Nelson

TENTATIVE

TM 11-2016

WAR DEPARTMENT TECHNICAL MANUAL

SWITCHBOARD SB-5/PT

WAR DEPARTMENT *25 APRIL 1944*

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WASHINGTON 25, D. C., 25 APRIL 1944.

Tentative TM 11-2016, War Department Technical Manual, Switchboard SB-5/PT, is published for the information and guidance of all concerned.

[A.G. 300.7 (4 Apr 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

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

DISTRIBUTION:

Modified 9a.
(For explanation of symbols see FM 21-6.)

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LIST OF ILLUSTRATIONS

DESTRUCTION NOTICE

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

WHEN—When ordered by your commander.

HOW — 1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—Smash—Parts mounted in back of panel, after removing panel from box. Be sure to smash drops and jacks.
2. Cut—Wires and cords; deface designation strip.
3. Burn—Cords, panel, box and wiring diagram in cover, and technical manual.
4. Bury or scatter—Panel, parts, box cover.

DESTROY EVERYTHING

SECTION I

DESCRIPTION

1. GENERAL (fig. 1). Switchboard SB-5/PT is a 6-line, portable, monocord, field switchboard for use with local battery telephone equipment. It weighs 12 pounds.

Figure 1. Switchboard SB-5/PT in carrying position.

a. The switchboard is enclosed in an olive drab, weatherproof, wooden box which is provided with a carrying strap and hardware

for various purposes described below. Bag BG-169 may be used to more completely waterproof models of Switchboard SB-5/PT manufactured with a wooden case. Bag BG-169 is not supplied with Switchboard SB-5/PT but may be obtained through proper supply channels. The box has a cover that can be removed completely. The cover is held to the box by four catches. The front panel on which are mounted all necessary terminals and other parts that have to be operated (fig. 2) is exposed when the cover is removed.

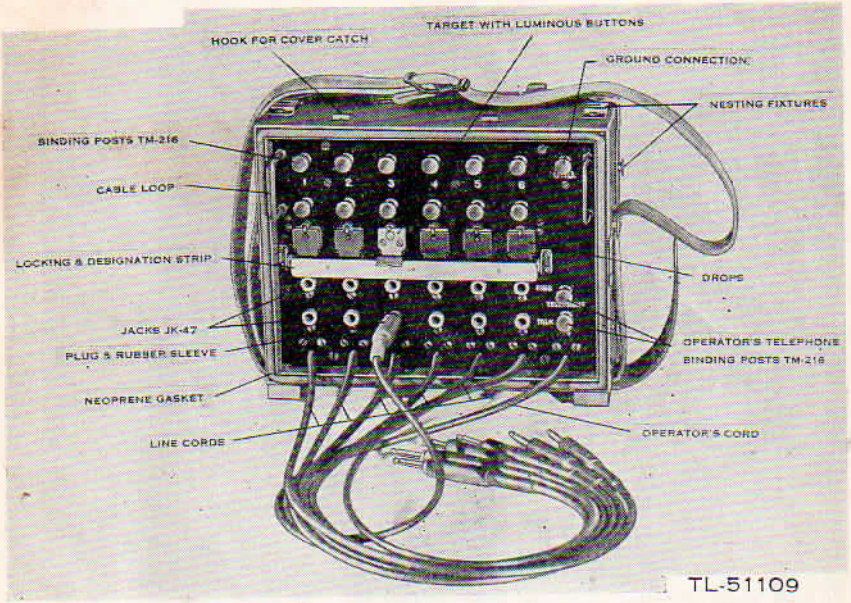


Figure 2. Switchboard SB-5/PT, front view.

b. No additional parts are supplied with each Switchboard SB-5/PT. However, a Telephone EE-8-(*) is required for the operation of the board. This telephone can be equipped with an operator's Headset HS-30 and Chest Set TD-1, or Head and Chest Set HS-19, if these are available. Telephone EE-8-(*) will be used throughout this manual to denote Telephones EE-8, EE-8-A, and EE-8-B.

c. As many as four Switchboards SB-5/PT may be nested together to form an exchange for up to 24 lines. It is possible to connect any line on one switchboard to any line on another switchboard. Only one operator's Telephone EE-8-(*) is necessary for such an exchange.

d. The lines of Switchboard SB-5/PT are equipped for metallic circuits only, and have no internal provisions for simplexing for telegraph operation.

2. PARTS OF SWITCHBOARD SB-5/PT.

a. **Box (fig. 3).** The box is a plywood case containing the associated necessary hardware for securing the cover, the panel, and the carrying strap, and for fastening the switchboards together. The box is provided with valances and a molded rubber gasket. All screw holes are caulked to make the box as watertight as possible.

b. **Lid.** The box lid contains four catches to secure it either in front for protection during transportation and when the switchboard is not in operation, or in back during operation. The inside of the cover contains the combined wiring and schematic diagram.

c. **Carrying Strap.** The carrying strap is made of cotton webbing, 1½ inches wide, and has an adjustable buckle.

d. **Panel.** The panel is mounted to the box by four captive screws (figs. 2 and 8). On the panel are mounted the following components:

(1) Twelve line terminal Binding Posts TM-216 at the top of the panel.

