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# TM 11-439

## WAR DEPARTMENT TECHNICAL MANUAL

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# 'LASH RANGING SET GR-4-A

*AR DEPARTMENT • 1 NOVEMBER 1943*

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*War Department Technical Manual*

*TM 11-439*

# FLASH RANGING SET GR-4-A

*War Department* *1 November 1943*



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WAR DEPARTMENT,
WASHINGTON 25, D. C., 1 November 1943.

TM 11-439, Flash Ranging Set GR-4-A, is published for the information and guidance of all concerned.

[A.G. 300.7 (12 August 1943)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:

J. A. ULIO,
*Major General,*
*The Adjutant General.*

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(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, or when you are in immediate danger of capture.

HOW—

1. Smash—Use sledges, axes, hand-axes, pick-axes, hammers, crowbars, heavy tools, etc.
2. Cut—Use axes, hand-axes, machete, etc.
3. Burn—Use gasoline, kerosene, oil, flame-throwers, incendiary grenades, etc.
4. Explosives—Use firearms, grenades, TNT, etc.
5. Disposal—Bury in slit trenches, fox-holes, other holes. Throw in streams. Scatter.
6. USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—

1. Smash—Cabinet and operating panel completely including voltmeter, milliammeter, switching keys, generators, coils, bell, buzzer, relays, drops, condensers, resistance units and fuse blocks. Also operator's head and chest sets, tools, trouble light and nameplate.
2. Cut—Chop or rip loose all panel wiring, line wires or cables and battery and heater wires.
3. Break—Leg assemblies and metal parts of cabinet.
4. Burn—Wooden pieces of cabinet to destroy circuit label and Technical Manual.
5. Bury or scatter—Any or all of the above pieces after breaking.

**DESTROY EVERYTHING**

---

## WARNING

Severe shock may result from contact with current carrying parts of this equipment.

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**FIGURE 1. Switchboard BD-70 (Flash Ranging).**



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# SECTION I
# DESCRIPTION

**1. GENERAL.**—Flash Ranging Set GR-4-A is a telephone system used by Field Artillery observation batteries by which observers of gun flashes report the azimuths of enemy gun positions to a central station. There the azimuths from various observers are plotted as described in Field Manual 6-120. The observers use Outpost Units BE-51, connected to field telephone lines which lead to Switchboard BD-70 at the central station. The observer signals the switchboard operator at the central station, who connects the outpost telephone with the switchboard telephone. This makes it possible for the observer and switchboard operator to talk to each other, the operator repeating the reported azimuths to plotters at the central station.

**2. LIST OF COMPONENT PARTS.—**

| Quantity | Article | Approximate size in inches | Approximate weight in pounds |
|---|---|---|---|
| 6 | Axle RL-27-B | Handle $8\frac{3}{8}$x$1\frac{1}{4}$ | 5.13 |
| 36 | Battery BA-30, 12 in use, 24 spare (for EE-8-(*)) | $1\frac{1}{4}$ dia. x $2\frac{1}{4}$ | .25 |
| 4 | Battery BB-29, 2 in use, 2 spare | $10\frac{1}{8}$x8x$8\frac{11}{16}$ | 35.00 |
| 6 | Capacitor Unit BE-59 | $3\frac{13}{16}$x3x2 | 1.00 |
| 1 | Chest Set TD-1 (note 1) | | |
| 1 | Cord CD-425 | 50 ft. long | 25.00 |
| 4 | Foot FT-149 | 18x$\frac{23}{64}$x$1\frac{1}{4}$ | |
| 1 | Ground Rod GP-29 | 36x$2\frac{1}{4}$ | 35.00 |
| 1 | Handset TS-9-(*) | $9\frac{1}{16}$x$2\frac{3}{4}$x$3\frac{15}{16}$ | 1.10 |
| 1 | Headset HS-30-(*) (note 1) | | |
| 2 | TM11-439, Technical Manual for Flash Ranging Set GR-4-A | | |
| 1 | Knife TL-29 | | |
| 6 | Outpost Unit BE-51 | $2\frac{1}{2}$x$3\frac{1}{4}$x7 | 6.00 |
| 1 | Pliers TL-13-A (or TL-13) | | .44 |
| 2 | Plug PL-58 (1 for handset and 1 spare) | 2x$1\frac{3}{8}$x$3\frac{15}{16}$ | .12 |
| 1 | Pouch CS-34 | | .80 |
| 1 | Protector AR-8 | 14x6 dia. | 10.00 |
| 6 | Spring Assembly, Biasing, including stud and bracket for W. E. Co. 206 type Relay, or Equal (Spare) | | |

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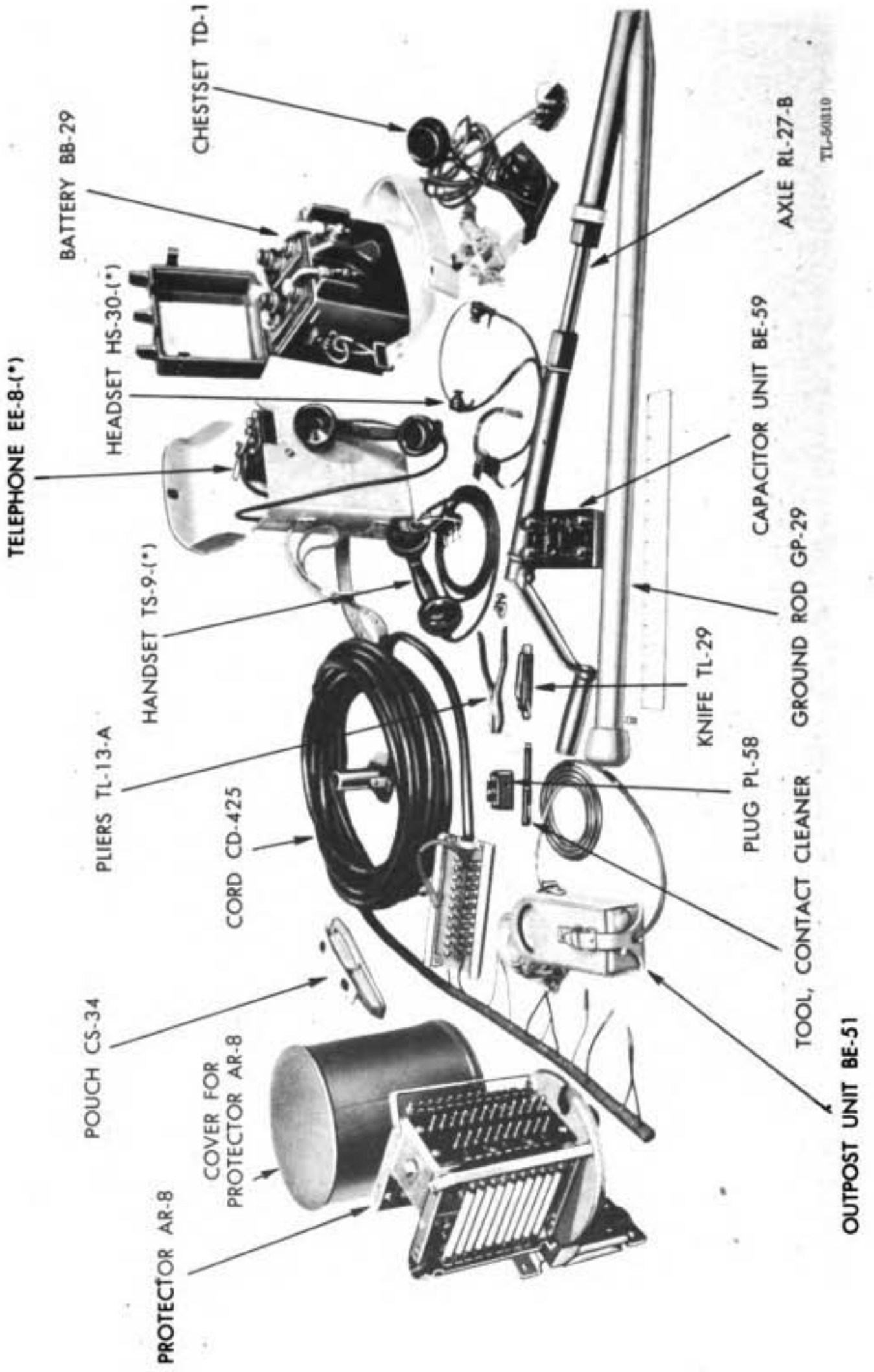



**FIGURE 2. Flash ranging components, less Switchboard BD-70.**



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| Quantity | Article | Approximate size in inches | Approximate weight in pounds |
|---|---|---|---|
| 2 | Strap ST-21 (for Battery BB-29) | 68x2x1/8 | .80 |
| 1 | Switchboard BD-70 | 23x21x10 | 85.00 |
| 6 | Telephone EE-8-(*) | 9 9/16 x7 11/16 x3 1/2 | 9.25 |
| 1 | Tool, contact cleaner (for relay points), W. E. Co. 265-C (contact burnisher), or equal | | |

Note 1. In case Headset HS-30 (*) and Chest Set TD-1 are not available, Head and Chest Set HS-19-(*) may be issued.

**3. SWITCHBOARD BD-70.—a. General.**—Switchboard BD-70 (fig. 1) is a flash ranging switchboard for use at the central station to permit telephone conversations between the switchboard operator and observers at outlying posts. The switchboard is arranged to connect the operator's telephone set to any of the six field telephone lines, equipped with Telephones EE-8-(*), for talking or ringing. Magneto drop and line lamp signals are supplied for each line and serve as signals of an incoming call. A hand generator is provided for ringing the outlying station.

**b. Front panel.**—When the front cover is lowered, the operating panel is exposed. The operating panel contains the following:

12 Line binding posts
6 Line drops with drop guards
3 Operator's circuit binding posts
1 Milliammeter
1 Voltmeter
1 Battery key
2 Battery binding posts
2 Heater binding posts
6 Line lamp sockets
6 Line lamps
6 Relays
1 Nameplate
12 Line cam keys
2 Alarm keys
2 Operator's telephone jacks
1 Hand generator crank
1 Panel lamp toggle switch
1 Inspection lamp socket
2 Panel lighting sockets

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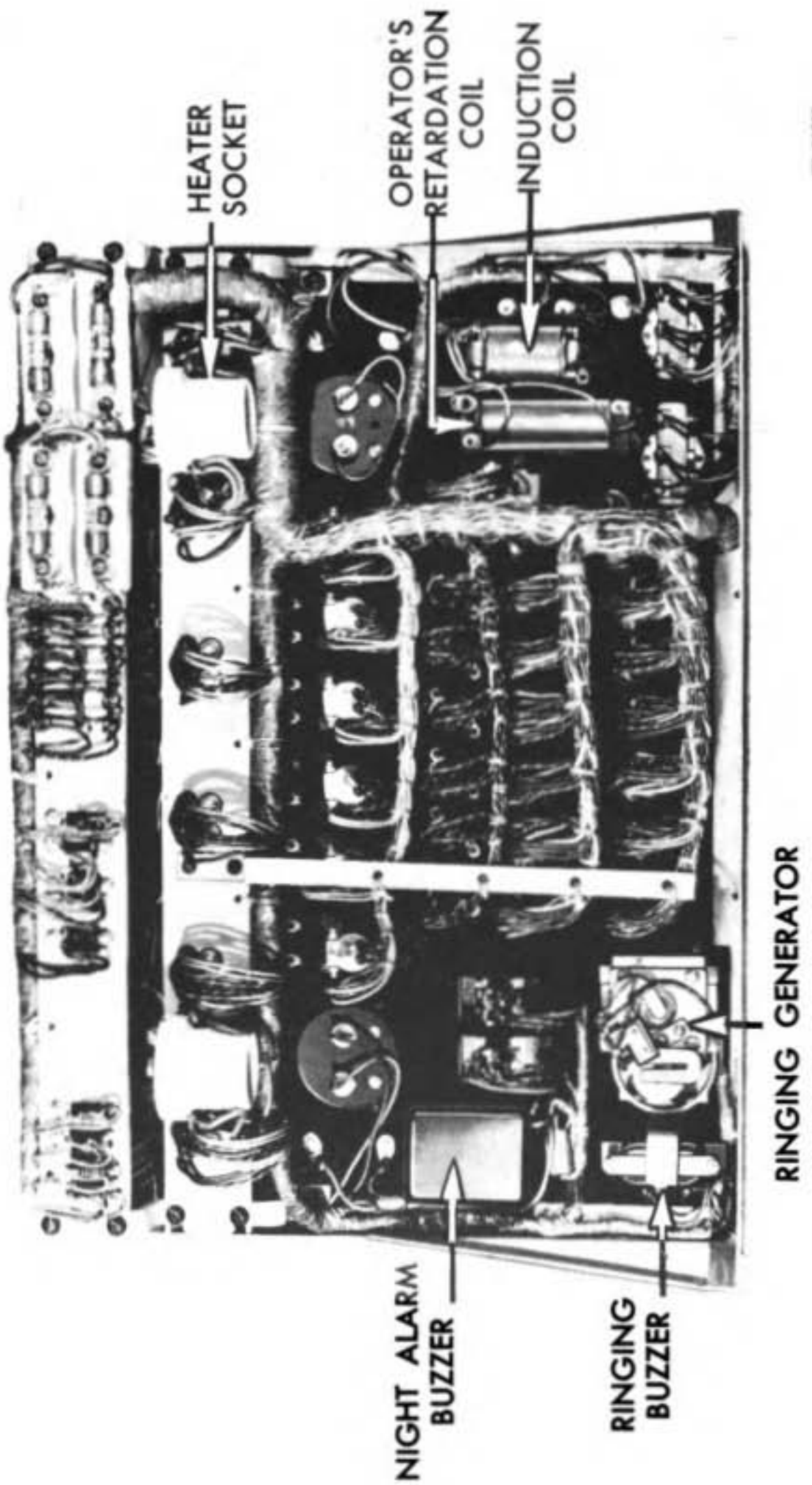



**FIGURE 3. Switchboard BD-70, rear panel view.**



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**c. Rear panel.**—The following are mounted on the rear surface of the panel:

Ringing generator
Ringing buzzer
Night alarm buzzer
Operator's retardation coil
Induction coil

The rear of the panel also holds a mounting frame. This frame has two mounting strips, on which are mounted the line relays (which project through the panel), heater element receptacles, battery and heater fuse cut-out bases, capacitors, and line resistance units. A drop alarm bell and bracket is mounted on the left mounting frame bracket facing the front of the switchboard. The panel is mounted on a steel frame held in place in the cabinet by means of ten flat-head machine screws, three at either end and four at the top of the cabinet a few inches back from the panel. Each of the two plates to which the shelf supports are anchored is secured by two screws to opposite sides of the cabinet. When these four screws and the previously mentioned ten screws are removed, the entire operating unit (with equipment and wiring) may be pulled forward out of the cabinet so that the equipment may be inspected, adjusted, and defective parts replaced. A sheet-metal drawer at the bottom of the switchboard (under the front panel) is used for storing tools, spare parts, etc.

**d. Circuits provided.**—Switchboard BD-70 contains the equipment for the following:

6 Combination line circuits
1 Operator's telephone circuit
1 Buzzer night alarm for line lamp signals
1 Bell night alarm for drop signals
1 Milliammeter test circuit
1 Voltmeter test circuit
1 Ringing circuit
1 Battery circuit (6 volts)
1 Inspection lamp circuit
1 Panel lamp circuit
1 Heater circuit

**4. POWER.**—Two Batteries BB-29 provide 6-volt d-c power. The batteries are 4-volt, 80-ampere hour, 2-cell storage batteries with a center tap which makes it possible to get the 6 volts needed to operate Switchboard BD-70.

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**FIGURE 4. Outpost Unit BE-51, assembled.**

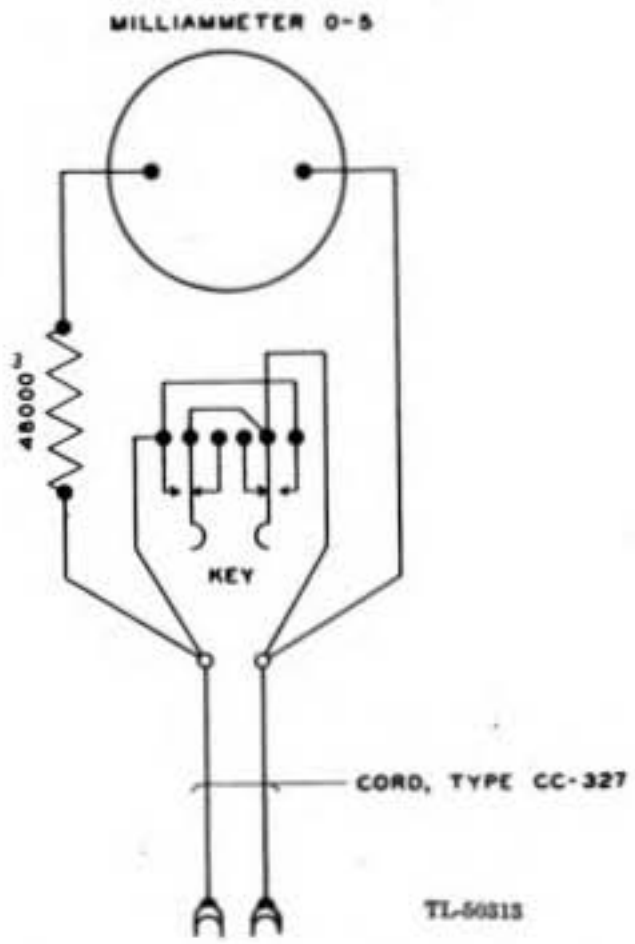



**FIGURE 5. Outpost Unit BE-51, wiring diagram.**



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**5. OUTPOST UNITS BE-51.**—Each Outpost Unit BE-51 (fig. 5) consists of a milliameter (0 to 5 scale) in series with a 48,000-ohm resistance and a non-locking plunger type key to short circuit the milliammeter and resistance. The equipment is mounted on a phenolic base and enclosed in a leather case with a shoulder strap. Cord CC-327 is used to connect the unit to the center terminals of Capacitor Unit BE-59.



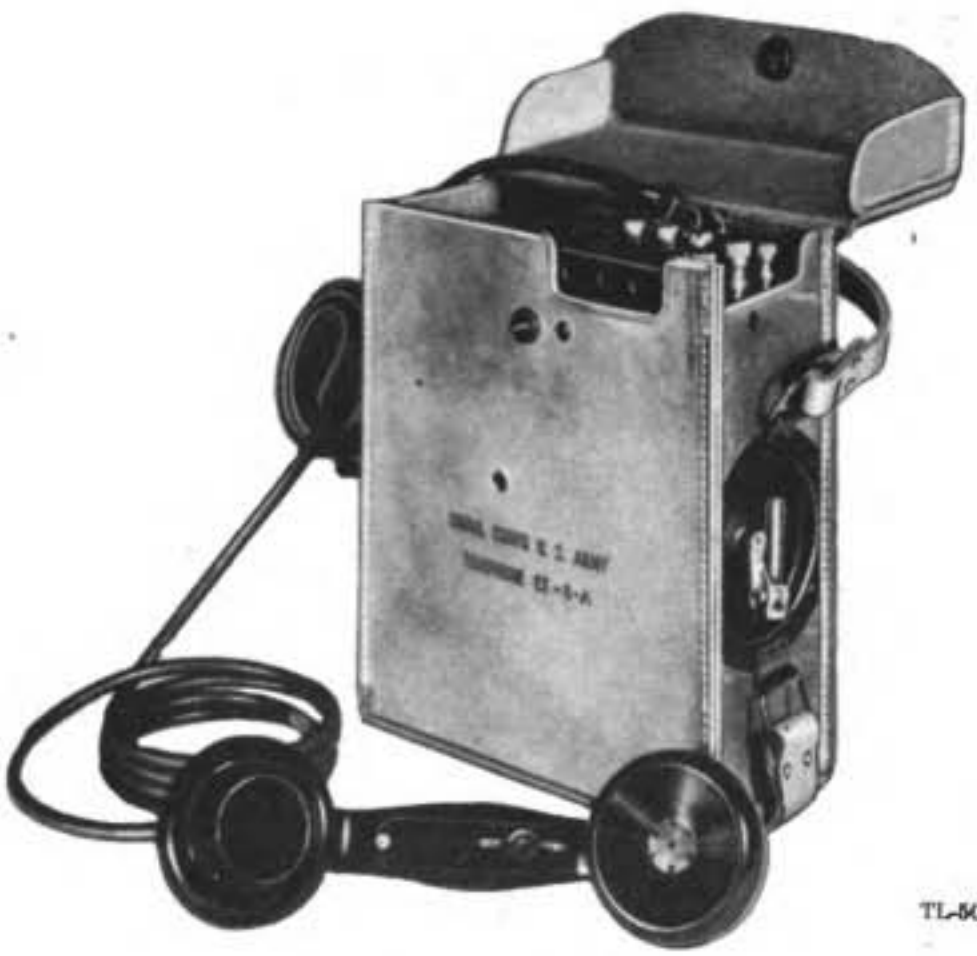

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**FIGURE 6. Capacitor Unit BE-59.**

**6. CAPACITOR UNIT BE-59.**—Capacitor Unit BE-59 consists of a 1 mf capacitor mounted in a case with a phenolic top fitted with six binding posts (fig. 6). This unit is used at outpost stations to connect Outpost Unit BE-51 and Telephone EE-8-(*) to the telephone line by means of three pairs of binding posts marked LINE, OUTPOST, and TEL.

