GENERAL DESCRIPTION
740A AND 740B PBX

CONTENTS

1. GENERAL:

1.1 This section gives a general description of the No. 740-A and No. 740-B P B X's and associated operating features.

1.2 These P B X's are intended to make telephone facilities available in cases where small dial installations can be used advantageously and to permit the attendant to conveniently operate the board and also perform other duties.

1.3 In general, intercommunicating calls are completed directly by dialing and outward central office calls either by dialing the central office code or requesting the attendant to set up the connection. All inward calls, however, are routed to the attendant, who distributes them to the desired extensions by dialing, as no extension multiple is furnished and the connection is automatically released after both parties have disconnected. Tie line connections to and from manual or dial P B X's are handled in a manner similar to connections to and from a central office.

2. GENERAL DESCRIPTION:

2.1 The No. 740-A and 740-B P B X's consist of three main units, which are the attendant's cabinet, switch frame and power plant.

2.2 The No. 740-A P B X has a maximum capacity of 88 extension lines with one group of 10 trunks, a test line and the attendant's extension line when one attendant's cabinet is used. Where the trunks and tie lines exceed 10, it is necessary to place two attendant's cabinets adjacent to each other, then a maximum of 19 trunks and tie lines can be provided. Where selector levels are assigned for those additional groups of trunks or tie lines, the extension line capacity is decreased by 10 for each level used. If more than 10 trunks are assigned to the zero level with none of the other levels assigned to trunks or tie lines, the extension line capacity is decreased by the number of additional trunks, as each trunk and tie line requires a line finder terminal.

2.3 The No. 740-B P B X is arranged for a maximum of 10 central office trunks and tie lines and 38 extension lines.

3. ATTENDANT'S CABINET:

3.1 The attendant's cabinet for both the No. 740-A and No. 740-B P B X's is similar in appearance to a cordless P.B.X., and is arranged to be mounted on an office desk or table (see Fig. 1). The woodwork is birch having a mahogany finish, and the face is of phenol fibre. The key panel is hinged and the cabinet top is removable. The cabinet is provided with lamp and key equipment and a standard desk stand or handset by means of which the attendant may answer or establish inward and outward calls.

3.2 Each of the 10 trunks or tie lines appearing on the face of the cabinet has associated with it three lamps and two keys. The three lamps are placed in a vertical row; the uppermost is the trunk (TRK) lamp and has a white lamp cap; the middle one is the guard (GD) lamp and has a green lamp cap; while the lowest is the busy (BSY) lamp and has a red lamp cap. Below these lamps is a turn-button type key used for night connections between extensions and central office trunks. The night key, although furnished, does not function with tie lines. Below the turn-button night key is the trunk or tie line key, which is arranged for normal, talk (TLK) and hold (HLD) positions. The key is in the normal position when the lever is horizontal, in the (TLK) position when it is operated partially downward and in the (HLD) position when it is operated far downward.

