

I N D E X

P.A.B.X.3 & SATELLITE

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Introduction

1. Until the early 1950's PABX's of 50 lines and over supplied by Contractors to the Subscriber were not of a P.O. approved pattern and each manufacturer was allowed to instal his own version of this system. At this time however, the P.O. standardised on a Cord type PABX which was known as the P.O. PABX No. 3.

This standardisation had for the P.O. great advantages the most obvious of these being the inter-changeability of equipment items with a consequent huge reduction in the number and variant of spares, to be carried.

Here perhaps we should mention that the P.O. have taken similar action with the Cordless type of PABX system and once again standardised.

The PABX No. 3 however, should not be considered as superseded by the PABX 4 as sales-wise it has a number of attractive features. For example:

- (a) The quantity of automatic equipment required is less, resulting in lower cost.
- (b) Less floor space is necessary.
- (c) Operators are able to provide a more personal type of service.
- (d) Manual extension can be supplied to allow selected personnel to make and receive calls via the operator only.
- (e) It is eminently suitable for those establishments, where owing to the movement of staff it is necessary for the operator to try several extensions in order to locate the wanted party. This can be achieved without having to dial every extension.

2.

Description

- 2.1. The PABX No. 3 is a Step-by-Step system generally for use with a minimum of 50 extensions. It does however, have capacity to cater for Exchanges of any number of extensions, Exchange lines, Private lines, Inter-switchboard circuits.

Satellite Exchanges are also a Standard feature.

The system uses 50 point uniselectors as line finders and 2000 or 4000 type two motion selectors as group and final selectors in the main Switching train. The relays employed are of the 600 type for line circuits and predominately of the 3000 type for all other applications. Most relay sets are of the Jack-in pattern.

Open type racks are used throughout and the present standard finish of these is cream.

2.2 A typical PABX No. 3 would consist of:-

- (a) Cord type Manual Switchboard with Cable Turning Section and End Panel.
- (b) Line and Final Selector Racks.
- (c) Group Selector Racks.
- (d) Relay Set Racks.
- (e) Pulse Distribution and Ringer Racks.

2.3 The Dimensions and Capacity of the Equipment are as follows:-

Manual Board

Standard Unit For use with up to 800 Extensions with lamp per line working or 1600 lines with "0" level working.

4 ft 8"ins high x 2'ft - 2 $\frac{1}{2}$ "ins wide x 2'ft 9.7/16"ins deep
END PANEL $\frac{7}{8}$ ins thick.

CABLE TURNING Section 4'ft 8"ins high x 1'ft 3 $\frac{1}{2}$ "ins wide x 1'ft 6.7/16" deep.

High Unit for use with up to 2000 lines "0" level working.

Height 5'ft 1"ins, all other dimensions as standard unit.

Capacity Standard Unit.

800 Extension lines or 1600 lines (see above)

15 Cord circuits Relay set mounted (5 R/S circuits per base) and cords and plugs.

High Units 2000 Extension lines 30 Exchange and Inter-switchboard, lines with F.L.S.

Line and Final Selector Rack

Dimensions 7'ft 6"ins high x 3'ft 6"ins wide (maximum 14 final Selrs

7'ft 6"ins high x 3'ft 9"ins wide (maximum 16 final Selrs

Capacity 100 Line Relays
14 or 16 Final Selectors (as required)
20 Line finders

Group Selector Rack (1st Incoming and Enquiry)

Dimensions 7'ft 6"ins high x 4'ft 6"ins wide.

Capacity 50 Selectors (5 shelves 10 selectors per shelf)

Relay Set Rack

Dimensions 7'ft 6"ins high x 4'ft 6"ins wide.

Capacity 20 Exchange line or inter-switchboard relay sets.

10 Lamp lighting relay sets (or "0" level R/S)
(2 per base i.e. 20 circuits)

5 Miscellaneous relay sets

5 Enquiry relay sets

5 Enquiry finders

3 Ring and tone relay sets) (Superseded by the)
fitting of a ringing) 1 per
machine & only required) 200
on extensions for old) lines
type systems))

3 Pulse relay sets

1 Manual ring and alarm relay sets

1 6V AC supply unit

Auxiliary Relay Set Rack

Dimensions 7'ft 6"ins high x 2'ft 9"ins wide

Capacity 25 Exchange line relay sets or inter-switchboard
relay sets (Mixed if necessary)

Pulse distribution and ringer rack

Dimensions 7'ft 6"ins high x 2'ft 9"ins wide

Capacity 2 Dynamotors 44A

2 Ringing machine control relay sets

1 Common services relay sets

1 Pulse generator relay set

1 Manual alarm relay set

1 Set automatic change-over equipment (required
if 2 ringing machines fitted)

2.4

Choice of Site

The room in which the apparatus is to be installed should be dry and have a level floor. It should be either parquet or covered with good quality linoleum, or thermo-plastic tiles. These are necessary in order to reduce the problem of dust, which is harmful to all telephone equipment.

Preferably the exchange should be located in a central position as this will permit the total amount of wiring to the extension telephones to be kept to a minimum.

The Equipment should not be installed in a position underneath water or soil pipes etc. When a building has a Sprinkler System of Fire Control, no sprinkler outlets are to be fitted in the rooms used for manual switchboard and Automatic equipment.

Special heat and smoke detectors that will give a fire alarm are usually installed in these rooms.

2.5 Floor Loading

250 - 300 lbs per foot run, 3½" wide base.

It is important that customers are informed of the floor loadings at an early stage in the negotiations, as many buildings would need reinforcement on all floors except the basement.

3. Numbering Scheme

3.1. Main PABX No. 3

The first selector levels are normally allocated in the following manner -

Level 1 SPARE, but may be used in exceptional circumstances subject to Post Office approval.

Levels 2 to 7

Extension numbers including inter-switchboard lines with final selector access or additional groups of inter-switchboard circuits etc.

Level 8 Inter-switchboard lines (either direct or via 2nd selector levels 81, 82 etc when necessary.

Level 9 Direct access to Public Exchange network.

Level 0 Manual switchboard operator.

3.2 Manual extensions outside the normal Automatic numbering scheme are prefixed by the digit "0" e.g. 00 to 019 etc.

When working to a satellite PABX, level 6 is usually allocated to unidirectional or bothway junctions. Level 7 is usually used for access to additional inter-switchboard circuits when required. 3, 4 or mixed 3 and 4 digit working can be given.

3.3 Satellite PABX No. 3

A Satellite exchange provides automatic connection between extensions, but calls to and from the Public Exchange Network are made with the assistance of the operator. At the main PABX direct outgoing access to the Public Exchange via level 9 can be provided as an optional facility.

3.4 Satellite PABX numbering Scheme

The first selector levels are normally allocated as follows:-

Level 1 SPARE
 Levels 2 to 6 Extension numbers or inter-switchboard circuits etc.
 Level 7 Unidirectional or bothway junctions to main PABX 3.
 Level 8 SPARE
 Level 9 Direct access to Public Exchange if required.
 Level 0 Main PABX manual switchboard operator.
 Again 3,4 or mixed 3 and 4 digit working can be supplied.

3.5 Tones

Dial tone, Busy Tone, N.U. tone (number unobtainable) are as standardised by the British Post Office. All tones and ringing current are produced by a Dynamotor. In the event of ringing failure a standby Dynamotor can be provided to take over tone and ringing supplies automatically.

3.6 Release

First party, (i.e. either party) release of local automatic calls.
 Alternatively calling party releases can be given if required.

4. PABX 3

The purpose of these notes is to convey to the reader the scope and application of the various circuits that comprise the PABX No.3. The circuits will be described as far as possible in the order in which they occur on the Typical trunking diagram on pages 24 and 25.

4.1 Extension Line Diagram SA 8151

This circuit has conventional line and cut-off relays, designated LS and CO respectively.

Line Limits Maximum loop resistance inclusive of telephone 700 ohms with 50000 ohms wire to wire or wire to earth.

- (a) The extension line can make and receive automatic calls via group and final selectors.
- (b) Receive a call direct via a cord circuit of the manual switchboard.
- (c) Direct access to the Public Exchange Network may be obtained by dialling "9".
 Any extension may be denied this facility by the alteration of a B.T.C. strap.

When trunk barring facility is required certain extensions may be permitted access to the Public Exchange Network for local calls, but any attempt to dial a trunk number is frustrated and the caller receives N.U. tone.

- (d) Extensions 30-34 and 80-84 of each hundred group may be used as manual extensions, or used as an incoming line associated with an inter-switchboard circuit.
- (e) Extensions 40 and 90 of each hundred group are wired via routine test jacks, but may be used as ordinary extensions as well.
- (f) Arrangements can be made for extensions to be called by the operator via her cord circuit, but prevented from receiving automatic calls via the Final Selector multiple. Generally this is used, or executive extensions.
- (g) P.G. or PERMANENT GLOW is a term which dates back to the days when most exchanges were manually operated, and indicates that either a telephone receiver has been left off its rest, or a short circuit is present on the line.
If the caller, when making an automatic call does not dial before 30 seconds have elapsed, the 1st group selector is released from the extension line circuit, and a signal passed to the operator indicating this condition exists.
Alarms are also given in the auto room.
- (h) There are two methods of signalling the manual board operators.
- (i) Lamp per Line Working
When lamp per line working is specified a call to the operator is indicated by the line lamp located above the calling extension line jack or the manual board, multiple.
- (ii) "0" Level Working
When level "0" working is specified a call to the operator is indicated by lighting the lamp on the manual board associated with an 0 level circuit. The operator will ask the caller his extension number and plug into the callers line multiple jack.