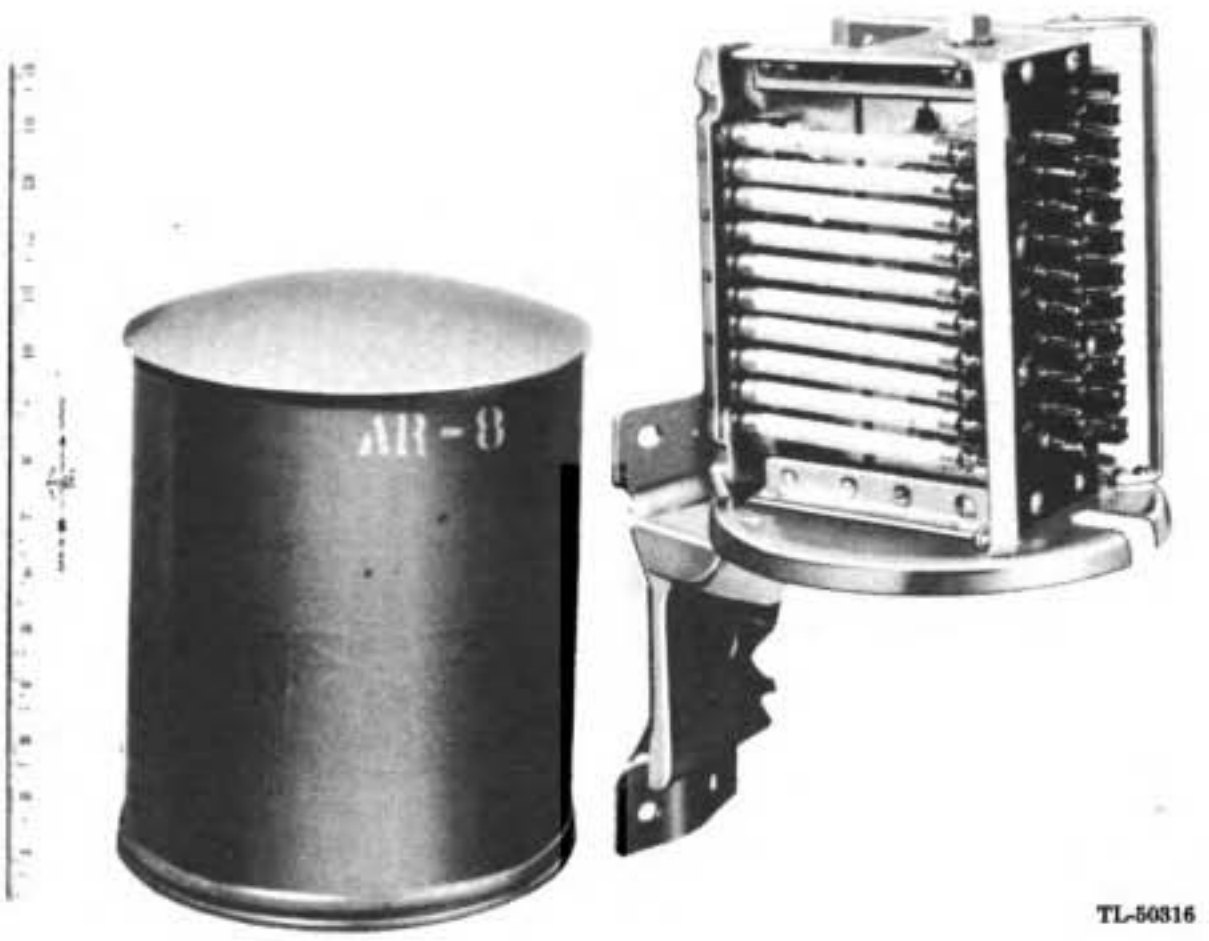


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**FIGURE 7. Telephone EE-8-(*).**




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**FIGURE 8. Protector Unit AR-8.**



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**7. TELEPHONE EE-8-(*).**—Telephone EE-8-(*) (fig. 7) is for field use on either local battery or common battery systems and may be used as a test telephone, an operator's telephone for monocord switchboards, or with a head and chest set equipped with Plug PL-58 accommodated by the jack of Telephone EE-8-(*). A screw switch is provided on the terminal block for adjusting the telephone for use with either a local battery or common battery line. For common battery use, the screw is turned clockwise (to the right) as indicated by the arrow pointing to CB. For local battery use, the screw is turned counterclockwise (to the left).

For a full description of Telephone EE-8-(*) see Technical Manual TM 11-333.

**8. PROTECTOR AR-8.**—Protector AR-8 consists of a Cook Electric Company type S-6 protector, a supporting bracket, and a slip-on cover. The bottom of the case has a pierced fibre plate through which the field telephone lines may be passed and connected to the terminals. Cord CD-425 is provided with a plug which engages the terminals of Protector AR-8. This connects the field telephone lines to Switchboard BD-70.

**9. MISCELLANEOUS PARTS.**—The following equipment is provided for the operation, installation, and maintenance of Flash Ranging Set GR-4-A:

**a. Operating equipment.—**

(1) Headset HS-30-(*) (note 1).
(2) Chest Set TD-1 with Plug PL-58 (note 1).
(3) Handset TS-9.
(4) Trouble light.

**b. Tools.—**

| | |
|---|---|
| (1) 1 #553-A | Lamp extractor. |
| (2) 1 #319-B | Lamp cap extractor. |
| (3) 3 #340 | Relay adjusting tools. |

**c. Spare parts.—**

| | |
|---|---|
| (1) 10 | 3-ampere fuses #388-643. |
| (2) 10 #6-B | Switchboard lamps. |
| (3) 6 #4-A | Lamp caps—white. |
| (4) 3 #40 | Mazda lamps—6 to 8 volts miniature screw base. |
| (5) 2 #82 | Mazda lamps—6 to 8 volts double contact bayonet base. |
| (6) 1 #67 | Trouble light with #82 Mazda lamps and double contact plug. |



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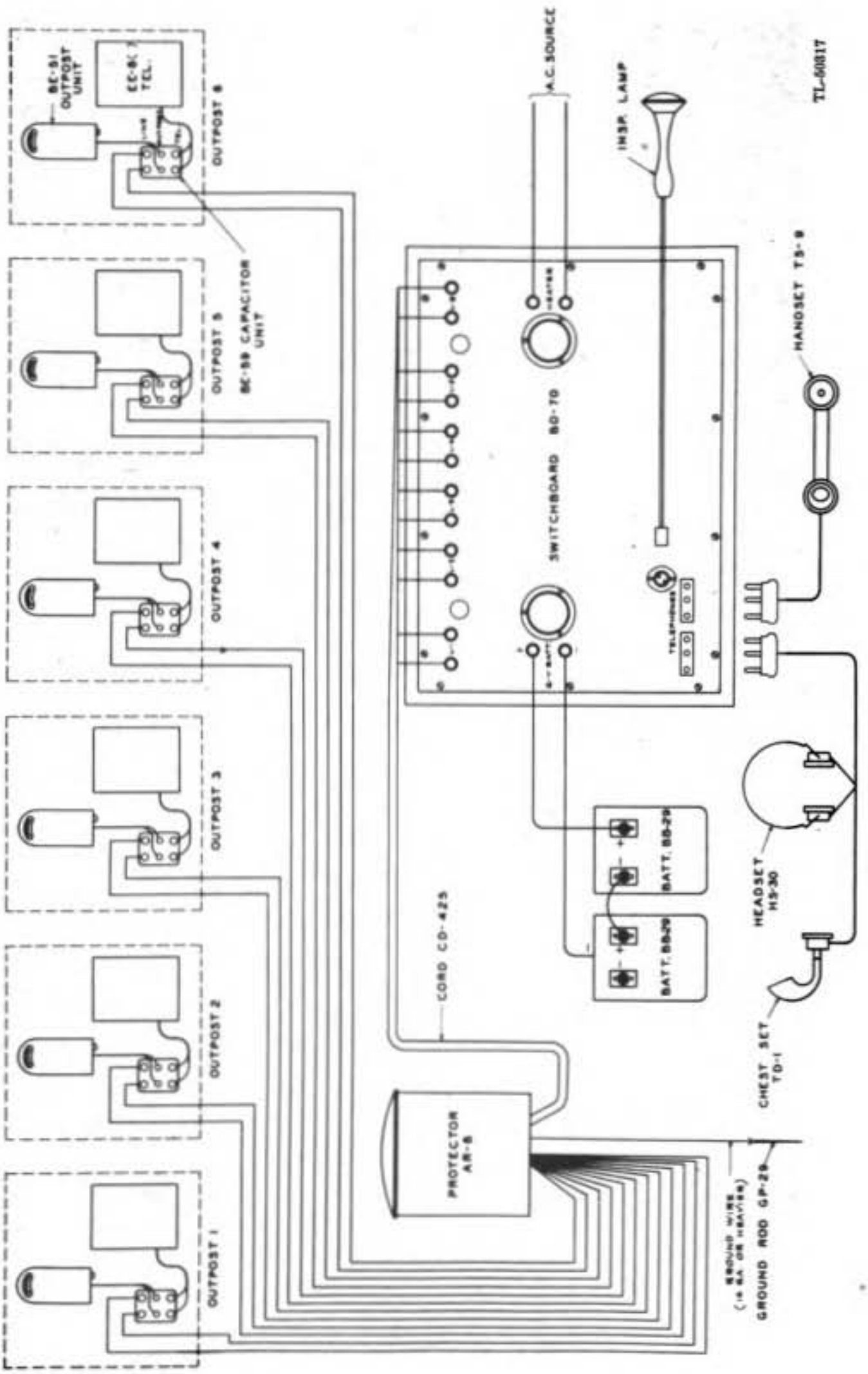



**FIGURE 9. Connecting diagram.**



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**d. Parts required but not included.**—The following equipment is needed for the operation of Flash Ranging Set GR-4-A, but is not included in the set:

(1) Field telephone wire.

(2) Wire for connecting Telephone EE-8-(*) to Capacitor Unit BE-59.

(3) Ground wire for connecting Protector AR-8 to Ground Rod GP-29.

(4) Battery supply wires.

(5) Heater supply wires.

## SECTION II
## INSTALLATION AND OPERATION

**10. INSTALLATION.—a. Outpost station.—(1) Capacitor Unit BE-59.**—Connect the field telephone lines at the outpost station to the binding posts marked LINE on Capacitor Units BE-59.

(2) **Outpost Unit BE-51.**—Connect Cord CC-327 of Outpost Unit BE-51 to the binding posts marked OUTPOST on Capacitor Unit BE-59.

(3) **Telephone EE-8-(*).**—Connect Telephone EE-8-(*) to the binding posts marked TEL on Capacitor Unit BE-59. (For information on Telephone EE-8-(*) refer to Technical Manual TM 11-333).

**b. Protector AR-8.**— (1) Mount Protector AR-8 near enough to Switchboard BD-70 so that Cord CD-425 (length 50 ft.) will reach from the switchboard to the protector.

(2) Put the field telephone line wires through the holes in the fibre plate in the bottom of Protector AR-8. Fan them out through the fanning strips. Connect the wires to the correct terminal lugs.

(3) Drive Ground Rod GP-29 into the ground at the dampest spot available.

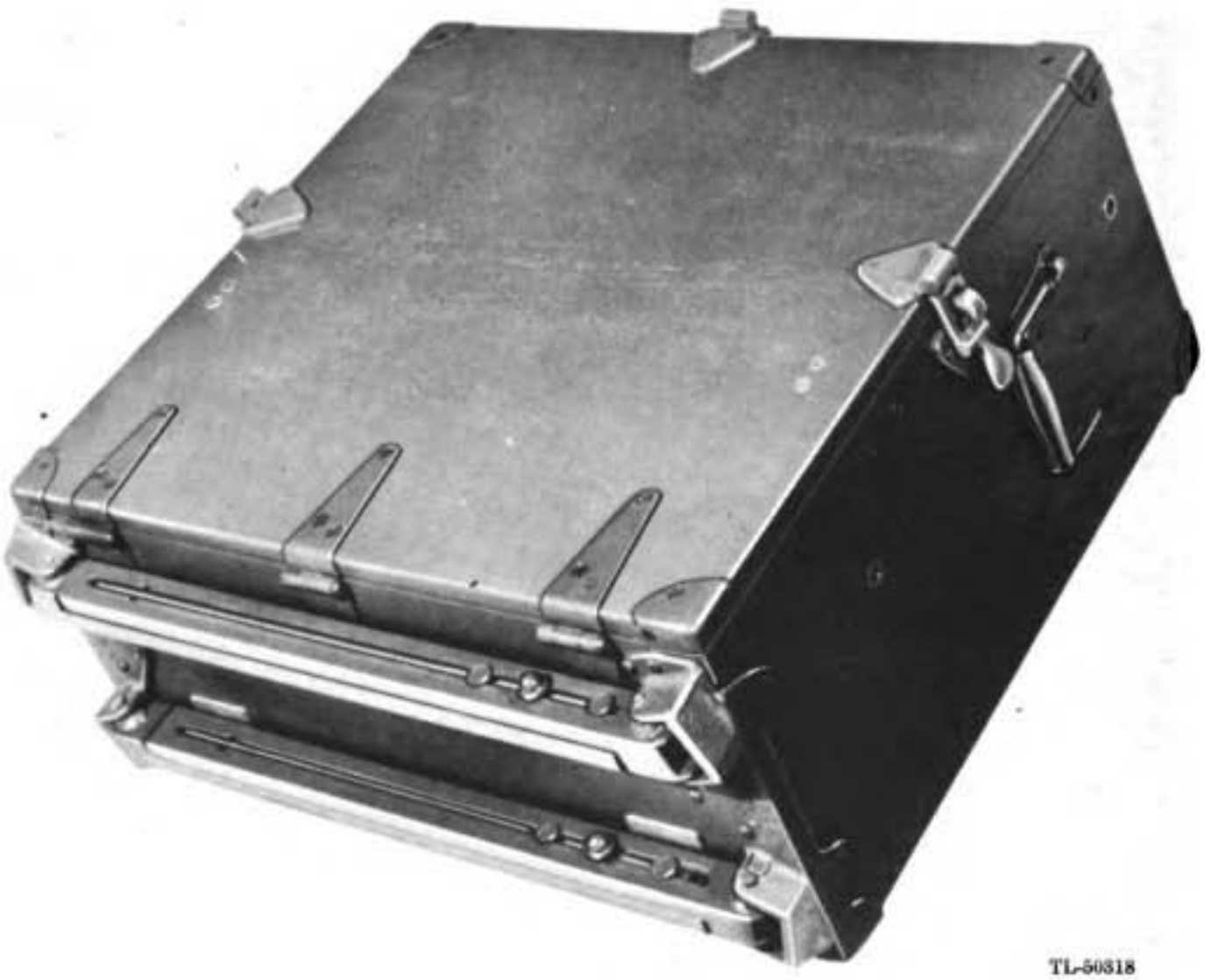
(4) Connect a heavy wire (at least 14-gauge) to the terminal on Ground Rod GP-29 and to the terminal provided for a ground connection on the bottom of Protector AR-8.

(5) Remove the cover of Protector AR-8. Place the multiple plug of Cord CD-425 on the multiple jack on Protector AR-8 and replace the cover.

**(c) Battery BB-29.**—(1) Connect two Batteries BB-29 in series by connecting the positive (+) terminal of one battery to the negative (—) terminal of the other battery.

(2) Using the center tap of one Battery BB-29, take off a 6-volt lead to be connected to the 6V BAT. terminals on Switchboard BD-70.

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**FIGURE 10. Switchboard BD-70, folded for transportation.**

**d. Switchboard BD-70.—(1) Setting up the switchboard.**—The front of the board is closed when it is folded for transportation. The front is held in place by clamps, one at each side and one at the top. The rear door is held closed by a clamping screw near the top center. The legs are folded and locked in place underneath the case. To set up the switchboard, first lay the switchboard face up. Release the button on the spring-release of each leg, and extend the legs full length. Set the switchboard in the location selected so that all legs rest firmly on the ground or floor. If the switchboard is placed on a table (or similar support) leave the legs folded and locked in place.

(2) **Procedure.—(a)** Release the clamps on the front cover of the switchboard and let it swing down. The lid support on each side will hold it at right angles to the operating panel.

**(b)** Connect the positive and negative terminals of the 6-volt battery supply to the 6V BAT. binding posts marked + and —, respectively on the face of the panel. ***Be careful to make a clean, tight connection.***



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(c) Connect the heater current leads, when needed, to the binding posts marked HEATER (at the right center of the panel). If a higher potential is used for the heater circuit than is used on other equipment, ***be sure no bare wire of this circuit is left exposed.*** Push the heater elements into the receptacles. Two receptacles are mounted by brackets on the relay mounting strip between the front panel and the rear wall of the switchboard. These receptacles can be reached through the rear door.

Note: BEFORE making the following connections, make the tests described in paragraph 11.

(d) Connect the fanned-out terminals of Cord CD-425 to the line binding posts (at top of front panel). ***Be careful—make clean, tight connections.*** Screw down the binding post, using fingers only. DO NOT USE PLIERS. Connect one of the two wires of each pair to one of the two binding posts of the line (L-1, L-2, etc.); that is, each pair of wires should terminate at its own pair of binding posts.

Note: Wiring for battery, heater and outpost lines should not interfere with or cover any of the operating parts on the panel, such as relays, drops, lamps, keys, generator crank, and operator's jacks.

**11. PREPARATION FOR USE.**—The following tests should be made before the telephone lines are connected (par. 10**d**.):

**a.** Operate BAT. key to ON. This will close the 6-volt battery circuit through to the switchboard circuit. *Be sure the BAT. key is in operated position during all tests and when the switchboard is in use.*

**b. Battery voltage.**—Operate VOLTS key and watch the voltmeter reading. When it registers less than 6 volts, adjust the battery supply to get a reading of at least 6 volts.

**c. Line relay and night alarm test.**—Operate TEST key on line 1. The line relay will operate and light the line lamp. Now operate BUZ. key. This operates the buzzer alarm. (The line lamp will not burn as bright when the buzzer is connected to the circuit. To determine which line signal is operated, restore BUZ. key to normal). Repeat this test on each line circuit.

**d. Milliammeter test.**—Short circuit the line binding posts of line 1. Now operate MA key on line 1, and watch the milliammeter reading. With a 6-volt battery source, the milliammeter should register at least 12 milliamperes.



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**e. Talking and ringing on lines and bell night alarm test.—** This test uses the following equipment:

1 Operator's Headset HS-30(*) and Chest Set TD-1. Throw toggle switch on Chest Set TD-1 to locking position (to close transmitter circuit) and insert Plug PL-58 into Jack JK-37 on switchboard.

1 Telephone EE-8-(*) adjusted for common battery signaling.

The test is carried out as follows:

(1) Connect the field telephone to line terminals L-1.

(2) Release the drop guard on the drop of line 1 and operate the hand generator of the telephone. This will cause the drop shutter on the switchboard to fall.

(3) Now operate the BELL key. This will connect the night alarm bell in circuit, and start it ringing.

(4) Restore the drop shutter by hand. This stops the ringing of the bell.

(5) Now operate the RING key on line 1, and crank the hand generator on the switchboard, which will ring the telephone bell. The generator buzzer (5-A) on the switchboard sounds when current passes through it, indicating a closed line loop.

(6) Restore the RING key, and operate the TALK key so that you may talk to the field telephone. The reception should be distinct in both receivers.

(7) **REPEAT this test on *each pair* of line terminals.**

NOTE: Ringing current coming from Telephone EE-8-(*) into the switchboard line circuit causes the line relay to flutter and lock in operated position through the low resistance of the test telephone line loop, and causes the associated line lamp to light. The line relay will be released and the line lamp extinguished when the RING key on that line is operated.

**f. Panel lamps.—**Throw LAMPS switch, which lights the two panel lamps. **Use only when necessary.**

**g.** Test trouble light (No. 67) to make sure it is ready for emergency use by momentarily plugging it in the socket on the front panel.

**12. OPERATION.—a.** When the above tests are finished, call each outpost station in turn. Operate the RING key and crank the hand generator. If the field telephone line is complete the 5-A special buzzer will sound. If the buzzer is heard, restore the RING key and throw the TALK key, and await an answer from the outpost station. If a re-ring is necessary, operate the RING key and crank



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the hand generator again. The TALK key may be left operated when the re-ring is made.

**b.** To signal a field station, raise TALK key of the associated line. Press RING key (which will lock in position), and crank the hand generator. When through ringing, restore RING key to normal. When the observer at the outpost answers the call, the connection will be completed. When through talking, restore TALK key to normal. This line circuit may be connected to field Telephones EE-8-A, EE-8-B, and EE-8.

**c.** When the outpost operator answers, tell him to ring Switchboard BD-70 with the hand generator of his Telephone EE-8-(*). Restore the TALK key until the drop shutter falls to show the incoming call.

**d.** Tell each outpost operator in turn to push and release the key on his Outpost Unit BE-51 several times. Restore TALK key to normal. The line lamp should flash each time the key on the outpost unit is pushed.

**e.** If it is desired to have the outpost operator call in as soon as he has made connections in the field, the above operations need not be made in the order given. The switchboard operator may interrupt the flash signals at any time by ringing on the line.

