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Panel-Mounted Cordless P.M.B.X. Switchboards

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A new range of private manual branch exchange (P.M.B.X.) switchboards is described. These have been designed to meet the requirements of the Fire Service and similar authorities who have P.M.B.X.s mounted in their control consoles alongside other switching panels. Ancillary working of these P.M.B.X.s is also described.

INTRODUCTION

CERTAIN subscribers, in particular the Fire Service and Electricity Authorities, find it necessary to concentrate their operational controls at a centralized desk or console where their officers can conveniently observe signals, operate switches, etc., and thus discharge their duties with maximum efficiency. It is often necessary for these officers to be provided with ready access to telephone facilities in the form of a private manual branch exchange (P.M.B.X.).

In the past, these requirements have been met by incorporating a standard Post Office type P.M.B.X. as part of the console. More often than not this resulted in an inconvenient, aesthetically displeasing, arrangement, and caused various non-standard type switchboards to be constructed specially for mounting in a console. An example of this type of installation is shown in Fig. 1.

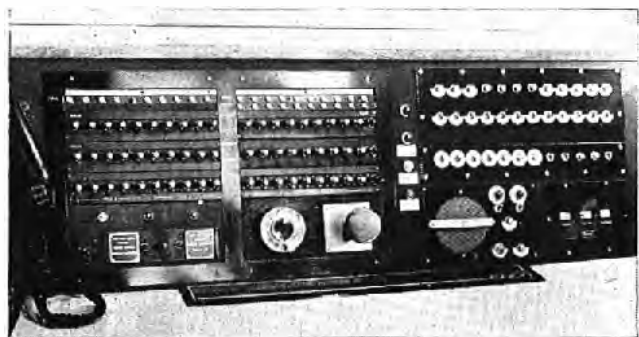


FIG. 1—NON-STANDARD P.M.B.X. PANELS INCORPORATED IN RENTER'S CONSOLE

To meet the growing demand for the type of installation described above, the decision was taken to introduce a standard panel-mounted P.M.B.X. suitable for incorporating in a console. The new P.M.B.X. was to be of modern design and was to compare favourably in appearance with other panels with which it might be associated.

A study of the requirements of a number of proposed installations showed that the needs could best be met by the development of two sizes of board: one, with a capacity of three exchange lines and 12 extensions (3 + 12), has been coded P.M.B.X. No. 3/3B, and the other, with a capacity of five exchange lines and 25 extensions (5 + 25), has been coded P.M.B.X. No. 3/5B.

The decision to produce a 5 + 25 size of cordless switchboard required careful consideration. Such a switchboard would be the largest of this type that the British Post Office had introduced, and it was possible that the large number of keys would introduce operating

difficulties. Furthermore, in order to keep the number of keys to a minimum, only seven connecting circuits were to be provided, which is less than the normal provision for a board of this capacity. For these reasons, therefore, the use of the larger board was restricted at first to Fire Service and Central Electricity Generating Board control rooms. It was considered that the lower calling rate at these establishments and the skilled operating staff available would permit the use of the board without difficulty. Recently, however, it has been decided to remove this restriction, and both sizes of P.M.B.X. are now available to any subscriber. For the larger size of switchboard it is, however, stipulated that the traffic rate should be relatively low.

Provision has been made for wall mounting the switchboards if this is required.

PHYSICAL CONSTRUCTION OF P.M.B.X.

Both sizes of P.M.B.X. are of similar physical design and consist of a key panel and an apparatus rack (coded Equipment, P.M.B.X., No. 3/ . . .) having the dimensions and weights shown in the table.

Dimensions and Weights of P.M.B.X.s No. 3/3B and 3/5B

Item	Width (in.)	Height (in.)	Depth (in.)	Weight (lb)
Panel, P.M.B.X., No. 3/3B	16	13	5	15
Equipment, P.M.B.X., No. 3/3B	20	18	8	47
Panel, P.M.B.X., No. 3/5B	24½	18	7	30
Equipment, P.M.B.X., No. 3/5B	24	18	8	60

Fig. 2 shows a front view of the panel portion of the switchboard; it is finished in elephant-grey stoved p.v.c. (Organosol) and contains only that equipment necessary to operate the switchboard, i.e. designation strips, lamps, keys, dial and operator's telephone jack.

The exchange-line designation strips are fitted in a rectangular opening above the exchange-line calling

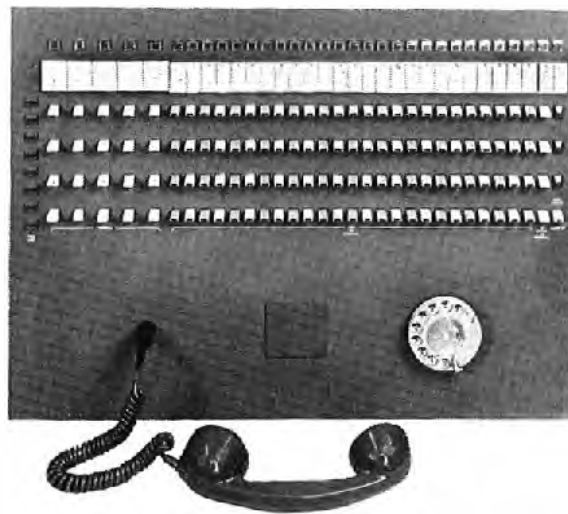


FIG. 2—FRONT VIEW OF KEY PANEL OF P.M.B.X. NO. 3/5B

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lamps. If s.t.d. meters are requested, these are fitted in place of the normal designation strip, which is replaced by a smaller type of strip secured by the upper fixing screws of the meters. The extension designation strips are mounted above the extension calling lamps, and are fitted with clips that slide into slots cut in the panel.