4.2 Long Line Circuit Diagram SA 8104

This is an applique circuit which is used when the resistance of the extension line is over 700 ohms and does not exceed 1000 ohms (including telephone instrument)
(which is approx 300 ohms)

4.3 Auxiliary Circuit for Inter-Switchboard Line to PMBX or Long Private Circuit Diagram SA 8190

The circuit provides:-

- (a) Access from a distant PMBX to a line circuit of the PABX No. 3 and facility for dialling the required extension.
- (b) For use as a manual termination at both the distant and PABX No. 3 end, in these circumstances an extension line circuit is not required.
The distant caller may be connected to a PABX extension via the operator and vice versa.
- (c) If required the circuit may be prohibited from being extended by the operator to the Public Exchange Network. This access to the Public Exchange is only given if the extension is in the same P.O. charge area.
- (d) The following methods of signalling may be used -
 - (i) One wire earth calling inward and outward for lines up to 2600 ohms loop.
 - (ii) One wire earth calling inward, one generator (17 CPS AC) outward.
 - (iii) Loop signalling inward generator signalling outward 3000 ohm line loop with auxiliary apparatus at the distant end or 1000 ohms only when to a CB telephone.

4.4 1st Group Selector Diagram SA 8152

The rate of provision for the 1st Group Selector circuit is the same as that of the line-finder.

Every 1st Group Selector is directly connected to its own particular line-finder.

The functions of the 1st Group Selector are as follows:-

- (a) To respond to the start condition put out by one of the extension line circuits associated with a group of 1st selectors.
- (b) To extend a start signal to the line finder drive magnet and provide testing-in conditions which cause the line finder mechanism to stop on the marked multiple outlet of the extension that is marking the call.
- (c) To return dial tone to the caller.
- (d) The wipers are stepped vertically under the control of the dial of the calling extension. At the end of the first train of impulses, the wipers change to a rotary movement to search for a free outlet within the dialled level.

- (e) To connect Busy Tone to the caller if all trunks connected to the dialled level are engaged.
- (f) To connect N.U. tone (number unobtainable) if an extension that is barred access to the Public Exchange dials level "9".
- (g) The selector is to release at the end of a call.
- (h) Forced release of the selector if dialling does not take place after an interval of 30 seconds. It should be remembered that the 1st Group Selector circuit has no speaking bridge, and therefore, any circuit e.g. Fire, Emergency, Code Calls etc, that may be operated from a 1st selector will require its own transmission bridge.

4.5 2nd Group, Incoming or Enquiry Selector Diagram SA 8160

This selector can be used for any of three purposes. The circuit provides -

- (a) The return of Dial Tone to the caller when selector is used as an enquiry or incoming selector, but not when used as second selector.
- (b) The wipers are stepped vertically under the control of the callers dial and the rotary movement automatically searches for a free outlet within the level dialled.
- (c) Switching the calling line through to the second outlet.
- (d) Connects Busy Tone, if all outlets of the level that has been dialled are engaged.
- (e) Returns N.U. tone to the caller when used as enquiry or incoming selector, and a barred level has been dialled.
- (f) Provides connection for 'L' lead of inter-switchboard circuit, through a lamp lighting or "0" level circuit, when access to PABX manual board is required, selector releases when call is terminated.

4.6 Final Selector (Regular) SA 8153

The circuit provides for:-

- (a) Busying the Final Selector to any simultaneous call in the same group grading.
 - (b) The vertical and rotary movement of the selector wipers under the control of dialled impulses.
 - (c) Interrupted ringing current to ring the bell of the called extension, and the return of ringing tone to the calling party.
 - (d) Return of Busy Tone to the caller if the called extension is engaged.
- NB. N.U. tone is heard by the caller if the extension dialled is in a P.G. condition, or not equipped.

- (e) Reversal of + and - leads, and the disconnection of ringing current when the called extension answers.
The + and - leads are reversed to provide answering supervisory conditions on dialled-in inter-switchboard calls.
- (f) A transmission bridge to provide speaking current on the line.
- (g) The selector releases as soon as either party to the call replaces his telephone receiver (First party release) calling party release can be arranged when required.

4.7 Final Selector 2 - 10 PBX Group Hunting

Diagram SA 8169

This selector has all the facilities described in section 4.6 paras. 'a to g' with the addition of PBX hunting over a maximum of 10 extension lines.

The function of PBX hunting is to allow callers who dial the first extension number of a PBX group and find it busy, to cause the final selector to search successively for a free outlet from the remaining extensions forming the group.

If all extensions of a group are engaged the caller receives Busy Tone.

PBX hunting groups can be of any number of extensions between 2 and 10. Group hunting only takes place when the first extension number of a group is dialled, any caller dialling an intermediate number, e.g. 245 of a group 240 + 249 will obtain Busy Tone if that extension is engaged and no search over the remaining extension will take place.

In practice PBX hunting is used in circumstances where a particular office or department receives a large number of similar calls, e.g. Wages Office, General Stores etc. Thus by dialling the number of the 1st extension, the caller has automatic access to all extensions forming the PBX group.

4.8 "0" Level Circuit Diagram SA 8168

The circuit provides :-

- (a) Lighting of an "0" level lamp on the PABX No.3 manual switchboard, when the single digit '0' is dialled.
- (b) Return of ring tone to the caller until the operator answers.
- (c) The circuit releases as soon as the operators cord circuit plug is withdrawn from the 0 level answering jack, the 1st Group Selector also releases at this stage.
- (d) The circuit is held, together with the 1st Group Selector all the time the operators cord plug is in the "0" level answering jack.
- (e) The circuit will also light the line lamp of the inter - switchboard circuit when "0" is dialled-in from a distant PABX or PMBX.
- (f) When more than one "0" level appearance i.e. 2 manual boards or more is required lamp lighting relays must be provided.

"0" level circuits are provided as an alternative to lamp per line working. The operator when answering an "0" level call must ask the caller his number and the service required, and then revert the call via the extension line multiple jack.

4.9. Lamp Lighting Circuit Diagram SA 8157

Lamp lighting circuits are connected to the "0" level multiple bank outlets of 1st Group Selectors and incoming selectors associated with dialling-in inter - switchboard circuits.

The circuit provides -

- (a) The lighting of the calling extension line lamp when, "0" is dialled as a single digit, when lamp per line working is operating.
- (b) Return of ring tone to the calling extension.
- (c) The release of the first group selector and lamp lighting circuit when the manual board operator answers the call.
- (d) The lighting of the line lamp of an automatic inter-switchboard line when a single digit "0" is dialled.

4.10 COMBINED "0" LEVEL AND LAMP LIGHTING CIRCUIT WITH NIGHT SERVICE ACCESS

Diagram SA 8167

Up to four of these circuits are connected to the last working outlets of the "0" level multiple of the 1st group selector. During normal working hours the circuits function as ordinary "0" level or lamp lighting circuits.

For night service conditions the circuits are automatically connected to the night service switchboard to enable extensions to obtain the night service switchboard operator. Also the circuit provides dialling access from the night service switchboard to extensions via an extension line circuit.

The circuit provides the following facilities

When used as a lamp lighting circuit.

- (a) Lights the calling extensions lamp on the manual board when the single digit "0" is dialled.
- (b) Returns Ring Tone to the calling extension.
- (c) Releases itself and the 1st Group Selector, when the operator answers the call.
- (d) Lights the line lamp of an automatic inter-switchboard line when the single digit "0" is dialled in.

When used as an "0" level circuit

- (e) Lights the "0" level lamp on the manual board, when the single digit "0" is dialled.
- (f) Returns ringing tone to the calling extension until the operator answers the call.
- (g) Releases with the 1st Group Selector as soon as the operator with draws the cord circuit plug.
- (h) Maintains the circuit busy to other calls all the time the cord circuit plug is in the jack.
- (j) Lights the line lamp of an inter-switchboard line when the single digit "0" is dialled in.
- (k) Manually held by operator (Manual Hold).
- (l) Extends "0" level calls through to the night service switchboard.
- (m) Provides access from the night service switchboard to an associated extension line circuit for dialling local calls.
- (n) Extends a clear down supervisory signal to the night service switchboard when a calling or called extension releases.

- (p) Buses the first group selector multiple "0" level outlets of those circuits not connected when the night service key is operated.
- (q) Any call that may be in progress when the night service key is restored will remain connected, and not released until the parties to the call clear.
- (r) Manual hold facility when required.

4.11 Exchange Line Circuit SA 8158

The circuit is suitable for working direct to Automatic and C.B. (Central Battery) Public Exchanges, but if used with C.B.S. (Central Battery Signalling) or magneto exchanges, special adaptor circuits are required.

The circuit provides for-

- (a) Bothway working to the Public Exchange.
- (b) Incoming calls are to light the calling lamp on the manual switchboard and when required give an audible signal to attract the operators attention.
- (c) Outgoing calls may be made via the Manual Switchboard operator.
- (d) Through dialling by an extension to the Public Exchange on all calls set up via the manual switchboard operator.
- (e) Direct access by extensions to the Public Exchange by dialling the digit "9". This facility may be barred to selected extensions by an alteration to B.T.C. strapping in the extension line circuit.
- (f) Enquiry and Operator recall facilities.
- (g) Through clearing to the Public Exchange and at the same time a clear down signal is given to the cord circuit supervisory lamps on the manual switchboard.
- (h) Busing the exchange line jack at the manual board when the circuit is engaged by a direct access call via a group selector level.
- (j) Busing its testing-in circuit on level "9" of the group selector multiple when the exchange line is engaged via the manual switchboard.
- (k) Disconnect clear by maintaining a busy condition at the PABX until the Public Exchange Equipment returns to normal (Automatic and C.B. exchanges only).