## SECTION III
## FUNCTIONING OF PARTS

**13. SWITCHBOARD BD-70.— a. Battery circuit.**—(1) The 6-volt battery circuit is connected to the BAT. key. This key in the normal, or OFF, position disconnects the battery from the switchboard equipment. To operate the switchboard, raise BAT. key to ON. The 6-volt battery fuse cut-out base is mounted on the mounting frame in the rear of the switchboard. The panel lamps are connected through the LAMPS toggle switch to the switchboard terminals of the BAT. key. The trouble light socket terminals are connected directly to the 6-volt binding posts, and will furnish current for this lamp even though the battery fuses are out.

(2) To prepare the switchboard for normal operation, insert Plug PL-58 of the operator's Headset HS-30-(*) and Chest Set TD-1 into Jack JK-37. Then throw toggle switch on Chest Set TD-1 to close the transmitter circuit. Release the drop guards on all drops of connected outpost lines by first swinging the guard spring to the right, and then swinging it down so as to catch the indenta-

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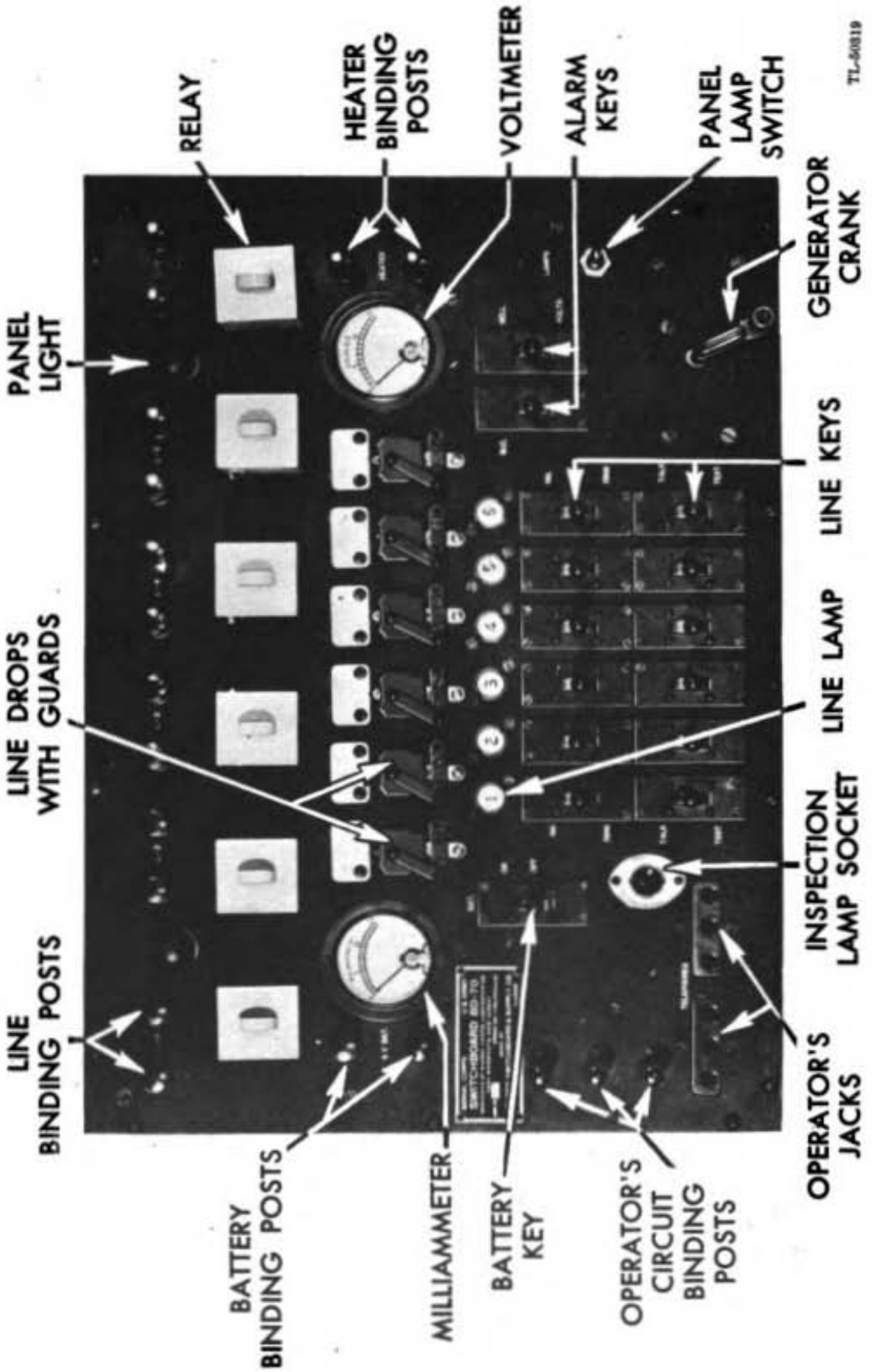



**FIGURE 11. Switchboard BD-70, front panel view.**



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tion on the guard plate. Raise BAT. key to ON, raise BUZ. key to the BUZ. position, and BELL key to the BELL position. If necessary, light the two panel lamps by throwing LAMPS toggle switch to the LAMPS position.

**b. Line circuit.**—The signals for an incoming call consist of a line lamp, controlled by the line relay, which lights when the key on Outpost Unit BE-51 is pressed, and a ring-down drop shutter for magneto signaling, which operates when the hand generator is cranked in Telephone EE-8-(*) at the outpost station. When the line relay operates, negative battery is connected through the line lamp, through the BUZ. key contacts to positive battery. When BUZ. key is raised, the return battery current is diverted through the buzzer (7 BW) which gives an audible signal (par. 11 **c.**). To determine which line signal is operated, restore BUZ. key to normal. Raise TALK key of that line. This will disconnect the line relay from the line circuit and connect the operator's telephone set to the line circuit. The line relay will now restore automatically and put out the line lamp.

**c. Operator's circuit.**—The operator's circuit gets its power from Battery BB-29 through BAT. key on the switchboard when the key is raised to ON. Two operator's jacks, connected in multiple, are provided. These may be used interchangeably, or with two operator's sets at the same time. Each TALK key is equipped with a set of springs which make contact and close the transmitter battery circuit when the key is operated. No battery flows through the transmitter when all TALK keys are normal, even though the battery toggle switch on the operator's set, Headset HS-30-(*) and Chest Set TD-1, is on.

**d. Alarm circuits for line signals.**—These circuits give an audible signal, plus the visual signals, for incoming line signals. The BUZ. key controls the operation of the buzzer (7 BW) for line lamp signals. When the BUZ. key is raised to BUZ., the operation of any line relay will connect battery through the associated line lamp in series with the buzzer (7 BW), and cause the buzzer to operate. The line lamp, when connected in series with the buzzer (7 BW), will not burn at full brilliance. Therefore, when the buzzer operates, it may be necessary to restore BUZ. key to normal in order to tell which line lamp has been operated. When the BELL key is operated to BELL, the operation of any line-drop shutter will connect battery to the bell (7 DW) and cause it to ring. Restoring the line-drop shutter by hand will stop the ringing of the bell.

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**e. Voltmeter test.**—The voltmeter test circuit is designed to check the potential of the battery supplying current to the switchboard circuit. The VOLTS key, when operated, connects the voltmeter directly across the battery leads and registers the voltage of the battery (par. 11 **b.**).

**f. Milliammeter test.**—The milliammeter test circuit tests the continuity of a line circuit, and also the amount (in milliamperes) of direct current flowing on each line circuit when in use. Since the amount of current which flows in any circuit is decreased when the resistance of that circuit is increased, this test will give an approximate indication of the working condition of the line to which it is applied.

(1) When the MA key of any line circuit on the switchboard is operated to MA position (the TEST-TALK key remaining normal or unoperated), the milliammeter will be connected in series with the line loop, the windings of the line relay, and the 6-volt battery source.

(2) When the line terminals of the line to be tested have been connected by a short piece of wire, making a zero resistance line loop, the milliammeter will register the amount of current (about 12 milliamperes) flowing through a line circuit having no external line resistance. Note that the line relay will operate and light the line lamp.

(3) When a field station line-circuit and its field telephone is connected to the line terminals, the additional resistance of the external line loop, plus the resistance of the holding coil in the field telephone (with the hand set removed from its cradle), will reduce the amount of current flow in the line circuit.

(4) The milliammeter will indicate the practical minimum current needed for reliable operation of the line relay by the following test:

(a) First, check the voltage of the battery and restore the VOLTS key (par. 11 **b.**).

(b) Now, operate the TEST and MA keys at the same time, and note the milliammeter reading. Also, note that the line relay operates to light the line lamp. The milliammeter reading should be about 3½ milliamperes. The above test disconnects the external line loop from the switchboard circuit and connects a resistor having a resistance of 1200 ohms (18 BJ). When any test on a field station line-circuit shows a milliammeter reading of less than 3½ milliamperes, adjust the field telephone connected to that line for local battery operation and generator signaling. Call the outpost operator and instruct him to make this adjustment.



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**g. Heater circuit.**—The heater circuit supplies current to heating elements for drying out the switchboard when necessary. Use heating elements having standard medium size screw bases and of a size to fit the space available. Use whatever type of heating element and current that is available (par. 10 **d.** (2) (**c**)). Two midget 3-ampere fuses are provided between the heater receptacles and the two binding posts marked HEATER on the front panel of Switchboard BD-70.

**14. PROTECTOR AR-8.**—Protector AR-8 houses the protectors which connect the field telephone lines to the Cord CD-425. These protectors are used to open the circuit if any harmful electrical currents contact the field telephone lines so that the equipment in Switchboard BD-70 will not be ruined.

**15. CAPACITOR UNIT BE-59.**—Connection of Telephone EE-8-(*) to the binding posts marked TEL of the Capacitor Unit BE-59 connects Telephone EE-8-(*) with the outpost line through a 1 mf capacitor. This stops the battery current passing through the ringer coil in Telephone EE-8-(*) from operating Switchboard BD-70 line relay.

**16. OUTPOST UNIT BE-51.**—The milliammeter and 48,000-ohm resistance contained in Outpost Unit BE-51 are normally connected across the outpost line and draw a current of approximately 0.12 milliampere. This is not enough current to operate the Switchboard BD-70 line relay, but pressing the plunger type key on Outpost Unit BE-51 short circuits the meter and resistance, and permits the line relay to operate. The outpost observer may check the continuity of the outpost line and circuit by noting the meter needle drop to zero when the key is pressed.

**17. HEADSET HS-30-(*).**—Headset HS-30-(*) includes two Receivers R-30-(*). An Insert M-300 made of soft rubber that fits into the ears is attached to each receiver. Bend Headband HB-30-(*) to fit the contour of your head. The tension of Headband HB-30-(*) is correct when there is just enough pressure of Inserts M-300 against the inner ears to make a partial seal against external noises. If properly adjusted, the pressure will not be uncomfortable.



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## SECTION IV
## MAINTENANCE

**18. UPKEEP AND REPAIR.**—Handle the equipment carefully while packing and unpacking, transporting and installing. After the switchboard has been set up for service, test all circuits at least *once each day*. Test battery voltage (par. 11 **b.**), and complete line test on all lines for talking and ringing in both directions. Pay special attention to the operation of line signals and alarm circuits.

**a.** You can remove and replace line lamps from the front of the panel, using the lamp and lamp-cap extractor tools. **BE SURE that the lamps are inserted in the lamp jacks at the proper angle and that the lamp terminal strips make good contact with the jack springs.**

**b.** The TEST-TALK, RING-MA, BAT., BUZ., and BELL-VOLTS keys may be pulled out from the face of the operating panel for inspection, cleaning or making minor adjustments. To adjust, remove the four flat-head machine screws in each corner of the key mounting plate.

**c.** Always move the drop-guard spring up to hold the drop shutter in position when the switchboard is to be transported. The drop shutters and alarm springs may need adjustment as they are easily bent. Remove and straighten them when necessary.

**d.** Pull out the relay covers from the front of the panel to expose the relay springs for inspection. If the line lamp does not light under test conditions, reduce the relay spring tension slightly by turning the front thumb screw counterclockwise (to the left). Keep enough tension to allow the relay to just operate under test conditions and to keep the armature from chattering too much when ringing current is received. Adjust the relay contact points to insure the armature making firm contacts in the non-operated (right) and operated (left) positions.

**e.** The heater elements, heater fuses, and battery fuses are reached through the rear door for test or replacement.

**f.** Test the trouble light periodically. Connect it for a short time to the socket on the front panel of Switchboard BD-70, so that it will be ready for locating trouble in an emergency.



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## SECTION V SUPPLEMENTARY DATA

## 19. TABULAR LIST OF REPLACEABLE PARTS FOR FLASH RANGING SET GR-4-A

*Note:* The list of stock numbers is intended to supplement the Signal Corps General Catalog until the Catalog is revised to include the stock numbers herein.

*Order replacement parts by stock number and description.*

### a. Switchboard BD-70:

| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-1 | #1 | 4G4770/SP/W1 (5-1) | Washer, countersunk, for #10 screw, steel, electrogalvanized. | | E.S. | Item 36 on 60005 or †SC-D-1890-C |
| 1-2 | #1 | 4G4770/SP/S1 (5-2) | Screw, F.H.I.M., 10-32 x 1", steel, electrogalvanized. | | E.S. | Item 35 on 60005 or †SC-D-1890-C |
| 1-3 | #4 | 4G4770/SP/W2 (5-3) | Washer, countersunk, for #8 screw, steel parkerized. | | E.S. | Item 33 on 60005 or †SC-D-1890-C |
| 1-4 | #4 | 4G4770/SP/W3 | Washer, countersunk, for #6 screw, steel, parkerized. | | E.S. | Item 32 on 60005 or †SC-D-1890-C |
| 1-5 | #6 | 4G4770/SP/W4 | Washer, for #10 screw, steel, zinc plate. | | K.S. | Item 31 on 60005 or †SC-D-1890-C |
| 1-6 | #4 | 4G4770/SP/W5 | Lockwasher, for #8 screw, steel, zinc plate. | | K.S. | Item 30 on 60005 or †SC-D-1890-C |

Note: # Available in Depot stock. * Furnished with equipment as running spare part. † Signal Corps drawing number.



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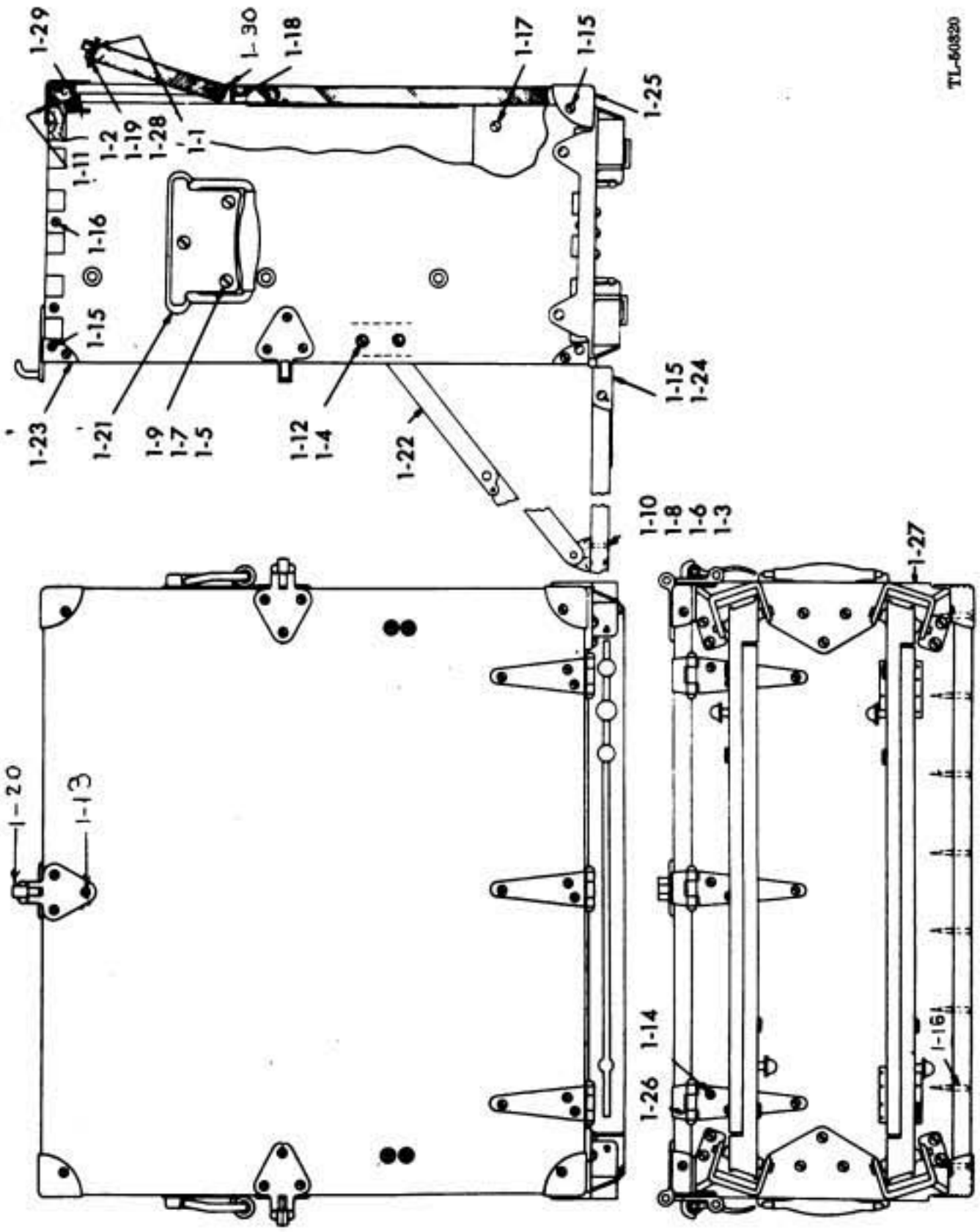



**FIGURE 12. Location of parts for Switchboard BD-70, cabinet.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-26 | #2 | 4G4770/SP/H2 | Hinge, steel | Hinges front cover to body of switchboard. | Stan. | Item 2 on 40748 or SC-D-SC-A-705 |
| 1-27 | #2 | 4G4770/SP/L1 | Leg assembly, steel | Supports for switchboard. | K.S. | Item 7 on 60005 or †SC-D-1903-B |
| 1-28 | #1 | 4G4770/SP/C5 | Collar, steel | To prevent loss of screw. | K.S. | Item 6 on 60013 or †SC-D-1892-C |
| 1-29 | #1 | 4G4770/SP/B1 | Block, steel | Stop for rear door. | K.S. | Item 5 on 60013 or SC-D-1892-C |
| 1-30 | #1 | 4G4770/SP/H2 | Hinge, steel | For rear door of switchboard. | K.S. | Item 4 on 60013 or †SC-D-1892-C |
| 1-31 | #1 | 3Z8168 | Toggle Switch SW-168 | Connects and disconnects battery for lamps which light up switchboard. | A.H. | 40605 or †SC-A-1042-N |
| 1-32 | #2 | 2Z5537 | Jack JK-37, operator's jack, moulded portion 2" x 9/16" x 2" having holes for plugs on 33/32" x 31/32" center, three make contacts, mounts with lugs having holes on 1" centers. | Terminates head and chest set conductors. | K.S. | 40631 or †SC-D-2568 |
| 1-33 | #1 | 4B455 | Crank GC-11, generator steel, one end 11/32" diameter with 1/4" - 28 tap, phenolic rod handle 1/2" diameter 1 1/8" long. | Means for turning generator. | K.S. | 40370 or †SC-D-1907-B |
| 1-34 | #8 | 4G4770/SP/L2 | Lockwasher, for #4 screw, steel, electrogalvanized. | | K.S. | Item 48 on 60006 or †SC-D-1893-H |

