid lubricant. The armature is driven from an upper shaft through a 21/99 gear ratio. This upper shaft has a cam arrangement, so that the crank shaft is moved to the left as it starts to turn, operating the generator switch mounted on the back of the generator. Operation of this switch disconnects the ringer and connects the generator to the line terminals. Crank GC-9 is used with, but is not a part of, the generator. When not in use, it hinges back automatically into its recess.

(5) All internal connecting wires are combined into a single cable form which is laced together with cotton twine. The color code is indicated on the wiring diagram pasted to the body of the telephone.



TL5i631

Figure 5. Telephone TP-3, terminal block, top view.

SECTION II

INSTALLATION AND OPERATION

4. INSTALLATION.

Telephone TP-3 is ready for operation when it is unpacked. No batteries or other external power source are required for operation. Install the telephone in a manner providing convenient access to the handset and the crank. Place the strap so it will not interfere with the operation of the telephone.

CAUTION: In all cases be careful that water does not enter the body of the telephone.

5. PREPARATION FOR USE.

Make certain that the conductors and the stay cord of the handset cord are fastened securely to the terminals and the screw eye, respectively, of the jack.

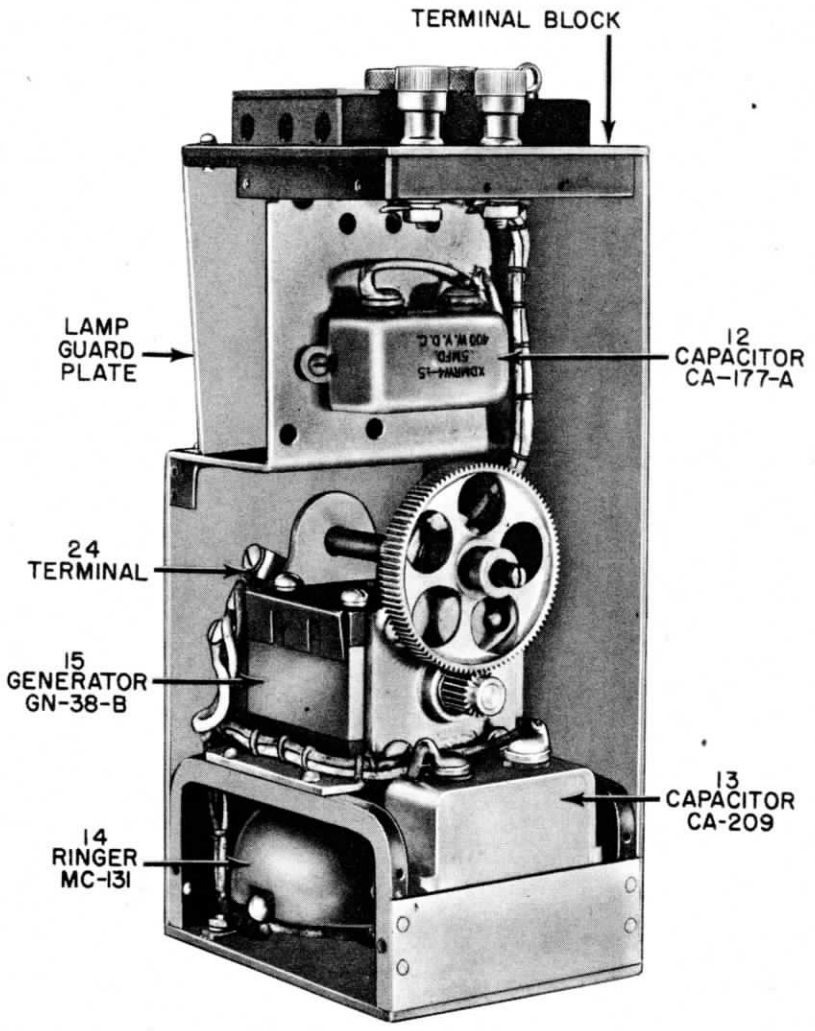
a. Test the handset by holding the receiver to the ear and blowing into the transmitter. A rushing sound (sidetone) should be heard in the receiver.

b. Test the signalling circuits by connecting the line terminals of the telephone to the line terminals of a magneto telephone which is known to be serviceable. Turn the crank of the telephone under test; the ringer of the other telephone should operate. Turn the screw switch of the telephone under test counterclockwise as far as it will go; turn the crank of the other telephone; the lamp of the telephone under test should flash. Turn the screw switch clockwise and again turn the crank of the other telephone; the ringer should now operate.

c. When the telephone is installed on a metallic circuit, connect one of the line conductors to binding post L1 and the other to L2. If it is installed on a ground return circuit, connect the conductor of the line circuit to one binding post and the conductor from a good ground to the other.

d. When a silent visual signal is desired, turn the screw switch counterclockwise as indicated by the arrow pointing to LAMP. If an audible signal is desired, turn the screw switch clockwise to BELL.

e. When an auxiliary sound-powered set (par. 1) is to be used with the telephone, insert Plug PL-58 into the jack of the telephone.



TL51632

Figure 6. Telephone TP-3, body with front wall and crankwell plate removed.

f. Test the installation for proper operation as described in paragraph 6.

6. OPERATION.

Before attempting to operate the telephone, make certain that it is properly installed (par. 4) and that it passes the preliminary tests (par. 5). Subparagraph a below applies when the telephone is connected to the equipment listed in paragraph 1, with the exception of the common battery line circuit which is described in subparagraph b below.

a. **Procedure.** (1) When several telephones are installed on a single line, challenge the line to see if it is busy. If no reply is heard, proceed as outlined below. If only one other telephone is installed on the line, omit this step.

(2) Turn the crank clockwise rapidly to signal the switchboard operator or the desired telephone.

(3) Hold the handset with the receiver to the ear and the transmitter close to the lips. Speak distinctly.

(4) When the conversation is completed on a call established through a switchboard, ring off by two or three sharp turns of the crank to signal the operator that the connection is no longer desired or that a new connection is desired. Replace the handset in the case when not in use.

(5) An incoming call is indicated either by the ringing of the bell or by the flashing of the lamp, depending on the position of the screw switch. Remove the handset from the case and answer at once.

b. **Emergency Use.** This telephone is not designed to provide common battery supervision. However, capacitors in series with the ringer and handset are provided so that the telephone may, in an emergency, be connected to common battery lines without causing a permanent signal at the switchboard. The line lamp on the common battery switchboard may be flashed by short circuiting slowly and intermittently the line binding posts on the telephone. Because the switchboard operator will not receive the usual supervision while the conversation is being held, the operator should be instructed not to take down the connection until the supervisory signal is flashed on and off. At the completion of the call, flash the supervisory signal at the switchboard by short circuiting slowly and intermittently the binding posts.

