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INSTRUCTIONS
FOR
SWITCHBOARDS BD-71 AND BD-72
(PRELIMINARY ISSUE)



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Prepared at
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CONTENTS

	<u>Pages</u>
I. DESCRIPTION.....	1-3
1. General.....	1
2. Case.....	1
3. Operating Compartment.....	1
4. Jack Panel.....	1
5. Switchboard Unit EE-2-B.....	2
6. Telephone Panel.....	2
7. Head and Chest Set HS-19.....	2
8. Terminal Compartment.....	2-3
9. Rear Compartment.....	3
10. Repeating Coil.....	3
II. INSTALLATION.....	3-5
11. Setting up the Switchboard.....	3-4
12. Tests Preliminary to Operation.....	4
13. Line Connections.....	4-5
14. Multiple Connections.....	5
15. Closing Station.....	5
III. OPERATION.....	5-6
16. Operating Technique.....	5
17. Night Alarm and Lights.....	6
18. Multiple Operation.....	6
IV. MAINTENANCE.....	6-7
19. Service.....	6
20. Repair and Replacement.....	7
V. SPECIAL INSTALLATION AND OPERATION.....	7-8
21. Emergency Installation and Operation of Field Telephone as Operator's Set for Switchboard.....	7-8

ILLUSTRATIONS

- Fig. 1 - Switchboard BD-72 - Front View
Fig. 2 - Switchboard BD-72 - Rear View
Fig. 3 - Wiring Diagram for Switchboard BD-71 and BD-72

INSTRUCTIONS

FOR

SWITCHBOARDS BD-71 AND BD-72

SECTION I

DESCRIPTION

1. General. Switchboards BD-71 and BD-72 are improved, portable monocord switchboards designed to provide all requisite facilities for terminating, interconnecting, ringing and supervising telephone lines. The capacity of Switchboard BD-71 is 6 lines while that of Switchboard BD-72 is 12 lines. Repeating coils are available on the first two lines of the six-line switchboard and on the first four lines of the twelve-line switchboard. Center taps on all repeating coils permit simplexing telegraph circuits over lines so equipped.

2. Case. All equipment is fitted into a strong 7-ply wooden case which is provided with carrying handles, an adjustable carrying strap and four collapsible steel legs. All equipment except the Head and Chest Set HS-19, the lamp-socket reflectors and the batteries are permanently secured in place.

The case is divided into several compartments, each being individually accessible from the front, top and rear. The front or operating compartment contains the switchboard panels, cords and the operator's head and chest set; the top or terminal compartment contains the binding posts for connection of the lines; and the rear compartment incloses the repeating coils, the battery trough for batteries in use, a rack for spare batteries, and the multiple terminal strip.

3. Operating Compartment. The front or operating compartment is closed in two parts - by an upper panel section which is fitted so that it may be placed to serve as a rain and sun shade or be pushed back into the recess at the top of the case; and by a lower panel section hinged at the bottom and provided with a brace to hold it horizontally so as to serve as a writing surface when open. A sheet of white pyralin serves as an erasable writing surface for traffic diagrams and other data.

4. Jack Panel. The small panel, to the left of the switchboard units, on which the Jack JK-37, the three binding posts, one of the panel lights, and the night-alarm and light switches are mounted is known as the jack panel. All elements are permanently interwired and connected to the remaining equipment by means of a flexible cable. The jack serves to connect the head and chest set by means of the cord and plug. The binding posts are provided to serve as an alternate means of connecting head and chest sets when a plug is not used.

5. Switchboard Unit EE-2-B. Six switchboard units are mounted in the BD-71 and twelve switchboard units are mounted in the BD-72. In each case the units are mounted in the center of the switchboard. Each unit consists of two terminal blocks at the top, the ring-talk key, the signal drop, the jack, the cord and plug, all interwired and connected to the switchboard by means of four flexible wire leads and three metal contacts. Each unit is removable for inspection by disconnecting the two line leads at the top and taking out the screws at the top and bottom. Complete removal requires disconnection of the remaining leads from their respective busses. When the key is pushed up to the nonlocking position the generator is connected to the line for ringing and when pushed down to the locking position the battery is connected to the transmitter and the operator's circuit to the line. The signal drop is actuated magnetically and is adjustable by means of a locked screw in the rear of the unit. The cord and plug serve to connect any one line to any other line. When a plug is inserted in the jack of a unit, the drop of that unit receiving the plug is disconnected from the line circuit, thus permitting but one drop to be bridged across two or more lines for supervision.

