



A New Dial PBX of Large Capacity

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BUSINESS organizations requiring between eighty and two thousand extensions may be served by a new dial PBX known as the 701-A. This PBX and the recently developed 740 types* which

give service to a smaller number of extensions, will take care of the majority of subscribers requiring dial type equipment. This latest addition to the family of dial-type private branch exchanges replaces the 700-C, and incorporates materially different circuits and equipment.

Because of the large range in the number of extensions that the new PBX is designed to serve, it will naturally be used in a wide variety of establishments, which means that the calling rates and the holding-times will vary considerably for different installations. Realizing these facts, Bell System engineers have made every effort to work out a design that would permit this wide range in size and traffic density to be handled with the smallest possible number of different types of equipment units. This is of prime importance for equipment that is to be produced on a quantity basis and for short deliveries.

The method of handling calls in this PBX closely resembles that for the 700-C PBX. All calls between different dial extensions in the PBX or from an extension to the PBX attendant are handled over dial equipment but outgoing calls, to a central office, to the attendant at a connecting PBX, or to an extension in the connecting PBX may be completed either by dial equipment or manually by the

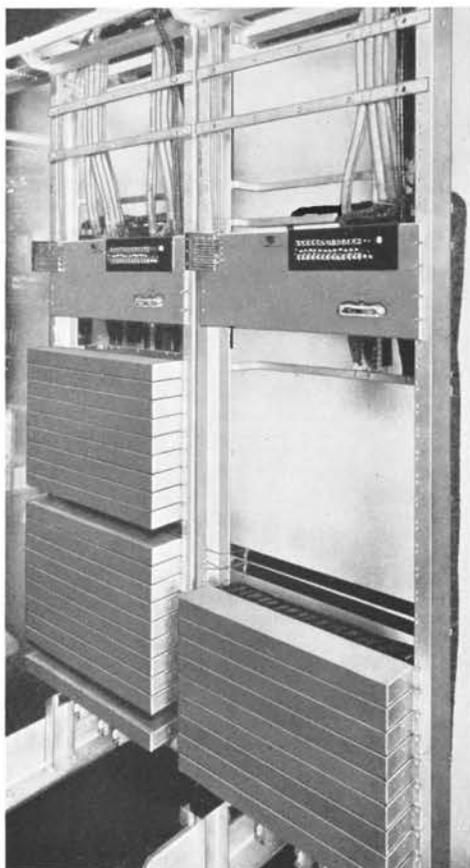


Fig. 1—Each line relay rack mounts equipment for 200 lines and is provided with fuse panel and terminal strips as well as space for a distributing rack at the top

* One of which has already been described in BELL LABORATORIES RECORD, Vol. VI, No. 6, pp. 399-402, August, 1928.

attendant. All incoming calls from a central office, however, are completed manually by the attendant who plugs a cord into the extension multiple in front of her.

Depending on the number of extensions, two, three, or four digits must be dialed to secure a local connection. To obtain a central office only one digit need be dialed; to obtain a tie-line one or two digits may be dialed, depending on the number of groups of tie-lines in use. In no case will more than one digit be required to call the local attendant, the number zero usually being retained for this purpose.

One of the major improvements incorporated in the new exchange, as compared with the earlier one it replaces, is the use of 200-point line finders, which are employed in the more recent step-by-step central offices, to establish connection between the calling extension and the dialing equipment. These function in a manner similar to that of the "A" or answering cord of a manual board. The instant a subscriber lifts his receiver from its hook a line finder starts hunting for the calling line, and when it is found a dial-tone is given—equivalent to the "Number Please" of an operator—which means that dialing may be begun.

Permanently connected to each line finder is a selector, or a selector-connector in the case of a two-digit system, which is equivalent to the calling cord at the "A" position of a manual board. It acts at the beginning of

dialing to pick a trunk to the destination wanted—much as the calling cord would be plugged into the proper jack of a manual board. When only three digits are required to call a local extension, this trunk leads directly to a connector which, upon the dialing of the two additional digits,

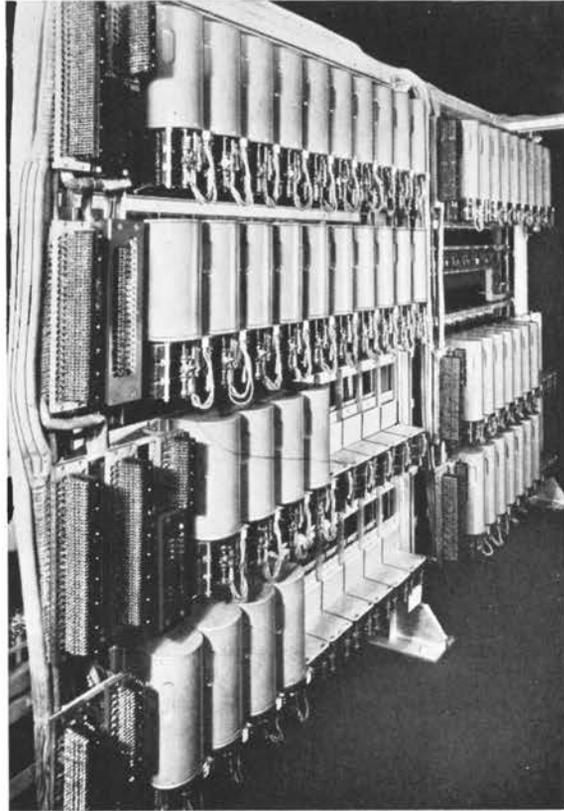


Fig. 2—200-point line finders are mounted with nine switches on a single shelf unit or twenty on a double, as may be seen here

completes the call as would the operator's cord at a "B" position of a manual board. When four digits are required for calling, a second selector is required between the first selector and the connector to make the additional selection required by the larger number of trunks. The connector re-

turns a "ringing" tone to the subscriber, to indicate that the station bell is being rung, or a "busy" tone in case the line is busy.