7. USE IN GAS ATTACK.

If, during a gas attack, it is necessary to continue communications with Telephone TP-3 (sound-powered), the handset may be used directly with the gas mask. If it is attempted to use the handset in the normal manner while wearing a gas mask, the results will be very unsatis-

factory. Hence, to be understood, hold the transmitter directly in front of and pressed against the outlet vent (*flutter valve*) or speech diaphragm of the gas mask. When through talking, indicate it in some way (such as saying "Over") and move the handset so that the receiver is directly over the ear. This procedure is necessary to prevent the person at the distant end from speaking when he cannot be heard by the person wearing the gas mask.

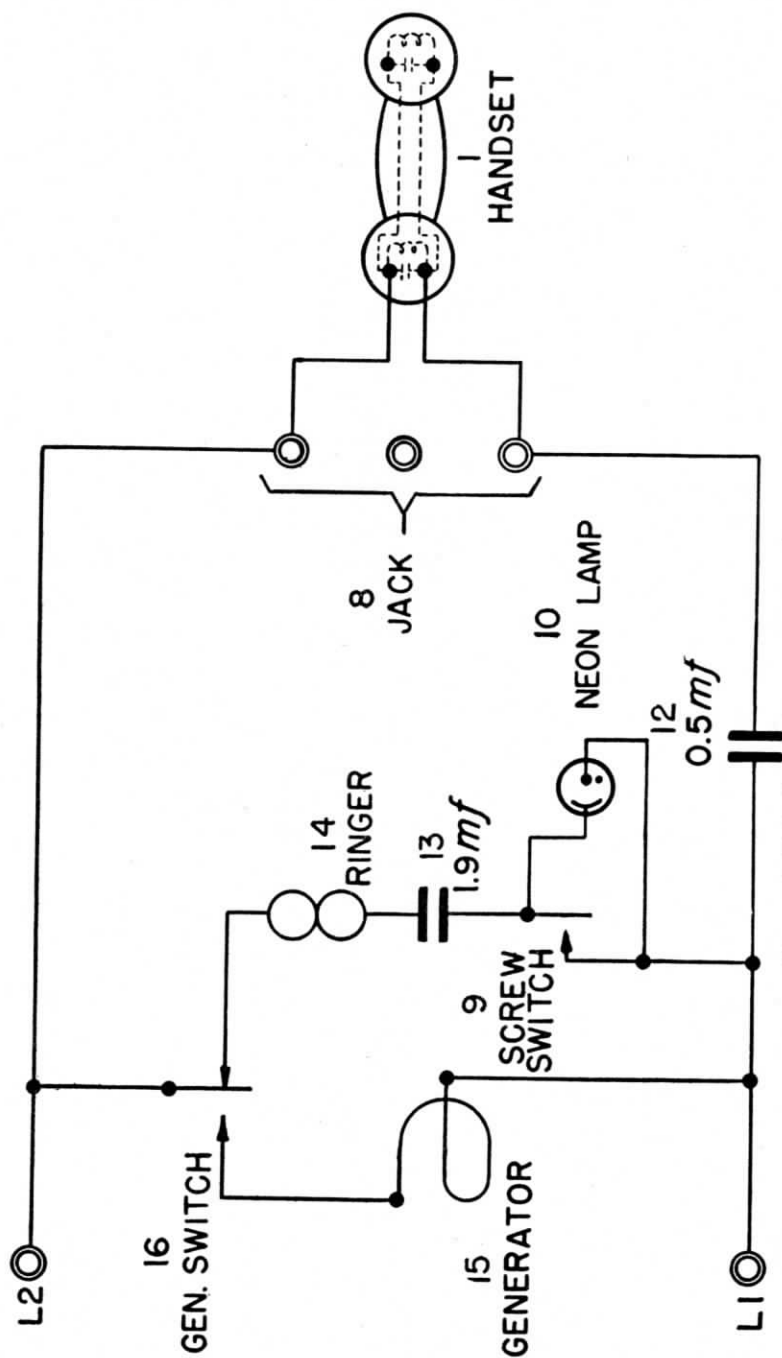


Figure 7. Telephone TP-3, schematic diagram.

SECTION III

FUNCTIONING OF PARTS

8. GENERAL.

The circuit (fig. 7) of Telephone TP-3 consists essentially of three parallel branches: Handset TS-10-(), in series with Capacitor CA-177-A, is permanently bridged across the line; Ringer MC-131, Capacitor CA-209, and the lamp, in series, are also normally bridged across the line; the generator circuit is normally open. When the crank is turned, the generator switch opens the ringer circuit and closes the generator circuit, so that the generator is bridged directly across the line.

9. HANDSET TS-10-().

This handset consists of two sound-powered units mounted in a molded plastic handle (fig. 8). The transmitter and receiver units are not interchangeable because the acoustical openings over the diaphragm are different. The units are arranged so that they cannot be inserted in the wrong cavity.

a. **Transmitter Unit.** The transmitter unit is a magnetic sound-powered type which requires only the power of the speaker's voice to make it operate. When acoustical power drives the diaphragm downward, the left-hand end of the pivoted armature approaches the south pole of the magnet and the right-hand end approaches the north pole (fig. 9). This causes the passage of a magnetic flux from the right-hand north pole through the armature to the left-hand south pole. When the diaphragm moves upward, the left-hand end of the armature approaches the north pole and the right-hand end approaches the south pole, causing the passage of a magnetic flux from the left-hand north pole through the armature to the right-hand south pole. This reversal of direction of the flux in the armature induces an alternating voltage in the winding which surrounds the armature. This voltage is applied to the line.

b. **Receiver Unit.** Because the power output of the sound-powered transmitter is very small, this deficiency is met in part, by making the receiver more sensitive than that used with a battery-powered telephone. The receiver unit of the handset is, like the transmitter unit, a sound-powered device. Because the electrical principles involved are the same as in the transmitter, figure 9 may again be used to consider the function of the receiver. When an alternating current flows through the coil, the

polarity of the magnetic field affecting the armature will reverse as a function of the frequency of the incoming signal. The motion of the armature in this field then causes the diaphragm to vibrate, producing the sound.

10. GENERATOR GN-38-B (fig. 10).

This generator consists of an armature arranged to rotate in a permanent magnetic field. Rotation of the armature generates a low-frequency alternating current in the armature windings. This current is sent out over the line to operate the ringer of the distant telephone or the line signal of the switchboard.