6. Telephone Panel. The panel to the right of the switchboard units is known as the telephone panel. In this unit are mounted all the elements essential to a regular magneto telephone substation, consisting of a Generator GN-38, Crank GC-12, induction Coil C-105, Capacitors CA-177-A and CA-259, Western Electric 3A Varistor and Edwards #13 bell. The other panel light is also mounted at the top.

The generator is of the new cobalt-steel magnet type, and is designed to deliver 50 milliamperes into a 1000-ohm circuit when the hand crank is turned at 200 revolutions a minute. The hand crank is in front of the panel. The lamp is turned on by the switch on the jack panel. The entire assembly may be removed as a unit by taking out two screws at the top and three screws at the bottom.

7. Head and Chest Set HS-19. The head and chest set is made up of Chest Unit T-26, Receiver R-22, a wire headband and pad, Cords CC-333 and CC-337 and Plug PL-58. The transmitter is a standard, nonpositional, commercial, carbon-button type. The receiver is also a standard commercial type and is fitted to the wire headband. Cord CC-337 connects the transmitter and receiver. Straps ST-24 and ST-25 are attached to the breast plate and serve to hold the unit in place in front of the operator. Cord CC-333 and Plug PL-58 connect the unit to the jack panel of the switchboard.

8. Terminal Compartment. The top or terminal compartment is specially designed to provide facilities for connecting the field wire lines to the switchboard. The binding posts are constructed to permit connection of the wire without removing any insulation whatsoever. Steel pins with hardened points riveted to the knurled top pierce the wire through the insulation and make positive contact. Each terminal is fitted with a spark-gap to ground in the form of an air space between the pointed metal strip at the base of each post and a bar running between each pair of terminals. This bar is connected to the ground post. Two upright metal corner posts serve to keep the wires in place at either end of the compartment.

The sides at either end of the cover ordinarily held closed by spring hinges provide the required outlet clearances when the compartment is closed after line connections have been made. A white sheet of pyralin on the under side of the cover serves as an erasable writing surface for line data.

9. Rear Compartment. The rear compartment incloses the repeating coils, batteries, and the multiple terminal strip for operating two switchboards together as one unit. The repeating coils are mounted centrally so that all terminal connections are accessible for ready inspection and test. Batteries in use are located in the trough at the bottom of the compartment. Spare batteries are placed in the vertical rack at the right side. The terminals for multiple connections are mounted on an insulating panel at the left. The edge of the case is fitted with a sponge-rubber closure designed to serve as a rain and dustproof outlet for multiple connections. The compartment is closed by means of the cover which is hinged at the bottom and provided with spring catches on the inside for closing while in service, and with latches at the top for closing prior to removal from service. The wiring diagram of the entire switchboard is mounted on the inside of the cover.

10. Repeating Coil. Coil C-161 is used for this purpose. This is a small lightweight repeating coil provided with balanced line windings for simplex telegraph use. It is of the talk-through, ring-through type and has an impedance in the order of 600 ohms. If desired, it may be disconnected from any line by disconnecting the line (yellow) leads from the line side of the coil and then connecting these leads to the switchboard (brown) leads removed from the switchboard side of the coil.

SECTION II

INSTALLATION

11. Setting up the Switchboard. As transported, the switchboard is entirely closed up with the steel supporting legs telescoped, folded and locked in place underneath the case. The legs should be unfolded and extended full length by setting the entire switchboard sideways or upside down on the ground and then releasing the button on the spring release of each leg in turn. Place the switchboard where desired so that it will be level and all four legs placed firmly upon the ground. If the switchboard is to be placed on a table or similar support, the legs should be left folded and locked in place.

Open the operating compartment, allowing the lower panel section to swing freely or hook it in place horizontally. Adjust the upper panel section so that it serves as a rain and sun shade or push it back into the recess just beneath the top of the case. Pull out the cords from under the switchboard units and release the signal drops by lowering the spring locking bars to the horizontal position.

Open the rear compartment and place six Batteries BA-30 in the battery trough so that the positive (center) terminal is toward the metal plate and the negative (case) terminal is toward the contact springs in all cases. (If Batteries BA-30 are not available, other 3-volt direct-current sources may be used by connecting them to the binding posts on the multiple terminal strip, marked +3V and -TR, and +3V and -LT.)