The operator's telephone jack provided on the front of the panel can be used to connect either a Handset No. 3 or a Headset No. 1. Tag blocks are provided on the rear of the panel for terminating the cable from the equipment case and to provide a convenient strapping point to enable certain extension terminations to be used either for extensions or private circuits.

The Equipment, P.M.B.X., No. 3/... (Fig. 3), which

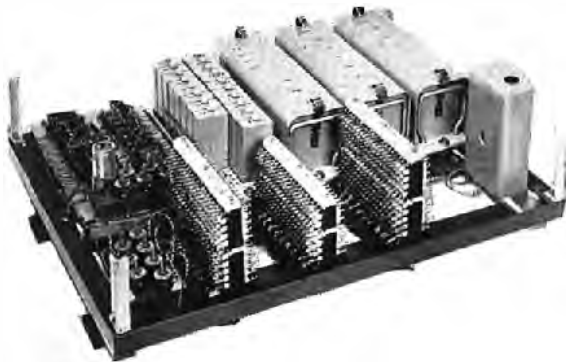


FIG. 3—APPARATUS RACK (EQUIPMENT, P.M.B.X., NO. 3/...).

may be mounted away from the panel portion, contains the remainder of the switchboard equipment, and consists of a mild-steel framework fitted with relay plates, tag boards for resistors and capacitors, the operator's telephone circuit, and tag blocks for terminating external cables and the interconnecting cable from the panel, all being enclosed by a steel cover finished in elephant grey.

WALL MOUNTING

Although the switchboards were primarily developed for use in consoles and similar positions, the shallow depth of the panel portion, coupled with remote mounting of the bulk of the equipment, makes these P.M.B.X.s very suitable for wall mounting. For this purpose drawings have been prepared of suitable cases that may be constructed by local Post Office staff, or, alternatively, the drawings may be supplied to a customer to make his own arrangement for manufacture.

ANCILLARY WORKING

It is not expected that there will be a big demand for ancillary working, but circuits have been designed that will permit two or more switchboards to be coupled together with a minimum of interference with the permanent wiring of the P.M.B.X.s.

Incoming lines are connected to both switchboards via additional switching equipment associated with each line. Operation of an exchange-line or extension speak key on one position causes the line to be switched to that position, lights the appropriate calling lamp on the other position to indicate a busy condition, and disconnects the control lead from the second speak key to prevent interference with the call should that key be accidentally operated. Simultaneous operation of the appropriate speak keys on both positions will result in the incoming line being switched to only one position.

Fig. 4 shows the basic circuit element of the auxiliary apparatus used to couple a 4-wire internal extension¹ to two P.M.B.X.s No. 3/... When the extension calls, relay L operates via the telephone loop; contact L2 connects interrupted earth potential to the extension-lamp circuits on both positions, and contacts L3 and L5 operate the buzzers on both positions. Operation of the speak key on position A transfers the calling-lamp circuit on that position only from the incoming B-wire to the C-wire: relay TA operates in series with the lamp circuit, but the calling lamp will not glow in series with the high-resistance windings of relay TA. Contact TA1 disconnects relay TB and operates relay SA. The disconnection of relay TB prevents interference with the call should the speak key on position B be accidentally operated. Contacts SA1 and SA2 switch the extension line through to the A-wire and B-wire of position A. Contact SA3 connects earth to the calling lamp on

¹LIDBETTER, E. J. The 4-Wire Extension Principle for Small Cordless P.M.B.X. Switchboards. *P.O.E.E.J.*, Vol. 53, p. 167, Oct. 1960.