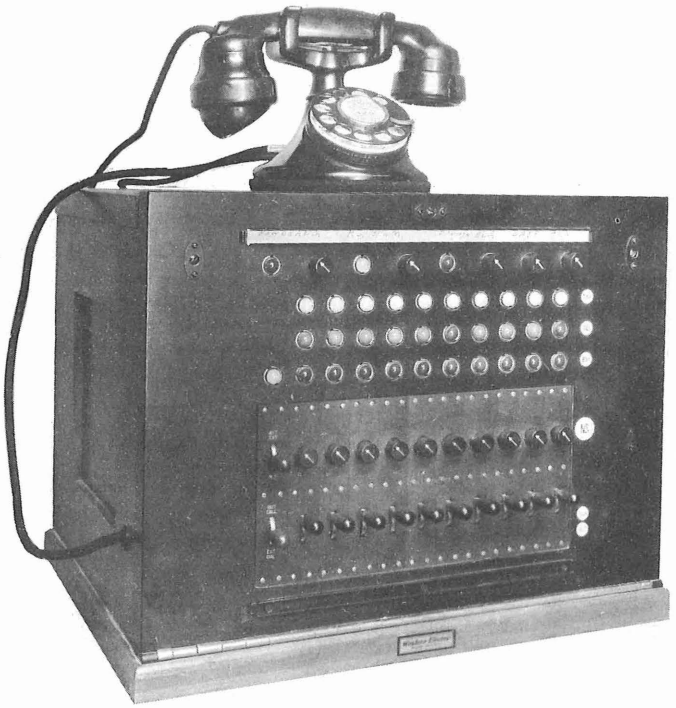

Fig. 1

3.3 To the left of the trunk and tie line keys are two common keys, namely, a two-way operating attendant-extension (ATT. EXT) and release (RLS) key, above which is located the attendant-extension call lamp. Below these is a two-way operating out call (OUT CALL) and extension dial (EXT DIAL) key. Both common keys are furnished to operate in common with the trunk and tie line key equipment. The attendant-extension and release key, in one position, is connected to the attendant's extension line circuit, which is terminated on the attendant's cabinet so that the attendant may assist the extension user in completing toll calls and other calls requiring aid. The other position of the key is used for releasing uncompleted trunk or tie line connections and the first extension on a transferred call. The out call and extension dial key is used in one position to complete outward calls on trunk or tie line connections and in the other position to dial the extensions in order to complete inward calls from trunk and tie lines.

3.4 In a horizontal row, at the top of the trunk lamps, are five turn-button type keys associated with alarms and auxiliary circuits, three of which are the power, switch frame and permanent signal alarm circuit keys, which function with associated signal lamps. The other two keys are the battery cut-off and buzzer keys.

3.5 The attendant's set and extension sets are provided with the standard type of station dials.

4. MECHANICAL APPARATUS:

4.1 All of the mechanical apparatus together with the apparatus for central office trunks, tie lines, attendant's telephone and miscellaneous alarm circuits are mounted on a double-sided frame. The frame is approximately 5 feet long and 7 feet high for the No. 740-A P B X, and 3 feet long and 7 feet high for the No. 740-B P B X Figs. 2 and 3 show the line finder side and selector-connector side of the frame, respectively, for the No. 740-A P.B.X. The equipment is similarly arranged in the No. 740-B P.B.X. Where it is desirable for appearance, protection or maintenance reasons to enclose the frame, a sheet steel casing may be provided.

4.2 On the line finder side of the frame (Fig. 2) are mounted two shelves of line finders, line and cut-off relays, group, subgroup alarm and test line circuits; also a fuse panel, terminal assembly, line finder jack, key and lamp apparatus and miscellaneous test and alarm circuit apparatus.

4.3 The selector-connector side of the frame (Fig. 3) has four shelves. The top shelf is arranged to mount the attendant's telephone and line circuit unit and trunk or tie line units. The second shelf is arranged for trunk or tie line units and the two bottom shelves are used to mount selector-connectors. The test line jack is also mounted on this side of the frame.

4.4 The line finder is similar in appearance to a selector-connector and functions automatically on originating a call, to establish connections to extension lines, central office trunks and tie lines that are terminated on its banks.

4.5 The selector-connector functions as a selector or connector depending on the level dialed. In a No. 740-A P B X on levels 1 to 6 the switch functions as a connector and on the zero level as a selector. On levels 7, 8 and 9 the switch action depends on the setting of the normal post springs. In a No. 740-B P B X levels 1 to 4 function as a connector and level 5 as a selector.

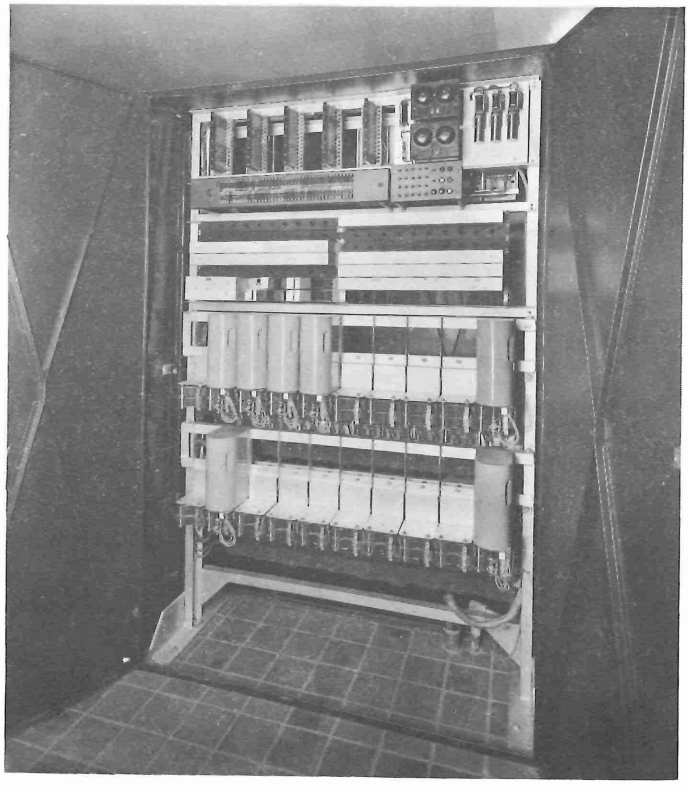

Fig. 2.

