



## A New P.B.X. for Large Establishments

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*Local Systems Development*

**T**O meet the need for private branch exchange facilities for very large establishments, a new dial P.B.X., known as the 702-A, has been made available. Although utilizing dial equipment for local interconnections, it employs a manual switchboard for handling all incoming central-office traffic. Incoming tie-line traffic may be handled either at the manual board or by dial apparatus as desired. It is intended for use in installations requiring between 3,200 and 9,600 lines, or where the particular features provided by this equipment are desired. These capacities are nominal, and will vary with the number of trunks, tie lines, and miscellaneous circuits, and with the arrangement of equipment on the face of the board. Where manual service only is desired the manual board of this

P.B.X. may be used alone without any dial equipment and, known as the 606-A P.B.X., has a nominal capacity of 5,000 lines.

The large size of the switchboard of this new P.B.X. has made it both economical and desirable to provide certain features formerly employed principally in central offices. Among these are machine ringing and the audible-flashing recall. The former is a circuit arrangement that starts "ringing" automatically when a cord is plugged into a station jack, and the latter, one that—after a subscriber has operated his switchhook—causes a lamp associated with the cord circuit to flash at regular intervals and a single stroke buzzer to sound each time the lamp flashes. The lamp continues to flash and the buzzer to operate until the attendant goes in on

the connection. The audible flashing recall may be employed either for both parties, or—with less expense—for one party only, at the customer's option.

The switchboard of the new P.B.X. is similar in structural arrangement and external appearance to those used in manual central offices. There are certain circuit differences, however, because of requirements peculiar to a P.B.X. Talking battery for all calls passing through a central office is supplied from the central office. The battery feed feature of a central office cord circuit is shown in Figure 1. When either the called or calling subscriber is a P.B.X. the same connection is employed: battery for both parties is supplied from a central office.

Because of this fact, however, the cords at a P.B.X. cannot be arranged to provide always the same battery connections. For calls to or from a central office, it is desirable to supply talking battery from the central office, and therefore the cord circuit must connect the station directly to the trunk. For local calls, on the other hand, where a connection is to be established between two stations of the P.B.X., battery must be supplied by the P.B.X. cord. Two types of connection are thus required of the same P.B.X. cord circuits: one for local calls, and one for central-office calls. The cord circuit is arranged to provide the required connection auto-

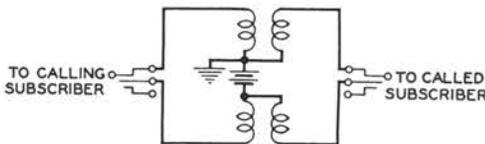


Fig. 1—Battery for talking is supplied by the cord circuit at a central office

matically. The two types of connection are shown in Figure 2.

In many of the earlier P.B.X. boards it has been possible to obtain these two types of connections with a simple cord circuit by employing a jack which, in addition to the usual tip, ring, and sleeve connections, made an auxiliary connection when a plug was inserted. This jack, known as the No. 295, is larger than those used at central offices but with the smaller number of lines terminating at the previous P.B.X. boards, the size of jack has not been of great importance.

With the new P.B.X. switchboard, because of the increased number of

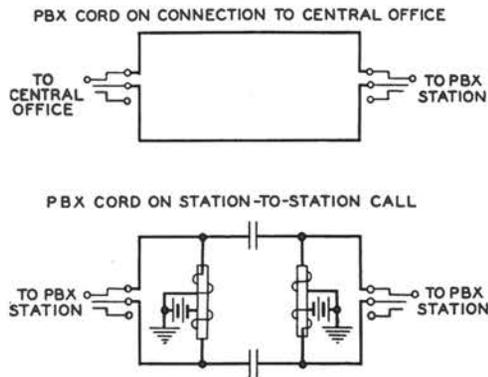


Fig. 2—At a P. B. X. the cord circuit is arranged to supply battery only for local calls. For central-office calls the cord circuit cuts directly through

lines that must be provided for, it has not been possible to use the large No. 295 jack. Instead, the small No. 92 jack, used quite generally for central offices, is employed. It does not have the additional contact, however, so that a more complicated cord-circuit arrangement has been required to obtain both the busy indications and the two types of connection needed.