(2) The lightning arrester bar in back of the panel with the associated ground terminal.

(3) The target-type line drops, including a luminescent button for each drop. After a drop shutter falls, it exposes the silver-plated target with the luminescent button which is visible in complete darkness.

(4) The line designation strip, which also serves to lock the drops during transportation.

(5) The 12 Jacks JK-47 arranged in two rows of six each, marked RING and TALK.

(6) The six line cord and plug assemblies with black, rubber plug sleeves.

(7) The operator's cord and plug assembly with a red, rubber plug sleeve.

(8) The operator's TELEPHONE terminals.

SECTION II

INSTALLATION AND OPERATION

3. PREPARING SWITCHBOARD SB-5/PT FOR INSTALLATION (figs. 3 and 4). Install the switchboard in a manner which will

prevent the plugs from coming in contact with the ground or other conducting surfaces. Wherever possible, the installation should permit the cords to hang freely. This may be accomplished by mounting the switchboard on empty ammunition boxes or similar improvised stands. Unnecessary straps may be removed before nesting switchboards. Use loose straps to anchor the whole assembly to its support. Remove the cover by releasing the four catches, and snap the cover to the back of the box with the same four catches. For best operation, the panel of the board must be vertical or tilted forward slightly.

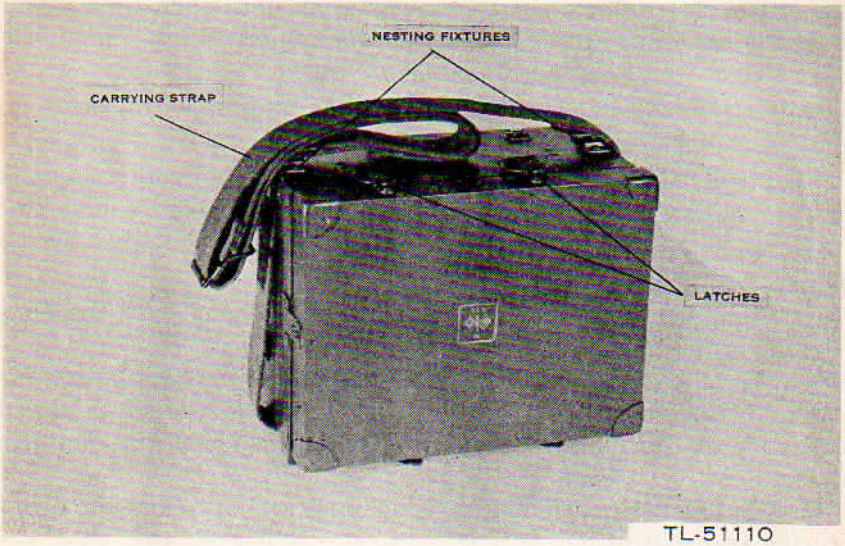


Figure 3. Switchboard SB-5/PT, Prepared for transportation.

4. WIRING EQUIPMENT.

a. Bring the outside lines into the switchboards from either side so that they will pass underneath the loops. Connect the two wires from each line to the two terminal Binding Posts TM-216 above and below the number assigned to that line (fig. 4). Wire ends should be stripped, since Binding Posts TM-216 are not of the insulation-piercing type.

b. Turn down the designation strip (drop-locking strip) to expose the writing surface, and mark the designation of the line or telephone associated with that drop unit.

c. Connect TELEPHONE terminals to a Telephone EE-8-(*). If available, connect an operator's Headset HS-30 and Chest Set

TD-1, or Head and Chest Set HS-19 to the telephone. Make sure that batteries and operator's circuit of the telephone are in working order.