(l) Direct extension night service. This facility enables an exchange line to be connected to a particular extension for periods outside normal working hours.

(m) Ancillary Working

The ancillary appearance of the Exchange line call lamp or other manual switchboard positions is lit, by 6V A.C without the addition of a lamp lighting relay.

(n) Follow on call trap

In the event of another incoming call arriving before the operator has cleared down the cords from a preceding call, the Public Exchange ringing current does not operate the bell of the extension telephone, but to attract the operators attention, the cord circuit supervisory lamps on the manual switchboard will flash in phase with the interruptions of the ringing current from the Public Exchange.

(p) Free Line Signalling

When specified free line signalling can be used to indicate to all manual switchboard positions the next free exchange or inter-switchboard line circuit that is available. The advantage of this facility is to indicate immediately to the operator the circuit to use and also eliminates the risk of over-plugging i.e. plugging in to an already engaged circuit.

Line Limits

The resistance of the extension line plus the resistance of the exchange line should not exceed 650 ohms.

The limiting factor in all cases is that the resistance of the exchange line plus the resistance of the extension line must not exceed the signalling limits of the type of Public Exchange concerned.

ENQUIRY CIRCUIT - Diagram SA 8159

4.12

An extension that is connected to the Public Exchange by way of an exchange line relay set, either directly or via the manual switchboard is able to make an enquiry call.

To make an enquiry call the person using the P.A.B.X extension will press the push button on his telephone and this causes an enquiry finder to search for the multiple outlet to which the exchange line relay set is connected.

When the required outlet is reached the drive to the enquiry finder is disconnected and an enquiry selector is seized.

The person originating the enquiry call will hear dialling tone, and then dial the internal number required in the usual manner. During the period of time the enquiry call is in progress, the Public Exchange caller is held separately and is not able to overhear the parties to the enquiry call. On completion of the enquiry call the push button on the telephone is operated once more to re-connect the calling extension to the Public Exchange caller and to release the enquiry circuit together with its associated enquiry selector.

In the event of all enquiry circuits being engaged, an attempted enquiry call will signal the PABX No. 3 manual board in one of two ways -

- (a) If the Public Exchange call has been made with the assistance of the PABX operator the associated cord circuit supervisory lamps will flash.
- (b) If the Public Exchange call has been dialled direct via level "9" the appropriate exchange line lamp will flash at the manual board.

4.13 Bothway Auto-Auto inter-switchboard Line Circuit SA 8161

This circuit is used to terminate a bothway dialling inter-switchboard line at a PABX 3. When working to a non-standard PABX a suitable termination should be provided at the non-standard PABX. The inter-switchboard circuit is normally used with a directly connected incoming group selector.

If the total of inter-switchboard lines is small, an extension line circuit can be used in place of the incoming selector. Extension line circuit numbered 30-34 of each group of 50 lines are specially wired for this purpose.

The circuit provides -

- (a) Loop dialling in from distant PABX.
- (b) Loop dialling out to distant PABX.
- (c) Access from group selector levels.
- (d) Access from the PABX No. 3 Manual board.
- (e) Lighting the inter-switchboard line lamps on the PABX No. 3 manual board and to give an alarm to attract the operators (If required).
- (f) A busy signal is given to the PABX operator when the circuit is engaged by an incoming or outgoing automatic call.

- (g) A busy condition on the group selector multiple outlet, when a call is established by the manual board.
- (h) Free line signalling if specified.
- (j) Exchange line prohibition unless authorised by the Post Office, Public Exchange Calls may not be extended via the inter-switchboard circuit.
- (k) The release of the incoming 1st group selector when the PABX manual board operator is called by dialling "0" from the distant end.
- (l) Where an extension line is used instead of an incoming selector the automatic equipment is released if dialling does not take place before 30 seconds have elapsed and a P.G. alarm is indicated after a period of 3 minutes (approx.)

4.14 Bothway Inter-switchboard Circuit Manual-Manual (with Access from Selector Levels Diagram SA 8162

The circuit is used to terminate a bothway manual to manual inter-switchboard lines at the PABX No. 3 and is suitable for working to another PABX or a PMBX.

The three different methods of signalling are -

- (1) One wire earth calling inward and outward, maximum line loop 4200 ohms.
- (2) One wire earth calling inward alternating current (17 CPS) outward maximum line loop 2100 ohms.
- (3) Loop signalling inward alternating current (17 CPS) outward maximum line loop 2100 ohms.

Other facilities are -

- (a) Lighting of inter-switchboard lamp at the PABX manual board when the distant end calls.
- (b) Calling the distant end as soon as the PABX operator inserts a cord circuit plug in the manual board jack.
- (c) Access from group selector (if required).
- (d) Free line signalling (optional).
- (e) Exchange line prohibition.
- (f) Ancillary working if required.

4.15 Bothway Inter-Switchboard Line Cct
Dialling in from P.M.B.X. (Earth Dialling) SA 8163

This circuit is used to terminate a dialling inter-switchboard line from a PMBX.

The termination at the PMBX end should be arranged for one wire earth signalling, a dial key or jack must be inserted in the line side of the relay set at the PMBX.

The circuit provides -

- (a) Access to the PABX No. 3 via an incoming selector, or when the number of inter-switchboard lines is small an extension line circuit may be used for incoming calls. Extension lines 30-34 of each group of 50 lines are specially wired for this purpose. Only the line finder bank contacts of each extension line circuit are used, the associated LS and CO relays may be arranged for manual extension working if required.
- (b) One wire earth calling to distant PMBX.
- (c) Access from group selector levels.
- (d) Access from PABX No. 3 manual board.
- (e) Lighting the inter-switchboard line lamp on the PABX NO. 3 manual board and to give an audible signal to attract the operators attention when required.
- (f) A busy test at the PABX 3 manual board when the current is being used via automatic equipment.
- (g) Busying the circuit on the auto equipment when the circuit is used by the PABX manual board.
- (h) Free line signalling (optional).
- (j) Exchange prohibition when required.
- (k) Release of incoming selector when access to the manual board is required.
- (l) Release of automatic equipment if in-dialling distant PMBX has not dialled within a period of 30 seconds.
NB. This facility is only available when the inter-switchboard line is terminated on PABX extension line circuit.

4.16 Bothway Auto-Auto Inter-switchboard Line Circuit S.C.D.C Signalling SA 8215

This circuit is used when the loop resistance of the line between the two PABX's exceeds the limits for the other types of inter-switchboard previously described. The S.C.D.C. inter-switchboard circuit will respond to dialled impulses on lines with loop resistance up to a maximum of 8,200 ohms.

The circuit provides -

- (a) Dialling out from a PMBX to an automatic extension at the distant PABX.
- (b) Dialling out from one PABX to another.
- (c) Access by dialling "0" to the PABX operator at the distant end.

(d) Exchange line prohibition when required.

4.17 Direct Extension Night Service Facility

The least complicated method of providing night service is by using direct extensions.

Certain extension lines are chosen for use as night service telephones.

These lines are wired to special night service jacks fitted to the PABX No. 3 manual position and are crossed connected by a double ended cord to selected exchange line extensions from the Public Exchange and may make and receive calls via the Public Exchange.

4.18 Night Service Switchboard SA 8168

A night service switchboard is provided when more facilities are required, than those offered by direct extension night service.

The night service switchboard provides an operator circuit together with four cordless connecting circuits, which enables a maximum of four simultaneous calls to be set up between the Public Exchange and extensions of the PABX No.3. Under night service condition the connecting circuits are associated at one side with night service access circuit and the other to selected exchange line circuits.

The circuit provides -

- (a) For incoming Public Exchange calls to light the Exchange line supervisory lamp at the night service switchboard, and to sound an audible alarm.
- (b) For night service "0" level calls to light the night line supervisory lamp and to sound an audible alarm.
- (c) The operator is able to answer Public Exchange and level "0" calls.
- (d) To dial PABX extensions via the night service access circuit.
- (e) To call a Public Exchange subscriber via selected exchange line circuit.
- (f) To extend incoming Public Exchange line calls to the person requiring by dialling the appropriate extension number.
- (g) To connect PABX extension to the Public Exchange.

- (h) The operators circuit may be switched to any one of the four connecting circuits.
- (j) Both connecting circuit supervisory lamps (night line supy. and exchange line) light when an extension clears down, from a call connected via the Public Exchange.

Under normal circumstances the first four exchange lines of the PABX will be connected to the night service switchboard connecting circuits in the order 1,2,3,4, the night service access circuit will be connected in the reverse order 4,3,2,1. This arrangement minimises the possibility of a call occurring on both sides of the connecting circuit at the same time.

5 PABX NO.3. SATELLITE EXCHANGE

A Satellite PABX No.3 Exchange is usually provided in circumstances where the Head Office of an organisation has branch offices or works in the same district, the local Gas Board or Electricity Authority are typical examples.