11. RINGER MC-131 (fig. 10).

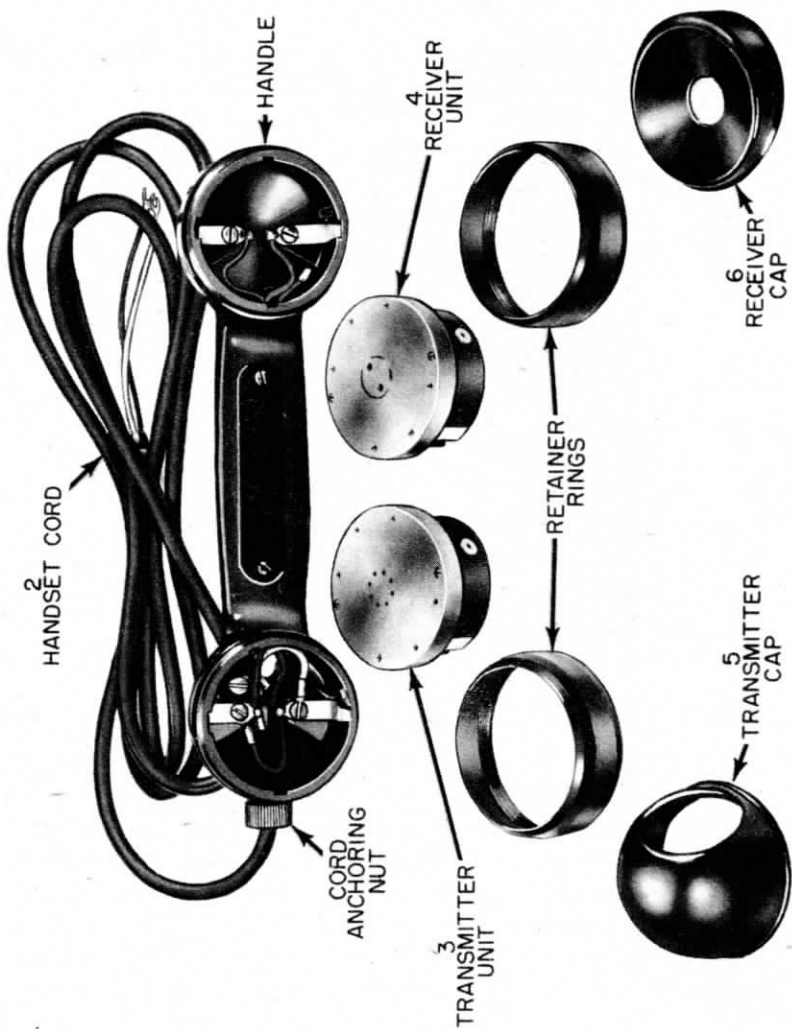
This ringer operates on 16- to 20-cycle alternating current. When the coils are energized, they cause the armature to vibrate so that the clapper strikes the internal projections on the gong. The acoustical output is high for a relatively low electrical input if the ringer is properly adjusted.

12. NEON LAMP AND RESISTOR (fig. 10).

The neon lamp and resistor have a very high impedance so that the lamp operates on a small current. With the lamp and ringer in series, the lamp will not pass sufficient current to operate the ringer. When the lamp is shunted by operating the screw switch to BELL, the ringer will operate.

13. BLOCKING CAPACITORS.

Capacitor CA-177-A (fig. 10) is a 0.5-microfarad capacitor connected in series with the handset to block direct current and limit the low-frequency signalling current through the handset. The impedance of this capacitor is high at low frequencies, but very low at voice frequencies thus providing good transmission. Capacitor CA-209 (fig. 10) is a 1.9-microfarad capacitor connected in series with the ringer to prevent direct current from magnetizing the ringer coils and interfering with proper operation, and also to help balance the line impedance. The impedance of the ringer circuit is relatively low at signalling current frequency, but very high at voice frequency so as not to interfere with voice transmission.



TL51633

Figure 8. Handset TS-10-(), component parts.

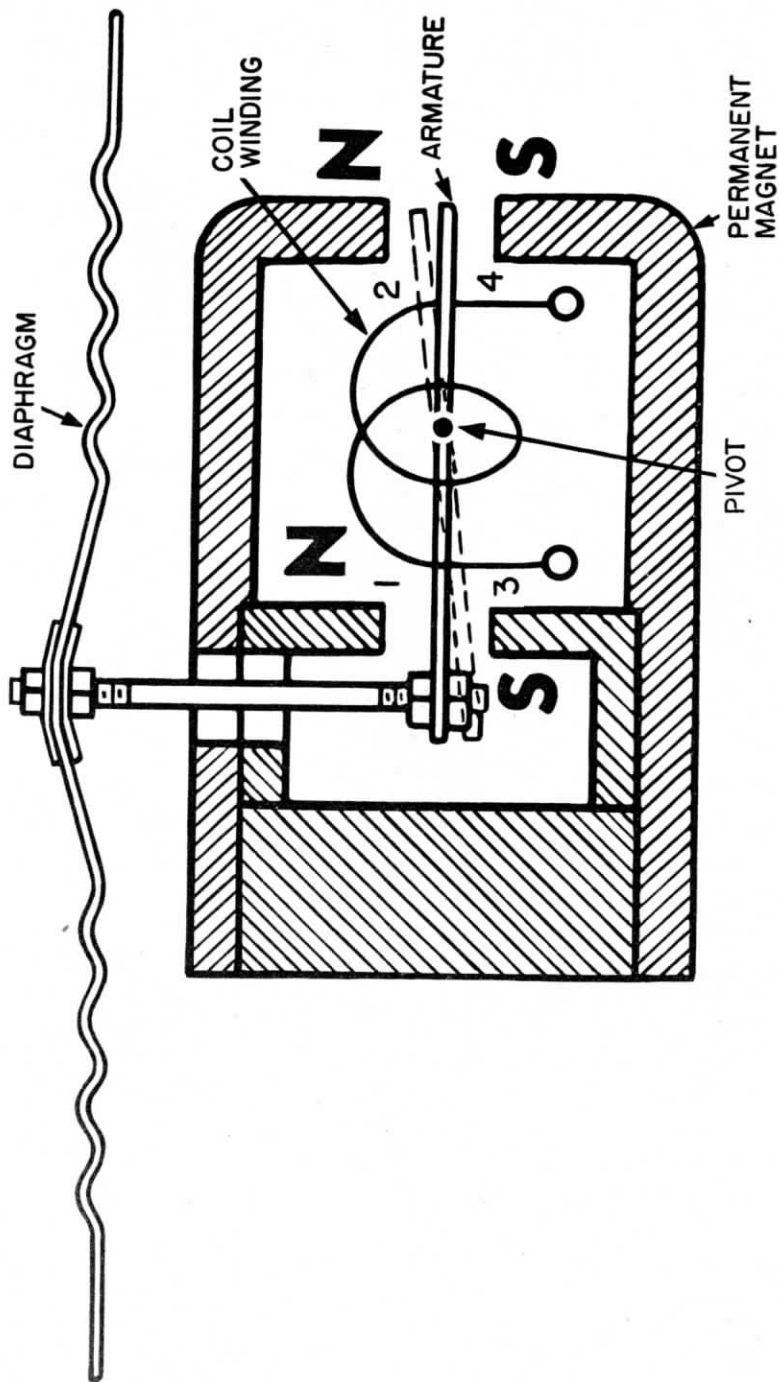


Figure 9. Sound-powered unit, schematic diagram.