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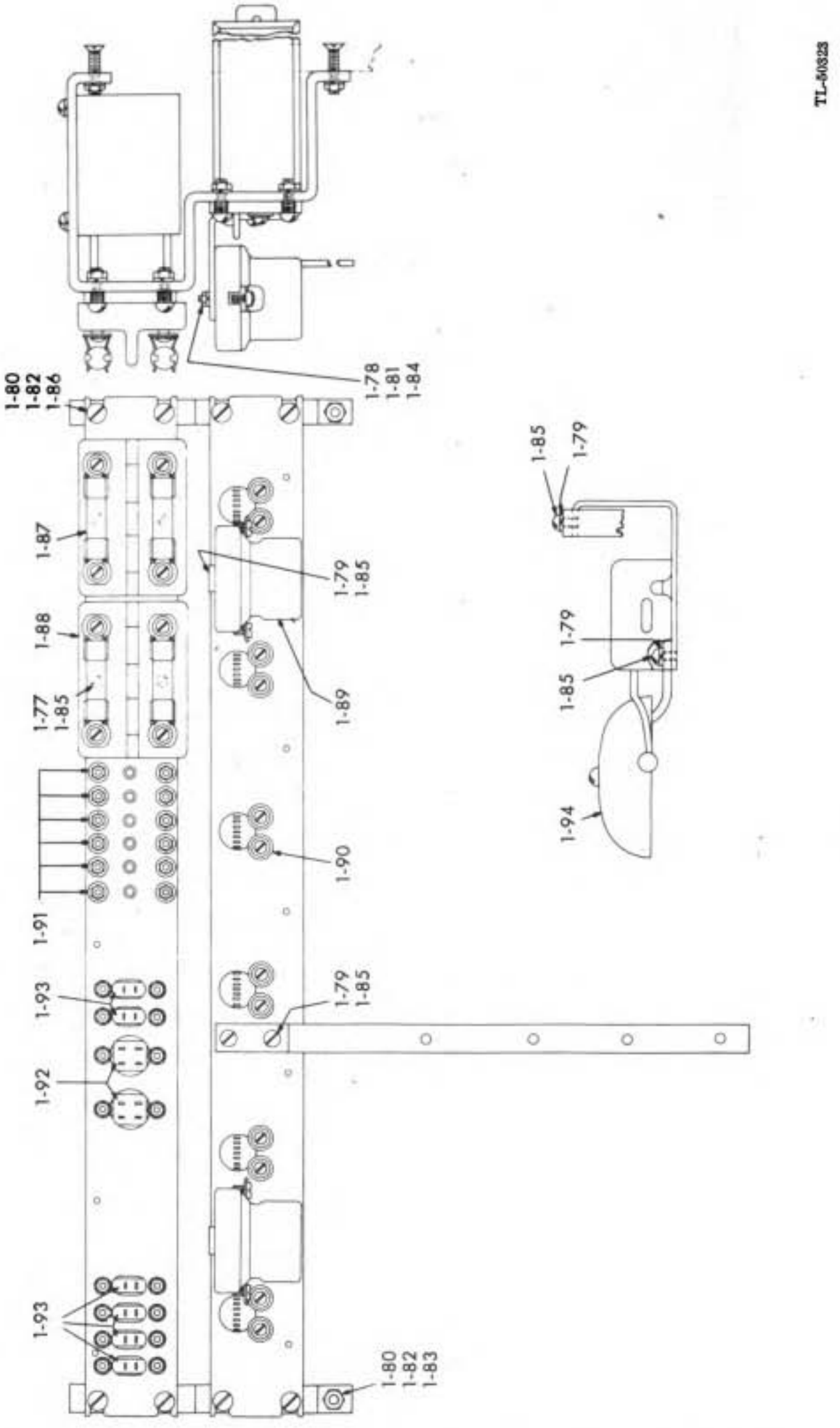



**FIGURE 15. Location of parts for Switchboard BD-70, top rear view.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-35 | #35 | 4G4770/SP/L3 | Lockwasher, for #6 screw, steel, zinc plated. | | K.S. | Item 47 on 60006 or †SC-D-1893-H |
| 1-36 | #20 | 4G4770/SP/L4 | Lockwasher for #8 screw, steel, electro-galvanized. | | K.S. | Item 46 on 60006 or †SC-D-1893-H |
| 1-37 | #4 | 4G4770/SP/LS | Lockwasher for #10 screw, steel, galvanized. | | K.S. | Item 45 on 60006 or †SC-D-1893-H |
| 1-38 | #8 | 4G4770/SP/N3 | Nut, hex., for 4-40 screw, steel, electro-galvanized. | | K.S. | Item 44 on 60006 or †SC-D-1893-H |
| 1-39 | #43 | 4G4770/SP/N4 | Nut, hex., for 6-32 screw, steel, electro-galvanized. | | K.S. | Item 43 on 60006 or †SC-D-1893-H |
| 1-40 | #20 | 4G4770/SP/N5 | Nut, hex., for 8-32 screw, steel, electro-galvanized. | | K.S. | Item 42 on 60006 or †SC-D-1893-H |
| 1-41 | #4 | 4G4770/SP/S10 | Screw, steel, 2-56 x 1/4" R.H.M., parkerized. | | K.S. | Item 41 on 60006 or †SC-D-1893-H |
| 1-42 | #60 | 4G4770/SP/S11 | Screw, steel, 4-36 x 3/8" F.H.M., parkerized. | | K.S. | Item 40 on 60006 or †SC-D-1893-H |
| 1-43 | #6 | 4G4770/SP/S12 | Screw, steel, 4-40 x 3/4" R.H.M., parkerized. | | K.S. | Item 39 on 60006 or †SC-D-1893-H |
| 1-44 | #2 | 4G4770/SP/S13 | Screw, steel, 4-40 x 3/4" R.H.M., parkerized. | | K.S. | Item 38 on 60006 or †SC-D-1893-H |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-45 | #12 | 4G4770/SP/S14 | Binding screw, H. M., 6-32 x ¾" brass silver plated. | | K.S. | Item 37 on 60006 or †SC-D-1893-H |
| 1-46 | #14 | 4G4770/SP/S15 | Screw, steel, 6-32 x ¾" F.H.M., parkerized. | | K.S. | Item 36 on 60006 or †SC-D-1893-H |
| 1-47 | #4 | 4G4770/SP/S16 | Screw, steel, 6-32 x ⅝" F.H.M., parkerized. | | K.S. | Item 35 on 60006 or †SC-D-1893-H |
| 1-48 | #2 | 4G4770/SP/S17 | Screw, steel, 6-32 x 1¾" F.H.M., parkerized. | | K.S. | Item 34 on 60006 or †SC-D-1893-H |
| 1-49 | #2 | 4G4770/SP/S18 | Screw, steel, 8-36 x ⅝" F.H.M., parkerized. | | K.S. | Item 33 on 60006 or †SC-D-1893-H |
| 1-50 | #6 | 4G4770/SP/S19 | Screw, steel, 8-32 x ⅞" F.H.M., parkerized. | | K.S. | Item 32 on 60006 or †SC-D-1893-H |
| 1-51 | #4 | 4G4770/SP/S20 | Screw, steel, 10-32 x ½" R.H.M., parkerized. | | K.S. | Item 31 on 60006 or †SC-D-1893-H |
| 1-52 | #14 | 6L7032-10.1SP | Screw, steel, 10-32 x ⅝" R.H.M., parkerized. | | K.S. | Item 30 on 60006 or †SC-D-1893-H |
| 1-53 | #4 | 3Z12011 | Terminal, ½" diameter at one end and 5/16" at other, 15/16" long with hole for wire and hole for stud of meter. | | Sher. | Item 29 on 60006 or †SC-D-1893-H |

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|---|---|---|---|---|---|---|
| 1-54 | #28 | 3Z12072-1 | Terminal, bent at right angle, one end approximately ¼" in diameter with a 28 drill hole and other end having elongated slot 1/16" x 5/32". | | Zie | Item 28 on 60006 or †SC-D-1893-H |
| 1-55 | #6 | 3Z9913 | Terminal, 25/32" long, ⅜" diameter at one end, 3/16" diameter at other end, #8 drill hole in large end, #44 drill hole in other end. | | K.S. | 60022 or †RL-A-320-6 |
| 1-56 | #1 | 3C1712M | Coil, retardation, resistance 2.3 ohms 3¼" long, wooden ends 1" square. | Used in operator's circuit. | W.E. | Item 26 12-M †SC-D-1893-J |
| 1-57 | #1 | 3C105 | Coil, induction, C-105, inductance at 1000 cycles with one milliampere current flowing 120, 5 and 80 henries, D. C. resistance 25, 3 and 370 ohms, laminated core, size 2⅜" x 1 3/16" x 1⅝". | Used in operator's circuit. | K.S. | Item 25 C-105 †SC-D-1893-J |
| 1-58 | #1 | 4Z2810 | Buzzer 7-BW, 10.5 ohms resistance, operates on 2 to 6 volts D.C., 2½" x 2" x 1". | Night alarm buzzer. | W.E. | Item 24 7-BW †SC-D-1893-J |
| 1-59 | #1 | 4B404 | Buzzer BZ-4, two coils 80 ohms in series, 2 3/32" x 2½" x 1 7/16". | Operates when ringing on line. | W.E. | 3-Z4 †SC-A-988-C |
| 1-60 | #1 | 4B838B | Generator, output at rotor speed of 1000 R.P.M. with 200 ohm load equals 81 milliamperes, approximately 4" x 3⅛" x 2⅜", mounts on ⅞" x 1⅜" centers (4 holes). | Furnish ringing current. | K.S. | GN-38-B †SC-D-816-S |
| 1-61 | #1 | 2Z5990-8 | Socket, lamp, face plate elongated 1 3/16" x 1 11/16", mounting holes on 1 3/16" centers, double pole spring contacts. | Socket for extension lamp. | Mut. | 18-P double contact. †SC-D-1893-J Item 21 |
| 1-62 | #2 | 4C9971/104 | Assembly panel, light, 15/16" diameter, 1" long having a ⅜" x 13/16" slot also two springs for connections. | Housing for lamp on front panel. | Yax | 330 †SC-D-2930-C |
| 1-63 | *#2 | 2Z5925 | Lamp, mazda, flashlight type socket, 6-8 volts. | Lamp for lighting front panel. | G.E. | Item 19 40 †SC-D-1893-J |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-64 | #6 | 4C5104.79GH | Key on escutcheon, double locking type, 13 springs consisting of 2 make before break sets and 1 make set in one direction and 1 make before break set and 1 make set in opposite direction, cam handle 3/16" thick, black bakelite handle, escutcheon 2 1/4" x 15/16" x 1/16" steel, black-enameled. | Test and talk key. | K.S. | Item 18 ES-3401 key on ES-3404 escutcheon †SC-D-1893-J |
| 1-65 | #6 | 4C5104.79AF | Key on escutcheon, locking and restoring type, 12 springs consisting of 1 break make set and 1 make before break set on restoring side and 2 break make sets on locking side, cam handle 3/8" thick, black bakelite handle, escutcheon, 2 1/4" x 15/16" x 1/16" steel, black-enameled. | Ringing and milliameter key. | K.S. | Item 17 ES-3402 key on ES-3404 escutcheon †SC-D-1893-J |
| 1-66 | #1 | 4C5002 | Key on escutcheon, double locking type 8 springs consisting of 2 make sets of springs on each side, cam handle 3/16" thick, black bakelite handle, escutcheon 2 1/4" x 15/16" x 1/16" steel, black-enameled. | Bell and voltmeter key. | K.S. | Item 18 1002 Key on ES-3404 escutcheon †SC-D-1893-J |
| 1-67 | #1 | 4B8168/50 | Key on escutcheon, single locking type, 6 springs consisting of 2 break make sets of springs, cam handle 3/16" thick, black bakelite handle, escutcheon 2 1/4" x 15/16" x 1/16" steel, black-enameled. | Battery and buzzer key. | K.S. | Item 15-A ES-3404 escutcheon †SC-D-1893-J |
| 1-68 | *#6 | 4C2504-A | Cap, lamp, white opalescent glass in brass frame 57/64" in diameter. | Cap for line lamps. | W.E. | Item 14 4-A †SC-D-1893-J |
| 1-69 | #6 | 4G9783-4 | Socket, lamp, 9/16" x 2 15/16" with lugs for 5/8" panel having mounting holes on 1 1/32" centers, two contact springs. | Socket for line lamp. | W.E. | Item 13 34 for 5/8" panel †SC-D-1893-J |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 1-70 | *#6 | 4C5492-E | Lamp, 12 volts, current consumption .105 to .120 amperes, carbon filament, 1¾" x 5/16", tipless glass bulb, contacts on sides. | Lamp for line signals. | W.E. | Item 12 E-2 †SC-D-1893-J |
| 1-71 | #6 | 4C3503 | Drop, 500 ohms resistance, drop shell ¾" x 2 7/16", two mounting screws on 7/16" centers. | Drop signal for magneto lines. | K.S. | M-203 †SC-D-4229-E |
| 1-72 | #3 | 3Z252 | Binding post, bakelite screw type head ½" x 7/16", base ½" diameter 9/32" high, 3/32" wide, hole in neck, neck terminates in 6-32 x 9/16" thread for mounting. | For terminating operator's head set. | Eby. | TM-152 †SC-D-530-P |
| 1-73 | #4 | 3Z737-5 | Binding post, bakelite screw type head 5/8" x 7/16", base 5/8" x 9/32", 3/32" x 1/8" slot in neck, neck terminates in 6/32" screw ¾" long. | For terminating lines, heater and battery lead. | Eby. | Item 9 Commander S †SC-D-1893-J |
| 1-74 | #1 | 3F901ES-1 | Milliammeter D.C. 0 to 15 M.A., 2% accuracy, flange 2½" diameter, body 2 1/16" diameter by 1" deep, metal case, mounting holes on 1 5/32" radius. | For measuring current flow. | West. 506 type | Item 8 506 flush type M.A. with mtg. holes an 1 5/32" radius, 0 to 15 range †SC-D-1893-J |
| 1-75 | #1 | 3F7257 | Voltmeter D.C. 0 to 15 volts, 2% accuracy, flange 2½" diameter, body 2 1/16" diameter by 1" deep, metal case, mounting holes on 1 5/32" radius. | For measuring voltage. | West. | Item 7 1S-57 †SC-D-1893-J |
| 1-76 | #2 | 4G4770/SP/S21 | Studs, extension. | Extension for stud of binding posts. | K.S. | Item 4 on 60018 or †SC-D-1897-E |
| 1-77 | #4 | 4G4770/SP/W6 | Washer, for #8 screw, steel, electrogalvanized. | | K.S. | Item 25 on 60009 or †SC-D-1900-F |
| 1-78 * | #2 | 4G4770/SP/L6 | Lockwasher, for #10 screw, steel, electrogalvanized. | | K.S. | Item 24 on 60009 or †SC-D-1900-F |



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 1-79 | #10 | 4G4770/SP/L7 | Lockwasher for #8 screw, steel, electro-galvanized. | | K.S. | Item 23 on 60009 or †SC-D-1900-F |
| 1-80 | #12 | 4G4770/SP/L8 | Lockwasher for #12 screw, steel, electro-galvanized. | | K.S. | Item 22 on 60009 or †SC-D-1900-F |
| 1-81 | #2 | 4G4770/SP/N6 | Nut, hex., for #10-32 screw, steel, electro-galvanized. | | K.S. | Item 21 on 60009 or †SC-D-1900-F |
| 1-82 | #12 | 4G4770/SP/N7 | Nut, hex., for #12-24 screw. | | K.S. | Item 20 on 60009 or †SC-D-1900-F |
| 1-83 | #4 | 4G4770/SP/S22 | Screw, steel, 1-24 x 1" F.H.M., electro-galvanized. | | K.S. | Item 19 on 60009 or †SC-D-1900-F |
| 1-84 | #2 | 4G4770/SP/S23 | Screw, steel, 12-24 x ¾" R.H.M., electro-galvanized. | | K.S. | Item 18 on 60009 or †SC-D-1900-F |
| 1-85 | #14 | 4G4770/SP/S24 | Screw, steel, 8-32 x ½" R.H.M., electro-galvanized. | | K.S. | Item 17 on 60009 or †SC-D-1900-F |
| 1-86 | #8 | 4G4770/SP/S25 | Screw, steel, 12-24 x ⅝" R.H.M., electro-galvanized. | | K.S. | Item 16 on 60009 or †SC-D-1900-F |
| 1-87 | *#4 | 3Z2443 | Fuse, cartridge type. | 3-ampere fuse for heater circuit. | J.E. 388-643 type. | Item 15 on 60009 or †SC-D-1900-F |
| 1-88 | #2 | 3Z2874 | Base, fuse cut out, 3112 Type B, midget 2-pole enclosed. | Base for fuses. | Colts. | Item 14 on 60009. |
| 1-89 | #2 | 6Z7807-3 | Receptacle, 9171 medium base porcelain cleat receptacle. | Receptacle for heater element. | H.H. | Item 13 on 60009. |

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|---|---|---|---|---|---|---|
| 1-90 | #6 | 2Z7691-2 | Relay, consisting of 2 windings each 5500 turns of 34 A.W.G. wire approx. 250 ohms resistance. | Relay used in line circuit. | W.E. type 206 | Item 12 †SC-D-1900-F |
| 1-91 | #6 | 3Z6120-12 | Resistance, micanite core, 1200 ohms ± 5%, 6 watts, 4 31/32" x 1 31/64" x 3/8". | Used for testing operations of line relay. | W.E. 18BJ | Item 11 (18-BJ) †SC-D-1900-F |
| 1-92 | #2 | 3DB2.39A | Capacitor, 2 mf min. 2.5 mf max., 500 volts D.C., tinfoil and paper, tin can, 2½" x 1½" x 31/32", screw terminals on 1" centers. | Used in operators circuit. | W.E. 139A | Item 10 (139-A) †SC-D-1900-F |
| 1-93 | #6 | 3DA500-20 | Capacitor, ½ mf., 500 volts D.C., tinfoil and paper, tin can 3 7/16" x 1½" x 15/32", screw terminals on 1" centers. | Condenser used in line circuit. | W.E. 141-B | Item 9 (141-B) †SC-D-1900-F |
| 1-94 | #1 | 4Z1107DW | Bell, 15.8 ohms resistance, operating voltage 3 to 10 volts D.C., 6 to 18 volts A.C., 5½" x 3½" x 1½", three terminals. | Night alarm bell. | W.E. 7-DW | Item 8 (7-DW) †SC-D-1900-F |

**b. Handset TS-9-K:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 2-1 | #1 | 4B1109 | Handset TS-9-K assembly consisting of the following parts: | For use as telephone. | K.S. | 40443 |
| 2-2 | 1 | | Handset body (blk. moulding compound, approx. 9" long). | Holding transmitter receiver & switch assem. | K.S. | Pc. 60942 |
| 2-3 | 1 | | Cord CC-333 (3 cond. rubber covered tinsel cord. 6 ft. butt to butt). | Connection between handset TS-9-K and Telephone EE-8-B. | K.S. | 40389 Item 2. |
| 2-4 | 1 | | Switch (double action switch, zinc die cast approx. 2⅝" x ⅝".) | Connects transmitter to line. | K.S. | 40177 |
| 2-5 | 1 | | Transmitter (zinc base alloy body, approx. 2" x ½"). | Transmits speech. | K.S. | Pc. 66523 |



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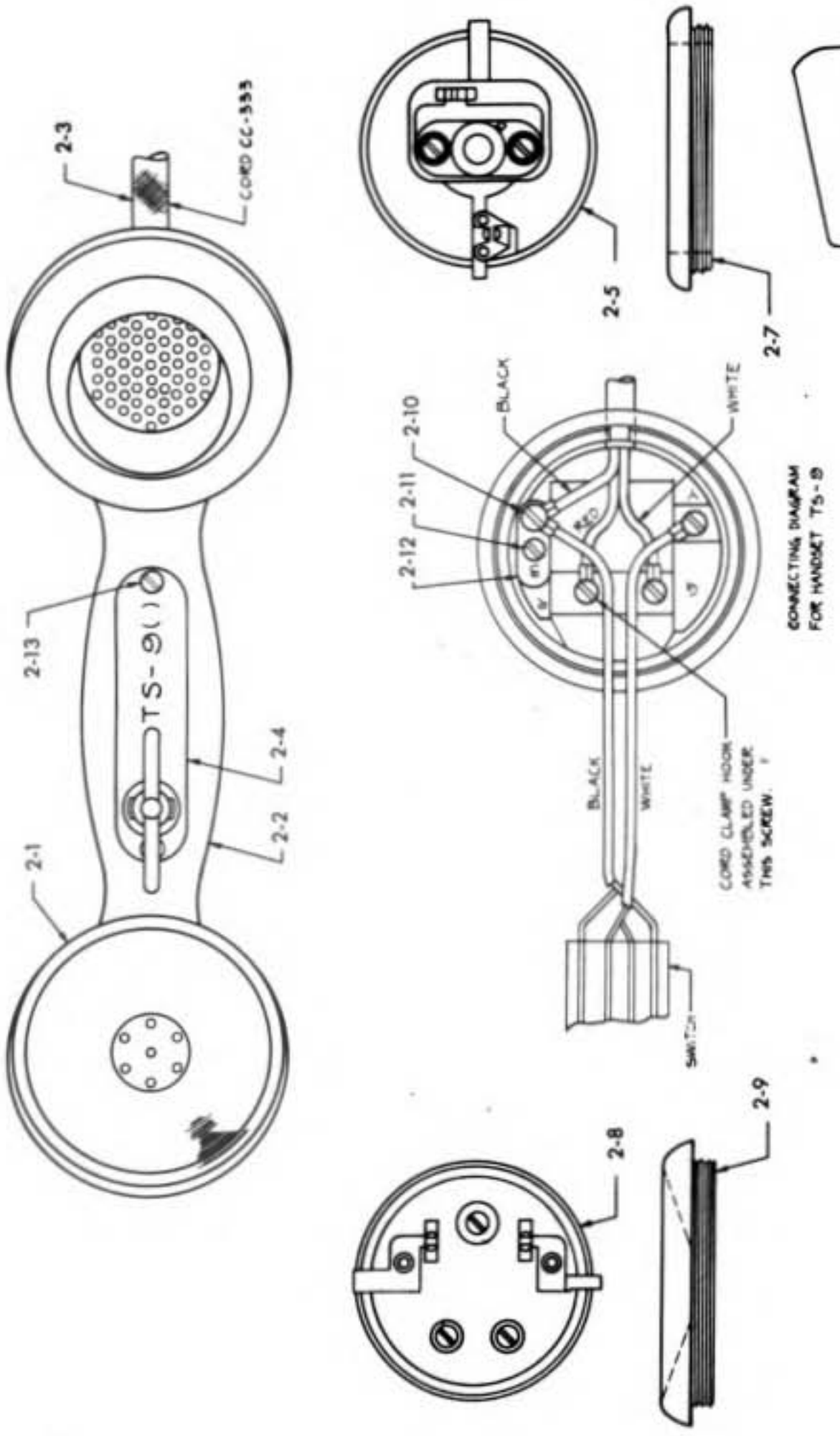