The main PABX provides manual board operator assistance for the connecting Public Exchange calls to the Satellite exchange, and when necessary provides tandem switching facilities to other Satellite exchanges or PABX and PMBX exchanges connected by inter-switchboard lines.

A Satellite PABX provides fully automatic calls between extensions, and the optional facility of direct access to the Public Exchange Network by dialling "9". These exchange lines are outgoing only, incoming calls to Satellite extension lines are routed by the operator at the main PABX.

As a general rule the lines connecting main and Satellite Exchanges should not exceed a loop resistance of 900 ohms.

It is not generally an economic proposition to provide a Satellite PABX for less than 50 extension lines.

The amount of racks and the number of lines to be supplied are based on traffic figures supplied by the P.O.

PABX No. 3 SATELLITE FACILITIES

- 5.1 (a) A Satellite PABX provides automatic facilities for Satellite extension lines circuits to make local calls to other Satellite extensions.
- (b) A Satellite extension by dialling 7 can gain access to the main PABX, and subsequently dial any extension line circuit at the main, or alternatively dial the code of inter-switchboard lines.
- (c) Assistance from the operator at the main PABX by dialling "0".

- (d) Direct access to Public Exchange by dialling "9"
NB The exchange lines used for this purpose are for outgoing calls only.

5.2 Satellite Junction, Bothway, Incoming or Outgoing, Auto-Auto with Manual Board Access Diagram SA 8177

The circuit contains two uni-directional elements that can be used separately or by adding certain straps, will function as a bothway circuit.

Access to the satellite exchange is gained via an associated incoming selector. Outgoing calls to main PABX is obtained from an appropriate group selector level.

The circuit provides -

- (a) Loop dialling in from associated main PABX.
- (b) Loop dialling out to main PABX.
- (c) Discrimination between an outgoing call intended for the main PABX Automatic equipment and a call intended for the manual board.

This relay set may be seized by a satellite extension, dialling "7" or "0", but in the latter instance the manual board at the main PABX receives a calling signal without any further action by the caller.

- (d) When a call is originated from the main PABX operator, a signal is put forward to the satellite final selector to enable the operator to trunk offer a call to a busy satellite extension.
- (e) To provide supervisory signal to the main PABX operator by the reversal of the line polarity.
- (f) Extends a guard condition to the outgoing alarm extension circuit. The outgoing alarm extension is normally associated with the last choice of the inter-switchboard circuit group.
- (g) Provides operator recall facility on calls routed via the main PABX manual board.
- (h) Maintains a busy condition to selector level calls during the period the circuit is engaged on a call connected via the main PABX manual board operator.

5.3 1st Grp Selr Diagram SA 8152

The same as used for main PABX para. 4.4.

5.4 Incoming Group Selector Diagram 8160

The same as used for main PABX see para. 4.5.

5.5. Satellite Final Selector with Trunk Offering and 2/10 PBX Group Hunting Diagram SA 8158

The circuit provides for -

- (a) Busying the final selector, to any subsequent call in the same grading.
- (b) The vertical and rotary movement of the selector wipers are under the control of dialled impulses.
- (c) Interrupted ringing current (17 CPS AC) to ring the bell of the called extension, and the return of ringing tone to the called party.
- (d) Returning busy tone to the caller if the called extension is engaged.
- (e) Returning N.U. tone to the caller if an unequipped number or P.G. extension is dialled.
- (f) Reversal of the + and - leads and the disconnection ringing current when the extension answers.
- (g) Calling party release.
- (h) 2/10 Group junting (see para 4.7.).
- (j) Trunk offering this facility allows the main PABX operator to interrupt a call already in progress to inform either party that an urgent call is waiting for them. Special cord circuit and key are provided on the manual board for this purpose.
- (k) Operator recall, a called extension wishing to transfer an incoming call may attract the attention of the operator at the main PABX by pressing the recall button on the telephone instrument, which will cause the associated cord circuit supervisory lamps to flicker.

5.6 Night Service Switching Circuit Diagram SA 8186

This circuit provides remote control switching of selected satellite extensions to direct extensions night service working.

The sequence of operation is as follows:-

The operator at the main PABX dials the final selector outlet number allocated on the switching circuit. The relay set trips the ringing and N.U. tone is returned to the operator. The operator uses the Trunk offer facility to energise the night switching relay and should now hear warn tone to indicate that the night service switching circuit has operated.

The operator now releases from the circuit leaving the night service switching circuit in an operated condition.

To restore the satellite extensions to normal working the operator will again dial the final selector outlet number and will hear Warn Tone. The operator now "Trunk Offers" on the circuit to release the night service switching relays and will hear N.U. tone to indicate that the night switching circuit has released.

The operator now clears down the cord circuit.

5.7 INTER-SWITCHBOARD CIRCUITS

Any of the inter-switchboard circuits used to connect main PABX to other PABX's or PMBX's may also be used to provide direct links between a Satellite PABX and other PABX's or PMBX's.

6. OPTIONAL STANDARD FACILITIES

6.1 PRIVATE METERING

(a) Exchange Line Metering

A cyclometer type meter on each outgoing or bothway exchange line to record the value of calls made on each exchange line.

(b) Extension Line Metering

A totals or trip cyclometer type meter to record the value of outgoing calls made on the Public Exchange network either directly via level 9 or with the assistance of the PABX operator.

(c) Extension Line Metering (Clock Type)

A combined totals and trip meter provided adjacent to the extension telephone (clock type meter supplied by P.O).

(d) Cord Circuit Metering

Trip meters directly associated with each cord circuit.

NB. The provision of 3 minute tone signals similar to that given by Public Auto-manual exchange is not permitted.

6.2 Dictation Recording

Access to the recording equipment is obtained from a group selector level. The control of the dictation recorders must be in accordance with S SPEC 662.

6.3 MANUAL EXTENSION

Two type of manual extension facility may be provided.

- (a) Manual outgoing and Auto incoming, these extensions are within the automatic extension numbering scheme, and five such extensions may be included in each group of 50 extension lines.
- (b) Manual outgoing and manual incoming, these extensions have numbers outside the automatic numbering scheme, e.g. 01-019.

6.4 Local Emergency Service

- (a) One or more circuits may be terminated at the manual switchboard for reporting an emergency. The circuits may be extension lines, or available from a group selector level, and can be arranged to present non-busy conditions to other emergency calls made at the same time.
- (b) Circuits described above may be associated with a display panel, which indicates the location of the telephone which has originated the emergency call.
- (c) If lamp per line signalling is in use distinctive signals may be given on the normal calling lamp. The signals are controlled from a relay operated from a selector level.
- (d) Under night service conditions the Fire Alarm may be operated directly by an extension dialling the emergency code.

6.5 Circuit Diversion Keys

These keys should be mounted on the manual switchboard positions or any other convenient location within the manual room, a lamp is associated with each key to indicate when the circuit is diverted for a special purpose.

The keys are used for switching exchange or inter-switchboard links from their normal use to date transmission or similar purposes. When the keys are operated the associated PABX circuit is busied out.

6.6 Enquiry Desk

A number of extension line circuits from selector levels and bothway circuits to the manual positions may be terminated on the enquiry desk. Hold and recall facilities are provided on the circuits to the manual positions.

6.7 Staff Location

A privately owned and maintained Staff Location System may be connected to the PABX. (P.O. APPROVAL REQUIRED)

6.8 Night Watchmans Reporting System

A privately owned and maintained night watchmans reporting system may be connected to the P.A.B.X. (P.O. APPROVAL REQUIRED)

6.9 Public Exchange Direct Access Barred

A lock may be provided on the telephone instrument so that unauthorised users of the telephone may be prevented from making Public Exchange calls.

THIS FACILITY IS SUPPLIED BY POST OFFICE

6.10 Timing of Inter-Switchboard Calls

The provision of a chargeable time clock to give pips at 3 minute intervals is permitted on inter-switchboard calls only.

6.11 Key Calling

Key calling enables selected extensions usually referred to as Master Stations to make calls to a number of specified internal extensions by means of an appropriate keys, and thus avoid the need for dialling extensions number.

6.12 Conference Facility (Operator Controlled)

An exchange line conference jack is provided at the PABX manual switchboard together with a number of extension line conference jacks up to a maximum of eight.

NB. When the total of conference circuits exceeds five an amplifier 36A is connected to the exchange line termination.