TL 50196A

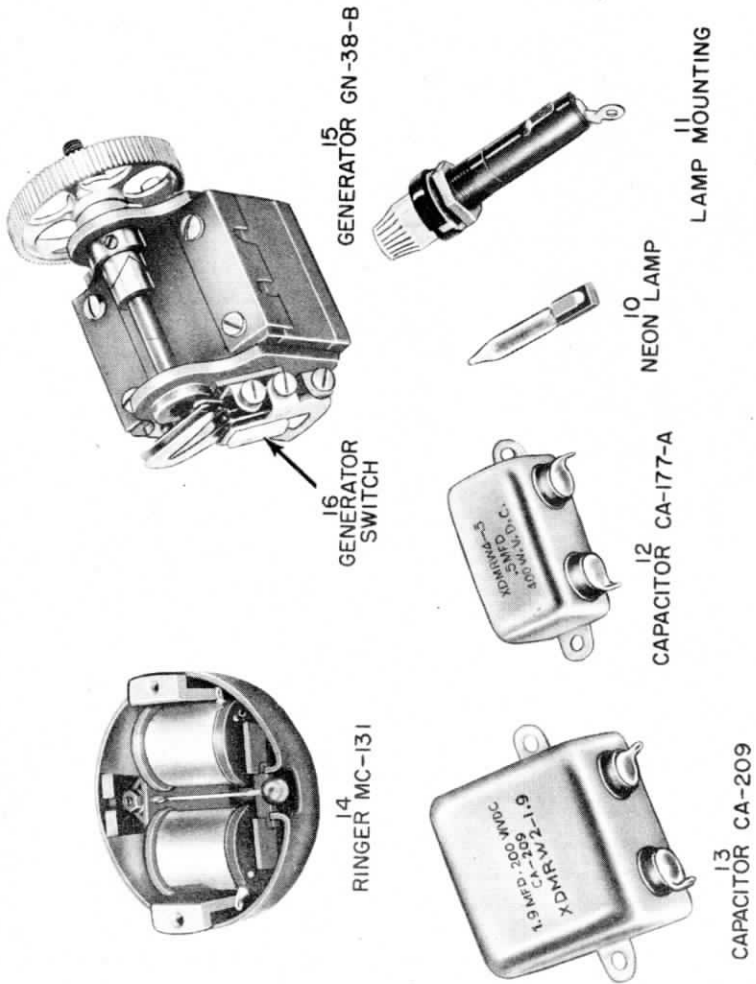


Figure 10. Telephone TP-3, generator, ringer, capacitors, lamp, and lamp socket. TL51634

SECTION IV

MAINTENANCE

14. INSPECTION.

Keep the telephone protected from the weather as much as possible when installed. Do not permit dirt to accumulate on any part of the telephone. This applies particularly to terminals, binding posts, and contacts. Keep all wire connections and screws tight.

NOTE: Do not attempt to repair the telephone in the field except for replacement of the handset or neon lamp. Other repairs should be made only by personnel having the proper replacement parts and equipment.

15. TROUBLE LOCATION.

Localize the trouble as described below in the particular component which is faulty. Disconnect the telephone from the line before making any repairs. Make sure all wire connections are clean and tight.

a. **Repairs by Operating Personnel.** (1) If the telephone fails to operate when the operator is talking or listening, the trouble may be in the handset circuit. Test the handset by holding the receiver to the ear and blowing into the transmitter. A rushing sound is heard in the receiver, indicating that the handset is satisfactory. If no sound is heard, disconnect the handset from the telephone and test again, holding the cord so that the terminals do not touch. If still no sound is heard, the handset is faulty; install a new handset. If the handset is satisfactory, the trouble is within the body; have the telephone repaired by the maintenance personnel. (2) If the neon lamp or ringer fails to operate, the trouble may be in the signalling circuit. Check to be sure the signalling current is being received from the line; this current should be heard in the receiver. If current is being received, make the following tests, checking for current with the handset during each test. Turn the screw switch clockwise toward BELL as far as it will go. If the ringer fails to operate, have the telephone repaired by the maintenance personnel. If it operates satisfactorily, turn the switch to LAMP. If the lamp fails to operate, install a new lamp. If this lamp does not operate, have the telephone repaired by the maintenance personnel.

(3) If any other trouble is encountered, have the telephone repaired by the maintenance personnel.

b. Repairs by Maintenance Personnel. (1) **TALKING CIRCUIT.** If the handset is determined by the tests outlined above to be faulty, connect it directly to a handset known to be serviceable. By talking into the good handset and listening alternately to the receiver and the transmitter of the other, determine which unit of the handset is faulty. Replace this unit. If no sound is heard in either unit, check the continuity of the cord and the internal connections of the handset handle; if necessary, replace the connecting cord. If the fault is within the body of the telephone, check the circuit by referring to figure 7 or to the circuit diagram attached to the body of the telephone. Disassemble the body according to the following procedure:

(a) To take the body out of the carrying case, remove the seven screws which hold it in place, and lift the body out. It is not necessary to remove the generator crank.

(b) Take off the front wall of the body by removing the five machine screws which hold it in place.

(c) To remove the crank-well plate, unscrew the crank by turning it quickly in a counterclockwise direction. Remove the three screws holding the plate to the chassis. Be careful not to lose the lockwasher or the flexible disk on the generator shaft.

(d) To remove the floor, remove the four corner screws holding the floor to the chassis. Do not loosen the other screws.

(e) To remove the lamp guard plate, remove the four screws holding the cover plate to the chassis.

(2) **SIGNALLING CIRCUIT.** Test as described in subparagraph *a*(2) above. Clean and adjust the spring contacts of the generator switch as described in paragraph 17*b*(3) below. Check all wires and connections.

(a) If the neon lamp fails to operate when signalling current is applied, replace the lamp. (The screw switch must be turned to LAMP when testing.) Test by applying signalling current directly to the terminals on the lamp mounting. If the lamp still fails to operate, install a new mounting. If the lamp operates when the current is applied to the mounting but not when it is applied to the line connections, the trouble is elsewhere in the circuit.

(b) If the ringer fails to operate when the screw switch is turned to BELL and current is applied, test by applying the current directly to the ringer terminals. If it still does not operate, replace the ringer. The ringer may be adjusted as described in paragraph 17*a*.

(c) If no signalling current is sent out from the telephone, connect a serviceable ringer directly to the middle and lower terminals of the generator. If the ringer does not operate when the crank is turned, the generator is faulty and must be replaced. The generator may be further tested as described, in paragraph 17*b*.