Put on the head and chest set and adjust both neck and chest straps. Adjust the transmitter so that it is in position for talking. Put the headband and receiver in place and insert the plug into the jack panel. Raise the toggle switch on the Head and Chest Set HS-19 up to the locking position to close the transmitter circuit.

12. Tests Preliminary to Operation.

a. Generator Circuit. Raise the key of any one of the switchboard units with neither line nor repeating coil connected to it. Turn the generator crank rapidly. It should turn easily. Now, raise the key again but this time short-circuit the terminals directly with a piece of wire or metal. The generator should now be difficult to turn.

b. Operator's Circuit. Short-circuit one of the line circuits or use a unit with a long line or repeating coil connected to it. Depress the key of the switchboard unit to the talk position. Blow into the transmitter mouthpiece and see that this sound is heard in the receiver. Side-tone should be heard only when the key is depressed.

c. Line and Signal Circuit. Connect a field telephone to each pair of line terminals in turn. See that the drop on each unit falls as the generator on the telephone is turned. Remove the unit and readjust the drop if required. This test may be combined with that of d below. Raise the key and ring into the telephone, then depress the key to the locking position and talk into the transmitter on both telephone and switchboard. See that the voice can be heard distinctly through the other receiver.

d. Night Alarm. To insure that the night-alarm circuit is in operating order proceed as in c but turn on the NT.AL. switch on the jack panel first. As each drop falls the circuit to the bell should be closed and the bell start ringing. Restoring the drop should stop the ringing of the bell.

e. Lights. The lamps should light when the LA. switch is turned on. See that the reflectors are focused across the designation strips of the switchboard units.

13. Line Connections. The field-wire lines are connected to the binding posts in the top compartment. Do not remove the insulation from the wire. Secure the wires of long incoming trunk lines to the binding posts at points about two feet from the end by placing the wire in the slot and turning down the head tightly with the fingers. Do Not Use Pliers. The hardened steel pin pierces the insulation and makes contact with the strands of the wire. Local lines may be connected near the end of the wire.

Lines desired for the operation of simplex telegraph circuits should be connected to the first two or four lines of the six- and twelve-line switchboards respectively. Telegraph lines should be connected to the binding posts marked TG1 to TG4 for simplexing over lines 1 to 4 respectively.

A length of wire should be connected to the ground terminal and to a suitable stake driven into the ground. (Stake GP-3 or Ground Rod GP-16 is satisfactory.)

Arrange all wires so that they lie behind the metal corner posts on either end of the compartment. Close the cover while holding the sides open. The partially open sides provide ample clearance so that the cover may be completely closed and latched with the wires in place.

14. Multiple Connections. To obtain additional line capacity, Switchboards BD-71 or BD-72 may be operated in multiple with another Switchboard BD-71 or BD-72. To do this, place the switchboards adjacent to each other and connect the terminals marked +3V, A, B, C, and D in the rear compartment of one board with similarly marked terminals in the rear compartment of the other board. Place the wires in each case over the sponge-rubber closure at the edge of each case before closing the compartment. This outlet is designed to provide enough clearance for all necessary wires with the cover shut and latched.

Do not plug in the second head and chest set, but if desired the night alarm and lamps may be used by installing four batteries in the second board. In emergency, if extra batteries are not available, the lights and the night alarm may be operated by running a wire between the two -LT posts on the multiple terminal strips.

15. Closing Station. If the station is to be closed down and another is not to be set up on the same communication network, simply reverse the procedure used in setting up the switchboard. If, however, the station is to be closed down and its traffic is to be handled by another board at some extended position, all traffic may be handled without interruption by connecting the new lines to the ends previously left free and projecting out of one end of the terminal compartment. This will permit incoming calls from a line to be received on the same unit which served the line until the time of cutover and disconnection of the board.

Note: Batteries may be left in place if the switchboard is to be put in service again within a short time but otherwise they should be removed.

SECTION III

OPERATION

16. Operating Technique.

To handle traffic on either switchboard, first raise the toggle switch on the Head and Chest Set HS-19 to the locking position to close the transmitter circuit. An incoming call will be indicated by the falling of the signal drop. Depress the key, answer the party calling and restore the drop. After determining the party to be called, connect the lines by inserting the cord and plug of the calling party into the jack of the called party's unit. Ring the called party by lifting the key of that unit and cranking the generator simultaneously. The key of the calling party may be left down until actual conversation has begun. It should then be restored to its normal position.