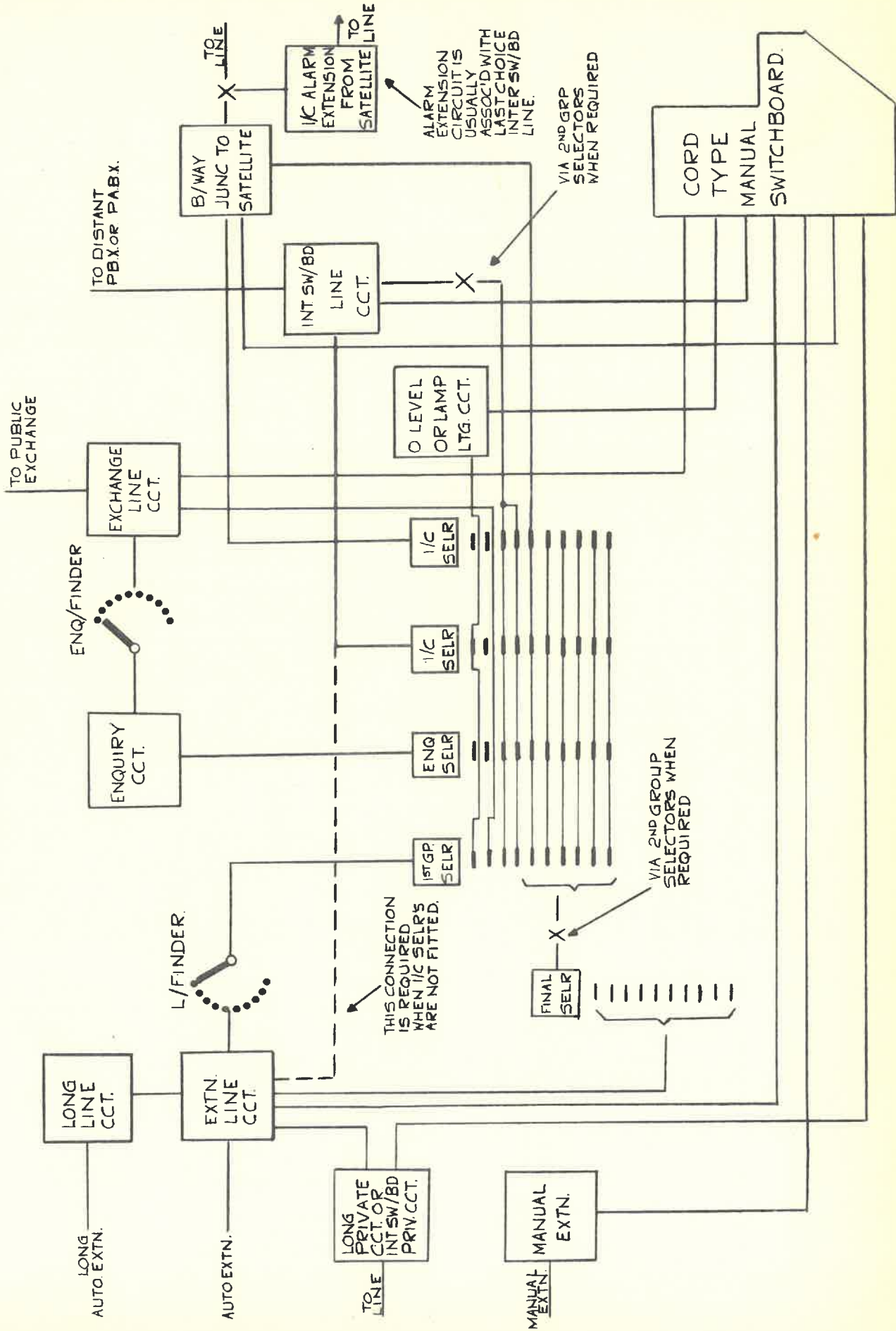
The conference is set up in the following manner:-

The exchange line circuit to which the conference is to be connected is answered by the PABX operator by plugging into the exchange line, a cord circuit answer plug, the associated call cord is plugged into the exchange line conference jack. The operator by using other cord circuits calls the parties to the conference, the extensions are called via their multiple jacks and are connected to the conference extension line jacks. Any person who wishes to withdraw from the conference, may do so by replacing their telephone receiver. A clear down signal to the operator is given by the appropriate cord circuit supervisory lamps.

Conference facilities may also be provided with inter-switchboard and private wire in place of Exchange line, or internal extension lines only.

P.A.B.X. No 3. TYPICAL TRUNKING.

MAIN WITH SATELLITE



B.P.O. P.A.B.X. No. 47. Introduction

7.1 The B.P.O. P.A.B.X. No. 4 system was developed at the request of the Post Office Engineering Department to take the place of the various cordless P.A.B.X. switchboards produced independently by each of the manufacturers.

The B.P.O. P.A.B.X. No. 4 in many respects follows closely the A.E.I. P.A.B.X. 97 (A.E.I. No. 4). The most significant departures from P.A.B.X. No. 97 practice are:-

- (a) The provision of selector finders in the incoming selector train.
- (b) Operator controlled selective answering for six separate groups of lines or common answering, as built in alternative facilities.
- (c) Separate ringing, busy, and waiting supervisory lamps for each connecting circuit on the cordless switchboard, instead of one supervisory lamp for each connect circuit as on the P.A.B.X. No. 97.
- (d) When the total number of exchange lines, assistance circuits and interswitchboard line circuits exceed 50, a system of Call Distribution is used to extend the total of exchange lines etc., in units of 50 up to a maximum of 200. If the total of exchange lines etc., is greater than 200, the circuits will be suitably divided among odd and even positions, i.e. ODD and EVEN position working.
- (e) The operator once having attached a call to a connecting circuit, is free to deal with any other calls by using a different connect circuit.

8. Description

8.1 The P.O. P.A.B.X. No. 4 uses 50 point ratchet driven uniselectors, 50 point motor uniselectors, 4000 type two-motion selectors, B.P.O. 600 and 3000 type relays. The majority of relay sets are of the Jack-in type. All equipment is mounted on open type racks.

8.2 A typical P.A.B.X. No. 4 would comprise of the following racks:-

- (a) Line and Final selector racks (1 per 100 lines).
- (b) Group Selector racks.
- (c) Position racks (1 per position for a maximum of 100 exchange and interswitchboard lines, etc.).

(d) Relay set racks.

(e) Pulse distribution and Ringer Rack.

8.3

The dimensions and sizes of the automatic equipment racks are as follows

Line & Final Selector Racks

Dimensions 7ft. 9ins. high x 4ft. 6ins. wide.

Capacity 100 line relays.
24 linefinders.
30 Final selectors (local and i/c).

Group Selector Racks (First incoming and Enquiry)

Dimensions 7ft. 9ins. high x 4ft. 6ins. wide.

Capacity 50 selectors (5 shelves of 10 selectors).

Relay Set Rack No. 1 (Typical)

Dimensions 7ft. 9ins. x 4ft. 6ins. wide.

Capacity 5 Assistance circuit relay sets.
5 Operator access circuit relay sets.
5 Night service relay sets.
5 " " uniselectors.
14 Junction finder uniselectors.
10 Exchange or interswitchboard line relay sets.

Relay Set Rack No. 2A (Typical)

Dimensions 7ft. 9ins. x 4ins. wide.

Capacity 14 Junction finder uniselectors.
30 Exchange or interswitchboard line relay sets.

Relay Set Rack No. 2B (Typical)

Dimensions 7ft. 9ins. x 4ft. 6 ins. wide.

Capacity 14 Junction finder uniselectors.
20 Route barring or exchange line adaptor relay sets.
20 Exchange or interswitchboard line relay sets.

Relay Set Rack No. 2C (Typical)

Dimensions 7ft. 9ins. x 2ft. 9ins.

Capacity 6 Junction finder uniselectors.

15 Exchange or interswitchboard line circuit relay sets.

Relay Set Rack No. 2D

Dimensions 7ft. 9 ins. x 2ft. 9 ins.

Capacity 6 Junction finder uniselectors.
10 Trunk barring or exchange line adaptor relay sets.
10 Exchange or interswitchboard line relay sets.

Position Rack (Typical) One per position when the total of exchange lines, interswitchboard lines, assistance circuits, etc., is 100 or less.

Dimensions 7ft. 9ins. high x 4ft. 6ins. wide.

Capacity 1 Keysender (3 relay sets).
4 Keysender finders.
8 Connecting circuits (2 per base).
16 Connect finder uniselectors (2 per connect circuit) i.e. 8 circuits.
2 Motor uniselector position finders.
8 Plate mountings for call distribution.
2 Position circuit relay sets A & B.
1 Marker relay set.
1 Auxiliary marker relay set.
1 Internal keysender relay set.

Auxiliary Position Rack Fitted in addition to position rack when total of exchange lines, interswitchboard lines, assistance circuits, etc., is greater than 100 but does not exceed 200.

Dimensions 7ft. 9ins. high x 4ft. 6ins. wide.

Capacity 16 Connect finder uniselectors.
2 Motor uniselector position finders.

Ringer & Pulse Distribution Rack

Dimensions 7ft. 9ins. high x 2ft. 9 ins.

Capacity 2 Dynamotors (automatic changeover).
2 Ringer control relay sets.
1 A & Z pulse.
1 Pulse generator.
1 Calls wait.
1 Alarm extension.
1 Int. ring B.generator.

8.4 Numbering Scheme Main P.A.B.X. No.4

The first group selector levels are normally allocated in the following manner:-

Level 1 SPARE, but may be used in special circumstances subject to Post Office approval.

Levels 2, 3, 4, 5, 7

Extension numbers including interswitchboard with final selector access or additional groups of interswitchboard circuits, etc.

Level 6 Extension numbers or OUTGOING TO SATELLITE (when specified).

Level 8 Extension numbers or DIAL 8 NIGHT SERVICE (when specified).

Level 9 Direct access to Public Exchange network.

Level 0 Manual switchboard operator.

8.5 Floor Loading

300 - 350 lbs. per foot run $3\frac{1}{2}$ " wide base.

8.6 Tones

Dial tone, busy tone, N.U. tone are standard B.P.O. tones.

Warn Tone (Tick-tick tone) to indicate that the P.A.B.X. operator is monitoring the call or listening on the line.

Equipment Engaged Tone 400 CPS tone interrupted .45 secs. on, .3 secs. off, .225 secs. on, .525 secs. off. This tone is used to indicate to the caller that all the automatic equipment at a particular stage of the call is engaged.

