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THE INSTITUTION OF POST OFFICE ELECTRICAL ENGINEERS

Post Office Standard P.A.B.X.s

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Part 2.—The P.A.B.X. No. 2

U.D.C. 621.395.24

The author gives an outline of the P.A.B.X. No. 2, which is similar to the P.A.B.X. No. 1 (see Part 1) but works in conjunction with a cord-type manual board and permits the connection of an additional 30 manual extensions. Some detail is given of the differences in circuitry, which relate particularly to calls handled at the manual board. Part 3 will conclude the series with a description of the largest exchange, i.e. the P.A.B.X. No. 3.

Introduction

THE description of the automatic equipment of the P.A.B.X. No. 1 given in Part 1 applies, in general, also to the P.A.B.X. No. 2. The important difference is that for the No. 2 a conventional floor-pattern cord-type manual board is provided; and incidental to that, a group of 30 manual extensions, additional to the maximum of 49 automatic extensions, can be added for all sizes of automatic equipment. The greater proportion of the automatic equipment is common to both types of P.A.B.X. and the slight changes in circuitry are concerned with the different type of termination on the manual board and the changes in operating procedure.

The design of the P.A.B.X. No. 1 emphasises a main design objective which is to reduce operating attention to a minimum, vesting as much control as possible in the extension user. This must always be an important consideration when comparing the advantages of automatic working against manual working. Indeed, it is the most important factor from the subscriber's point of view, since he is usually concerned only with the hard facts of economic comparison and is unlikely to be impressed by the niceties of automatic working or the designing engineer's ingenuity. It may seem odd, therefore, that the P.A.B.X. No. 2 should have been introduced as it would appear to be a step in the wrong direction. At the time of the introduction of the P.A.B.X.s, however, it was considered that a demand would still exist in the special case, for the personal attention of a full-time operator. Although the demand for P.A.B.X.s No. 2 is at present very small, it is perhaps too early to suggest that its provision as an alternative was not justified.

The Manual Board and Manual Extensions

The cord-type manual board is illustrated in Fig. **1**. It is in fact the floor-pattern manual board now standard for all multiple P.B.X. installations whether manual or automatic. The equipment was described in its original form in an earlier article[1] and although it has undergone improvement since then, it is not sensibly different to-day. The dual function of the switchboard is achieved by jacking-in the appropriate cord circuit relay sets at the rear of the switchboard. The face equipment is, of course, arranged as required. A 50V cord circuit is used for auto working and an additional relay, differentially connected in series with the feeding relay, is used for recall purposes. Otherwise the circuit is similar to that used for manual working.

The numbering scheme and provision of automatic extensions is the same as for the P.A.B.X. No. 1. As previously mentioned, however, it is possible to provide an additional 30 manual extension circuits. These circuits are terminated directly on the manual board, the line relays being mounted at the rear of the switchboard. Connection to these circuits can only be obtained from the switchboard and they are thus different from the two manual circuits provided on the No. 1 equipment, which fall within the automatic numbering scheme and are accessible from the auto multiple. It is of interest to note that they are allocated 3-digit numbers 010 to 029. The first digit "0" ensures that if they are dialled from an automatic extension the call will be routed to the P.B.X. operator.