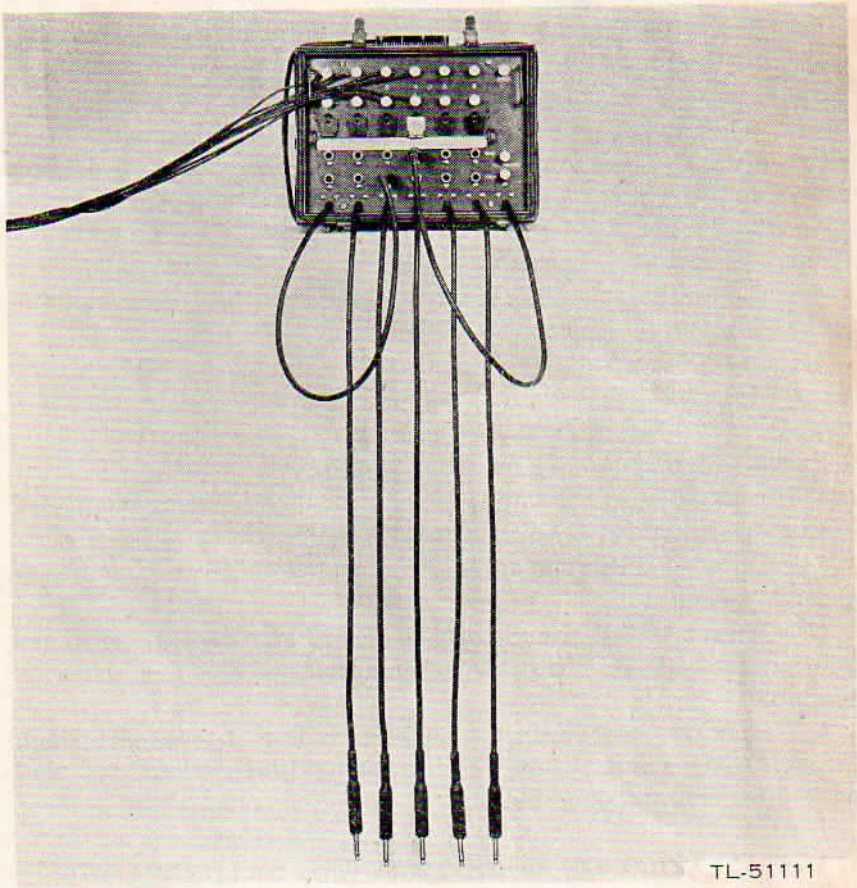


Figure 4. Switchboard SB-5/PT, Prepared for operation.

d. Connect GND terminal to a good earth ground, using any suitable ground rod. No rod is furnished with the switchboard. In making the ground connection, it is essential that the resistance of the circuit to earth be as low as possible. Wherever possible, the ground lead should be connected to a water pipe or other buried metallic earth contact of large area and conductivity. If this cannot be done, a suitable ground rod should be driven deeply into moist ground and a short ground wire of low resistance run from the ground rod to the GND terminal on the switchboard.

(1) The procedure for grounding the switchboard follows:

(*a*) Select a site near the switchboard (preferably in moist ground).

(*b*) Dig a hole at least 6 inches deep.

(*c*) Drive the ground rod, free from paint or grease, into the hole until the top of the rod is about 3 inches above the bottom of the hole.

(*d*) When driving the ground rod, be sure to make good contact between the rod and the soil. Use a light hammer blow in driving the rod to prevent the hole from becoming too large and destroying the contact between the rod and the soil. Tamp the soil down firmly around the rod.

(*e*) Clamp the ground-lead wire securely to the ground rod and to the GND terminal on the switchboard.

(*f*) In cold locations, make sure the ground rod is driven deep enough to reach below the frost line. Under such circumstances, a large hole 4 or 5 feet deep may be required. Drive the ground rod to the bottom of the hole. Fill up the hole with earth.

(2) If a satisfactory ground is not obtained by the method outlined in subparagraph *d*(1) above, proceed as follows:

(*a*) Dig a basin in the soil around each rod 3 feet in diameter and 1 foot deep.

(*b*) Mix at least 5 pounds of salt and 12 quarts of water in the solution for each rod. Use larger quantities of salt and water, if available.

(*c*) Pour the solution in the basin and allow it to seep through the soil. After about ½ hour, fill the basin with excavated soil, and pack down firmly around the rod.

5. INSTALLATION OF MORE THAN ONE SWITCHBOARD. To nest a number of switchboards in order to form a larger exchange, as many as four additional switchboards can be added by means of the nesting fixtures. Only one Telephone EE-8-(*) is necessary. Attach it to the TELEPHONE terminals on the lower right switchboard.

***a.* Nesting Two Switchboards.** To nest two switchboards, proceed as follows:

(1) SIDE BY SIDE (fig. 5). Remove the covers and snap them to the back of each switchboard. Holding the switchboard on the left in place (switchboard A), slide the second switchboard (switchboard B) with a *downward* movement until it snaps into place.

(2) ONE OVER THE OTHER (fig. 6). In order to connect a second switchboard on top of a first one, place the second switchboard (switchboard B) on top of the first one (switchboard A) in such a manner that B rests approximately ¾ inch to the *left* and on top of A. Then, push B to the right until it snaps into place.