**FIGURE 16. Location of parts for Handset TS-9.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 2-6 | 1 | | Mouthpiece (blk. moulding compound, approx. 2 5/16" x 1 1/16"). | Directs sound to transmitter. | K.S. | 40178 Item 21 |
| 2-7 | 1 | | Clamping ring (blk. moulding compound, approx. 2 5/8" x 7/16"). | Secures mouthpiece and transmitter to handset. | K.S. | 40178 Item 20 |
| 2-8 | 1 | | Receiver (48 ohms, res.) | Producing sound. | K.S. | 40179 |
| 2-9 | 1 | | Receiver ear cap (blk. moulding compound, approx. 2 1/2" x 1/2"). | Holds receiver in handset. | K.S. | 40181 Det. 23 |
| 2-10 | 4 | | Screw, button head machine, brass, dull nickel #4-48 x 3/16". | Holds cord leads at transmitter. | K.S. | Pc. 36850 |
| 2-11 | 1 | | Screw, flat head machine, brass, dull nickel #4-48 x 3/16". | Secures terminal to handset. | K.S. | Pc. 60939 |
| 2-12 | 1 | | Terminal, brass, dull nickel. | Terminating leads. | K.S. | Pc. 60848 |
| 2-13 | 2 | | Screw, flat head machine, brass, 4-40 x 1/4". | Holding switch to handset. | K.S. | Pc. 62653 |

**c. Telephone EE-8-B:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 3-1 | #1 | 4B5008A/B1 | Block, battery (black moulding compound.) | For holding dry cells. | K.S. | Pc. 66191 Item 16 †SC-D-9000-B |
| 3-2 | #1 | 4B5008/47 | Spring, battery spring steel, lead alloy coated. | Holds battery against contacts. | K.S. | Pc. 66192 Item 17 †SC-D-9000-B |
| 3-3 | #1 | 4B5008/47 | Spring, battery spring steel, lead coated alloy. | Holds battery against contact. | K.S. | Pc. 67121 Item 17 †SC-D-9000-B |
| 3-4 | #1 | 6L6440-7.1 | Screw, flat head machine steel, parkerize P-2 #4-40 x 7/16". | Secures battery block to chassis. | K.S. | Pc. 63774 Item 41 †SC-D-8998-B |

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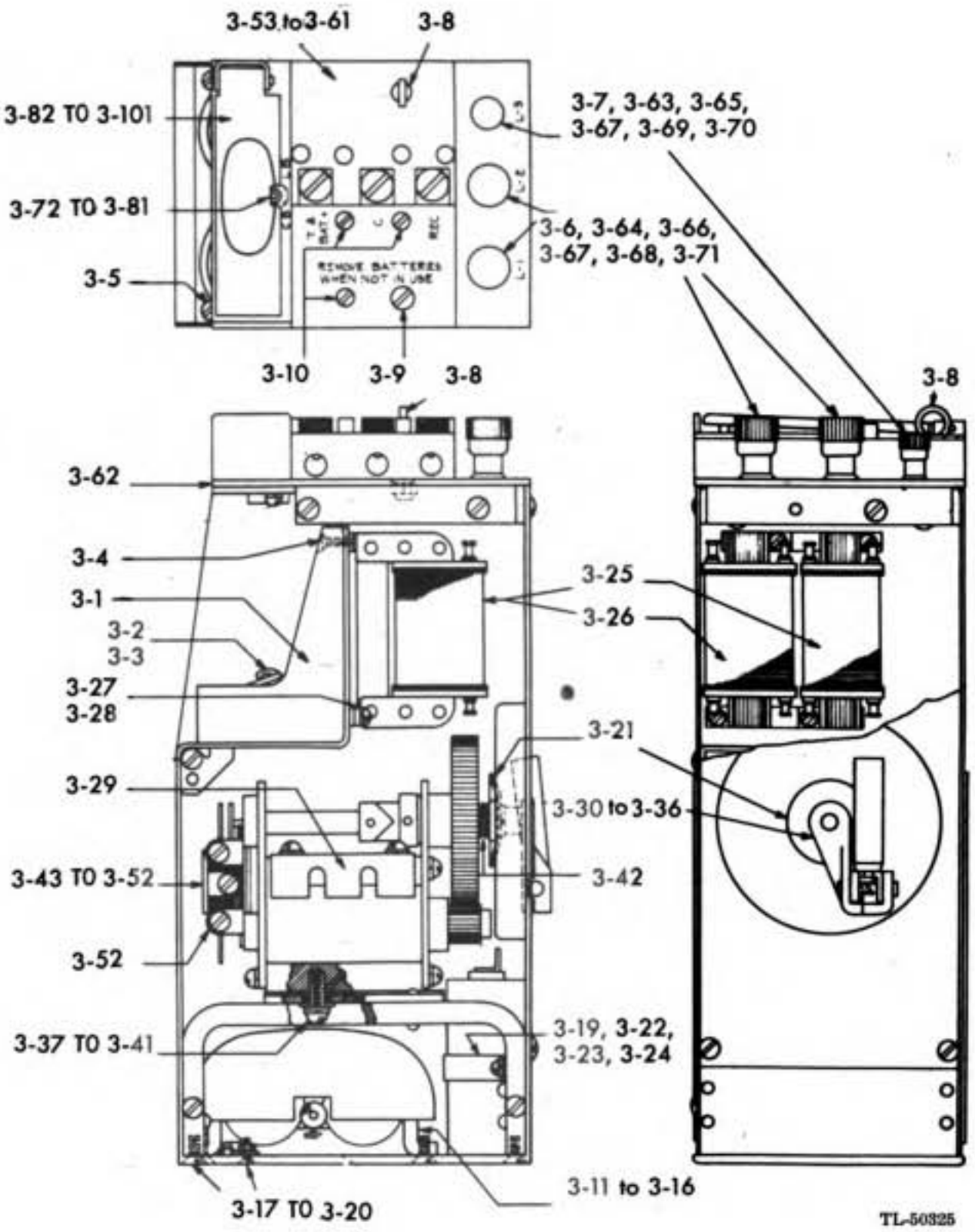



**FIGURE 17. Location of parts for Telephone EE-8-(*).**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-5 | #2 | 6L6440-14SE | Screw, flat head machine steel, elec-galv. #4-40 x 7/8". | Holds battery block to chassis. | K.S. | Pc. 66255 Item 23 †SC-D-8998-A |
| 3-6 | #2 | 3Z-315 | Binding post, code TM-214, (#8-32 x 13/16" brass stud.) | Terminating line leads. | Eby. | Pc. 66305 †SC-D-530-P |
| 3-7 | #1 | 3Z-314 | Binding post, brass stud, #6-32 x 11/16". | Battery connection. | Eby. | Pc. 66300 †SC-D-530-P |
| 3-8 | #1 | 6L-21006-32 | Screw eye, cast brass, silver plated, #6-32 x 15/16". | Place to secure stay cord. | K.S. | Pc. 66206 Item 9 †SC-D-9004-B |
| 3-9 | #1 | 6L-6632-16SE | Screw, flat head machine, steel, elec. galv., #6-32 x 1". | Holds jack assembly to chassis. | K.S. | Pc. 66421 Item 13 †SC-D-9003-A |
| 3-10 | #3 | 6L-6440-4SE | Screw, flat head machine, steel, elec. galv., #4-40 x 1/4". | Holds cover and designation plate to body of jack. | K.S. | Pc. 63789 Item 15 †SC-D-9003-A |
| 3-11 | #1 | 4B3371 | Ringer MC-131 | Audible Signaling. | K.S. | 40256 †SC-D-822-N |
| 3-12 | 2 | | Screw, flat head machine, steel, parkerize P-7, #6-32 x 5/16". | Holds ringer bracket to chassis. | K.S. | Pc. 63778 Item 12 †SC-D-8997-A |
| 3-13 | 1 | | Gong, carbon steel, parkerize P-4. | Produces ringing sound. | K.S. | Pc. 67295 and †SC-D-823-R |
| 3-14 | 1 | | Support, brass strip. | Supports gong and ringer. | K.S. | Pc. 67293 and †SC-D-823-R |
| 3-15 | 2 | | Screw, filister head machine, brass, parkerize P-4, #6-23 x 7/32". | Holds gong to ringer. | K.S. | Pc. 67847 and †SC-D-822-N |
| 3-16 | 2 | | Lockwasher, steel, electrogalvanize for #6 screw. | On screw holding gong. | K.S. | Pc. 54367 †SC-D-822-N |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-17 | #5 | 6L6440-5.8 | Screw, flat head machine, steel, electrogalvanize, #4-40 x 5/16". | Secures cable clamp to chassis; secure bottom plate to generator brackets. | K.S. | Pc. 63780 Item 25 †SC-D-8998-A |
| 3-18 | 1 | | Clamp, steel, black enamel. | Secures cable to chassis. | K.S. | Pc. 66190 Item 14 †SC-D-8998-A |
| 3-19 | #3 | 6L73004 | Washer, spring steel, electrogalvanize. | Between cable clamp and hex. nut. | K.S. | Pc. 55651 Item 32 †SC-D-8998-A |
| 3-20 | #1 | 6L3104-40B | Nut, hex., #4-40 brass. | Secures cable clamp to chassis. | K.S. | Pc. 66433 Item 33 †SC-D-8998-A |
| 3-21 | #1 | 4B801 | Disc. corprene, 1¼" O.D., 5/16" I.D. 1/16" thick. | Prevents water from seeping into body of unit. | K.S. | Pc. 66223 Item 15 †SC-D-8997-A |
| 3-22 | #1 | 3D335 | Capacitor CA-335 (200 V-3 windings) 2 M.F. .5 M.F. & .3 M.F.) P-4 finish on outside. | Prevents flow of direct current thru receiver and ringer. | K.S. | Pc. 40440 †SC-D-2990-D |
| 3-23 | 1 | | Strap, steel, black enamel. | Holds capacitor to generator brackets. | K.S. | Pc. 66193 Item 18 †SC-D-8998-A |
| 3-24 | #2 | 6L6440-5.5 | Screw, rd. hd. machine, brass 4-40 x 5/16". | Holds capacitor and strap to generator bracket. | K.S. | Pc. 66402 Item 28 †SC-D-8998-A |
| 3-25 | #1 | 3C158 | Coil, retard, code C-158, 1.0 Henries, 1 volt at 1000 cycles D.C. 100 ohms. | Holding coil. | K.S. | Pc. 40433 †SC-D-2878-G |
| 3-26 | #1 | 3C105 | Coil, induction C-105 Term. 1 & 2 (3.7 henries, 350 ohms) terms. 3 & 4 (.08 henries, 12 ohms.) | Steps up transmitter voltage and acts as insulating transformer. | K.S. | Pc. 40432 †SC-D-2877H |

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|---|---|---|---|---|---|---|
| 3-27 | 4 | | Screw, rd. hd. machine, steel, 6-32 x 7/32" parkerize P-6. | Holds coils C-105 and C-158 to chassis. | K.S. | Pc. 63777 Item 13 †SC-D-8997-A |
| 3-28 | #4 | 6L73006 | Washer, locking, steel, electrogalvanize. | Used on mounting screws of coils C-105 and C-158. | | Pc. 55657 Item 14 †SC-D-8997-A |
| 3-29 | #1 | 4B838-B | Generator, GN-38-B. Generator output at rotor speed of 1000 RPM with 200 ohm load equals 81 milliamperes; approx. 212 RPM of crank, (approx. 4" x 3 1/8" x 2 3/8" mounts on 7/8" x 1 3/8" centers 4 holes). | Supplies ringing current. | K.S. | Pc. 40981 †SC-D-816-S |
| 3-30 | #1 | 4B454 | Crank, GC-9 forged brass, electrogalvanized. | Turning Generator GN-38-B. | K.S. | Pc. 40431 †SC-D-1797-F |
| 3-31 | 1 | | Handle, black phenolic tube, 1 3/8" x 3/8". | Fits spindle of crank GC-9. | K.S. | Pc. 61842 Item 2 †SC-D-1797-F |
| 3-32 | 1 | | Arm. forged brass, electrogalvanize. | Body of Crank GC-9. | K.D. | Pc. 61842 Item 1 †SC-D-1797-F |
| 3-33 | 1 | | Spindle, brass, electrogalvanize. | Fits body of arm, and handle of Crank GC-9. | K.S. | Pc. 61843 Item 3 †SC-D-1797-F |
| 3-34 | 1 | | Pin, brass, electrogalvanize. | Acts as hinge for spindle. | K.S. | Pc. 61844 Item 4 †SC-D-1797-F |
| 3-35 | 1 | | Spring, steel music wire, electrogalvanize. | Retainer for handle of crank GC-9 | K.S. | Pc. 61845 Item 5 †SC-D-1797-F |
| 3-36 | 1 | | Washer, brass, electrogalvanize. | Holds handle on spindle. | K.S. | Pc. 61846 Item 6 †SC-D-1797-F |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-37 | 4 | | Screw, rd. hd. machine steel, electrogalvanize, #10-32 x ½". | Generator holding screw. | K.S. | Pc. 63602 Item 29 †SC-D-8998-A |
| 3-38 | 4 | | Lockwasher, steel,electrogalvanized. | On generator screw. | K.S. | Pc. 54364 Item 31 †SC-D-8998-A |
| 3-39 | #4 | 6L73010-1E | Washer, steel, electrogalvanize, for #10 screw. | Between lockwasher and insulator on generator holding screw. | K.S. | Pc. 63603 Item 30 †SC-D-8998-A |
| 3-40 | #4 | 4B1922/J1 | Washer, insulating, phenolic plate 9/16" x 1/32" for #10 screw. | Insulates generator mounting screw from mtg. plate. | K.S. | Pc. 66195 Item 20 †SC-D-8998-A |
| 3-41 | #4 | 4B1922/J2 | Bushing, phenolic rod, 5/16" x 5/64" for #10 screw. | Insulates mtg. screw from plate. | K.S. | Pc. 66196 Item 21 †SC-D-8998-A |
| 3-42 | 1 | | Spring, steel, music wire, parkerized P-4. | Returns gen. shaft to normal. | K.S. | Pc. 63698 Item 5 †SC-D-817-N |
| 3-43 | 1 | | Spring, assembly. | Contacts on generator. | K.S. | Pc. 63704 Item 28 †SC-D-816-S |
| 3-44 | 1 | | Bracket, mounting, brass. | Secures spring assembly to generator. | K.S. | Pc. 63725 Item 5 †SC-D-820-T |
| 3-45 | 1 | | Plate, steel, parkerize P-4. | Clamps spring assembly. | K.S. | Pc. 63728 Item 8 †SC-D-820-T |
| 3-46 | 1 | | Spring, phosphor-bronze. | Contacts armature contact. | K.S. | Pc. 63724 Item 4 †SC-D-820-T |

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| 3-47 | 9 | | Insulator, phenolic plate, 13/16" x 7/16" x 1/32". | Insulate spring term. fillers on generator spring assembly. | K.S. | Pc. 63729 Item 9 †SC-D-820-T |
| 3-48 | 2 | | Bushing, phenolic tube 15/32" x 3/16". | Insulate generator spring assembly from mounting screws. | K.S. | Pc. 63734 Item 10 †SC-D-820-T |
| 3-49 | 2 | | Terminal, brass, lead alloy coated. | Terminate L-1 & L-2 leads. | K.S. | Pc. 63726 Item 6 †SC-D-820-T |
| 3-50 | 1 | | Terminal, brass, lead alloy coated. | Terminate ringer lead. | K.S. | Pc. 63727 Item 7 †SC-D-820-T |
| 3-51 | 2 | | Screw, fl. hd. machine steel, electrogalvanize, 6-32 x 11/16". | Holds spring assembly to mounting bracket. | K.S. | Pc. 66021 Item 14 †SC-D-820-T |
| 3-52 | #3 | 6L6632-4.9S | Screw, (binding hd., machine, steel, electrogalvanize, 6-32 x 1/4"). | Hold generator leads to term. | K.S. | Pc. 66031 Item 13 †SC-D-820-T |
| 3-53 | #1 | 4E8255 | Terminal block assembly. | Terminates leads to Telephone EE-8-B. | K.S. | Pc. 66210 †SC-D-9001-B |
| 3-54 | 1 | | Cover, phenolic plate 1 1/2" x 1 15/16" x 1/16". | Cover for term. block. | K.S. | Pc. 66198 Item 2 †SC-D-9003-A |
| 3-55 | #1 | 4B5008A/20 | Jack assembly. | Part of terminal block. | K.S. | Pc. 66209 †SC-D-9003-A |
| 3-56 | 1 | | Block, bakelite 3 1/4" x 1 15/16" x 1/2". | Mounts spring. | K.S. | Pc. 66197 Item 1 †SC-D-9004-B |
| 3-57 | 3 | | Terminal, brass, lead alloy coated. | Terminates leads on jack assembly. | K.S. | Pc. 66220 Item 12 †TM-36 |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-58 | 3 | | Screw, diameter knurl hd., brass, electrogalvanize, #8-32 x 7/16". | Holds spring assembly to block. | K.S. | Pc. 66204 Item 7 †SC-D-9004-A |
| 3-59 | 3 | | Screw, fl. hd. machine brass, electrogalvanize #6-32 x 7/16". | Hold spring assembly to block. | K.S. | Pc. 61710 Item 14 †SC-D-9003-A |
| 3-60 | 3 | | Nut.,hex., brass, silver plated. #4-40. | On screw Pc. 61710. | K.S. | Pc. 66245 Item 8 SC-D-9003-A |
| 3-61 | 3 | | Lockwasher, steel, electrogalvanize, for #6 screw. | On screw Pc. 61710. | K.S. | Pc. 55657 Item 17 †SC-D-9003-A |
| 3-62 | 1 | | Plate, phenolic, 3 13/16" x 3 1/4" x 1/32". | Insulates term. equipt. from chassis. | K.S. | Pc. 66163 Item 1 †SC-D-9002-B |
| 3-63 | #4 | 6L3106-32 | Nut., hex., brass electrogalvanize #6-32. | On battery binding post. | K.S. | Pc. 63600 Item 14 †SC-D-9001-B |
| 3-64 | #4 | 6L3108-32 | Nut., hex., brass electrogalvanize #8-32. | Used on L-1 & L-2 binding posts. | K.S. | Pc. 63599 Item 13 †SC-D-9001-B |
| 3-65 | #3 | 6L73006 | Lockwasher, steel, electrogalvanize, for #6 screw. | On battery binding posts. | K.S. | Pc. 55657 Item 16 †SC-D-9001-B |
| 3-66 | #2 | 6L73008 | Lockwasher, steel, electrogalvanize, for #8 screw. | On L-1 & L-2 binding posts. | K.S. | Pc. 55656 Item 15 †SC-D-9001-B |
| 3-67 | #9 | 3Z1107 | Terminal, brass, tinned. | On binding posts and battery contacts. | K.S. | Pc. 66219 Item 19 †SC-D-9001-B |

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| 3-68 | 2 | | Washer, steel, tinned, for #8 screw. | On L-1 & L-2 binding posts. | K.S. | Pc. 43156 Item 17 †SC-D-9001-B |
| 3-69 | 1 | | Washer, steel, tinned, for #6 screw. | On battery binding posts. | K.S. | Pc. 63601 Item 18 SC-D-9001-B |
| 3-70 | #1 | 4B5008A/30 | Spacer, phenolic rod 3/8" x 3/16" #27 drill. | Spacer and insulator between chassis & term. on batt. binding post. | K.S. | Pc. 66164 Item 2 †SC-D-9002-B |
| 3-71 | #2 | 4B5008A/31 | Spacer, phenolic rod 3/8" x 1/4" #18 drill. | Spacer and insulator, L-1 & L-2 binding posts. | K.S. | Pc. 66165 Item 3 †SC-D-9002-B |
| 3-72 | #1 | 4B5008A/50 | Screw switch assembly, with replacement. Parts as follows: (Ref. 73 to 81 incl.) | Adjusting screw for local or common battery use. | K.S. | Pc. 66162 SC-D-9006-C |
| 3-73 | 1 | | Centerpiece, brass, silver plated. | Base for contact screw, on screw switch assembly. | K.S. | Pc. 66169 Item 1 †SC-D-9006-C |
| 3-74 | 1 | | Contact, top, brass, silver plated. | Connects capacitor and screw switch. | K.S. | Pc. 66170 Item 2 †SC-D-9006-C |
| 3-75 | 1 | | Contact, bottom, brass, silver plated. | Connects lever and screw switches. | K.S. | Pc. 66171 Item 3 †SC-D-9006-C |
| 3-76 | 1 | | Retainer, steel, parkerized P-4. | Clamp for spring assembly, on screw switch. | K.S. | Pc. 66172 Item 4 †SC-D-9006-C |
| 3-77 | 1 | | Screw, contact, stainless steel, 1/4"-20 x 11/32". | Changes set for local or common battery use, on screw switch. | K.S. | Pc. 66173 Item 5 †SC-D-9006-C |
| 3-78 | 2 | | Bushing, phenolic rod, 5/32" x 9/32" with #37 drill. | Insulates spring from mounting screws, on screw switch. | K.S. | Pc. 66174 Item 6 †SC-D-9006-C |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-79 | 2 | | Insulator, phenolic plate, 3/8" x 7/8" x 1/32". | Insulates spring from center piece, on screw switch. | K.S. | Pc. 66175 Item 7 †SC-D-9006-C |
| 3-80 | 1 | | Insulator, phenolic plate, 3/8" x 7/8" x 1/32". | Insulates bottom spring from retainer, on screw switch. | K.S. | Pc. 66176 Item 8 †SC-D-9006-C |
| 3-81 | 2 | | Screw, fl. hd. machine steel, parkerize P-7, #3-48 x 1/2". | Holds spring assembly to lever switch assembly. | K.S. | Pc. 66235 Item 9 †SC-D-9006-C |
| 3-82 | #1 | 4B5008A/51 | Lever switch assembly, with replacement parts as follows (Ref. 83 to 100 incl.) approx. 3 1/8" x 1" x 7/16". | Opens and closes line circuit. | K.S. | Pc. 66162 †SC-D-9005-B |
| 3-83 | 1 | | Case, steel, black enamel approx. 3 1/8" x 1" x 7/16". | Mounting springs of switches. | K.S. | Pc. 66144 Item 1 †SC-D-9005-B |
| 3-84 | 1 | | End, R.H. steel, black enamel. | Case mounting bracket. | K.S. | Pc. 66145 Item 2 †SC-D-9005-B |
| 3-85 | 1 | | End, L.H. steel, black enamel. | Case mounting bracket. | K.S. | Pc. 66146 Item 3 †SC-D-9005-B |
| 3-86 | 1 | | Lever assembly, steel, black enamel. | Hook switch, on lever switch assembly. | K.S. | Pc. 66065 Item 4 †SC-D-9005-B |
| 3-87 | 1 | | Insulator, phenolic plate, 59/64" x 2 31/64" x 1/32". | Between top spring and case, on lever switch assembly. | K.S. | Pc. 67159 Item 5 †SC-D-9005-B |
| 3-88 | 1 | | Spring assembly, phosphor-bronze, with palladium contacts. | Contact spring, lever switch assembly. | K.S. | Pc. 66149 Item 6 †SC-D-9005-B |