The circuit provided is shown in Figure 3. With this arrangement the

sleeve of the jacks must be connected to either ground or battery since some method must be provided for selecting the type of connection to be made by the cord circuit, and there is no auxiliary switch contact on the jack to make a connection when a plug is inserted. Ground is therefore connected to the sleeves of both trunk and line jacks but with the trunk jacks a high resistance is put in series with the ground. Connected to the sleeve lead of each end of the cord circuit are two relays in series. One of these is a marginal relay which does not operate through the high resistance in series with ground on the sleeve of the trunk jack. When a plug is inserted in a jack of a local line both of the relays operate, either FS and FM or RS and RM, depending on which end of the cord is inserted. Operation of the marginal relay pre-

vents relay T from operating so that talking battery is connected in the talking circuit. When the plug is inserted in a trunk jack, on the other hand, only one of the relays in the sleeve of the cord circuit operates, FS or RS, and in turn operates relay T so that the circuit is cut through without battery.

Because ground is permanently connected to the jack sleeves, it is necessary to arrange the cord circuits so that battery alone gives the busy indication instead of either battery or ground as with the earlier boards. This has required the use of an additional relay, SL, to make the dial switches busy when a call has been completed manually. This relay operates whenever a plug is inserted in a station jack and connects ground to the dial switches to make them busy. When a call has been completed

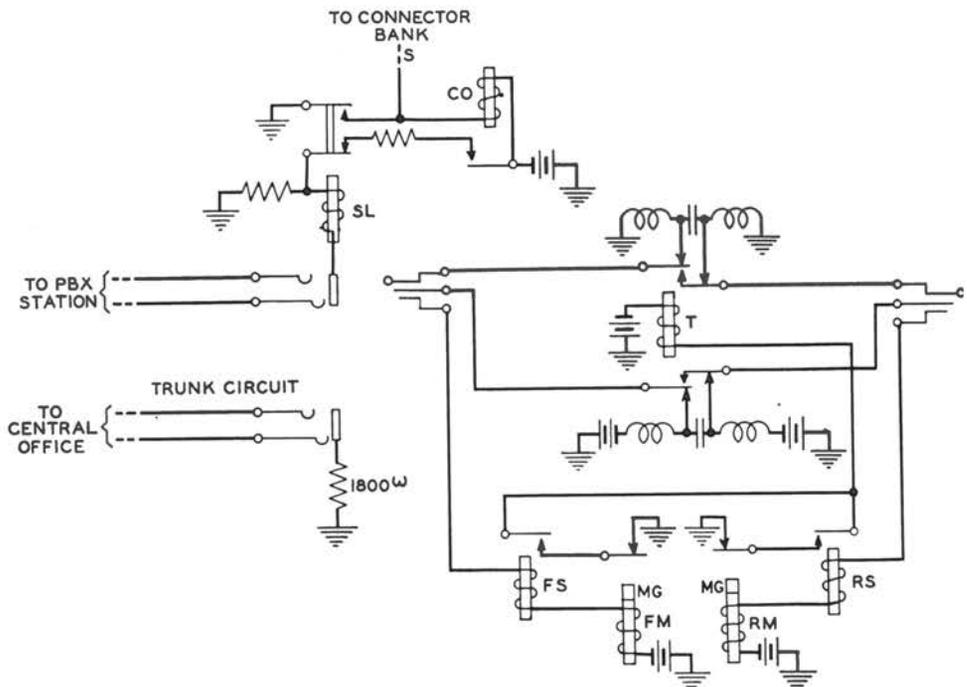


Fig. 3—By the use of additional relays a single cord circuit permits the two types of connection without the aid of large jacks

through the dial apparatus, the CO relay is operated, which makes the station jack busy through a back contact of relay SL. Insertion of a plug at the manual board also makes the other appearances of that jack busy by connecting battery to the sleeve through the FS and FM relays.

This arrangement, made necessary by the employment of the smaller jack, makes possible a somewhat simplified operation of the board. With the earlier boards, only one end of the cord was arranged for connection to central-office trunks. This made it necessary to answer central-office calls with one end of the cord and station calls with the other. With the new circuits all calls are answered with the rear cord and completed with the front, which is the usual central-office practice.

The dial equipment of the new 702 P.B.X. is similar to that used by step-by-step central offices although the line finder frames are somewhat longer to accommodate the additional relay in the line circuit. Line finders, selectors, and connectors are the same as the corresponding central-office switches except when it is necessary to restrict a group of stations from making central-office calls. At a P.B.X. where such restrictions are made, different line finders and first selectors, arranged for this feature, are provided. The line circuits differ from step-by-step central-office line circuits in that they are arranged for appearance at the manual board. With these new P.B.X.'s, large commercial and industrial establishments are given service and equipment essentially the same as a central office.