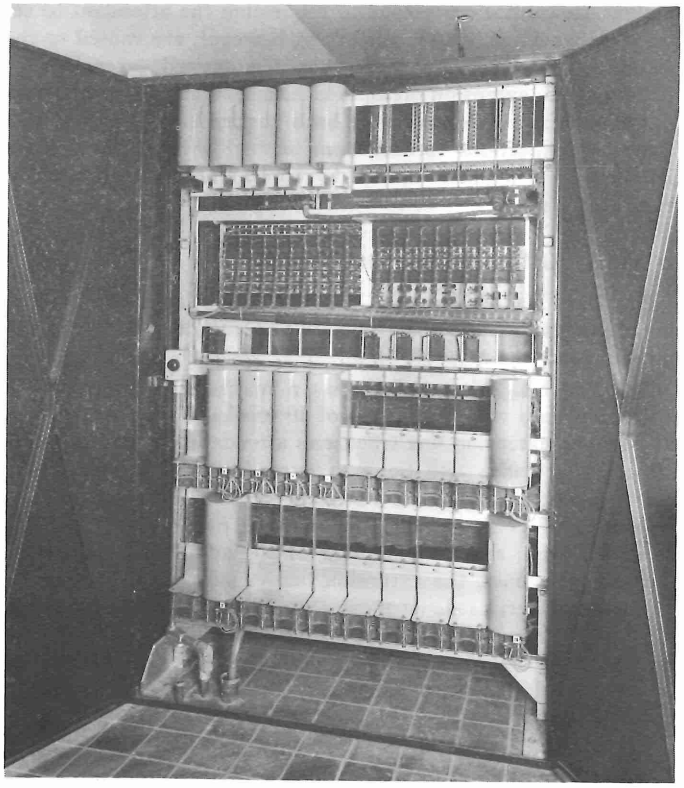

Fig. 3.

4.6 Each extension, trunk and tie line is connected to a line and cut-off relay and terminates on a line finder bank and on a selector-connector bank.

4.7 The multiple banks of the line finders and selector-connectors consist of two 100 point banks for the No. 740-A P.B.X. and one 100 point bank for the No. 740-B P B X

5. POWER PLANT:

5.1 The power plant for the No. 740-A and No. 740-B P B X's is approximately 4 feet long and 7 feet high (see Fig. 4). It consists of a 23-cell storage battery, a continuously operated charging set and four counter E.M.F. cells controlled by a voltmeter relay. The 23-cell radio type battery is made up of seven three-cell units and one unit having two active cells and one dummy cell. The counter E.M.F. cells which are in two groups and have no polarity, are known as NAK cells. The storage cells are enclosed in a steel cabinet having a green finish.

5.2 The battery is charged by tungar rectifiers where alternating current is available and by a motor-generator set where direct current is available.

5.3 A voltmeter relay is provided to control the counter E.M.F. cells to keep the discharge voltage within the limits of 44-50 volts. The regulating and generating equipment is mounted on top of the storage battery cabinet.