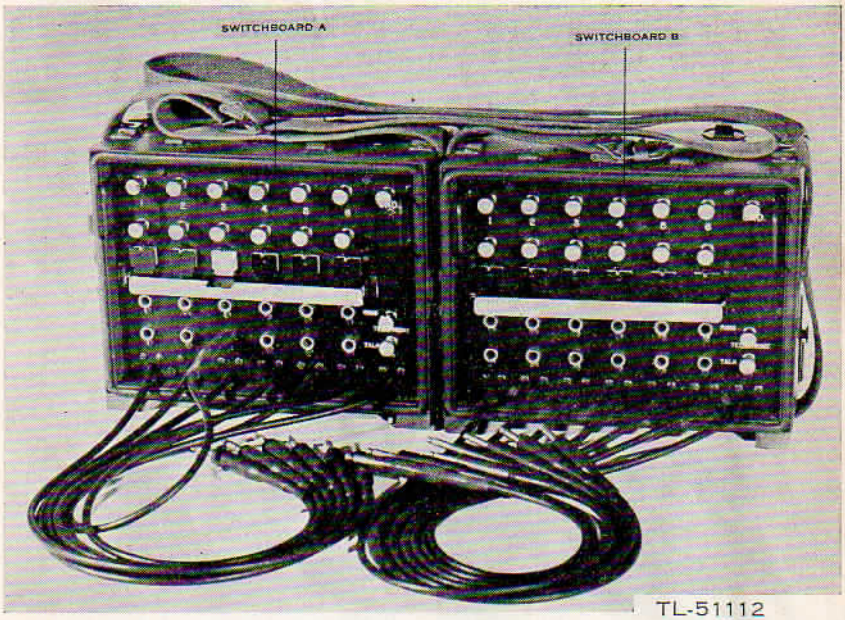


Figure 5. Two Switchboards SB-5/PT, Nested side by side.

b. **Nesting Three or Four Switchboards.** To nest three or four switchboards connect two of the switchboards side by side and place the others on top, side by side.

6. TESTING OF SWITCHBOARD DROPS BEFORE OPERATION. To test the switchboard, insert operator's plug (red sleeve) into the RING jack of any one line. Touch the upper binding post of that line with the tip of the plug of the same line. Crank the operator's telephone. After about one turn, the line drop should fall. Repeat with all other lines and restore drops.

7. ANSWERING A CALL. (Refer to FM 24-5 for operating phrases.) When the line drop falls, proceed as follows:

a. Insert operator's cord and plug into the TALK jack of the calling line.

b. Learn from the calling party the party to be called.

NOTE: In this and following paragraphs, wherever the word party appears, it also refers to other switchboards.

c. Plug the calling party's line cord into the called party's TALK jack.

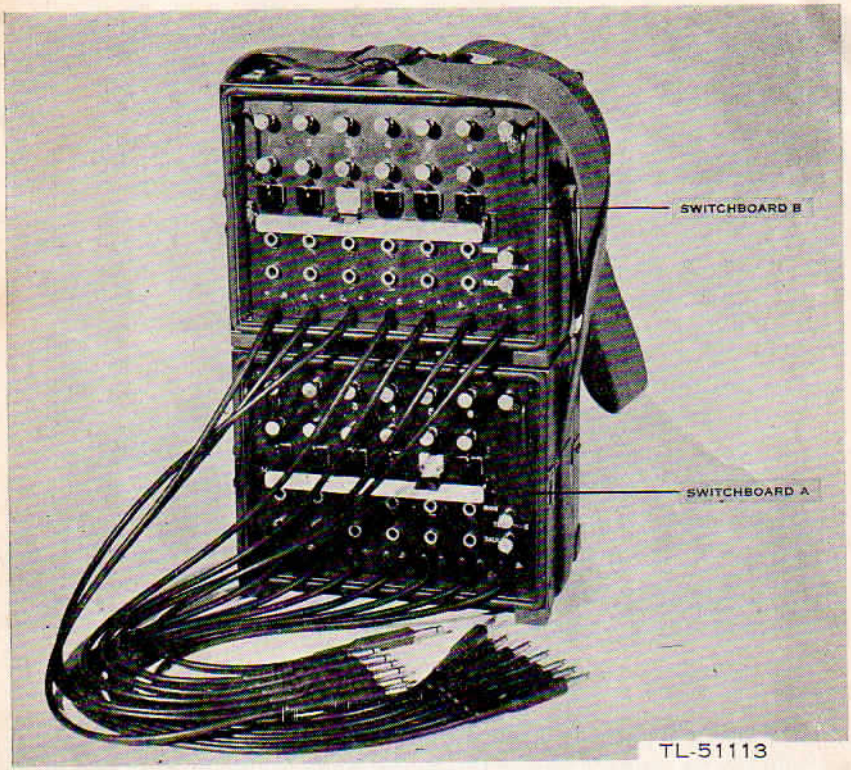


Figure 6. Two Switchboards SB-5/PT, Nested one over the other.

d. Plug operator's cord into called party's RING jack and turn the generator crank of operator's telephone for 2 seconds to ring the called party.

e. Immediately after ringing, return operator's plug to the calling party's TALK jack and supervise until the call is answered.

f. If necessary, repeat steps described in subparagraph *d* and *e* above.

g. When called party answers, restore the calling party's line drop and remove operator's plug.