Line finders, selectors, and connectors are all of the same general type of step-by-step switches, which is

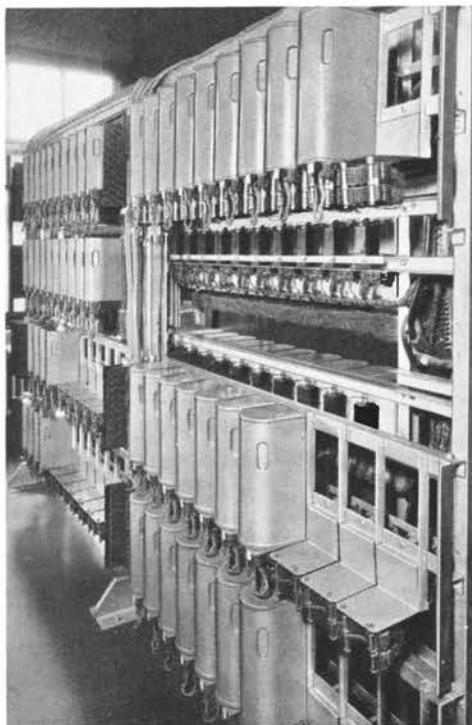


Fig. 3—Connectors are supplied in units of ten or twenty. The universal switch frame mounts four rows, each of ten switches, on both sides

a great advantage in giving uniformity of installation and simplifying maintenance. The manual switchboard associated with the new PBX is usually of the non-multiple type for the smaller (two or three digit) installations, and of the multiple type for the larger installations where more than two attendants are required. The non-multiple board is the same as the 551-B* PBX, except in details of

cord circuit supervision; and for the multiple board, the 605-A, a new manual board is used. This possibility of using standard multiple boards with the new dial PBX is of considerable value, because it reduces the amount of equipment that must be stocked, and simplifies a conversion from manual to dial equipment.

The dialing equipment consists of relay racks for both line and miscellaneous relays; shelf units for mounting the line finders, selectors, and connectors; and switch frames—channel iron frameworks on which any of the shelf units can be fastened in any location. The relay racks and switch frames are self-supporting and their height has been limited to seven feet so that they may be installed in rooms of ordinary ceiling height.

On each line relay rack, two of which are shown in Figure 1, are mounted the line and cut-off relays for a group of two hundred lines, together with the group and sub-group relays used for controlling the operation of the line finders. Fuse panels and terminal strips are also provided, and at the top is space for additional terminal strips which may be used in the smaller installations for distributing purposes. With the larger exchanges separate distributing frames are used. On the miscellaneous relay racks are mounted all the apparatus such as relays, resistances, and condensers required for the various trunks and tie-lines. As twenty-three inch mounting plates are required for the line relays, all relay equipment is designed for this width of plate so that only one width of rack would be required.

The universal switch frame is five feet ten inches wide and shelf units may be mounted on both sides. It is

* BELL LABORATORIES RECORD, Vol. VI, No. 5, pp. 363-365, July, 1928.

so arranged that the various types of shelf units—single or double, for selectors, line finders, or connectors—can be mounted on it interchangeably. This universal arrangement permitting all types of shelves to be mounted interchangeably as well as the provision for mounting shelves on both sides, results in a considerable economy in floor space. This is desirable since a PBX may be located in an office building where space is particularly valuable.

Shelf units are angle-iron structures which fasten directly to the universal switch frames. They are all of the full width of the frame but of two heights depending on whether they mount two rows or only a single row of switches. The shelf units for line finders and selectors are of the same height but differ from those for connectors. Each double unit mounts twenty switches and each single unit, ten; except the single-shelf line-finder unit which mounts only nine switches. Only nine could be used in this case because each group of line finders requires two one-hundred-line terminal strips. One of these is mounted at one end of each shelf with the double unit, but with single shelf units additional space must be provided for the second terminal strip.

Two types of line-finder units are thus available: a single-shelf unit mounting nine line finders, and a double-shelf unit mounting twenty. These may be mounted singly or multiplied together so that line finders in groups of 9, 20, 29, or 40 can be supplied. This makes it possible to take care of a wide variation in the originating traffic as it allows anything up to a maximum of forty simultaneous connections in a group of 200 lines, thus permitting eighty extensions to

hold conversation at one time. Connectors in groups of either ten or twenty per hundred lines may be furnished which should care for all ordinary variations in traffic density.

This unit method of mounting equipment has been extended in the new PBX, to the miscellaneous relay racks. Equipment for trunks, tie-lines, and miscellaneous circuits has been arranged on self-contained units of which a total of about thirty has been designed to care for different types of circuits. Each unit usually mounts the equipment for a single circuit but in a few cases multi-circuit units have been provided when it seemed more economical to do so. All these units, as well as the various shelf units, are assembled, equipped, and wired at the factory and are provided with a terminal strip to which the switchboard cable can be connected.

The power plant is of the automatic type. Different sizes are available and are arranged for either alternating or direct current operation. A trickle charger to supply continuous charging, is used for the smaller installations while for the larger, the amount of charging is governed by an ampere-hour meter. Voltage regulation is obtained by relays which cut in or out the required number of end-cells. Ringing current and tones are obtained from a machine which, under the control of the switches operates only when required. Ringing current for the manual board, however, is furnished from the central office.

The new 701-A PBX is thus equipped with the latest type of apparatus throughout and at the same time is conveniently and compactly arranged. It should require less maintenance than its predecessor and give the best possible service.