With this telephone system it is necessary for either party desiring to end the conversation to ring off; i.e., to crank the generator of a telephone in order to indicate to the operator the end of the conversation by causing the drop on the switchboard unit to fall. When a drop falls, therefore, the operator should depress the key and answer the recall to see if either party desires to put through another call. It must be remembered that the insertion of a plug in the jack of a switchboard unit opens the circuit through the signal drop, therefore the drop signal can be received only on the unit with the empty jack.

When two parties desire a straight-through connection so that either party can ring the other without requiring the services of the operator and operation of the drops, the cords may be crosspatched; i.e., the plug of one unit should be inserted into the jack of the other unit and vice versa. This disconnects both signal drops from the line circuit and provides direct connection between the two lines.

17. Night Alarm and Lights. The night-alarm consists of a bell which rings as soon as any drop falls. The alarm is set for each board by operating the NT.AL. switch on the jack panel to the right. The night lights are controlled by the LA. switch on the jack panel. The reflector shades should be turned so as to direct the light across the designation strips of the switchboard units.

18. Multiple Operation. Multiple operation is the same as operation of a single board. Only the head and chest set and generator of one board are used, however, to facilitate operation. If the night alarm and lights are desired on the second board, four Batteries BA-30 should be installed. In emergency, if additional batteries are not available, both night alarms and the four panel lights may be operated with one set of batteries by running another wire between the two -LT posts on the multiple terminal panel. Important - In multiple the NT.AL. switch on the second board must also be turned on whether one or two sets of batteries are used in order to ring the bell when any of the signal drops of the second board fall.

SECTION IV

MAINTENANCE

19. Service. These switchboards require little servicing, as they consist of relatively simple equipment not likely to get out of order in ordinary service. However, periodic inspection and cleaning of the entire board will aid in maintaining the equipment in proper working order. Contacts on the key, drop and jack of the switchboard units should be burnished with a piece of soft wood or heavy paper (do not use sandpaper). The air gaps under the line terminal must be kept clean if leakage currents to ground are to be reduced to a minimum. Cloth may be used to clean these gaps. All connections to the coil binding posts and other terminals must be checked to see that they are tight and free from dirt or corrosion of any kind. The mechanical parts of the drop must be free to function without sticking and the key mechanism on the units must function so as to move the contact springs sufficiently to insure correct circuit changes as indicated on the wiring diagram.

20. Repair and Replacement. If inspection or tests indicate faults, proceed cautiously to determine the nature of the trouble before attempting any disassembly. Elements not functioning properly or not at all are usually indicated by loose or broken connections. By far the largest proportion of trouble is caused by such conditions. All equipment is accessible either directly or by removal of screws serving to hold them in place. Disassemble carefully. All elements are incorporated in such a way as to facilitate ordinary adjustments and repairs. Spare Switchboard Units EE-2-B should be available for replacement by the using personnel. If the equipment is damaged to such an extent that minor repairs and replacements will not be sufficient to restore the switchboard to proper working order, return it to the depot. Be careful not to injure any of the spring contacts. If any appear to be out of shape, use proper tools designed for this purpose. If proper tools are not available for repair, return the unit to the depot.

In removing and replacing the switchboard units, be sure to reconnect properly: the yellow-green lead going to the top or right-hand screw and the yellow lead going to the bottom or left-hand screw.

In effecting repairs on the telephone panel it may be more desirable to remove the defective parts individually, although the entire unit can be removed, if desired, by taking out the panel screws and disconnecting the leads.

The generator may be removed by disconnecting the leads and the four screws under the panel shelf. Be careful to retain the bakelite washers and insulating strip as they are necessary to insulate the unit from the frame of the panel and keep it from grounding.

The Lamps LM-19 are the usual two-cell flashlight type and are easily removed and replaced by pulling out the lamp cap and unscrewing the lamp from the socket.

