

# CURRENT COMMENTS

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## Private Automatic Exchanges An All-Relay Unit for Small Systems

**A**N internal telephone system is universally accepted as one of the first essentials of an efficiently conducted business, proving, in small commercial houses as in large, a valuable aid to the transaction of business affairs. Whilst the telephone systems in office, factory, warehouse, etc., have a common objective, the principles of operation differ, being largely dependent upon the size of installation. The majority of modern systems may be placed in two classes, the first comprising those known as intercommunication systems and the second being formed of systems incorporating an automatic exchange. In the former each telephone is fitted with a set of push buttons, one for each line, and to call any party the appropriate button is depressed, selection of the wanted line being thus made actually at the calling instrument. This involves, however, the linking together of all telephones by a multiple cable containing wires to a total greater than the number of telephones. In an exchange system, on the other hand, since the telephones are individually connected to a central switching equipment, the multiple cable is dispensed with.

The multiple cable and the push-button mechanism necessary to each telephone confine the use of the inter-communication system to small installations, in which sphere

it has found a wide application. Nevertheless, the necessity for this cable and the further disadvantage that conversations are not secret have in many instances led to a preference for a small automatic exchange. This practice has not always resulted in the greatest measure of economy since it has often involved the provision of a partly-equipped switchboard with little prospect of full use being made of the maximum capacity. In order to eliminate this uneconomic provision and thus extend to the smallest telephone service the advantages of the automatic system, The General Electric Company has produced the 10-line unit shown in Fig. 1

In a unit of this size the lowest capital cost, a compact design and a minimum current consumption are secured by employing relays for all switching operations. With the recent standardisation by the British Post Office of the major and minor relays, and their consequent production in large numbers, the time was particularly opportune for the production of an all-relay P.A.X. incorporating them. The new unit affords a good example of the respective applications of these relays, both types being employed for the purpose for which they are specifically designed. The connecting link circuits—brought into operation on every call—comprise major relays, the characteristics of this

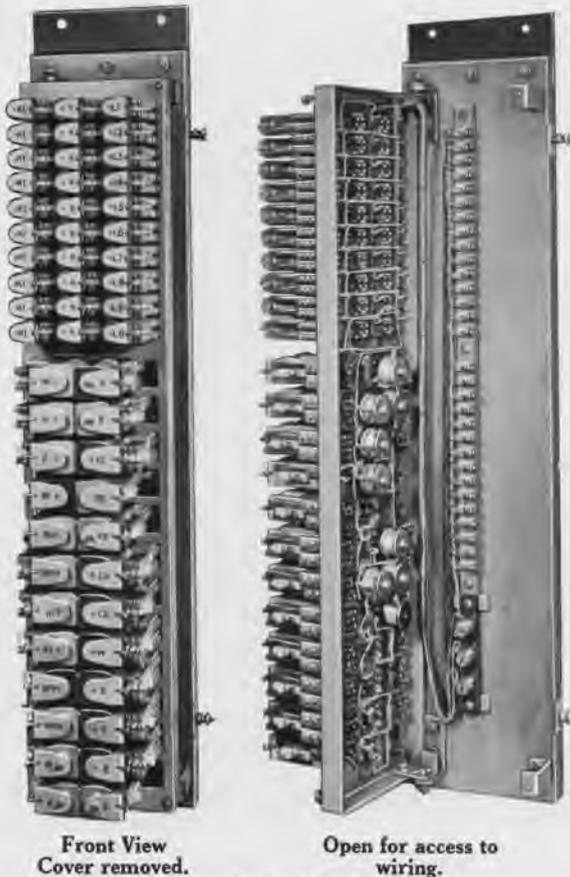


Fig. 1.—10-line all-relay P.A.X.

type being particularly suited to the requirements of heavy-duty circuits. On the other hand, in line circuits—which are individually in action only when their respective lines are in use and thus make but little demand upon their components—economy is secured by employing minor relays.

In the case of large exchanges the percentage of total cost represented by the power equipment is quite reasonable, but when, say, a 25-line switchboard requiring probably a 26-volt supply, is equipped for a small number of lines, the cost of power equipment assumes proportions not in keeping with the balance of the initial outlay. This new unit, however, involves a minimum

of expense in respect of power plant since it is designed to operate from A.C. mains through a small rectifier equipment, entirely dispensing with batteries. Alternatively, of course, a battery may be employed but since the voltage required is only 8 volts, and the current consumption is quite small, such a battery need present no problem of accommodation or charging.

#### Equipment.

From Fig. 1, it is seen that a wood base, arranged for wall mounting, accommodates the relay plate, the whole assembly being enclosed under a sheet steel cover. The plate is hinged as shown, in order to give ready access to the terminations of the line and power wires. Terminals are of the screw type, the whole installation of this unit involving only the use of a screwdriver.

Two connecting links are provided, thus permitting two simultaneous conversations. The relays in each link are five in number and occupy ten positions on the left-hand side of the mounting plate, being designated HR, H, F, BF and RH in the first link and HR1 etc., in the second link. On the right are eleven relays forming a register circuit, whilst the last three relays—M, N and O—are provided as an interrupter chain when interrupted ringing is required. The upper portion of the plate carries the line relays. Each line circuit consists of three relays, one designated L, which is the line relay proper, and two others designated K and K1, which are associated also with the first and second links respectively.

#### Operation.

The lines are numbered in a straightforward series from 1 to 0 and thus to establish any connexion a single digit is



Fig. 2.—Gecophone set for use with 10-line P.A.X.

dialled. This is received by the register circuit, which then “marks” a lead to the K and K1 relays in the line circuit of the called line. Through the agency of the L relay a circuit is already prepared for the K and K1 relays of the calling line. Assuming that the first link is not already in use on a call, relay H operates over a circuit established by the register and completes the circuits for the K relays of the called and calling lines. The operation of these relays connects the lines to the link. Relay F in the link applies current to the line to ring the bell of the wanted party. The bell is of the trembler type, its action giving rise to varying potentials on the lines, which are used to produce ringing tone in the receiver of the calling party’s telephone. When the call is answered relay F establishes circuit conditions by which relay BF becomes the current-feed relay for speech over the established connexion. Relay BF also holds the link engaged in order to pass a succeeding call to the second link. In all cases of this link being taken into use the K1 relays in the line circuits are operated instead of the K relays.

It should be noted that the register is not operative until a dial is moved off-normal and therefore no common apparatus is held engaged should a receiver be not replaced.



Fig. 3.—Mains Unit—Cover removed.

### Telephones.

The telephone for use in conjunction with this new unit is of the modern self-contained type seen in Fig. 2. Provision is made for three connexions to the instrument—two line wires and an earth return for ringing current. If a good earth connexion be available near to the point of installation of a telephone this may provide the ringing return, whilst in other cases triple conductors may be employed between the automatic unit and the telephones.

### Mains Unit.

In a separate unit (Fig. 3) is incorporated a metal rectifier together with associated mains transformer and smoothing equipment. The unit is supplied as required for any specified mains voltage. On the output side three terminals are provided, which, one being common, terminate the equivalent of two pairs of leads to the switchboard. These pairs serve the operating and speech-current feed circuits respectively, being separated in order to ensure that speech circuits are not affected by voltage variation arising from the fluctuating load imposed by the operating circuits.