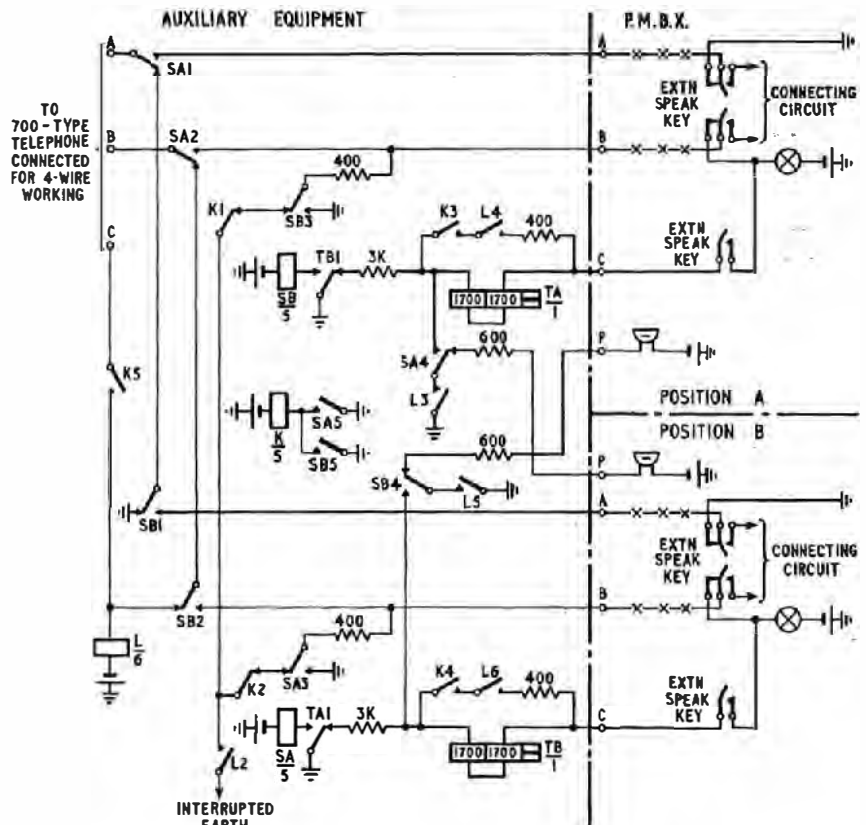


FIG. 4—SIMPLIFIED DIAGRAM OF COUPLING CIRCUIT

position B, causing it to glow and give the busy indication. Relay L releases on the operation of relay SA and disconnects the buzzer circuit on both positions. Contact SA5 operates relay K, which connects relay L to the C-wire of the extension telephone.

If the extension user presses the recall button or replaces the handset, earth potential is connected to the telephone C-wire, operating relay L. Contact L3 short-circuits the 3,000-ohm resistor in series with relay TA, and contact L4 connects a 400-ohm resistor across relay TA. This increases the current flowing in the C-wire to position A to a value high enough to cause the lamp to glow without releasing relay TA. Contact L5 connects earth to the buzzer on position A, and contact SA4 prevents the operation of the buzzer on position B. When the speak key is restored, relays TA, SA and K release.

Similar circuits have been developed to provide the

ringing is derived from a transistor-type ringing device energized by the 50-volt battery. Indication of a mains failure is given on a small key-and-lamp unit, which may be mounted on the front of the panel in place of a removable plate.

ADDITIONAL FACILITIES FOR THE FIRE SERVICE

The Fire Service frequently requires the facility of priority signalling,* and provision has been made to cater for this in conjunction with the new switchboards. The appropriate circuits have been designed, and small matching panels of keys and lamps are available which can be mounted adjacent to, and to line up with, the extension lamps on the P.M.B.X.

Matching panels have also been developed to accommodate the keys and lamps, etc., for the miscellany of alarm and firemen's call-out circuits provided by the Post Office for the Fire Service.



The priority-signalling panel is fitted above the left-hand switchboard; the miscellaneous-control panel is in the centre.

FIG. 5—TYPICAL INSTALLATION OF TWO 5 + 25 P.M.B.X. PANELS, A PRIORITY-SIGNALLING PANEL AND A MISCELLANEOUS-CONTROL PANEL

coupling facility on 2-wire external extensions, exchange lines and private circuits.

POWER SUPPLIES

Both P.M.B.X.s have been designed to operate from a nominal 50-volt d.c. supply that may be obtained either direct from a power unit connected to the mains or from a battery of float-charged secondary cells if stand-by power is required.

If full operation under mains-failure conditions is not required, ringing supplies are obtained from a rectifier-and-frequency-division unit² connected directly to a.c. mains. If the mains fail, established extension-to-exchange calls will be unaffected. Incoming calls on the first exchange-line will ring a magneto bell associated with the operator's telephone circuit; the remaining exchange lines may be extended by the connecting-circuit keys to selected extensions to maintain exchange-line service.

If full operation during mains failure is required,

Fig. 5 illustrates a typical installation using two 5 + 25 panel-mounted P.M.B.X.s, with a priority-signalling panel above the left-hand switchboard and a miscellaneous control panel, fitted with keys and lamps for call-out purposes, in the centre.

CONCLUSIONS

The panel-mounted switchboards have proved suitable for the operating requirements of the services for which they were designed, and, in practice, have found applications in wider fields than was originally anticipated. P.M.B.X.s of this type have been installed in locations as widely different as solicitors' offices, laundries and radio stations.

*Priority signalling is a facility which enables a P.M.B.X. operator to send an emergency signal (usually to another operator) over an engaged extension circuit.

²MOORE, M. B., and GORE, J. S. A New Range of Ringing Convertors for Subscribers' Apparatus. *P.O.E.E.J.*, Vol. 57, p. 187, Oct. 1964.