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|---|---|---|---|---|---|---|
| 3-89 | 1 | | Spring assembly, phosphor-bronze with palladium contacts. | Double contact spring, lever switch assembly. | K.S. | Pc. 66151 Item 7 †SC-D-9005-B |
| 3-90 | 1 | | Spring assembly, phosphor-bronze with palladium contacts. | Single contact spring, lever switch assembly. | K.S. | Pc. 66153 Item 8 †SC-D-9005-B |
| 3-91 | 1 | | Spring, phosphor-bronze. | Holds spring against stop, lever switch assembly. | | Pc. 66154 Item 9 †SC-D-9005-B |
| 3-92 | 3 | | Insulator, phenolic plate, 1/4" x 11/16" x 1/16". | Separates contact springs, lever switch assembly. | K.S. | Pc. 66156 Item 10 †SC-D-9005-B |
| 3-93 | 1 | | Insulator, phenolic plate, 1/4" x 11/16" x 1/32". | Insulates spring from clamp plate, lever switch assembly. | K.S. | Pc. 66157 Item 11 †SC-D-9005-B |
| 3-94 | 1 | | Clamp plate, steel, electrogalvanized. | Clamps spring assembly, lever switch assembly. | K.S. | Pc. 66155 Item 12 †SC-D-9005-B |
| 3-95 | 1 | | Screw, special, brass #3-48 x 9/32. | Limits travel of lever, lever switch assembly. | K.S. | Pc. 66066 Item 13 †SC-D-9005-B |
| 3-96 | 1 | | Hinge pin, brass nickel finish, .095" x 3/4". | Hinge of lever, lever switch assembly. | K.S. | Pc. 66168 Item 14 †SC-D-9005-B |
| 3-97 | 2 | | Bushing, phenolic rod, 5/32" x 19/64" with #33 drill thru. | Insulates springs and mounting screws, or lever switch assembly. | K.S. | Pc. 66214 Item 15 †SC-D-9005-B |
| 3-98 | 1 | | Pin, phenolic rod, 1/8" x 9/16". | Operates lever, on lever switch assembly. | K.S. | Pc. 66141 Item 16 †SC-D-9005-B |
| 3-99 | 2 | | Screw, flt. hd. machine, steel 4-40 x 7/16" parkerize P-7. | Holds plate and case together, lever switch assembly. | K.S. | Pc. 66225 Item 20 †SC-D-9005-B |

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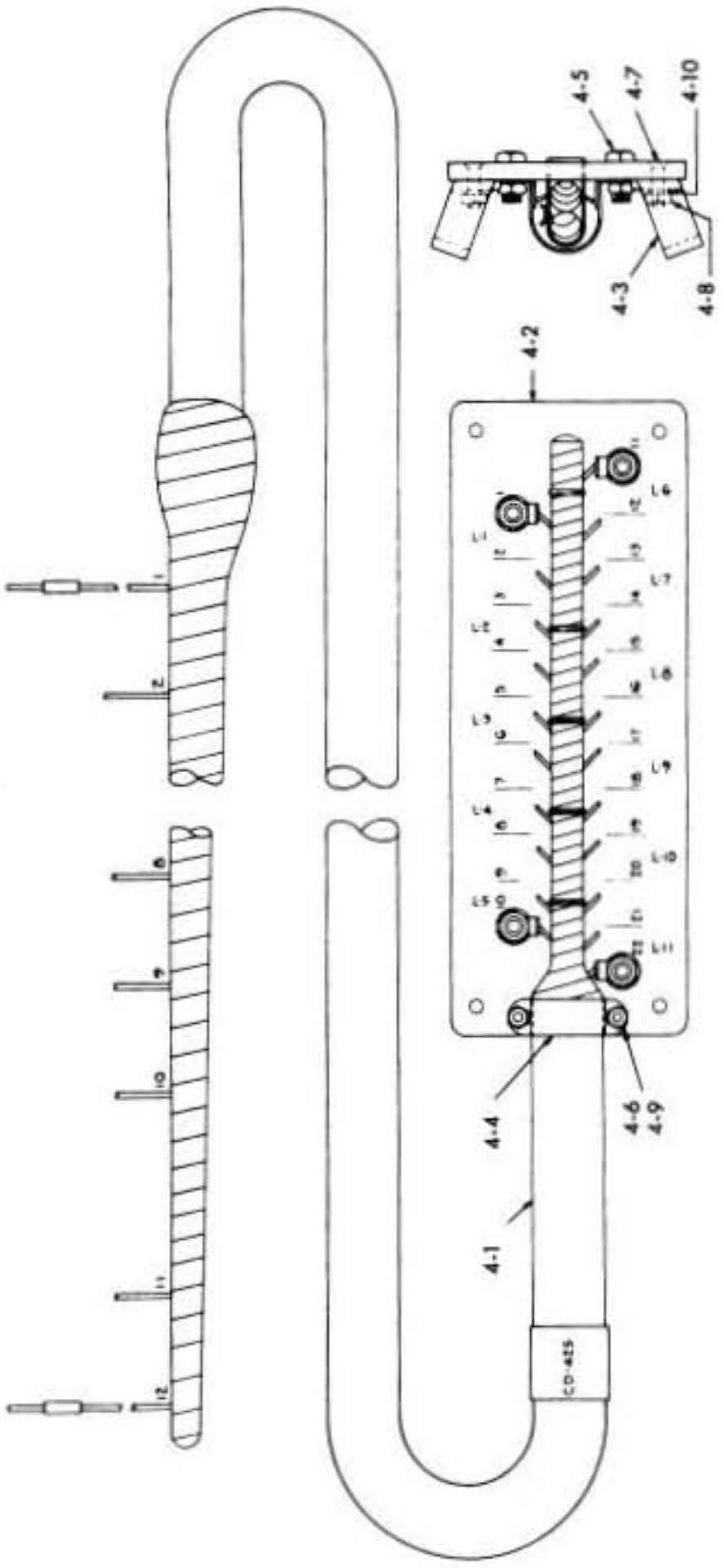



**FIGURE 18. Location of parts for Cord CD-425.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 3-100 | 1 | | Pin, escutcheon, brass #18 A.W.G. x ¼". | Stop on lever hinge pin, for lever switch assembly. | K.S. | Pc. 66161 Item 22 †SC-D-9005-B |
| 3-101 | 1 | | Case assembly, leather approx. 9¼" x 7½" x 3½". | For carrying telephone set. | M.S. | 60050 †SC-D-9577-D |

**d. Cord CD-425:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 4-1 | 1 | | Cable form assembly. | Connecting cable between Protector AR-8 and Switchboard BD-70. | | P-67299 |
| 4-2 | 1 | | Base, natural phenolic linen 3" x 8" x ¼". | Base for mounting jacks and terminating cable. | | P-67300 |
| 4-3 | 2 | | Bracket, steel, zinc plated ½" x ⅛" flat wire. | Guide for protector can cover. | | P-67301 |
| 4-4 | 1 | | Cord clamp. | For clamping cord to base. | | P-67302 |
| 4-5 | 22 | | Jack. | Termination for wires. | | P-67304 |
| 4-6 | 2 | | Screw, zinc plated, 8-32 x ½" F.H.I.M. | Used for fastening clamp to base. | | P-63898 |
| 4-7 | 4 | | Screw, zinc plated, 8-32 x ⅝" F.H.I.M. | Used for fastening brackets to base. | | P-63904 |
| 4-8 | 4 | | Nut, 8-32 Hex., iron, zinc plated. | Used for 8-32 screw. | | P-63844 |
| 4-9 | 2 | | Nut, 8-32 hex., iron, zinc plated, special with one side cut off. | Used with 8-32 screw. | | P-67303 |
| 4-10 | 2 | | Washer spring for #8 screw. | Used with 8-32 screw. | | P-55656 |

**e. Protector AR-8:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 5-1 | 2 | | Bracket, U-shaped, 8¼" long with one end 2 3/16" and other end 1 5/16" made of ½" x ⅛" steel, electrogalvanized. | Support for cover. | | Item 1 60049 †SC-D-6393-A |



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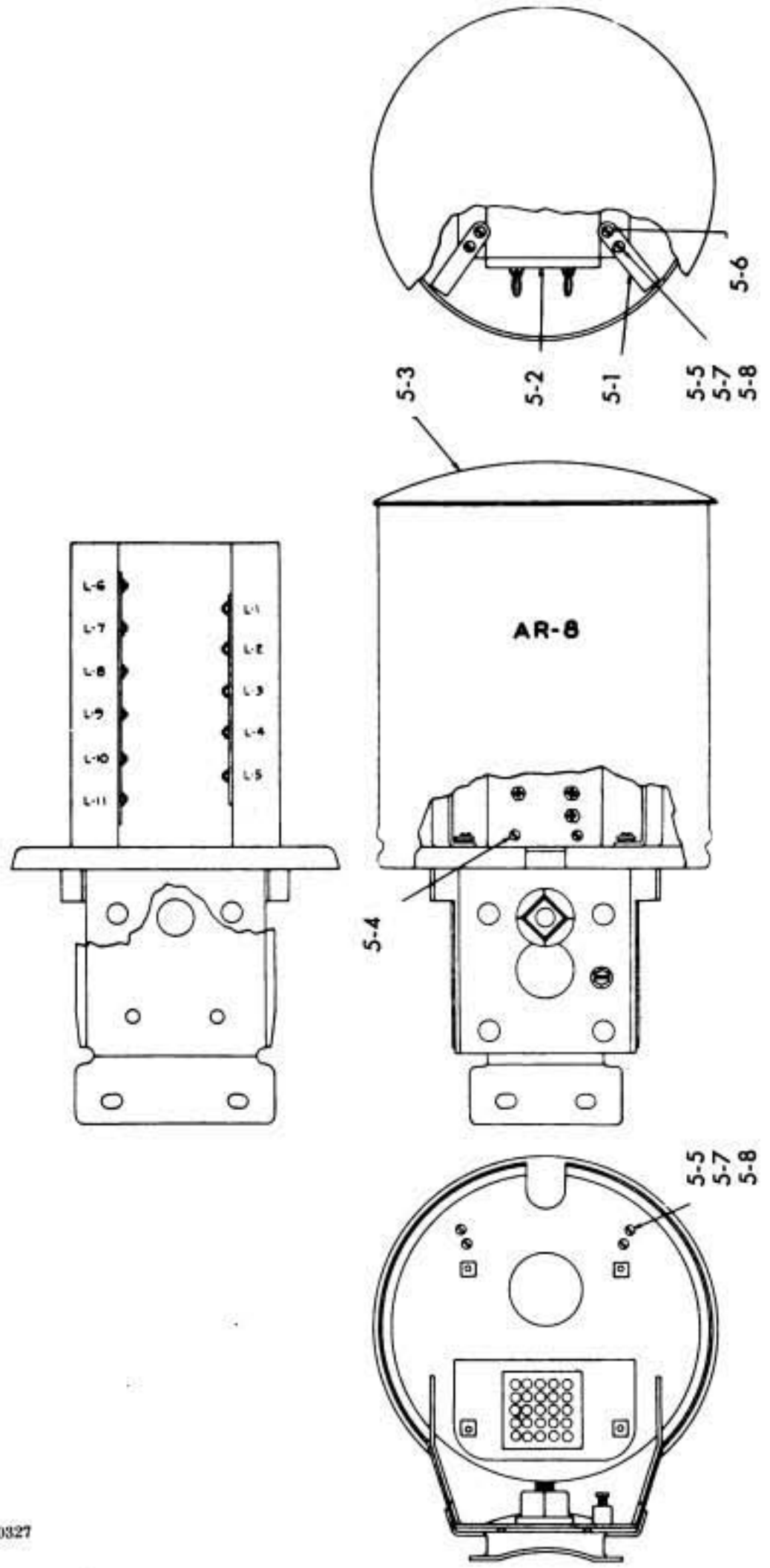



**FIGURE 19. Location of parts for Protector AR-8.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 5-2 | 1 | | Plate, natural phenolic, 8" x 3" x ¼" complete 22 plugs 274-P as made by General Radio Co., Cambridge, Mass. | Terminal block assembly. | | 60064 †SC-D-6394-A |
| 5-3 | 1 | | Protector, type S-6 and bracket 112-130 as made by Cook Electric Company, Chicago, Illinois, modified as shown on drawing SC-D-6393-A. | Protects switchboard from lightning discharges. | S-6 special | Item 3 60049 †SC-D-6393-A |
| 5-4 | 8 | | Screw, machine, 10-32 x ½" binding head, brass, dull nickel finish. | | | Item 4 60049 †SC-D-63939 |
| 5-5 | 6 | | Screw, machine, 8-32 x ⅜" R.H.B., dull nickel finish. | For fastening brackets for cover. | | Item 5 60049 †SC-D-6393-A |
| 5-6 | 2 | | Screw, machine, 8-32 x ¼" R.H.B., dull nickel finish. | In fastening brackets for cover. | | Item 6 60049 †SC-D-6393-A |
| 5-7 | 6 | | Nut, 8-32 hex., dull nickel finish. | Used with #8 screw. | | Item 7 60049 †SC-D-6393-A |
| 5-8 | 8 | | Lockwasher, for #8 screw, steel, nickel plate. | Used with #8 screw. | | Item 8 60049 †SC-D-6393-A |

**f. Outpost Unit BE-51:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 6-1 | 1 | | Case, with strap, leather. | Housing for equipment. | | P-67190 |
| 6-2 | 1 | | Base, black bakelite. | Plate on which equipment is mounted. | | P-67186 |
| 6-3 | 1 | | Sub-case assembly, brass, sides with leather riveted to brass bottom, top cut out for milliammeter. | Stiffener for leather case. | | P-67189 |

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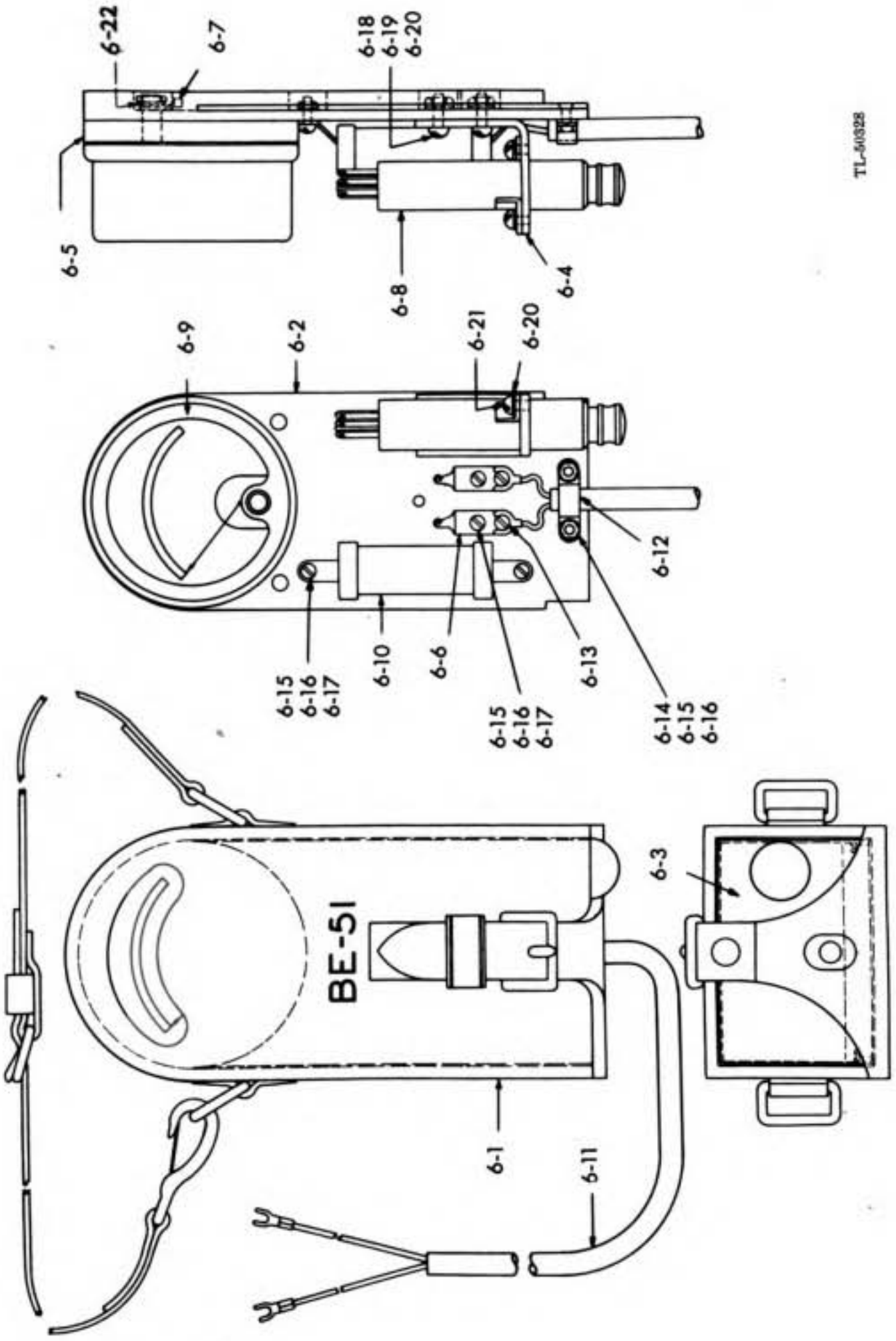



**FIGURE 20. Location of parts for Outpost Unit BE-51.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 6-4 | 1 | | Bracket, iron, fasteners to base. | Mounts W.E. Co. 92-Y key. | | P-67192 |
| 6-5 | 1 | | Spacer, block bakelite, 2¾" dia. 9/32" thick with 2 holes for milliammeter studs. | Blocks up milliammeter to proper height. | | P-67191 |
| 6-6 | 2 | | Terminal, brass 5/16" x #12 B & S with 1-6-32 tapped hole, 1 .128 clearance hole and end bent up for soldering. | To terminate cord. | | P-67195 |
| 6-7 | 2 | | Terminals, brass, solderless ½" diameter with clearance hole for ¼" screw. | To mount on milliammeter terminals. | | P-67196 |
| 6-8 | 1 | | Key, 92-Y, push-button restoring type, for ⅞" mounting, 2 sets of make springs. | Key for connecting milliammeter. | 92-Y W.E. Co. | |
| 6-9 | 1 | | Milliammeter, 0 to 5 milliamperes, 2% accuracy, surface mounted, 3¾" diameter, 2 9/16" diameter of body 1¼" thick, mounting studs 21/32" long. | For measuring current flow. | 301 Weston | |
| 6-10 | 1 | | Resistor RS-26, carbon filament resistance on porcelain core, 2¾" mounting centers, 48000 ohms. | Protection for milliammeter. | RS-26 W.E. Co. | |
| 6-11 | 1 | | Cord CC-327, 2 conductor brown rubber jacketed, 72" long, TM-163 terminals on both ends of conductors. | For connecting Outpost Unit BE-51 to Capacitor Unit BE-59. | CC-327 | |
| 6-12 | 1 | | Clamp, cord, ¼" x ¾" x #16 BW gauge steel with 2 .120" holes on ¾" centers zinc plated. | To clamp Cord CC-327 to base. | | P-67687 |
| 6-13 | 2 | | Screw, machine, 6-32 x ¼" binding head, brass, dull nickel finish. | Used with binding posts. | | P-67171 |
| 6-14 | 2 | | Screw, machine, 4-36 x ⅜" F.H., brass, dull nickel finish. | Used with clamp. | | P-63907 (60347) |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 6-15 | 2 | | Nut, 4-36 hex., brass, dull nickel finish. | Used with #4 screw. | | P-36488 (36661-P) |
| 6-16 | 6 | | Washers, spring, for #4 screw, dull nickel finish. | Used with #4 screw. | | P-55655 (54336-P) |
| 6-17 | 4 | | Screw, machine, 4-36 x 3/8" R.H.B., dull nickel finish. | For mounting resistor and terminal. | | P-52606 (36647-P) |
| 6-18 | 2 | | Screw, machine, 6-32 x 1/16" R.H.B., dull nickel finish. | For mounting key bracket. | | P-36398 (35542-P) |
| 6-19 | 2 | | Nut, 6-32 hex., brass, dull nickel finish. | Used with #6 screw. | | P-63873 (53815-P) |
| 6-20 | 2 | | Spring washer for #6 screw. | Used with #6 screw. | | P-54365 (54336-P) |
| 6-21 | 2 | | 6-32 x 3/16" R.H.B. machine screw, dull nickel finish. | Used to fasten key to mounting bracket. | | P-36378 (36083-P) |
| 6-22 | 2 | | Spring washer for #6 screw, dull nickel finish. | Used with #6 screw. | | P-54366 (54336-P) |