8. SUPERVISION. To supervise the call, insert operator's cord into calling party's TALK jack.

9. DISCONNECTION.

a. When the calling party's drop shutter falls, indicating a ring-off, insert operator's cord into calling party's TALK jack.

b. Determine by supervising whether the conversation is completed, or whether either party wishes to initiate a new call.

c. If conversation is completed, proceed as follows:

(1) Restore calling party's drop shutter.

(2) Remove calling party's cord from called party's TALK jack.

d. If the *calling party* wishes to initiate a new call, remove the calling party's cord from the TALK jack into which it was plugged, and proceed as described above, beginning with paragraph 7*c*.

e. If the *called party* wishes to initiate a new call, plug the cord of the previous called party (which now becomes the calling party) into the new called party's TALK jack. Remove former calling party's cord and restore its line drop. Proceed as described, beginning with paragraph 7*d* above.

10. CONFERENCE CALLS. When a calling party requests a simultaneous connection with two or more called parties, proceed as follows:

a. Insert the plug of the calling party's line into the TALK jack of the first called party.

b. Insert the operator's plug into the RING jack of the first called party and ring for 2 seconds.

c. When the first called party answers, request him to stand by for a conference call.

d. Plug the line cord of the first called party into the TALK jack of the second called party.

e. Transfer the operator's plug to the RING jack of the second called party and ring for 2 seconds.

f. Repeat as necessary until all called parties have answered.

g. Then return the operator's plug to the TALK jack of the calling party and report the conference call as ready. When conversation begins, restore the line drop.

SECTION III

FUNCTIONING OF PARTS

11. THEORY OF SWITCHBOARD SB-5/PT. The function of Switchboard SB-5/PT is to connect various telephone lines with each other and with the switchboard operator when required. This

purpose is served by the circuit shown in fig. 7. Referring to the operation of the switchboard as described in paragraph 7, the circuits, at various stages of operation, can be traced as follows:

a. A ringing signal arriving at one pair of terminals will appear across the winding of the drop through the following path: lower terminal — drop winding — auxiliary contact of TALK jack — auxiliary contact of RING jack — blue wire to upper terminal.

b. When the operator inserts the operator's plug into the TALK jack as described in paragraph 7*a*, the right-hand end of the drop winding is disconnected, and the pair of line terminals connects to the operator's telephone as follows: lower terminal — sleeve of TALK jack — operator's telephone — tip contact of TALK jack — auxiliary contact of RING jack — blue wire to upper terminal.

c. When the operator inserts his cord and plug into the called party's RING jack, the operator's telephone is connected directly to the called party's terminals as follows: lower terminal — sleeve contact of RING jack — operator's telephone — tip terminal of RING jack — blue wire to upper terminal.

d. After the called party has answered, the operator removes his cord from the calling party's talk jack and thereby establishes a through circuit between two stations as follows: calling station, lower terminal — sleeve of calling cord — sleeve contact of TALK jack of called station — lower terminal of called station. In a similar manner, the upper terminals are connected through the auxiliary contacts of RING jacks of both circuits.

e. The through connection between the calling party and the called party is interrupted when the operator's cord is plugged into either RING jack.

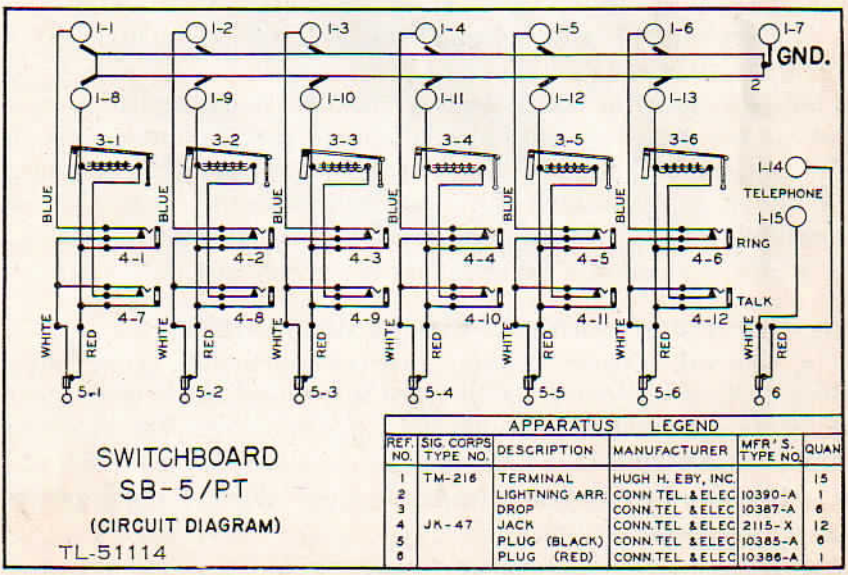
f. When the operator inserts his cord into the calling party's TALK jack for supervision, his telephone is connected across the through line between the calling and called party. However, during supervision, the calling party's drop is disconnected, and a ring-off is indicated by the ringing of the bell on the operator's telephone.