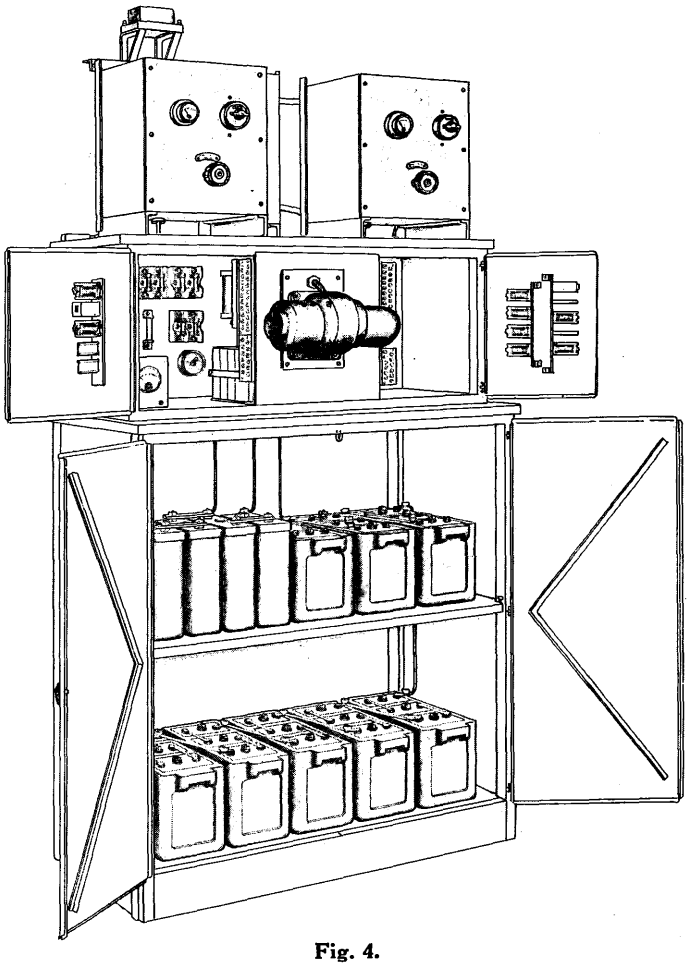

Fig. 4.

5.4 The ringing current supply is normally furnished over cable pairs from the central office power plant. The interruptions for dial and busy tones are normally produced by means of relay equipment on the switch frame. Arrangements are also made so that a ringing machine can be used to supply the ringing current and tones.

3. LINE AND TRUNK OPERATING FEATURES:

(a) Call from One Extension to Another Extension:

6.1 To make a call from one extension to another extension, the user of the calling extension removes his receiver from the switch hook and upon hearing dial tone, dials the number of the called extension. The ringing signal is heard until the called extension answers. If the calling party hangs up and the called party leaves his receiver off the switch hook, dial tone will be heard at the called extension. If the called party hangs up and the calling party keeps his receiver off the switch hook, the called party's line will test busy.

(b) Call from an Extension through the Central Office:

6.2 To call through the central office, the extension user upon hearing dial tone, dials zero for the No. 740-A and five for the No. 740-B P B X When central office trunks and tie lines are provided for a No. 740-B P B X, it is necessary to dial five and then another digit to select the group of trunks or tie lines. If a trunk is available and if the P B X is in a dial office area, a second dial tone is heard; also, the trunk busy lamp is lighted at the attendant's cabinet and the trunk is made busy in the central office. As the central office trunk is arranged for one-way outward service dialed directly from the station to the central office and for two-way service between the attendant and the central office, it is assigned selector-connector terminals and line finder terminals in the switching equipment. In a manual office area the trunk is not made busy at the central office until a plug is inserted into the answering jack. If the trunk is selected on an inward call before the "A" operator answers, the ringing will be tripped and the inward call completed to the calling extension. In this case the P B X attendant is flashed from the calling extension and informed of the condition. She then operates the release key to disconnect the calling extension and completes the incoming call as described in paragraph 6.4. The calling extension user must momentarily depress his switch hook before again dialing the central office trunk code. When the extension user hangs up after being connected through a dial office, the busy feature is removed at the dial office, and the busy lamp is extinguished at the board. The busy conditions, however, are not removed if the connection is made through a manual office or a dial office "A" or toll operator, until the connections are taken down by the "A" operator. Should the extension user attempt to transfer the connection, it will be broken as soon as the switch hook is depressed.

Note: The station line circuit is arranged so that any station can be restricted from outward direct dial central office service.

(c) Call from an Extension to the Attendant:

6.3 To call the attendant, the extension user dials the code of the attendant's extension line. If the attendant's extension is not busy, a ringing signal is heard, and the extension lamp lights at the cabinet. To answer the call the attendant removes her receiver from the switch hook and operates the attendant-extension key. This extinguishes the lamp signal and connects her telephone circuit to the line. From this point on, the connection is controlled in the same manner as an extension to extension connection (paragraph 6.1).

(d) **Call from an Extension Completed to the Central Office by the Attendant:**

6.4 The extension user proceeds as in paragraph 6.3 and notifies the attendant that he wishes to make an outward call (such as a toll call or an out call from a restricted extension). The attendant acknowledges the call and the extension user hangs up the receiver. The attendant then releases the attendant-extension key, operates the out call key and depresses the trunk key of an idle trunk to the talk position. The busy conditions on the trunk function as on a call from an extension through a central office (paragraph 6.2). After the called subscriber answers, the attendant, with the trunk key in the talk position, restores the out call key and operates it to the extension dial position. This causes the trunk guard lamp to light, holds the trunk and disconnects the attendant's telephone set from the trunk. The busy lamp remains lighted. Upon hearing dial tone the attendant dials the number of the calling extension. When the ringing signal is heard by the attendant, she restores the trunk and extension dial keys to the normal position. When the extension answers, the guard lamp of the trunk is extinguished and the trunk is automatically connected to the extension line. From this point on, the connection functions as a call from the extension through the central office (paragraph 6.2).