16. REPLACEMENT OF PARTS.

a. **Handset TS-10-**(). (1) To replace the handset and/or cord, disconnect the cord from the body of the telephone by loosening the two screw terminals on the jack; untie the stay cord, unscrew the transmitter cap and remove the transmitter unit. Unscrew the cord anchoring nut. Loosen the screws holding the two conductors and untie the stay cord. Replace the handset and/or cord, tighten the screws and cord anchoring nut, and retie the stay cord.

(2) To replace the transmitter or receiver unit, unscrew the cap, remove the faulty unit, and substitute a serviceable unit. Replace the cap and test the handset for proper operation with a telephone known to be serviceable.

b. **Case.** Do not attempt to repair the case except for replacement of the carrying straps. Remove the strap by cutting it between the rivets and the metal loop holding the strap to the case. Fasten the new strap to the loop either by stitching or riveting. If the tools are available, the carrying straps may be replaced by removing the rivets holding the steel end clips to the ring in the case, and riveting on a complete new strap assembly. If the entire case must be replaced, remove the body as described in paragraph 15b(1) and install it in a new case.

c. **Crank GC-9.** To unscrew the crank, spin it sharply counterclockwise. Be careful not to lose the lockwasher on the generator shaft. Screw the new crank in place on the shaft.

d. **Generator GN-38-B.** Remove the body of the telephone from the case and remove front wall, crank-well plate, and floor of body. Loosen the three terminal screws on the back of the generator and remove the wires. Remove the four screws from the bottom of the generator, being careful not to lose the washers and insulators. Remove the generator and replace with a new one. Be sure that the insulating plate between the generator and the base plate is in place. Assemble washers on the screws as follows: lockwasher, washer, insulating washer, insulating bushing. Screw this assembly through the base plate and insulating plate into the bottom of the generator. Be sure the bushing goes into the hole in the base plate. Connect the three wire terminals to the generator terminal screws according to the color code on the wiring diagram attached to the body of the telephone. Tighten the terminal screws. Place flexible disk and lockwasher on generator shaft. Replace crank-well plate, front wall, floor, and crank, and fasten the telephone into the case.

e. **Ringer MC-131.** Remove the body from the case and take off the floor. Remove the two screws holding the ringer to the floor and remove the ringer. Unsolder the two wires on the coils; solder the wires to the new ringer. Place the new ringer in position and replace the two screws holding the ringer to the floor plate. Push the wires away from the

ringer so that they will not interfere with the operation. Replace the floor and put the telephone back in its case.

f. **Capacitor CA-209.** Remove the body from the case. Remove front wall, crank-well plate, and floor of telephone body. Unsolder the two wires from the capacitor. Loosen, but do not remove, the screw holding the capacitor strap. Slide the capacitor down through the strap and out. Slide a new capacitor into place. It may be necessary to bend or remove the mounting ears. Tighten the screws on the strap. Solder the wires to the capacitor terminals. Close the body and replace in the case.

g. **Capacitor CA-177-A.** Remove the body from the case. Remove front wall and crank-well plate from body. Unsolder the wires from the capacitor and remove the two screws holding the capacitor in place. Mount a new capacitor in place of the old one and solder the wires to the terminals. Replace front wall and crank-well plate.

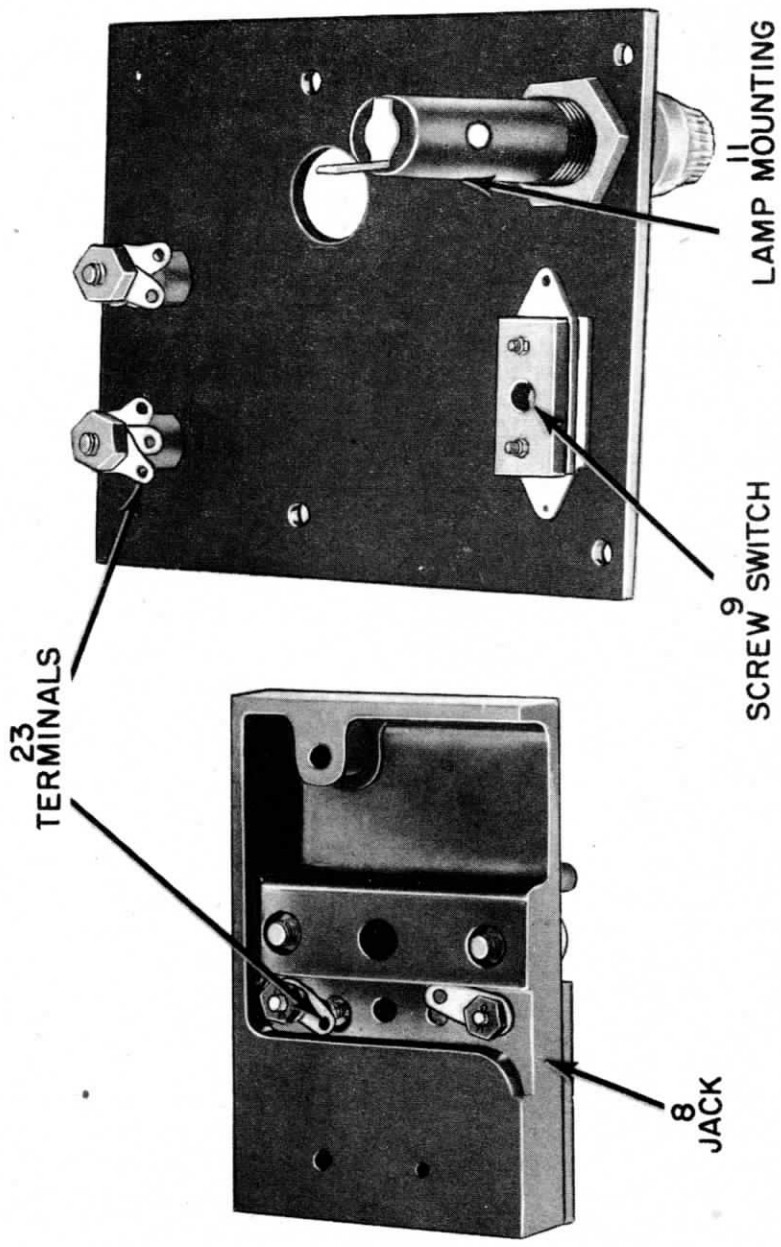
h. **Terminal Block.** Remove the body from the case and take off the lamp guard plate. Unsolder the wires from the screw switch and the lamp mounting. Remove the mounting by unscrewing the nut holding it in place. Remove the eye screw and the large flathead screw in the jack. Lift off the terminal block. Remove the soldering terminals with the wires from the jack and the binding posts, or unsolder the wires from the terminals. Attach the wires to the new terminal block according to the color code shown on the wiring diagram attached to the body of the telephone. Fasten the terminal block to the top plate with the eye screw and flathead screw through the jack. Attach the lamp mounting with its nut. Solder the wires in place according to the color code on the wiring diagram. Fasten the cover in place with the four screws and replace the body in the case.

i. **Jack.** Disconnect the handset from the jack terminals. Remove the eye screw and flathead screw holding the jack in place. Unsolder the wires from the jack and solder them to the new jack. Attach the jack to the body with the two screws and fasten the handset to the terminals. Fasten the tie cord securely so that no strain is placed on the conductors.

j. **Lamp.** (1) Unscrew the transparent plastic cover and pull out the lamp. Slide a new lamp in place; be sure that proper contact is made between the lamp and the mounting. Replace the transparent cover.