SECTION V

SPECIAL INSTALLATION AND OPERATION

21. Emergency Installation and Operation of Field Telephone as Operator's Set for Switchboard. If the telephone or ringing circuit of the switchboard should fail and cannot be repaired immediately, a field telephone may be used as the operator's set. Connect the plug of the head and chest set into the jack at the top of the telephone and connect the spare Cord CC-59 with Plug PL-11 to the line binding posts of the telephone. After inserting batteries, the telephone is placed flat against the right side of the switchboard and the switchboard carrying strap passed around it and through the loop on the leg casting. The strap is then doubled back to the buckle and tightened so that the telephone rests securely against the side of the box and is flush with the front face so that the generator handle can be easily rotated by the operator. The spare Cord CC-59 with Plug PL-11 is used to connect the telephone to the jacks of the party calling and the called party in turn. In the event that this cord is not available, ordinary field wire may be used to connect the telephone line terminals to a pair of line terminals in the top compartment. In this case it will be necessary to use one of the switchboard units for the operator's service.

When a telephone is used in this way the keys are not used and should be allowed to remain in the normal position. Calls are answered by plugging the telephone cord into the jack of the unit indicated. Determine the party to be called and then withdraw the cord and plug into the jack of the called party's unit. Rotate the generator of the telephone to ring. After the called party answers, withdraw the cord again and insert the plug from the calling party's line unit.

If the telephone is connected to the line terminals of a switchboard unit, follow the same procedure, using the cord and plug of that unit.