12. DROP. The drop used in Switchboard SB-5/PT consists of an electromagnet, an armature, a latch, and a drop shutter. Whenever the electromagnet is energized by ringing current, the armature assembly vibrates in its pivot bearings, thereby lifting the latch bar so that the shutter drops. In its pulled-in position, the latch bar clears the upper edge of the drop shutter by at least $\frac{1}{64}$ inch. This drop will respond only if the switchboard panel is in a vertical position.

13. JACK JK-47. Two of these jacks are required in each line circuit. When a plug is inserted, the normally closed contact between the two contact springs is opened and the plug is connected between tip contact and sleeve. In the case of the RING jacks, this auxiliary contact serves to disconnect the line of the calling party while ringing out to the called party. In the case of the TALK jacks, the auxiliary contact serves to interrupt the drop-coil circuit so that the drop can be reset after the calling signal has stopped.

14. CORD AND PLUG ASSEMBLY. Seven cord and plug assemblies are used. Six have a black molded-rubber sleeve and are connected to the six incoming lines. The seventh has a red molded-rubber sleeve and signifies the operator's telephone circuit. Plugs and cords are molded as one moistureproof unit and should be replaced as a unit in case of failure.

15. TERMINALS AND LIGHTNING ARRESTER. The six pairs of terminals, Binding Posts TM-216, at the top of the panel are assigned to the incoming lines. At the same time, they form a lightning protective device together with the grounded lightning arrester bar at the back of the panel. The protrusions of the lightning arrester bar are adjusted for a clearance of 0.010 to 0.020 inch. The GND terminal and the operator's TELEPHONE terminals are also Binding Posts TM-216.



APPARATUS LEGEND

REF. NO.	SIG. CORPS TYPE NO.	DESCRIPTION	MANUFACTURER	MFR'S. TYPE NO.	QUAN.
1	TM-216	TERMINAL	HUGH H. EBY, INC.		15
2		LIGHTNING ARR.	CONN. TEL. & ELEC.	10390-A	1
3		DROP	CONN. TEL. & ELEC.	10387-A	6
4	JK-47	JACK	CONN. TEL. & ELEC.	2115-X	12
5		PLUG (BLACK)	CONN. TEL. & ELEC.	10385-A	6
6		PLUG (RED)	CONN. TEL. & ELEC.	10386-A	1

Figure 7. Switchboard SB-5/PT, Circuit diagram.

SECTION IV

MAINTENANCE

NOTE: Unsatisfactory performance of this equipment will be reported immediately on W.D. A.G.O. Form No. 468. If form is not available see TM 38-250.

16. INSPECTION.

a. Raise the latch of each drop to see that the clearance between the latch and the drop shutter is approximately $\frac{1}{64}$ inch. This can be done from the front of the panel without removal of the panel from the box.

b. To remove the panel from the box, loosen the four captive screws and lift the panel out of the box by means of the wire loops.

c. Inspect all solder connections and all terminal screws to make sure that they are tight.

d. Insert a gauge, 0.010 inch thick, between the lightning arrester bar and each terminal. The clearance should be from 0.010 to 0.020 inch.

e. Make the test described in paragraph 6.

17. MINOR REPAIRS OR ADJUSTMENTS.

a. To adjust clearance between the latch and drop shutter, press the armature of the drop against the core, and bend the latch so that it clears the drop shutter by approximately $\frac{1}{64}$ inch.

b. Keep plugs bright. Polish, metal, paste (stock No. 6G1516) or equal should be used.

c. To replace the cord assembly, bend the hook slightly so as to release the staycord, and untie latter. Loosen the contact screws. Pull out the cord from the front of the panel. Insert the new cord, tie the staycord around the hook, and close the hook. Connect terminals to the contact screws.

d. No lubrication is required for the switchboard.

18. MOISTUREPROOFING AND FUNGIPROOFING.

a. **General.** Communication failures commonly occur when Signal Corps equipment is operated in tropical areas where temperature and relative humidity are extremely high. The following problems are typical:

(1) Hook-up wire and cable insulation break-down. Fungus growth accelerates deterioration.

(2) Moisture forms electrical leakage paths on terminal boards and insulating strips, causing flash-overs and crosstalk.

b. Treatment. Switchboard SB-5/PT as manufactured, is already moistureproofed and fungiproofed. However, periodic retreatment may be necessary. A moistureproofing and fungiproofing treatment has been devised which, if properly applied, will provide a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture-resistant and fungi-resistant varnish applied by a brush.

***c.* Step-by-step Instructions.**

(1) PRELIMINARY STEPS.