(2) To replace the lamp mounting, remove the lamp guard plate, unsolder the wires from the mounting, and remove the nut holding it to the top plate. Remove the mounting and replace with a new one. Tighten the nut, solder the wires in place, and replace the lamp guard plate.

k. **Screw Switch.** Remove the lamp guard plate. Remove the two screws holding the screw switch to the top plate; hold the switch parts together with the fingers while removing these screws. Remove the screws, which



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hold the parts in their proper position, from the new screw switch. Keeping the parts assembled with the fingers, put the screws through the plate and back into the new screw switch. Solder the wires to the terminals and replace the lamp guard plate.

1. **Binding Post TM-214.** Remove the crank-well plate as described in paragraph 15*b*(1). Hold the head of the binding post with pliers or a pin inserted through the hole in the head, and remove the nuts, terminals, lockwasher, washer, and spacer from the binding post. Remove the binding post from the phenolic plate. Put a new binding post through the plate and replace in order, the spacer, washer, lockwasher, one nut, the terminal lugs on the ends of the wires, and the other nut. Make certain that the wires are connected according to the color code on the wiring diagram attached to the body of the telephone. Replace the crank-well plate and fasten the body in the case.

17. ADJUSTMENT.

All parts of the telephone are adjusted in production and should not require adjustment in normal field use. If adjustments are necessary, however, make the following tests:

a. **Ringer MC-131.** (1) When the clapper is moved manually, it is necessary to move the clapper only part way, as the magnet pulls it against the gong projection. If this does not occur, the magnet is weak and must be replaced.

(2) The resistance of each coil is about 650 ohms (1,300 ohms for the two in series). A deviation of more than 15 percent from this value indicates a defective coil.

(3) The ringer should operate on 6 milliamperes at 16 to 20 cycles per second. A greater current requirement indicates a defective ringer.

(4) Adjust the ringer as follows:

(a) Operate the clapper manually. It should strike the gong projections and rebound and come to rest with a slight clearance between the clapper and nearest gong projection.

(b) If the condition in subparagraph (a) above does not exist, loosen the two gong-clamping screws and rotate the gong until the clapper strikes each gong projection equally.

(c) If the travel of the clapper is not sufficient or is excessive, increase or decrease the armature travel by means of the two adjusting nuts located at the end of the magnet opposite the clapper.

(d) If the ringer cannot be adjusted by the above means, as a last resort it may be necessary to bend the clapper rod.

b. **Generator GN-38-B.** (1) The generator should turn easily when the output circuit is open. When the output terminals are short circuited, the generator should turn hard as though a drag has been placed on it.

(2) The resistance of the armature winding should be about 400 ohms. The output of the generator at 1,000 revolutions per minute of the armature, which corresponds to 212 revolutions per minute of the crank, should be at least 85.0 milliamperes with a 200-ohm resistance load and 0.87 milliamperes with a 100,000-ohm resistance load. The frequency at this speed is $16\frac{2}{3}$ cycles per second.

(3) If the generator switch is faulty, clean the contacts and adjust the springs as follows:

(a) The contact pressure of the lower spring against the end of the armature should be at least 100 grams (3.5 ounces).

(b) The clearance between the buffer on the upper shaft and the nearest spring should be at least 0.025 inches when the shaft is in its normal position.

(c) The clearance between the two upper springs should be at least 0.035 inches.

(d) When the shaft is in the cranking position, the contact pressure between the two upper springs should be between 75 grams (2.6 ounces) and 125 grams (4.4 ounces).

18. MOISTUREPROOFING AND FUNGIPROOFING.

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

(1) Resistors, capacitors, and coils fail.

(2) Electrolytic action takes place in resistors and coils causing eventual break-down.

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

(4) Moisture forms electrical leakage on terminal boards and insulating strips, causing noise and crosstalk.

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

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

c. Step-by-step Instructions for Treating Telephone TP-3.

(1) PREPARATION.

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

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

(2) DISASSEMBLY.

(a) Open flap of telephone case.

(b) Remove handset from case.

(c) Remove hand generator handle. (Handle is not treated.)

(d) Disconnect handset cord leads and tie cord from chassis by loosening two screws. (Handset and cord are not treated.)

(e) Remove seven screws from outside of case and lift chassis from case. (Case is not treated.)

(f) Remove cover from jack mounting by removing four screws. (Cover is not treated.)

(g) Loosen jack mounting by removing stay-cord screw eye.

(h) Remove front and crank-well plate held in place by eight screws. (Panels are not treated.)

(i) Loosen bolt holding wiring clip in place. Remove wiring from under clip.

(j) Loosen bell from base plate by removing the two large screws near the center of bottom panel. Do not disconnect wires.

(k) Remove bottom panel by removing the four screws at each corner of panel. (Panel is not treated.)

(l) Remove the three leads from the hand generator by loosening the three screws.

(m) Remove generator from body by removing the four screws which enter the bottom of the generator. (Generator is to be treated.)

CAUTION: Do not loosen the four top screws on the generator which hold the pole pieces in place.

(n) Loosen setscrew on collar of generator drive shaft and remove gear and drive shaft. (Gear and drive shaft are not treated.)

(o) Remove generator armature and end plate by removing the four screws on the gear and plate. (Armature coil is to be treated.)

(p) Remove bell gong held in place by two screws in center of gong. (Gong is not treated.)

(q) Remove lamp socket guard plate held in place by four screws. (Plate is not treated.)