P.O. P.A.B.X. No.4 CIRCUIT DETAILS

9. Extension Line Circuit XTW.80431

9.1 Each extension line has two 600 type relays per line designated LS & CO.

The facilities provide:-

(a) The extension line can make and receive automatic calls via

local group and final selectors.

- (b) The extension may be called from the cordless manual switch-board via an operator access selector, or incoming group selector, each of these selectors have common access to an incoming final selector.
- (c) Forced release of local 1st group selector under P.G. or similar fault conditions.
- (d) Prohibiting or permitting access to Public Exchange network by dialling '9'.
Barred access to S.T.D. facilities at Public Exchange (when required).
- (e) May be associated with other adjacent extensions to form a P.B.X. Group.
- (f) Extension line metering (when required).
- (g) Line limits, the circuit will operate satisfactorily connected to lines of 600 ohms loop resistance, not including the resistance of the telephone instrument.
- (h) Extensions 40 - 90 of each hundred group are wired via Routine Test Jacks but may be used for ordinary extensions.
- (j) P.G. Alarm to indicate that a telephone handset has been left off its rest, or the wiring to the telephone extension has been short-circuited.
- (k) Any extension line circuit may be used for direct extension night service or designated extension night service.

9.2 Long Line Extension Equipment SA 8104

This circuit is used when the resistance of the extension line is over 600 ohms but does not exceed 1000 ohms (excluding telephone).

9.3 Automatic Private Circuit Long Line Auxiliary Circuit SA 8324

This circuit is used when the loop resistance of the extension line is over 1000 but does not exceed 2000 ohms.

9.4 Local Group Selector SA 8302

A 1st group selector is directly connected to a line finder uniselector. The circuit provides:-

- (a) Returns an earth to the extension line circuit to act as a busy condition on the Final selector multiple.
- (b) Extends a start signal to the linefinder drive magnet and to

provide testing-in conditions which cause the linefinder uniselector to stop on the multiple outlet of the calling extension.

- (c) To extend dial tone to the caller.
- (d) The selector wipers are stepped vertically under the control of the dial of the calling extension, at the end of the first train of impulses, the wipers change to a rotary movement, to search automatically for a free outlet within the dialled level.
- (e) To connect Busy Tone to the caller if all trunks connected to the dialled level are engaged.
- (f) To connect N.U. tone (number unobtainable) if an extension that is barred access to the Public Exchange diale Level 9.
- (g) The selector releases at the end of a call.
- (h) Forced release of the selector if dialling does not take place after an interval of 30 secs.
- (j) Overflow and congestion meters may be fitted if required.

N.B. It should be remembered that the 1st group selector circuit has no speaking bridge, and therefore any circuit, e.g. Fire, Emergency, code call, etc., that may be operated from a 1st selector level will require its own transmission bridge.

9.5 Local First Group Selector (Directly connected) Local 2nd Group Selector, or Satellite 1st Group Selector SA 8303

- (a) This selector is used as a directly connected 1st group selector to provide access to main P.A.B.X. from bothway satellite junction circuit.
- (b) To provide access to satellite P.A.B.X. when directly connected to bothway satellite junction.
- (c) To function as satellite 1st group selector when seized by satellite register circuit.
- (d) To function as a second group selector when main P.A.B.X. has 4 digit numbering scheme.

9.6 Local Final Selector (Regular) SA 8304

The circuit provides:-

- (a) Seizure from a 1st or 2nd local group selector, a satellite finder circuit, or a Bothway junction at a Satellite P.A.B.X.

- (b) Returns and earth on the H lead to hold the preceding equipment.
- (c) Vertical and rotary movement of the selector wiper are under the control of dialled impulses.
- (d) Return of Busy Tone to the caller if the extension is engaged or in a P.G. condition.
- (e) Ringing Tone to the caller, and Ringing current to ring the bell of the called extension (if free).
- (f) Completing a transmission path when the called extension answers and providing Battery and Earth feeds in both directions by means of a transmission bridge.
- (g) The selector is held by the calling extension loop, before switching.
- (h) The selector is held after switching by a loop on the incoming and outgoing + and - leads.
- (j) The selector may be released prior to switch by a disconnection of the calling loop.
- (k) Release of the selector after switching by disconnecting the loops on either the incoming or outgoing + and - leads.
- (l) Release of preceding equipment.

9.7 Local Final Selector SA 8305
(2/10 P.B.X. Group Hunting)

This selector has all the facilities described in Section 9.6 paras. (a) to (l) with the addition of P.B.X. hunting over a maximum of 10 extension lines.

The function of P.B.X. hunting is to allow callers who dial the first extension number of a P.B.X. group and find it busy, to cause the final selector to search successively for a free outlet from the remaining extensions forming the group.

If all extensions of a group are busy the caller will receive Busy Tone.

P.B.X. group can be of any number of extensions between 2 and 10.

Group hunting only takes place when the first extension number of a group is dialled. Any caller dialling an intermediate number e.g. 245 of a group 240 - 249 will obtain Busy Tone if that extension is engaged, and no search over the remaining numbers will take place.

In practice P.B.X. hunting is used in circumstances where a particular office or department receives a large number of similar calls, e.g. Wages Office, General Stores, etc. Thus by dialling the 1st extension number of a group the caller has access to all extensions forming the P.B.X. group.

- 9.8 To provide access to extensions from the cordless manual switchboard a train of incoming Group and Final selectors are required.

Incoming 1st Group Selector with Selector Finder SA 8307

The circuit provides:-

- (a) The transfer of the start signal if the selector is busy, to another 1st group selector.
- (b) The associated selector finder uniselector hunts for the calling exchange line or interswitchboard circuit, when a start signal is extended to a free selector.
- (c) Connects dial tone to the calling circuit.
- (d) Selector wipers step vertically under the control of dial or keysender impulses.
- (e) Seizes the first free trunk (outlet) on the level dialled and switches the calling circuit through.
- (f) N.U. tone is returned to the caller if a barred or an 0 level is dialled.
- (g) Returns Equipment Engaged Tone if all trunks on the dialled level are engaged.
- (h) Release of enquiry circuit when level 0 is dialled on an enquiry call.
- (j) Holds the called extension loop while finder drives to an exchange line or interswitchboard call during transfer condition.
- (k) Ringer start facility.
- (l) Indicates to congestion circuit when selector is busy.
- (m) Selector releases at the end of a call.

9.9 Incoming Final Selector Regular
SA 8309 or with P.B.X. Hunting SA 8310

The circuit provides:-

- (a) Seizure from a preceding selector or relay set.
- (b) Vertical and rotary stepping under the control of dial or

keysender impulses.

- (c) Busyng the final selector to any simultaneous call in the same selector group grading.
- (d) Returning via previous selectors the appropriate signals to indicate the state of the calling line to the incoming or enquiry relay set.
- (e) Ring when free facility, i.e. a call made to a busy extension will automatically follow on as soon as the previous call is finished.
- (f) Test Pulse Generator is started when a previously tested busy line becomes free.
- (g) Busyng the called extension number in the Final Selector multiple.
- (h) Selectors release at the end of a call.
- (j) A backward hold condition is returned if selector fails to release when directly connected to a relay set.
- (k) Trunk offer, the P.A.B.X. operator is able to speak to an extension that is engaged upon another conversation. Warn Tone is transmitted for the period of time the P.A.B.X. operator is on the line.

9.10 Cordless Position Circuits SA 8311, SA 8312, SA 8313

To answer or originate a call the operator will press the "SPEAK KEY" of a connecting circuit.

When the COMMON ANSWERING method is specified the ANSWER BAR is also pressed. If SELECTIVE ANSWERING is specified the Answer Bar is not provided, and the operator presses the appropriate group SELECTIVE ANSWER KEY instead.

To originate a call the operator "keys" a routing digit on the keysender button strip.

Any of these actions cause the CONNECTING CIRCUIT FINDER to drive to the marked outlet of the connecting finder multiple and switch to it. A start signal is extended to the position circuit, and the POSITION CIRCUIT FINDER drives to the marking condition extended to the P.M. arc, the POSITION CIRCUIT is switched.

Incoming Call

On an incoming call, the waiting lamp associated with the connecting circuit key will light. The operator is now able to speak to the caller and extend the call by keying the required extension number.

The incoming final selector is stepped to the appropriate outlet, the RINGING or BUSY supervisory lamp on the cordless position will light to tell the operator if the extension line is in use or not. When the called extension answers the Connecting Circuit is released automatically, unless the HOLD KEY has been operated at the Cordless switchboard, in which case the Connecting Circuit will be held for the duration of the call or until the HOLD KEY is released. When a call is held, the supervisory lamps associated with the corresponding connecting circuit are extinguished while the call is in progress, but will light when either party clears down from an incoming call.

If the operator releases, the SPEAK KEY of a connecting circuit, with

- (a) WAITING LAMP LIT
- (b) BUSY LAMP LIT
- (c) RINGING LAMP LIT
- (d) ALL LAMPS LIT (HOLD KEY OPERATED)

after 60-90 seconds the waiting lamp will flash to give a recall signal to the operator.