6.5 If the connection cannot be completed, the attendant releases the trunk and extension line by depressing the trunk key to the talking position, operating the release key and then restoring the trunk key.

6.6 If the extension is busy when called by the attendant, the attendant may hold the trunk connection by depressing the trunk key to the hold position after releasing the connection to the extension by means of the release key.

(e) **Call from the Central Office to the Attendant for an Extension:**

6.7 On a call from the central office, the busy lamp signal is lighted as soon as the trunk is selected and the trunk lamp is lighted when ringing is introduced on the trunk. To answer this call the attendant removes her receiver from the switch hook and depresses the trunk key to the talking position. This extinguishes the trunk lamp signal and connects her telephone set to the trunk. The attendant then connects the trunk to any desired extension as described in paragraph 6.4.

6.8 If, after connection has been established with the called extension, it is desired to transfer the call to another extension, the attendant may be flashed by the called extension which causes the trunk or uppermost lamp signal on the connection to flash.

(f) **Listening In:**

6.9 The attendant can listen in on any trunk or tie line connection by operating the trunk key to the talk position, regardless of whether she handled the call or whether it was made direct from the extension. The attendant extension key or the extension dial key must not be operated at this time. The attendant cannot, however, listen in on a connection between two extensions.

(g) **Night Service:**

6.10 To connect an extension with a trunk for night service, the attendant operates the night key and depresses the trunk key of that trunk to the talking position. The attendant then operates the extension dial key and, upon hearing dial tone, dials the number of the desired extension (with the night key operated ringing is tripped before the extension bell is rung), after which she restores the trunk and extension dial keys to the normal position. This makes it unnecessary for the extension to dial zero or five when making outward calls. On inward calls the bell at the extension rings when ringing is applied to the trunk. Both the station line and the central office trunk are made busy at the P B X when connected for night service and therefore cannot be reached by dialing from another station. When the position is left for the night, the battery cut-off key is turned to the OFF position.

(h) **Tie Line Connections:**

6.11 Tie line connections are handled in the same manner as trunk connections except for the following features: the holding position of the trunk key is not effective and night service keys do not function with tie lines.

7. POWER PLANT OPERATING FEATURES:

7.1 The continuously operated charging equipment is regulated at the time of installation so that whatever discharge is taken from the battery during periods when the load exceeds the output of the charging equipment will be returned to the battery during the light load or idle periods, with natural losses occurring in active cells taken into consideration.

7.2 The switching apparatus is designed and adjusted for operation within voltage limits at the distributing fuse panel of from 44 to 50 volts. To keep the voltage within these limits the voltmeter relay controls the two groups of counter E.M.F. cells which can be introduced into the discharge circuit. Thus if the voltage rises to 50, the voltmeter relay makes contact on its "High" side and operates a counter E.M.F. cells switch so as to remove the short-circuit from one group of counter E.M.F. cells, thus introducing them into the discharge circuit. If the voltage again rises to 50, the voltmeter relay operates the second switch and the second group of counter E.M.F. cells is introduced. When the voltage drops to 44, the voltmeter relay makes contact on its "Low" side and de-energizes one switch, thus short-circuiting one group of counter E.M.F. cells. When the voltage again drops to 44, the voltmeter relay de-energizes the second switch and so short-circuits the remaining group of counter E.M.F. cells. However, the first counter E.M.F. switch may be operated and then released without the second counter E.M.F. switch being operated.

8. TESTING EQUIPMENT:

8.1 **Test Set:** With the circuit arrangements in the test set, tests may be made of line finder and selector-connector operating features, particular line and restricted service features.

8.2 **Test Line:** A test line is provided for use in routine testing of the selector-connectors. It is so arranged that a switch can be dialed to the test line terminal and then tested for ringing, pre-tripping, tripping and busy.

8.3 **Test Key:** The line finder test key TST, located on the line finder test jack panel, is arranged to routine test the line finders or to start a line finder to hunt for the line connected to test jack "A."