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

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

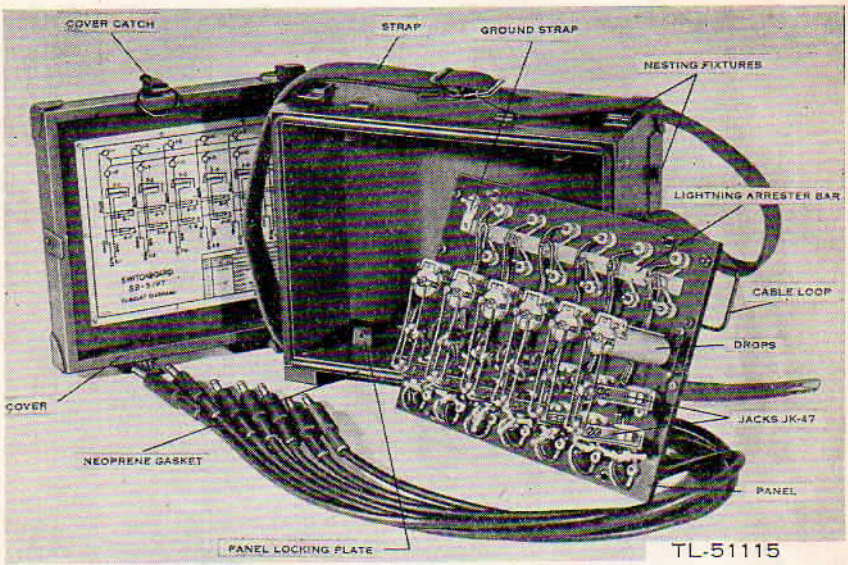


Figure 8. Switchboard SB-5/PT, rear view of panel.

(2) DISASSEMBLY. Loosen the four panel retaining screws. Remove the panel from the box (fig. 8).

(3) DRYING. Place the panel in an oven and dry for 2 or 3 hours at 160°F.

(4) VARNISHING. Do not spray. Brush-treat all metal parts and wiring on the back of the panel, except those parts listed below, with three coats of moistureproofing and fungiproofing varnish.

Do not brush any of the following parts:

(*a*) Pinions of drop shutters and pivots of drop armatures.
(*b*) Jack JK-47 contacts and jack holes.
(*c*) Lightning arrester points and adjacent ground terminals.
(*d*) Cords and plugs.

(5) REASSEMBLY. Reassemble panel in box and test for operation.

(6) MARKING. Mark MFP and date of completion.
EXAMPLE: MFP 13 Apr. 44.

***d.* Reference.** For a full description of the method of moistureproofing and fungiproofing, refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.