Outgoing Call

The operator will press the "SPEAK KEY" of a free CONNECTING CIRCUIT, this action also seizes the MARKER CIRCUIT. The operator may now key: the digit(s) necessary to select the required route, the digit(s) are stored and a start signal is given to drive the CONNECTING CIRCUIT FINDER to search for a free circuit within the required group that has been marked in the CONNECTING FINDER MULTIPLE. When the CONNECTING FINDER UNISELECTOR switches, a start signal is put through to the POSITION FINDER which drives to the multiple outlet associated with the one to which the CONNECTING FINDER has switched. If a call is to be made via the EXCHANGE LINE relay set to the Public Exchange network, the operator will now operate the KEYSENDER key which causes the KEYSENDER FINDER to drive and find the KEYSENDER FINDER multiple outlet associated with the particular EXCHANGE LINE. The operator may now by using the keysender buttons at the Cordless switchboard impulse out to the Public Exchange (max. 10 digits).

9.11 Function of Keys on Cordless Switchboard

All keys used on the Cordless position are of push-button type. In addition, the SELECTIVE ANSWERING, SUPERVISOR, and TRANSFER, keys have a lamp fitted internally to indicate when the circuit is in use.

Line Identity Key & Lamps

The line identity key is used by the operator to check

which line of a particular group she is switched.

Up to 99 lines of any particular group can be indicated by lighting a tens and unit together with the group lamp. When the number of exchange lines exceed 99 then for purposes of identification they should be divided into two groups.

Transfer Key

The operation of the TRANSFER KEY causes all the TRANSFER LAMPS on the other positions to light. The operator wishing to accept the transfer call presses the SPEAK KEY of a CONNECTING CIRCUIT and her own TRANSFER KEY.

Supervisor Key

This key operates a local call and speak circuit between the operator and supervisor

Speak Exchange Key

This key allows the operator to speak to the Public Exchange caller, without being overheard by the extension line.

Speak Extension Key

By pressing the SPEAK EXTENSION KEY the operator is able to speak to an extension without being heard by the Public Exchange caller. This key is also used when the operator wishes to speak to an extension that is already engaged on another call, i.e. TRUNK OFFERING.

Keysender Key

The KEYSENDER KEY switches the 10 digit Keysender into circuit via the keysender multiple during an outgoing call.

Cancel Key

If a mistake has been made during keysending by pressing the CANCEL key the operator is able to reset the keysender and begin again.

Dial Key

When an external keysender (10 digit) is not fitted, or is out of service for any reason, the operator may, by pressing the DIAL KEY bring the dial switch into use.

Recall Key

The operator, by pressing and releasing the RECALL KEY slowly, may "flash" to attract the attention of the distant operator.

Release Key

By operating the RELEASE KEY, the operator can release the Exchange Line or similar outgoing circuit from the connecting and position circuit.

9.12 Function of Lamps on Cordless Board ScreenCalls Waiting

There are two methods of indicating calls that are waiting. They consist of a separate display either side of the connecting circuit supervisory lamps.

The left-hand calls waiting indicator is calibrated numerically to show 1, 2-3, 4-5, 6-9, 10 and OVER, calls waiting. The calls waiting indicator to the right-hand of the connecting circuit supervisory lamps uses the thermometer principle.

Calling Group Lamps

These lamps indicate the type of call that is waiting i.e. Exchange Line, Interswitchboard, etc., and are lit as soon as the POSITION FINDER tests-in to the circuit that is calling.

Busy Group Lamps

These lamps light when the last circuit of a particular group is in use.

Keysender Lamp

The KEYSENDER lamp lights when the 10 digit keysender is seized.

Sending Lamp

The SENDING lamp is lit for the period the keysender is impulsing.

Dial Lamp

The DIAL lamp is lit when the Dial switch is in circuit.

Route Engaged Lamp

The ROUTE ENGAGED lamp lights when all circuits of a particular group are busy and the operator attempts to make an outgoing call.

Emergency Pilot Lamp

This lamp is used with Special Emergency circuits, and indicates an emergency call.

Pilot Lamp

This lamp operates with any incoming call when common answering is used.

Pilots Lamps A, B, C, D, E & F

These lamps are mounted in their respective SELECTIVE ANSWERING KEYS and indicate the arrival of an incoming call in that particular group.

Position Fail Lamp

The POSITION FAIL lamp when lit indicates that a PROMPT ALARM has occurred on the associated POSITION RACK.

Listen-in Monitor

Supervisory lamp for a Private Circuit between manual position and supervisors desk.

Meter Supervisory Lamp

The METER SUPERVISORY lamp denotes when the PRIVATE METERING facility is switched in to circuit. When the exchange line circuit releases the METER SUPERVISORY lamp changes from a steady glow to a flicker.

Line Identification Lamps Tens & Units

The number of a line in any group to which the operator is

connected via the connecting finder multiple may be ascertained by the operator pressing the LINE IDENTIFICATION key, which will light the appropriate tens and units lamp.

9.13 Calls Distribution

Calls distribution is introduced when the aggregate number of Exchange lines, interswitchboard lines, assistance circuits, etc., exceed 50.

The call distribution is arranged in 4 groups of 50 circuits, designated A, B, C and D. When the aggregate number of Exchange lines, interswitchboard lines, etc., exceed 50 and is not greater than 100, call distribution groups A and B are provided. Call distribution groups C and D are added when the aggregate number of circuits exceed 100 and 150 lines respectively.

The Calls Distribution circuit consists of a call distributor uniselector and a wiper switching relay for every POSITION FINDER, CONNECTING FINDER, KEYSENDER FINDER, POSITION METER FINDER MULTIPLE, e.g. a P.A.B.X. No. 4 with POSITION METERING and 175 Exchange x interswitchboard lines, assistance circuits, etc., would require 4 groups of call distribution (wiper switching) relays HA HB HC HD (i.e. one group for each multiple).

Briefly, the CALL DISTRIBUTION CIRCUIT operates in the following manner:-

When the operator presses the connect key, followed by the answer bar (or selective answering key) the call distributor uniselector makes one step and then searches for the calls distribution group that contains a calling line, marked by the DP or D lead from the preceding relay set (exchange lines, etc).

When the uniselector stops the wiper switching relay (HA HB, HC, HD) is operated and the Connecting Finder, Position Finder, Keysender finder, and position meter finder are rotated to the marked outlet of their respective multiples.

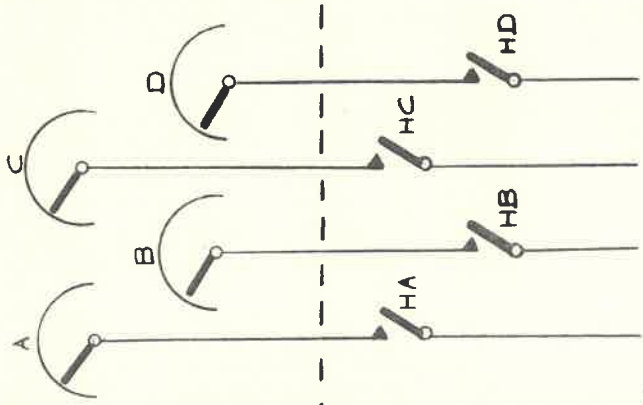
9.14 Enquiry Circuit SA 8327

When connected to an exchange or interswitchboard line, an extension may make a call to another extension by pressing the button provided on the telephone instrument.

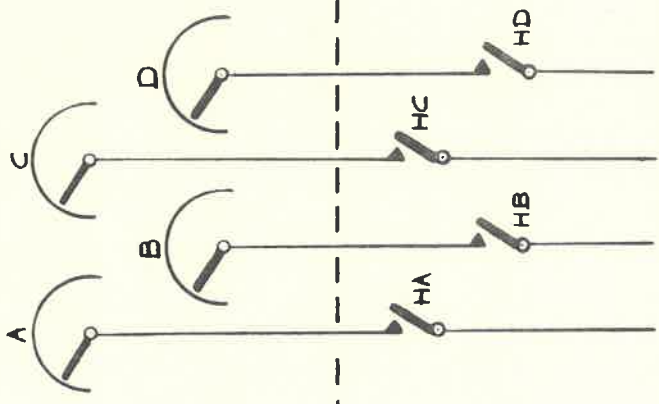
This action causes the exchange line (or interswitchboard) call to be held, and an earth is extended to the START DISTRIBUTION circuit which in turn connects and earth to the ENQUIRY START CHAIN to engage the first free Enquiry circuit.

When the enquiry circuit has been seized the ENQUIRYFINDER

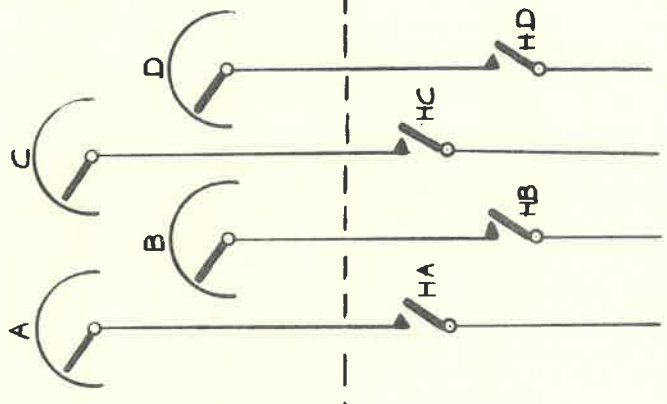
SA 8311
POSITION CIRCUIT A
FINDERS.