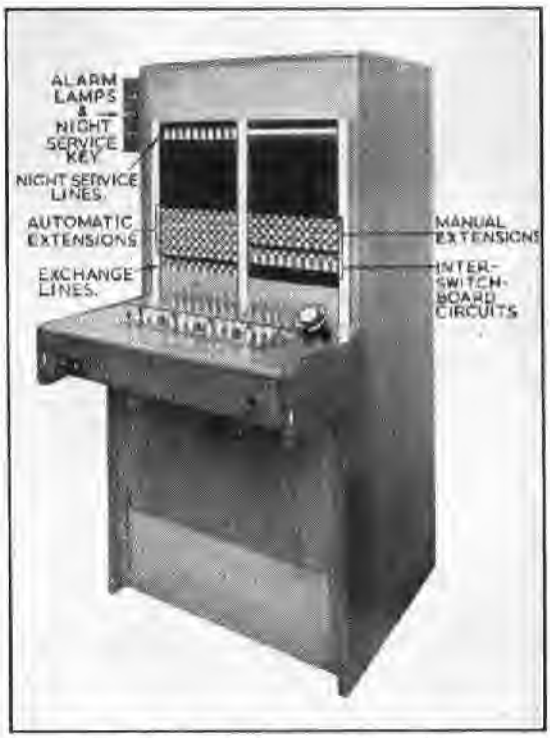

FIG. 1.—THE CORD-TYPE MANUAL BOARD.

Outline of Operation

The similarity between the No. 1 and 2 types of equipment makes it unnecessary to go into detail except to point out some differences, particularly in the method of switching via the manual board.

The trunking arrangements are given in Fig. **2**. Points of difference between this and the No. 1 trunking are that the cordless switchboard is replaced by the cord board; the marker and switchboard circuit is no longer required; the "0" level circuit is referred to as the "lamp lighting" circuit; and the extension multiple is connected to the manual board.

Extension-to-extension and direct-access incoming or outgoing calls operate in exactly the same manner as for the No. 1, but there are some changes in the manual board call.

Incoming and Outgoing Calls via Manual Board.

The P.A.B.X. No. 1 cordless switchboard has no direct connection to automatic extension circuits and all calls handled by the operator are routed through the automatic equipment by means of key-sending and marking equipment. A jack and lamp appearance for every extension is

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[1] *P.O.E.E.J.*, Vol. 32, Part 2, p. 57.

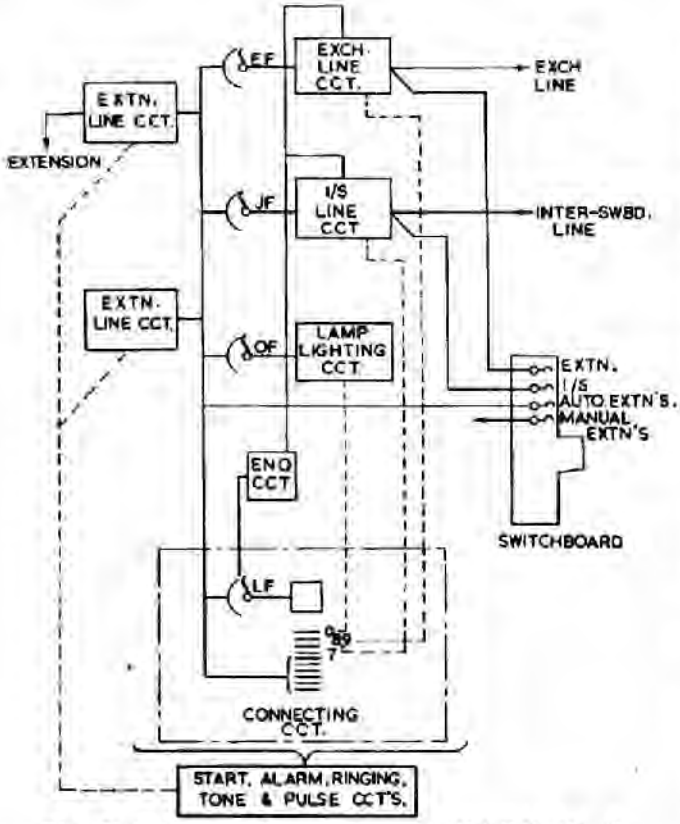

FIG. 2.—TRUNKING ARRANGEMENTS OF P.A.B.X. NO. 2.

provided, however, on the P.A.B.X. No. 2 switchboard and connection of calls by the operator follows normal P.M.B.X. practice. The method of obtaining the operator from an automatic extension is of interest, particularly because it applies equally to the smaller sizes of P.A.B.X. No. 3 (which will be described in Part 3 of this series) and is referred to as "lamp per line" working.