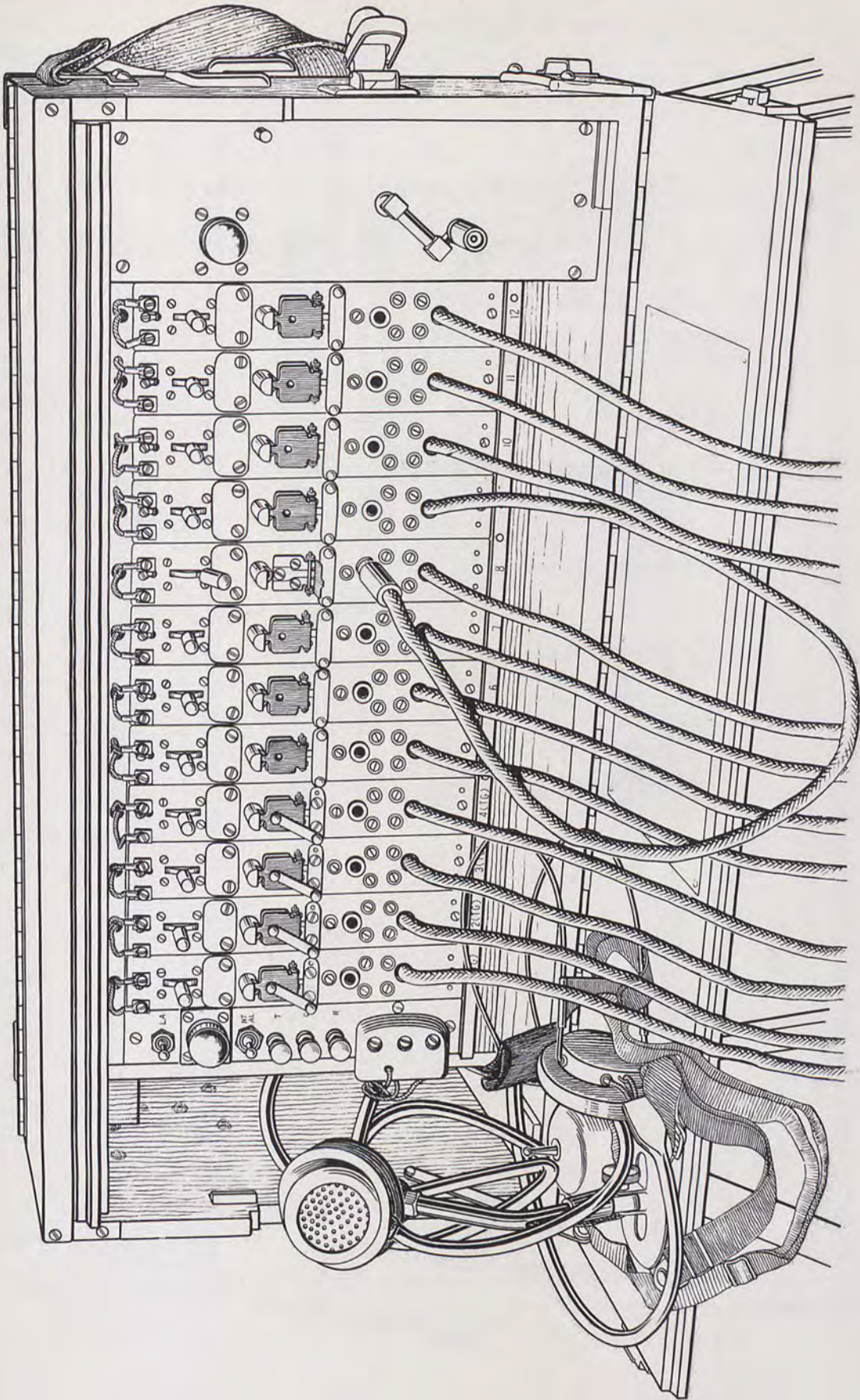


Fig. 1 - Switchboard BD-72, Front View

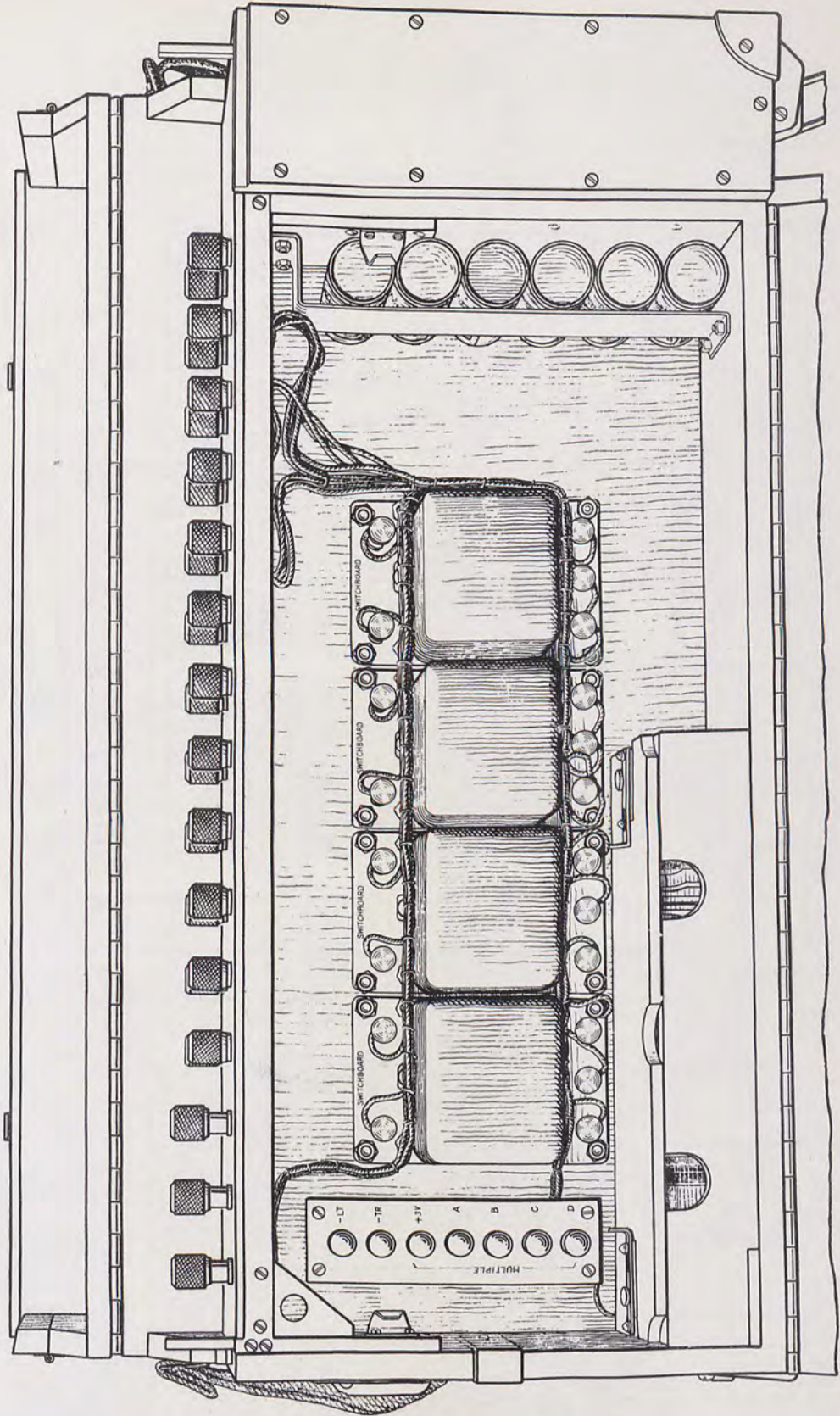
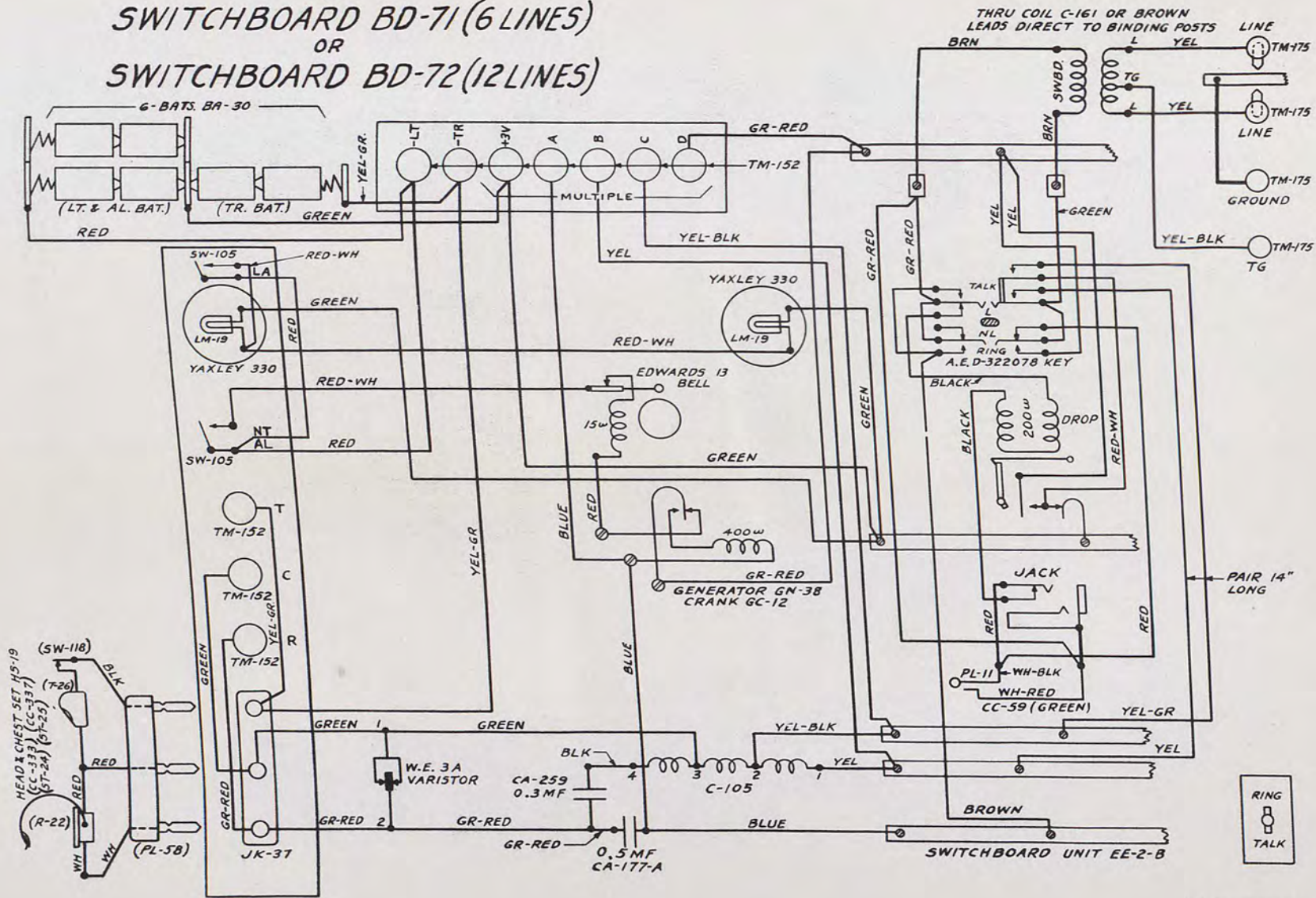


Fig. 2 - Switchboard BD-72, Rear View

WIRING DIAGRAM OF SWITCHBOARD BD-71 (6 LINES) OR SWITCHBOARD BD-72 (12 LINES)



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Fig. 3 - Wiring Diagram for Switchboards BD-71 and BD-72