**g. Other components:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 7-1 | 6 | | Axle RL-27-B steel, approximately 26¼" long, removable knurled handle on one end, knurled handle on other end, also crank for turning. | Axle for reel of wire, operated manually. | RL-27-B | 60061 †SC-D-6700-C |
| 7-2 | 4 | 3B29 | Battery BB-29, portable 4 volt, 2 cell, rubber case, 80 amp. hours. | To furnish D. C. power for Switchboard BD-70. | BB-29 | 60062 †SC-D-9629-B |
| 7-3 | 36 | 3A30 | Battery BA-30, dry cell type 1¼" dia. 2¼" long. | To furnish D. C. power for Switchboard BD-70. | BA-30 | |

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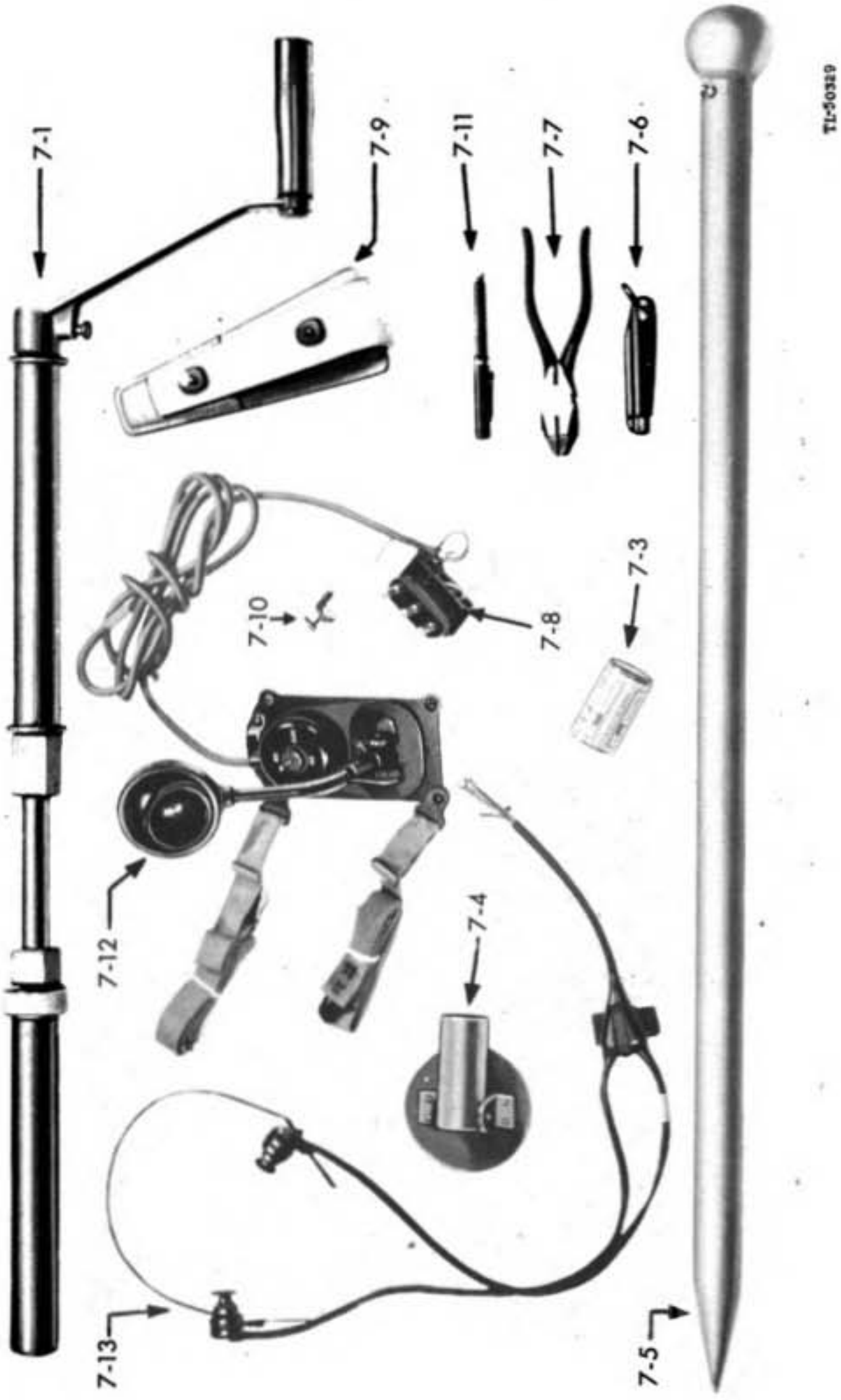



**FIGURE 21. Other components.**



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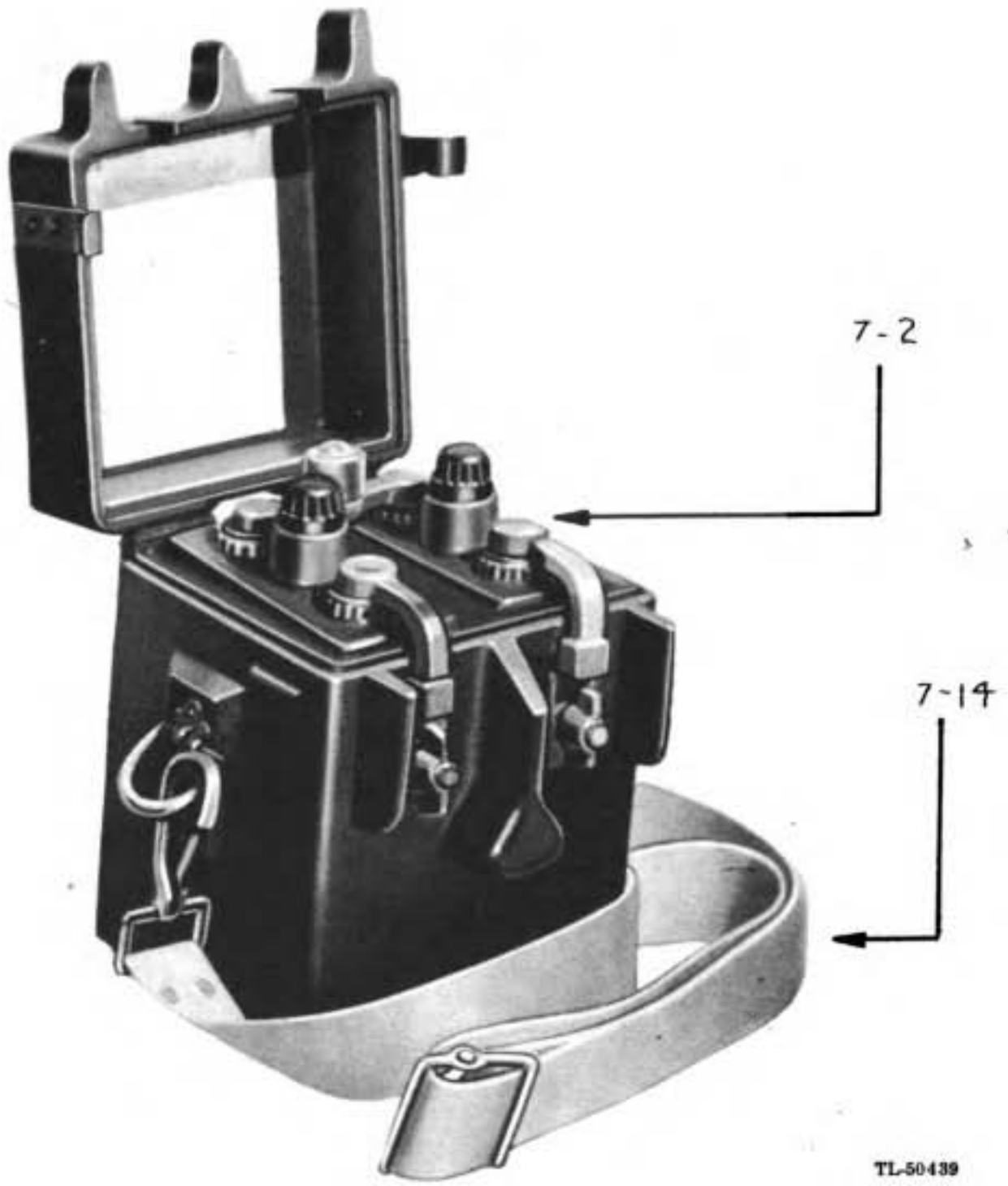



**FIGURE 22. Battery BB-29 with Strap ST-21.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 7-4 | 4 | 46849 | Foot FT-149, curved steel base 3½" dia. with 1¼" tube 3" long riveted to same. | Fitting for end of leg assembly of Switchboard BD-70. | FT-149 | 60030 †SC-D-1914-B |
| 7-5 | 1 | 3Z3329 | Ground Rod GP-29, 36" steel pipe with pointed end, driving head and means for attaching ground lead. | For exchange ground. | GP-29 | 60058 †SC-D-4311-E |
| 7-6 | 1 | 6Q60229 | Knife TL-29, electricians 1 blade, 1 screw-driver blade with safety lock. | For maintenance work. | TL-29 | 60057 †RL-A-532-D |
| 7-7 | 1 | 6R4513A | Pliers TL-13-A, 6" side cutting with notches in blade for wire skinning. | For maintenance work. | TL-13-A | 60053 †SC-A-534-D |
| 7-8 | 2 | 4B2358 | Plug PL-58, moulded housing with three metal plug inserts on 21/32" and 23/32" centers. | For terminating operator cord. | PL-58 | 40227 †SC-D-1053-C |
| 7-9 | 1 | 6R6534 | Pouch CS-34, leather case for knife and pliers. | Container for tools. | CS-34 | 60052 †SC-D-758-D |
| 7-10 | 6 | | Spring assembly, bracket with stud having watch type spring. | For adjusting Western Electric Co's 206 type relay. | | |
| 7-11 | 1 | | Tool 265-C, case containing pieces of steel music wire having a ball tip formed on each end, also a steel sand blasted blade. | For cleaning contact points. | 265-C Western Electric Company | |
| 7-12 | 1 | | Chest set TD-1, consists of cord CC-333, Plug PL-58, Chest Unit T-26. | Transmitter. | TD-1 | |
| 7-13 | 1 | | Head set HS-30 consists of 2-R-30 receivers, 1 Head band HB-30, 2-M-300 insert earpiece, 1 cord CD-620. | Receiver. | HS-30 | |
| 7-14 | 1 | 3B3821 | Strap ST-21, canvas straps with snaps on each end. | For carrying battery BB-29. | ST-21 | 60063 †RL-C-3854-F |

Note: # Available in Depot stock. * Furnished with equipment as running spare part. † Signal Corps drawing number.

Note: Drawing numbers given are Kellogg Switchboard and Supply Company drawings unless preceded by letters "SC" which indicate Signal Corps drawings.



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## 20. SPARE PARTS:

10 3-ampere fuses #388-643
10 6-B Switchboard lamps
6 4-A Lamp caps—white
3 40 Mazda lamps—6 to 8 volts miniature screw base
2 82 Mazda lamps—6 to 8 volts double contact bayonet base
1 67 Trouble light with #82 Mazda lamp and double contact plug

## 21. TOOLS:

1 553-A Lamp extractor
1 319-B Lamp-cap extractor
3 340 Relay adjusting tools

## 22. LIST OF MANUFACTURERS:

| Code | Name | Address |
|---|---|---|
| KS | Kellogg Switchboard and Supply Co. | Chicago, Ill. |
| GE | Graybar Electric Co. | Chicago, Ill. |
| WE | Weston Electrical Instrument Corp. | Newark, N. J. |
| Eby | H. H. Eby Manufacturing Co. | Philadelphia, Pa. |
| YM | Yaxley Manufacturing Co. | Indianapolis, Ind. |
| MS | Metal Specialties Mfg. Co. | Chicago, Ill. |
| ZM | F. R. Zierich Mfg. Works | New York, N. Y. |
| SM | H. B. Sherman Mfg. Co. | Battle Creek, Mich. |
| AH | Arrow Hart and Hegeman Mfg. Co. | Hartford, Conn. |
| KI | Kilbourn-Sauer Co. | Fairfield, Conn. |
| HH | Harvey Hubbell, Inc. | Bridgeport, Conn. |
| CA | Colt Patent Fire Arms Mfg. Co. | Hartford, Conn. |
| JE | Jefferson Electric Co. | Chicago, Ill. |

(27615-PHILA.-43) (1,300) (JAN. 1944); (40602) (10,000) (JAN. 1944); (41459) (5,000) (JAN. 1944).



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MINAL SIDE OF APPARATUS SHOWN.
BE 1/64" RUBBER COMPOUND NEW CODE
BRAID INSTRUMENT WIRE PER SPEC. 71-644
BE #18-A.W.G. BELDEN "RAVINE" WIRE.

SOCKETS.

MIDGET FUSE & MTGS.

RED

RED

HEATER 3-AMP.

HEATER

BLACK

BLACK

BROWN

BROWN

80~

W.E.CO. 5-A-SPECIAL BUZZER.

C T R

BROWN

GENER

GN-3

CRANK

0-15-M.A.

BLACK

BLACK

GREEN

RED/WHITE

BLK/WHITE

ORANGE

TS-9

JK-37

PL-58

R

C

T

CC-333

ORANGE/W

ORANGE

0-15-V VOLTMETER.

TRIPLE TWIST.

TRIPLE TWIST.

BLUE

GREEN

BLACK

ORANGE

JK-37

PL-58

R

C

T

ORANGE

1002 KEY

W.E.CO. 139-A CONDENSERS.

(SW-118)

BLK.

RED

WH.

CHEST SET TD-1 (CC-333) (ST-24) (ST-25)

HEAD SET HS-30-( ) (HB-30) (M-300) (CD-620-( ))

(T-26)

RED

WH.

M-300

R-30-( )

VOLTS

BELL

MIDGET FUSES & MTGS.

T.

3-AMP.

HT.

BLACK

RED

+

−

6-VOLT BATTERY.

W.E.CO. 7-DW-BELL

15~

GREEN/WHITE

RED/WHITE

GREEN

RED

BLACK

INSPECTION LAMP

W.E.C

141-

COND

0.5

FLUSH MOUNTING DOUBLE CONTACT SOCKET.

MAZDA 82 6-C.P. 6-8-V DOUBLE CONTACT.

105~

D K A

ORANGE

BUZZER 1028 KEY.

LAMP ASSEMBLIES.

MAZDA-40 6-8-V.

W.E.CO. 7-BW-BUZZER.

OR.WHITE

ORANGE.

TERMINAL NUMBERS FACING TERMINAL

TL-50440

SC-D-1888-F

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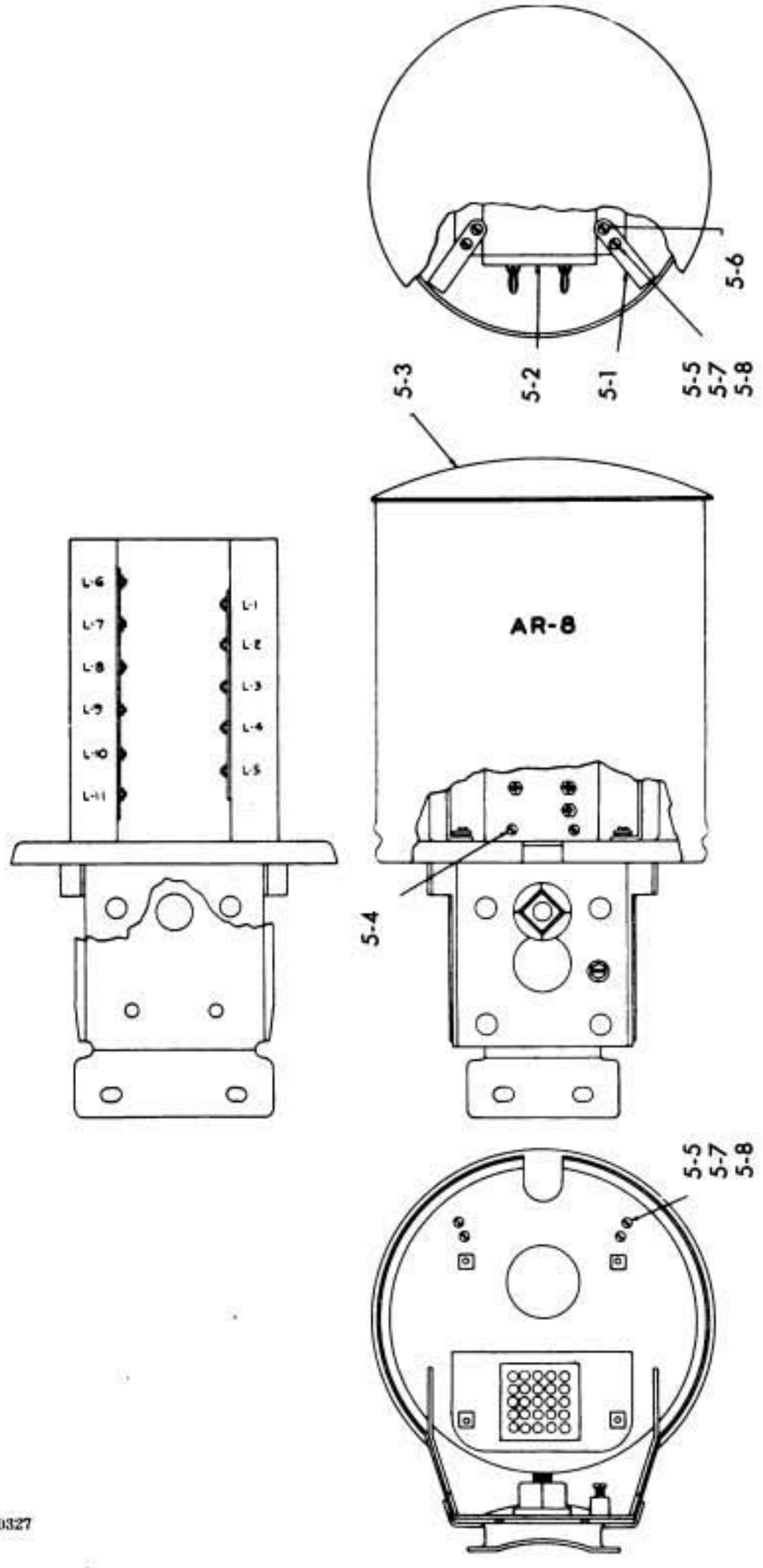



**FIGURE 19. Location of parts for Protector AR-8.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 5-2 | 1 | | Plate, natural phenolic, 8" x 3" x ¼" complete 22 plugs 274-P as made by General Radio Co., Cambridge, Mass. | Terminal block assembly. | | 60064 †SC-D-6394-A |
| 5-3 | 1 | | Protector, type S-6 and bracket 112-130 as made by Cook Electric Company, Chicago, Illinois, modified as shown on drawing SC-D-6393-A. | Protects switchboard from lightning discharges. | S-6 special | Item 3 60049 †SC-D-6393-A |
| 5-4 | 8 | | Screw, machine, 10-32 x ½" binding head, brass, dull nickel finish. | | | Item 4 60049 †SC-D-63939 |
| 5-5 | 6 | | Screw, machine, 8-32 x ⅜" R.H.B., dull nickel finish. | For fastening brackets for cover. | | Item 5 60049 †SC-D-6393-A |
| 5-6 | 2 | | Screw, machine, 8-32 x ¼" R.H.B., dull nickel finish. | In fastening brackets for cover. | | Item 6 60049 †SC-D-6393-A |
| 5-7 | 6 | | Nut, 8-32 hex., dull nickel finish. | Used with #8 screw. | | Item 7 60049 †SC-D-6393-A |
| 5-8 | 8 | | Lockwasher, for #8 screw, steel, nickel plate. | Used with #8 screw. | | Item 8 60049 †SC-D-6393-A |

**f. Outpost Unit BE-51:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 6-1 | 1 | | Case, with strap, leather. | Housing for equipment. | | P-67190 |
| 6-2 | 1 | | Base, black bakelite. | Plate on which equipment is mounted. | | P-67186 |
| 6-3 | 1 | | Sub-case assembly, brass, sides with leather riveted to brass bottom, top cut out for milliammeter. | Stiffener for leather case. | | P-67189 |