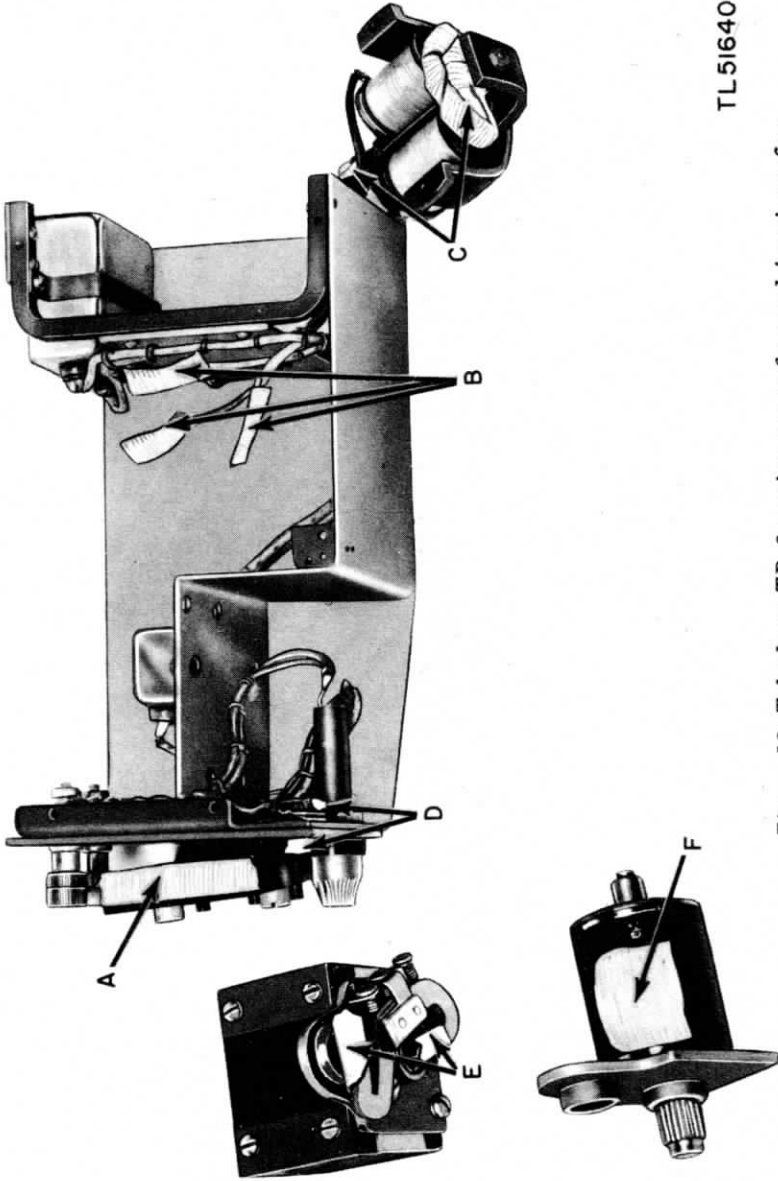
d. Masking.

(1) Mask plug openings on face of jack mounting (fig. 12A).

(2) Tighten cord terminal screws on jack mounting.

(3) Tighten line binding posts.

(4) Mask terminals on hand generator leads (fig. 12B).



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Figure 12. Telephone TP-3, moistureproofing and fungiproofing.

- (5) Mask clapper ball, contacts on armature, pole pieces, adjusting screw, and pivots of armature of the bell (fig. 12C).
- (6) Mask screw and bottom opening of bell and lamp switch (fig. 12D).
- (7) Tighten screws and mask generator spring contacts (fig. 12E).

e. **Drying.** Dry equipment at 160° F for a period of from 2 to 3 hours.

f. Varnishing.

(1) Spray all parts shown in figure 12 except generator armature with three coats of moistureproofing and fungiproofing varnish.

(2) Use brush to apply varnish to coil of armature of generator (fig. 12F).

g. Reassembly and Test. Reassemble and test for proper operation of equipment.

h. Marking. Mark the equipment with "MFP" and the date of treatment.

Example: MFP—8 June 1944.

SECTION V
SUPPLEMENTARY DATA

19. MAINTENANCE PARTS LIST FOR TELEPHONE TP-3.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z9405.57	BOARD ASSEMBLY: terminal; with two Binding Posts TM-214 marked L1 and L2 respectively; L1 with 3 solder lugs, L2 with 2 solder lugs; phenolic plate; $3\frac{13}{16}$ " x $3\frac{3}{8}$ " x $\frac{3}{8}$ "; two 0.144 mtg holes spaced $2\frac{1}{2}$ "; Fed Tel & Rad; SC-D-7691, item 1.	1	---	---	---	*	*	*
11	2Z5984.2/1	CAP: lamp; transparent; plastic; fits Littelfuse No. 1414 lamp mounting; (protects signal lamp).	1	---	---	*	*	*	*
12	3D177A	CAPACITOR CA-177-A: fixed; paper; 500,000-mmf +14% -6%; 400 v dc (working); Solar; Fed Tel & Rad No. UA-11381.	1	---	---	*	*	*	*
13	3D209	CAPACITOR CA-209: fixed; paper; 1.9-mf +14% -6%; 200 v dc (working); Solar; Fed Tel & Rad No. UA-11382.	1	---	---	*	*	*	*
18	4B5500-3/C1	CASE: carrying; canvas duck; complete with strap; identical with 4B5008B/10 except marked TELEPHONE TP-3.	1	---	---	---	---	*	*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
20	6Z3310.1	FASTENER: "Lift-the-dot"; United Carr No. 844 stud, No. 744-A washer, No. 608 socket, No. 709-A clinch plate; Fed Tel & Rad NE-29088; brass; clinches to fabric case; p/o TP-3 and EE-8-B; SC-D-7694-9 and SC-D-4394-9.	2	---	---	---	*	*	*
	4B5500-3/H1	HARNES: wiring; 11 conductors; color-coded; moistureproof and fungiproof; No. 20 AWG stranded; 21" over-all; Fed Tel & Rad dwg No. UP-120.	1	---	---	---	*	*	*
8	4C4312-10	JACK ASSEMBLY: telephone; 2 jacks mtd in bakelite block; for Plug PL-58; over-all $3\frac{1}{4}" \times 1\frac{15}{16}" \times \frac{3}{4}"$; two No. 6-32 mtg holes spaced $2\frac{1}{2}"$; (connect handset or other apparatus); Fed Tel & Rad No. UA-11380; SC-D-7692.	1	---	---	*	*	*	*
	4B5500-3/L1	LABEL: circuit; schematic; 80-lb coated white book paper; approx $3\frac{1}{2}" \times 4\frac{1}{2}"$; surface coated with Maas & Waldstein No. 512A lacquer; Fed Tel & Rad dwg No. UP-127.	1	---	---	*	*	*	*
	4B5500-3/L2	LABEL: circuit; wiring; 80-lb. coated white book paper; approx $3\frac{1}{2}" \times 4\frac{1}{2}"$; surface coated with Maas & Waldstein No. 512 lacquer; Fed Tel & Rad dwg No. UP-126.	1	---	---	*	*	*	*
10	2Z5888	LAMP: glow; 90-v, 0.1-watt; clear; $1\frac{3}{4}" \times \frac{9}{32}"$; octagon slide	1	---	*	*	*	*	*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
11		base; (visible signal); Littelfuse No. 5122; Fed Tel & Rad No. UA-11390; SC-D-7691, item 11.							
	2Z5984.2	LAMP HOLDER; neon; Littelfuse No. 1414-----	1	---	---	*	*	*	*
	6L3604-48Z	NUT; hex; steel; parkerized; (secures ringer pivot); No. 4-48NF.	1	---	---	---	*	*	*
	6L6632-3-1.10	SCREW; machine; flat Fil H; steel; parkerized; No. 6-32 x $\frac{7}{32}$ " (mounts ringer gong).	2	---	---	---	*	*	*
	6L6632-7.SE	SCREW; machine; FH; steel; parkerized; No. 6-32 x $\frac{7}{16}$ " (mounts jack terminals and springs and secures case).	6	---	---	*	*	*	*
9	3Z9581	SWITCH; screw; SPST; phenolic body; $\frac{3}{8}$ " x $\frac{5}{8}$ " x $1\frac{1}{2}$ "; locking; two No. 3-48 mtg holes spaced $\frac{9}{16}$ "; Fed Tel & Rad; SC-D-14056.	1	---	---	*	*	*	*
	6L72202-1	WASHER; lock; steel; spring; for No. 2 machine screw; (secures terminal to pinion shaft).	1	---	---	---	*	*	*
	6L69004	WASHER; lock; split; iron; for No. 4 machine screw; (secures capacitor straps and cable clamp).	9	---	---	*	*	*	*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock]
		NOTE: The following items are identical with items for Telephone EE-8-() and will not appear on composite maintenance parts list for Telephone TP-3; stock of parts for Telephone EE-8-() will be sufficient for repairs of Telephone TP-3.							
		TELEPHONE EE-8-()							
	4B454	CRANK GC-9-----	1	-----	-----	*	*	*	*
	4B638/D1	DISK: (moisture-sealing rubber gasket)-----	1	-----	-----	*	*	*	*
	4B3371/E5	**ELECTROMAGNET: (coils for Ringer MC-131, less yoke)-----	2	-----	-----	-----	*	*	*
	4B3371	RINGER MC-131-----	1	-----	-----	*	*	*	*
	3G1837-3	INSULATOR: phenolic; (generator insulating bushing)-----		-----	-----	*	*	*	*
	3G1838-9	INSULATOR: phenolic; (generator mounting washer)-----		-----	-----	*	*	*	*
	6L4115--3SP	RIVET: FH; $\frac{3}{32}$ " x $\frac{3}{8}$ " long; complete with burr; (case and strap repair).-----		-----	-----	*	*	*	*