SECTION V

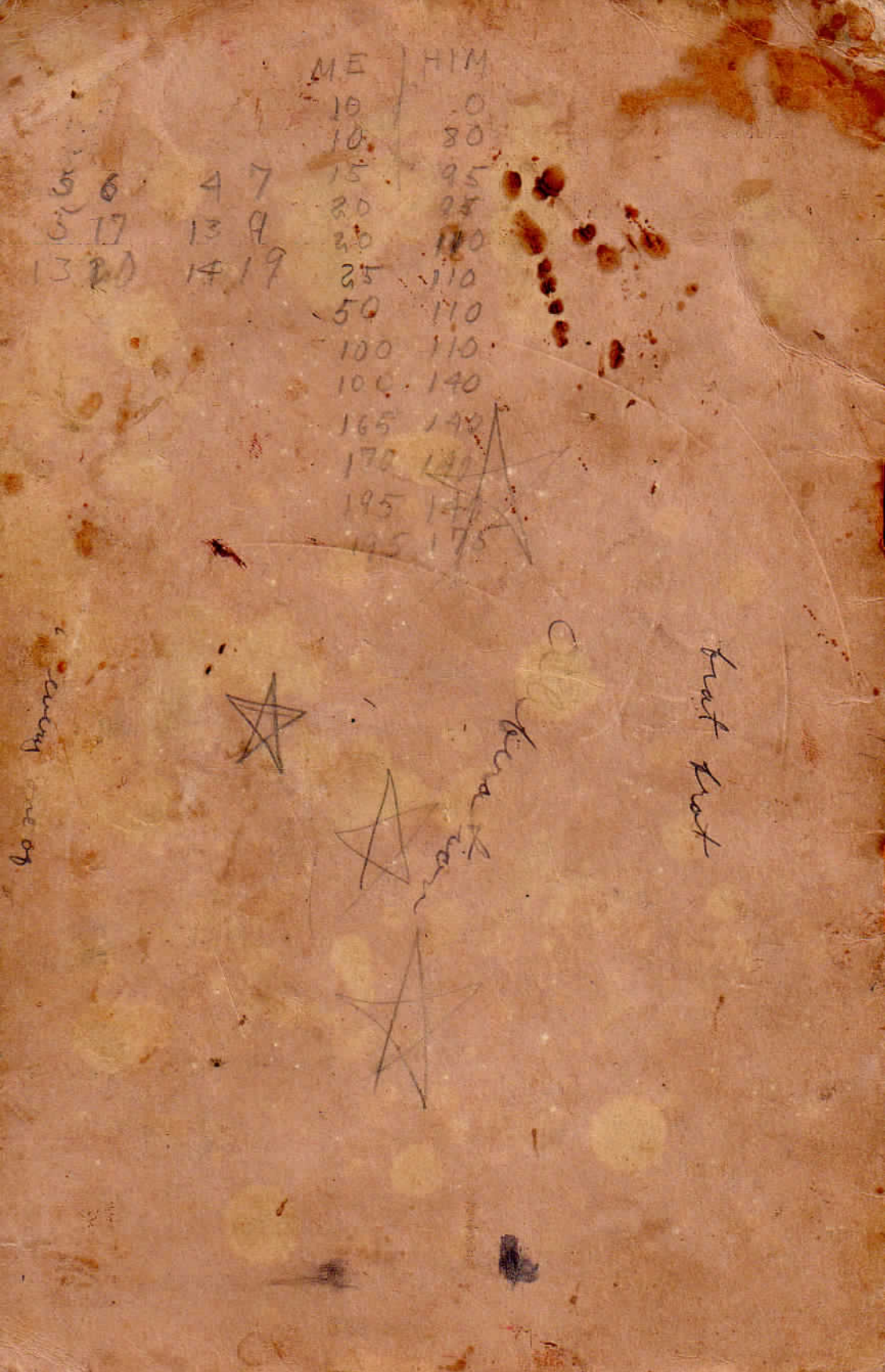
SUPPLEMENTARY DATA

19. MAINTENANCE LIST FOR SWITCHBOARD SB-5/PT.

NOTE: Order parts by stock number, name, and description. The list of maintenance parts as stock numbered apply only to Switchboard SB-5/PT manufactured by the Connecticut Telephone and Electric Division, Great American Industries. Units manufactured by another manufacturer will have parts carrying different stock numbers. This list is prepared preliminary to the issue of the Composite Maintenance List and in the event of any discrepancies, information contained in the Composite Maintenance List should be considered correct.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Organizational stock*	*3d echelon*	*4th echelon*	*5th echelon*	*Quan. per unit*
-	6Z8440-1	CARRYING STRAP ASSEMBLY: including buckle, cotton webbing; 84″ x 1½″; WLG 10428-A.		*	*	*	1
	4C9905-5/C1/1	GASKET: neoprene; black; 11″ x 8¼″ x $\frac{5}{16}$″; VRC 10427-A.			*	*	1
3	4C9905-5/D1	DROP ASSEMBLY: includes shutter, luminous button, and mounting screws; 3⅝″ x ⅞″ x ⅛″; CCN 10387-A.		*	*	*	6
4	4C4287	JACK JK-47.		*	*	*	12
5	3E7176	CORD AND PLUG ASSEMBLY: includes cord, modified Plug PL-11, with molded *black* rubber sleeve; 32″ over-all length; x $\frac{13}{32}$″ max diam; CCN 10385-A.		*	*	*	6
6	3E7176-1	CORD AND PLUG ASSEMBLY: same as above except with molded *red* rubber sleeve.		*	*	*	1
1	3Z316	BINDING POST TM-216.		*	*	*	15
	4C9905-5/D2	DETENTION SPRING ASSEMBLY: steel; with brass pin; 1½″ long; CCN 10392-A.			*	*	2

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Organizational stock*	*3d echelon*	*4th echelon*	*5th echelon*	*Quan. per unit*
	4C9905-5/H1	HINGE BRACKET ASSEMBLY: steel; with brass pin; ¾" x 5/16" x ½"; CCN 10395-A.			*	*	2
	4C9905-5/L1	LOCKING STRIP: steel; faced with white lamicoid; CCN 10398-A.			*	*	1
	4C9905-5/C2	CABLE LOOP: steel wire; parkerized 2⅛" x 1⅞"; CCN 10401-A.			*	*	2
	6L6632-8.9BS	SCREW: binding head, 6-32; ½" long.		*	*	*	51
	6L70006Z	WASHER: lock; No. 6.		*	*	*	12
	6L3106-32M	NUT: hex; 6-32.		*	*	*	36
	6L6440-7.15P	SCREW: oval binding head; 4-40; 7/16"; steel, parkerized.			*	*	8
	6L70004Z	WASHER: lock; No. 4; steel.			*	*	8
	6L3604-40Z	NUT: hex; 4-40; steel.			*	*	8
	6L70010Z	WASHER: lock; No. 10.			*	*	15
	6Z6918-6	CATCH: steel; CCN 10436-A.			*	*	4
	6Z6012-5	HOOK: steel; CCN 10437-A.			*	*	8
	4C9905-5/C3	CLIP: mounting; steel; CCN 10416-A.			*	*	4
	4C9905-5/S2	STUD: mounting; CCN 10419-A.			*	*	2
	6L2716-32TZ	NUT: tee; 6-32; CCN 10441-A.			*	*	28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