As with the P.A.B.X. No. 1 the extension dials "0" to obtain the operator. A similar sequence of operations takes place, i.e. the receipt of "0" by the connecting circuit causes an "0" level finder (OF) to find the calling extension. Separate "0" level circuits are not provided, however, and the circuit associated with OF is known as the "lamp lighting circuit." Its function is to light the calling lamp of the extension dialling "0" on the switchboard and return ringing tone.

Fig. 3 shows the elements of the circuit concerned. The

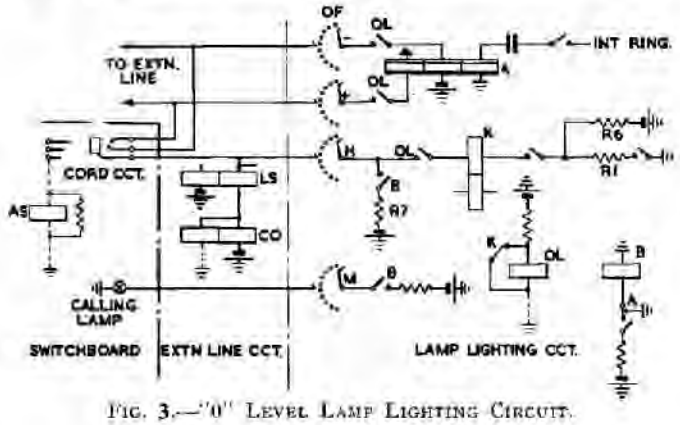

FIG. 3.—"0" LEVEL LAMP LIGHTING CIRCUIT.

receipt of a start signal causes OF to find the calling extension and the circuit is held over the hold wire (H). Relay A is operated from the extension loop and ringing tone is connected. The lamp on the switchboard is lighted over the M wire. The lamp lighting circuit is released when the operator answers, by releasing the holding relay K. The method of effecting the release of K is somewhat unusual because the only change of condition when the operator answers is the connection of the sleeve circuit to the H wire. The arrangement of resistors R1, R6 and R7 now becomes apparent—the 15-ohm coil of relay K is across a network comprising the sleeve circuit, line circuit and R7 on one side and R1 and R6 on the other, and the current through K is, for all practical purposes, reduced to zero.

SPECIAL FACILITIES

"Ring When Free."

This facility is not given on the P.A.B.X. No 2. It would be difficult to provide in any case, because there is no automatic equipment in circuit when an incoming exchange call is connected to an extension. Normal P.M.B.X. operating practice is therefore followed.

Enquiry and Transfer.

The enquiry facility is provided in exactly the same manner as for the P.A.B.X. No. 1, but automatic transfer is not provided while the switchboard is attended. The additional complication would be, of course, that, as an incoming call is set up through the manual board cord circuit it can only be transferred by the operator. It would be possible at the enquiry stage to connect the call through the automatic equipment, disconnecting it from the cord circuit and giving the operator a clearing signal, and so allow automatic transfer to be given. This method, has in fact, been used by some manufacturers for overseas equipment. It was decided for Post Office equipment, however, that manual transfer would be used and thus the extension user must call in the operator to transfer the connection.

During night service conditions, when the switchboard is not staffed, calls will be connected automatically to the extension by the use of "dial 8" night service and automatic transfer is given.

Night Service.

The standard "dial 8" night service arrangements apply. Additionally, as a standard facility it is also possible to provide "direct extension" night service, i.e. the connection of selected exchange lines to selected extensions by plugging them through at the manual board as in normal P.M.B.X. practice. Extensions so treated would not, however, have access to the P.A.B.X. equipment and could not participate in the "dial 8" service. They would become in effect single direct exchange lines.

Miscellaneous.

Alarms are extended to the manual board as in the case of the No. 1 equipment. Extension P.G. alarm is also provided but because each extension has a calling lamp on the switchboard the P.G. extension can be readily ascertained by operating a P.G. test key fitted on the switchboard, which will cause the calling lamp of the P.G. extension to glow. A manual extension will, of course, immediately light the calling lamp under P.G. conditions.

(To be continued)