* Indicates stock available.

** These items stocked for 4th and 5th echelon only.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	3d ech	4th ech	5th ech	Depot stock
		GENERATOR GN-38-()						
	4B838/A5	**ARMATURE ASSEMBLY	1	---	---	*	*	*
	4B838/S1	**CRANKSHAFT AND CAM ASSEMBLY: (shaft with driving cam and buffer).	1	---	---	*	*	*
	4B838/G1	**GEAR: large; 99-tooth	1	---	---	*	*	*
	4B838/G2	**GEAR: pinion; 21-tooth	1	---	---	*	*	*
	4B838/P1	**PIN: (for pinion gear)	1	---	---	*	*	*
	4B838/S3	**SPRING: steel wire; (cam operating)	1	---	---	*	*	*
	4B838/S2	**SPRING ASSEMBLY: contact	1	---	---	*	*	*
	6L6632-8.5	**SCREW: machine; No. 6-32 x 1/2"; RH; (generator contact spring assembly mounting).	2	---	---	*	*	*
	6L6632-6.5A	**SCREW: machine No. 8-32 x 3/8"; RH; (generator assembly)	7	---	---	*	*	*

* Indicates stock available.

** These items stocked for 4th and 5th echelon only.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	6L6832-6.7A	**SCREW: machine; No. 8-32 x $\frac{3}{8}$ " ; FH; (generator assembly) -----	1				*	*	*
	6L6832-2.31S	**SCREW: set; No. 8-32 x $\frac{1}{8}$ " ; cup-point; headless; steel; (crankshaft collar locking).	1				*	*	*
	6L73006	**WASHER: lock; steel; std for No. 6 screw; (generator contact spring assembly mounting).	2				*	*	*
	6L73008	**WASHER: lock; steel; standard for No. 8 screw; (generator assembly).	7				*	*	*
	3Z1137	CLIP TL-137 ----- HANDSET TS-10-()	1				*	*	*
	3E4058	CORD: 6'; 2-conductor; pencil -----	1				*	*	*
	6L6440-4.52	SCREW: machine; No. 4 40 x $\frac{1}{4}$ " ; OH, brass -----	2				*	*	*
	6L6440-3.4	SCREW: machine; No. 4 40 x $\frac{3}{16}$ " ; FII H; brass; black -----	2				*	*	*
	3Z9929	TERMINAL TM-29 -----	2				*	*	*

* Indicates stock available.

** These items stocked for 4th and 5th echelon only.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	3Z9930	TERMINAL TM-30	2				*	*	*
	3Z10162	TERMINAL TM-162	2				*	*	*
	3Z10182	TERMINAL TM-182	2				*	*	*
	3Z10189	TERMINAL TM-189	2				*	*	*
	4B1110C/22.1	HANDESET TS-10-C, -H, -K CAP: receiver; AE D-67324	1						*
	4B1110C/39	GASKET: cover plate; AE H-47807, detail 12	1						*
	4B1110C/40	GROMMET: gland nut; AE D-6724-B	1						*
	4B1110C/24	HANDLE: handset; AE GD-52134-A	1						*
	4B1110C/5	MOUTHPIECE: transmitter; AE D-38305	1						*
	4B1110C/9	NUT: gland; AE GH-69919, detail 9	1						*
	4B1110C/38	PLATE: cover; AE D-780006-B	1						*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR TELEPHONE TP-3 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	4B1110C/1	RECEIVER UNIT; handset; AE GH-69919, assem 2	1						*
	4B1110C/6	RING: clamping; AE GH-76040, detail 3	2						*
	4B1110C/3	TRANSMITTER UNIT: handset; AE GH-69919, assem 2 HANDSET TS-10-G	1						*
	4B1110G/22	CAP: receiver; RCA K-845778-1	1						*
	4B1110G/9	GUARD: cord; RCA K-841841-2	1						*
	4B1110G/24	HANDLE: handset; RCA P-712697-504 w/capacitor, K-85591-504.	1						*
	4B1110G/5	MOU/THPIECE: transmitter; RCA K-845777-1	1						*
	4B3059	RECEIVER UNIT: handset; RCA P-171460-501	1						*
	4B1110G/6	RING: clamping; RCA K-841840-5	2						*
	4B9859	TRANSMITTER UNIT: handset RCA 171460	1						*

* Indicates stock available.