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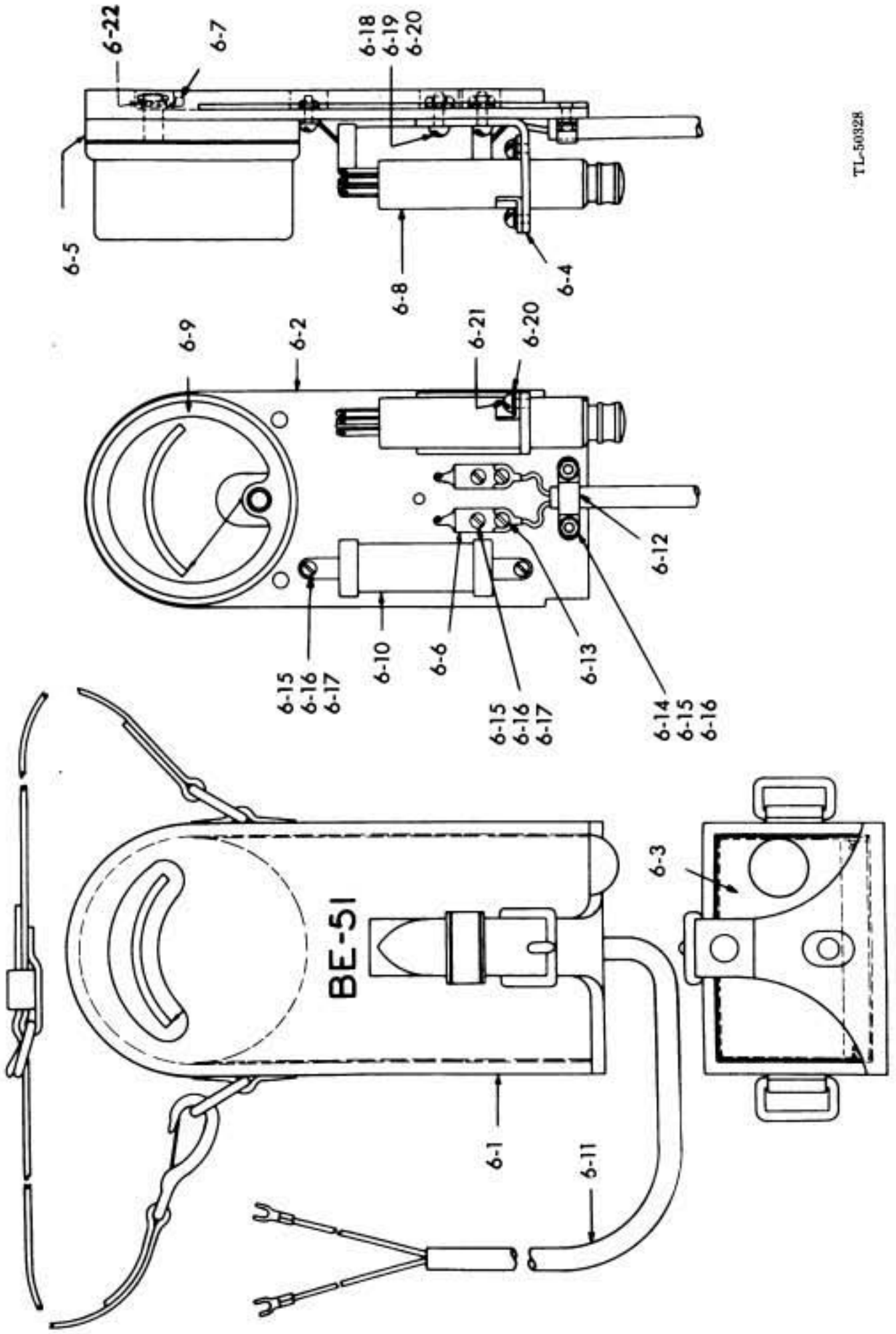



**FIGURE 20. Location of parts for Outpost Unit BE-51.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 6-4 | 1 | | Bracket, iron, fasteners to base. | Mounts W.E. Co. 92-Y key. | | P-67192 |
| 6-5 | 1 | | Spacer, block bakelite, 2¾" dia. 9/32" thick with 2 holes for milliammeter studs. | Blocks up milliammeter to proper height. | | P-67191 |
| 6-6 | 2 | | Terminal, brass 5/16" x #12 B & S with 1-6-32 tapped hole, 1 .128 clearance hole and end bent up for soldering. | To terminate cord. | | P-67195 |
| 6-7 | 2 | | Terminals, brass, solderless ½" diameter with clearance hole for ¼" screw. | To mount on milliammeter terminals. | | P-67196 |
| 6-8 | 1 | | Key, 92-Y, push-button restoring type, for ⅞" mounting, 2 sets of make springs. | Key for connecting milliammeter. | 92-Y W.E. Co. | |
| 6-9 | 1 | | Milliammeter, 0 to 5 milliamperes, 2% accuracy, surface mounted, 3¾" diameter, 2 9/16" diameter of body 1¼" thick, mounting studs 21/32" long. | For measuring current flow. | 301 Weston | |
| 6-10 | 1 | | Resistor RS-26, carbon filament resistance on porcelain core, 2¾" mounting centers, 48000 ohms. | Protection for milliammeter. | RS-26 W.E. Co. | |
| 6-11 | 1 | | Cord CC-327, 2 conductor brown rubber jacketed, 72" long, TM-163 terminals on both ends of conductors. | For connecting Outpost Unit BE-51 to Capacitor Unit BE-59. | CC-327 | |
| 6-12 | 1 | | Clamp, cord, ¼" x ¾" x #16 BW gauge steel with 2 .120" holes on ¾" centers zinc plated. | To clamp Cord CC-327 to base. | | P-67687 |
| 6-13 | 2 | | Screw, machine, 6-32 x ¼" binding head, brass, dull nickel finish. | Used with binding posts. | | P-67171 |
| 6-14 | 2 | | Screw, machine, 4-36 x ⅜" F.H., brass, dull nickel finish. | Used with clamp. | | P-63907 (60347) |

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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 6-15 | 2 | | Nut, 4-36 hex., brass, dull nickel finish. | Used with #4 screw. | | P-36488 (36661-P) |
| 6-16 | 6 | | Washers, spring, for #4 screw, dull nickel finish. | Used with #4 screw. | | P-55655 (54336-P) |
| 6-17 | 4 | | Screw, machine, 4-36 x 3/8" R.H.B., dull nickel finish. | For mounting resistor and terminal. | | P-52606 (36647-P) |
| 6-18 | 2 | | Screw, machine, 6-32 x 1/16" R.H.B., dull nickel finish. | For mounting key bracket. | | P-36398 (35542-P) |
| 6-19 | 2 | | Nut, 6-32 hex., brass, dull nickel finish. | Used with #6 screw. | | P-63873 (53815-P) |
| 6-20 | 2 | | Spring washer for #6 screw. | Used with #6 screw. | | P-54365 (54336-P) |
| 6-21 | 2 | | 6-32 x 1/16" R.H.B. machine screw, dull nickel finish. | Used to fasten key to mounting bracket. | | P-36378 (36083-P) |
| 6-22 | 2 | | Spring washer for #6 screw, dull nickel finish. | Used with #6 screw. | | P-54366 (54336-P) |

**g. Other components:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 7-1 | 6 | | Axle RL-27-B steel, approximately 26 1/4" long, removable knurled handle on one end, knurled handle on other end, also crank for turning. | Axle for reel of wire, operated manually. | RL-27-B | 60061 †SC-D-6700-C |
| 7-2 | 4 | 3B29 | Battery BB-29, portable 4 volt, 2 cell, rubber case, 80 amp. hours. | To furnish D. C. power for Switchboard BD-70. | BB-29 | 60062 †SC-D-9629-B |
| 7-3 | 36 | 3A30 | Battery BA-30, dry cell type 1 1/4" dia. 2 1/4" long. | To furnish D. C. power for Switchboard BD-70. | BA-30 | |

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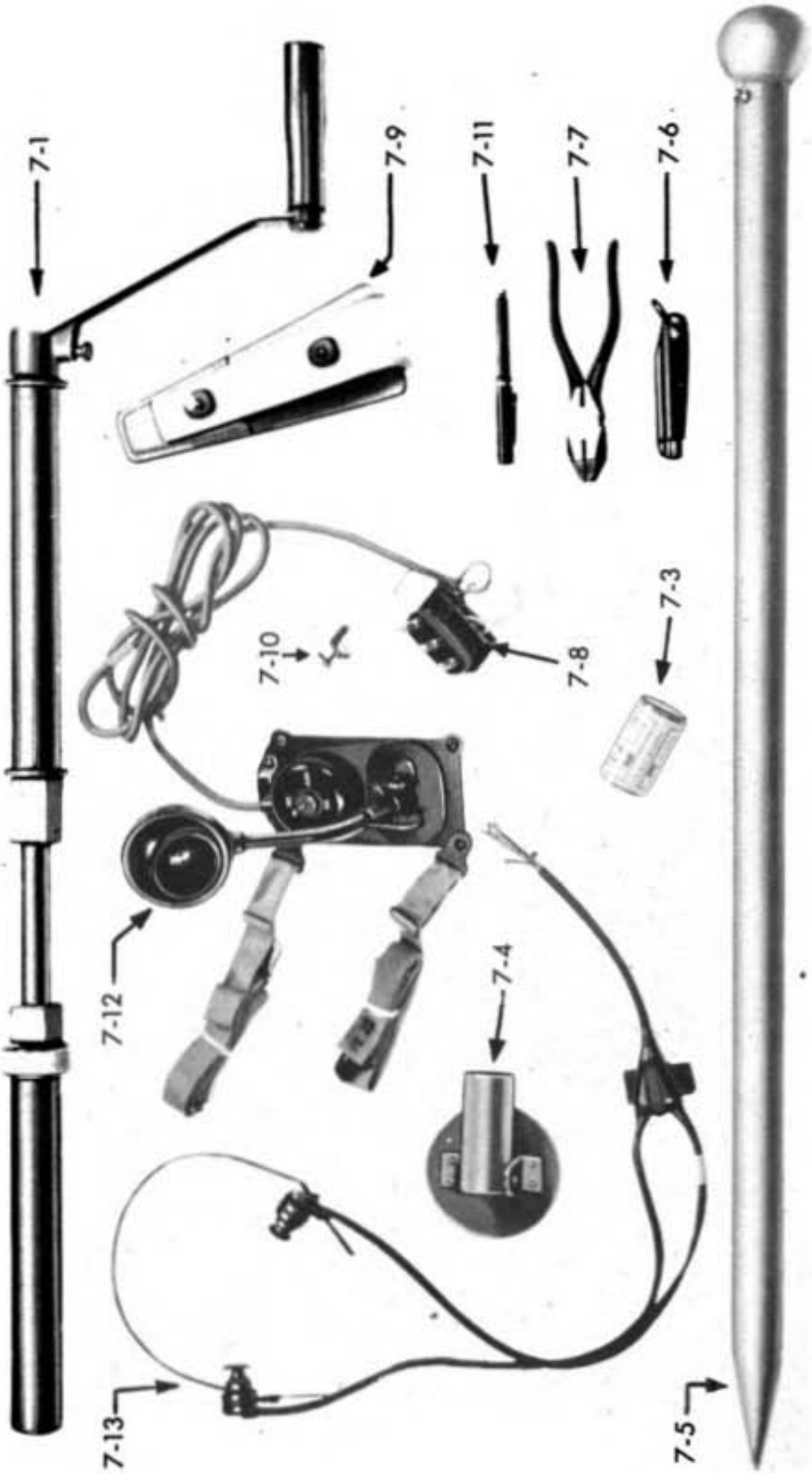



**FIGURE 21. Other components.**



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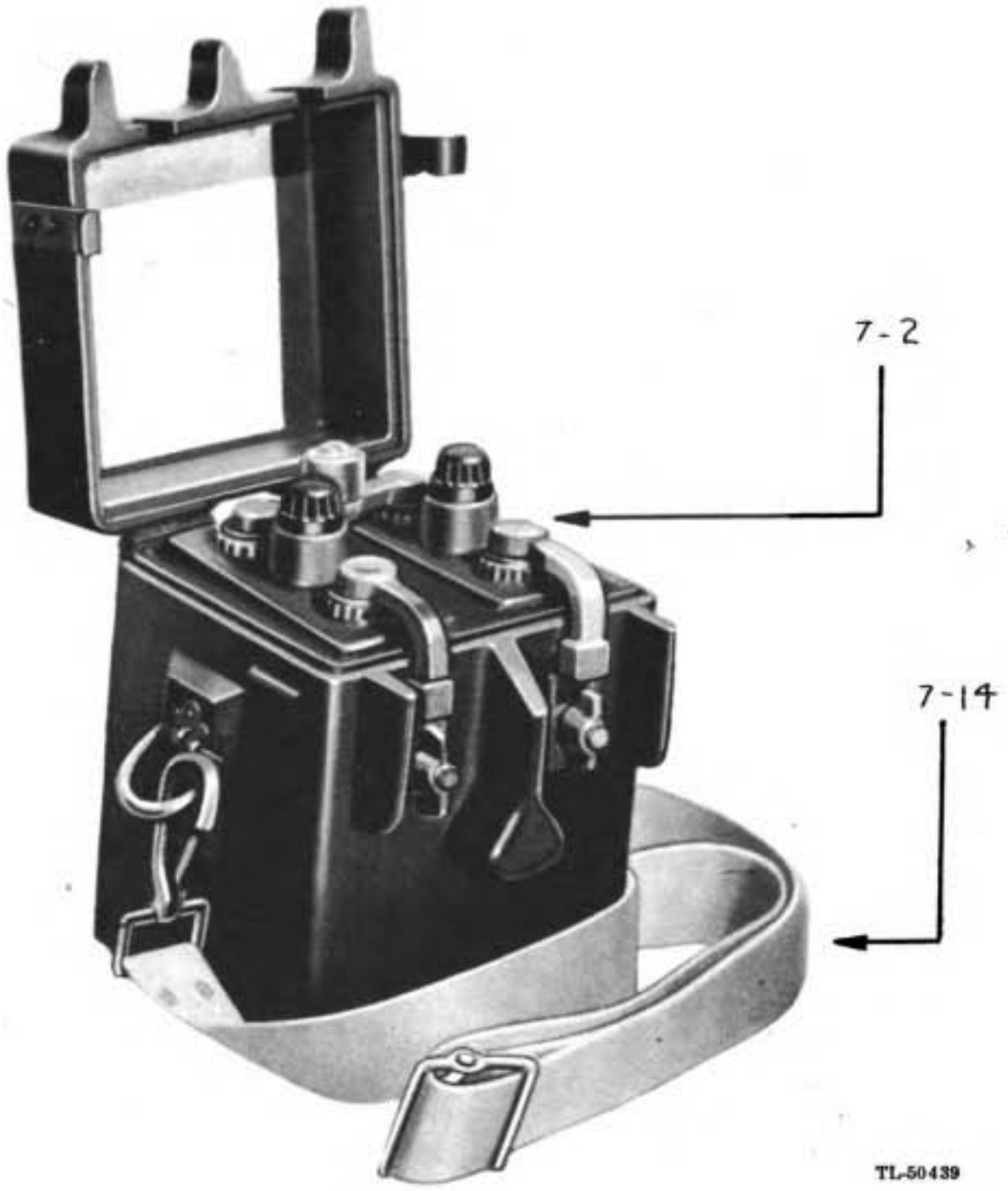



**FIGURE 22. Battery BB-29 with Strap ST-21.**



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| Ref. No. | Quan. in equip. | Signal Corps stock No. | Name and description of part | Function | Mfg. code & type No. | Contractors drawing No. |
|---|---|---|---|---|---|---|
| 7-4 | 4 | 46849 | Foot FT-149, curved steel base 3½" dia. with 1¼" tube 3" long riveted to same. | Fitting for end of leg assembly of Switchboard BD-70. | FT-149 | 60030 †SC-D-1914-B |
| 7-5 | 1 | 3Z3329 | Ground Rod GP-29, 36" steel pipe with pointed end, driving head and means for attaching ground lead. | For exchange ground. | GP-29 | 60058 †SC-D-4311-E |
| 7-6 | 1 | 6Q60229 | Knife TL-29, electricians 1 blade, 1 screwdriver blade with safety lock. | For maintenance work. | TL-29 | 60057 †RL-A-532-D |
| 7-7 | 1 | 6R4513A | Pliers TL-13-A, 6" side cutting with notches in blade for wire skinning. | For maintenance work. | TL-13-A | 60053 †SC-A-534-D |
| 7-8 | 2 | 4B2358 | Plug PL-58, moulded housing with three metal plug inserts on 21/32" and 23/32" centers. | For terminating operator cord. | PL-58 | 40227 †SC-D-1053-C |
| 7-9 | 1 | 6R6534 | Pouch CS-34, leather case for knife and pliers. | Container for tools. | CS-34 | 60052 †SC-D-758-D |
| 7-10 | 6 | | Spring assembly, bracket with stud having watch type spring. | For adjusting Western Electric Co's 206 type relay. | | |
| 7-11 | 1 | | Tool 265-C, case containing pieces of steel music wire having a ball tip formed on each end also a steel sand blasted blade. | For cleaning contact points. | 265-C Western Electric Company | |
| 7-12 | 1 | | Chest set TD-1, consists of cord CC-333, Plug PL-58, Chest Unit T-26. | Transmitter. | TD-1 | |
| 7-13 | 1 | | Head set HS-30 consists of 2-R-30 receivers, 1 Head band HB-30, 2-M-300 insert earpiece, 1 cord CD-620. | Receiver. | HS-30 | |
| 7-14 | 1 | 3B3821 | Strap ST-21, canvas straps with snaps on each end. | For carrying battery BB-29. | ST-21 | 60063 †RL-C-3854-F |

Note: # Available in Depot stock. * Furnished with equipment as running spare part. † Signal Corps drawing number.

Note: Drawing numbers given are Kellogg Switchboard and Supply Company drawings unless preceded by letters "SC" which indicate Signal Corps drawings.



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## 20. SPARE PARTS:

10 3-ampere fuses #388-643

10 6-B Switchboard lamps

6 4-A Lamp caps – white

3 40 Mazda lamps – 6 to 8 volts miniature screw base

2 82 Mazda lamps – 6 to 8 volts double contact bayonet base

1 67 Trouble light with #82 Mazda lamp and double contact plug

## 21. TOOLS:

1 553-A Lamp extractor

1 319-B Lamp-cap extractor

3 340 Relay adjusting tools

## 22. LIST OF MANUFACTURERS:

| Code | Name | Address |
|---|---|---|
| KS | Kellogg Switchboard and Supply Co. | Chicago, Ill. |
| GE | Graybar Electric Co. | Chicago, Ill. |
| WE | Weston Electrical Instrument Corp. | Newark, N. J. |
| Eby | H. H. Eby Manufacturing Co. | Philadelphia, Pa. |
| YM | Yaxley Manufacturing Co. | Indianapolis, Ind. |
| MS | Metal Specialties Mfg. Co. | Chicago, Ill. |
| ZM | F. R. Zierich Mfg. Works | New York, N. Y. |
| SM | H. B. Sherman Mfg. Co. | Battle Creek, Mich. |
| AH | Arrow Hart and Hegeman Mfg. Co. | Hartford, Conn. |
| KI | Kilbourn-Sauer Co. | Fairfield, Conn. |
| HH | Harvey Hubbell, Inc. | Bridgeport, Conn. |
| CA | Colt Patent Fire Arms Mfg. Co. | Hartford, Conn. |
| JE | Jefferson Electric Co. | Chicago, Ill. |

(27615-PHILA.-43) (1,300) (JAN. 1944); (40602) (10,000) (JAN. 1944); (41459) (5,000) (JAN. 1944).



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MINAL SIDE OF APPARATUS SHOWN.
BE 1/64" RUBBER COMPOUND NEW CODE
BRAID INSTRUMENT WIRE PER SPEC. 71-644
BE #18-A.W.G. BELDEN "RAVINE" WIRE.

SOCKETS.

MIDGET FUSE & MTGS.

RED

RED

HEATER 3-AMP.

HEATER

BLACK

BLACK

BROWN

BROWN

80~

W.E.CO. 5-A-SPECIAL BUZZER.

BROWN

GENERA

GN-31

CRANK

C T R

0-15-M.A.

BLACK

GREEN

RED/WHITE

BLK/WHITE

ORANGE

ORANGE/WHITE

ORANGE

JK-37

PL-58

T5-9

CC-333

0-15-V VOLTMETER.

TRIPLE TWIST.

TRIPLE TWIST.

BLUE

GREEN

BLACK

ORANGE

JK-37

PL-58

ORANGE

1002 KEY

W.E.CO. 139-A CONDENSERS.

CHEST SET TD-1 (CC-333) (ST-24) (ST-25)

(SW-118)

BLK.

RED

WH.

(T-26)

HEAD SET HS-30-( ) (HS-30) (H-300) (CD-620-( ))

H-300

R-30-( )

VOLTS

BELL

MIDGET FUSES & MTGS.

T.

3-AMP.

HT.

BLACK

RED

+

−

6-VOLT BATTERY.

GREEN/WHITE

W.E.CO. 7-DW-BELL

15

RED/WHITE

GREEN

RED

BLACK

INSPECTION LAMP

W.E.C

141-

COND

0.5

FLUSH MOUNTING DOUBLE CONTACT SOCKET.

MAZDA 82 6-C.P. 6-8-V DOUBLE CONTACT.

105

ORANGE

BUZZER 1028 KEY.

LAMP ASSEMBLIES.

MAZDA-40 6-8-V.

W.E.CO. 7-8W-BUZZER.

OR.WHITE

ORANGE.

TERMINAL NUMBERS FACING TERMINAL

TL-60440

SC-D-1888-F

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