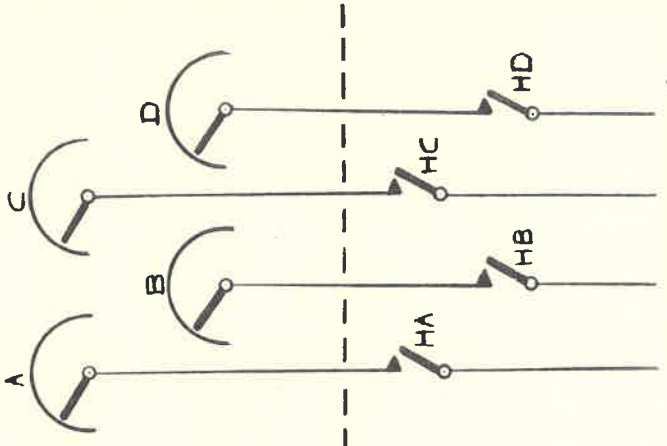
SA. 8313
CONNECTING CIRCUIT
FINDERS



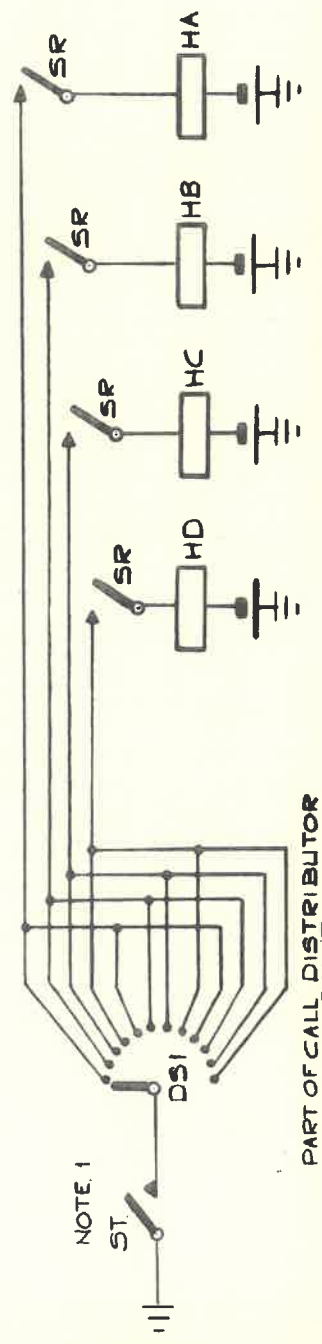
SA 8317
KEYSENDER
FINDERS.



SA 8322
POSITION METER
FINDERS



CALL DISTRIBUTION RELAY CONTACTS.



PART OF CALL DISTRIBUTOR
UNISELECTOR.

NOTES :-
1. TO ENSURE AN EVEN DISTRIBUTION OF CALLS, THE UNISELECTOR D'S MAKES ONE STEP WHEN THE OPERATOR ANSWERS AND THEN SEARCHES FOR A CALLS DISTRIBUTION GROUP CONTAINING A CALLING LINE.

CALL DISTRIBUTION.
EXPLANATORY DIAGRAM.
SHOWING CONNECTION OF WIPER SWITCHING RELAYS.

rotates to find the Exchange Line or Interswitchboard relay set associated with the enquiry call. On seizure a start signal is now extended to a 1st group selector which causes its associated finder to hunt for the ENQUIRY circuit. The enquiry call will now hear DIAL TONE, and be able to dial the required extension number. If the called line is engaged, Busy Tone is returned to the caller. If the called line is free, the caller will hear RING TONE and the bell of the called extension will ring. When the called party answers, the conversation cannot be overheard by the Public Exchange subscriber. To resume the Public Exchange call, the enquiry caller presses the push-button on the telephone instrument once again. If all enquiry circuits are busy, a recall signal is given to the P.A.B.X. operator.

Transfer

The method of setting-up a transfer call is similar to that used for an enquiry call up to the stage where the called extension answers.

To transfer the call, the calling extension informs the called party that there is a Public Exchange call and then replaces his telephone handset. The Public Exchange subscriber is now transferred to another extension. The train of selectors used to set up the original call are released, and the call is connected via the selectors used to establish the Transfer call.

If an extension which has set up a transfer call, abandons the call after the receipt of Ring Tone, the transfer will still take place providing the called party answer in approximately 15 seconds. After this period of time has elapsed the recall signal is given to the P.A.B.X. Operator.

9.15 Exchange Line Circuit SA 8306

The circuit is suitable for working direct to Automatic and C.B. (Central Battery) Public Exchanges. A special adaptor circuit is for Magneto Public Exchanges.

The circuit provides:-

- (a) Bothway or unidirectional working to the Public Exchange.
- (b) Incoming calls light the Calls Waiting Indicator and Pilot lamp at the manual position and can provide an audible signal to attract the operators attention if she is away from the switchboard.
- (c) Outgoing calls may be made by the operator, and reverted to the appropriate extension.

- (d) Direct Access by extension to the Public Exchange by dialling the digit 9 (This facility may be barred to selected extension by an alteration to B.T.C. strapping in the extension line circuit).
- (e) Enquiry Transfer and operator recall facilities.
- (f) Through clearing to the Public Exchange.
- (g) Busying the exchange line circuit to the operator, when the circuit is seized from a group selector level outlet.
- (h) Busying the group selector outlet when the circuit is seized by the P.A.B.X. operator or engaged by an incoming call.
- (j) Night Service. The circuit can be arranged for Dial 8, Direct Extension, or Designated Extension night service facilities.
- (k) Earth disconnect clear facilities are contained within the Exchange Line relay Set. If the Public Exchange caller clears first, the exchange line circuit will be forcibly released. If the public exchange caller clears during the period the P.A.B.X. extension is engaged on an enquiry call the exchange line circuit is seized again and made busy to other callers, and is forcibly released when the P.A.B.X. extension returns to the exchange line.
- (l) Ring when free (camp on busy) when an exchange line is connected to a P.A.B.X. extension that is engaged, the call will automatically go through as soon as the previous call is ended.
- (m) Applies a hold condition to the Public Exchange when an enquiry call or operator re-call is in progress.
- (n) Indicates to a Busy Line Display Panel the state of the Exchange Lines.
- (p) The relay set and access to the Public Exchange may be busied, from the Out of Order Panel (when specified).
- (q) Isolation of the relay set during routing testing.
- (r) Association with a Meter Unit 3B or Private Metering circuit for recording the value of STD calls.
- (s) When the exchange line is available to a satellite extension for outgoing direct access calls, a pulse regenerating circuit is required to enable signalling limits to be met.
- (t) Priority answering at the Cordless Manual positions (when required).

9.16 Trunk Barring (S.T.D.)

Separate circuits are provided to enable trunk barring to

be effective in the following circumstances: general case, fringe area, and digits 10.

General Case SA 8331

- (a) The barring circuit is interposed between outlets of Level 9 of the local 1st groupselector and the exchange line relay sets.
- (b) Recognises whether an extension is permitted or barred S.T.D. calls.
- (c) Checking from dialled impulses repeated back from the exchange line relay set if a barred code 0 or 10 has been dialled.
- (d) The circuit returns N.U. tone to the caller when a barred code has been dialled, and the succeeding equipment (i.e. exchange line) is released.
- (e) Extensions that are permitted to make S.T.D. calls may also have a special telephone fitted that has a Yale key operated switch, which connects a diode across the dial impulse contacts and makes them ineffective. (The Special Telephone is supplied by the G.P.O.).

This facility allows the user of the special telephone instrument to prohibit other persons using his telephone for S.T.D. calls while he is out of his office.

9.17 Fringe Area Case SA 8332

- (a) The barring circuit is inserted between the outlets of Level 9 of the local first group selector and the exchange line Relay sets.
- (b) Recognises whether an extension is permitted or barred S.T.D. calls.
- (c) Checks the dialled impulses repeated back from the exchange line relay set to register whether or not a barred code has been dialled.
- (d) Returns N.U. Tone to a barred extension which has dialled a barred code, and releases the succeeding equipment (i.e. Exchange Line Relay Set).
- (e) Barring all S.T.D. codes except the one giving access to the adjacent director area.
- (f) Barring the code 10 to barred extensions or to all extensions if required.
- (g) Barring code 010 (I.S.D.) International subscriber dialling when access is permitted to the London area by dialling 01.

- (h) Key controlled barring may be provided (Post Office to supply special telephone).

9.18 Barring Code 10 Only SA 8340

- (a) The barring circuit is inserted between the outlets of Level 9 of the 1st group selector and the Exchange line relay set.
- (b) Recognises whether an extension is permitted or not, on dialling 100, to call the operator at the Public Exchange.
- (c) Checks the dialled impulses repeated back from the exchange line relay set to register whether or not the code 10 has been dialled.
- (d) Returns N.U. tone when a barred extension dials code 10, and releases the succeeding equipment (i.e. exchange line relay set).

9.19 Operator Access Circuit SA 8326

- (a) An operator wishing to call an extension operates the SPEAK key of a free connecting circuit and then keys on the keysender button strip the access digit usually 0.

The connecting circuit finder, followed by the Position Finder, will hunt and test into the marked outlet in their respective multiples. The operators access circuit is seized, together with its directly connected selector. When the waiting supervisory lamp associated with the connecting circuit lights, the operator may dial the number of the required extension. If the call line is free, the bell of the call extension will ring and the "RINGING" supervisory lamp of the connecting circuit will light.

If the extension circuit is engaged the "BUSY" supervisory lamp will light. The operator can either release the call by pressing the CANCEL KEY or wait on the line until the extension becomes free.

If in the meantime the operator wishes to attend to another call, she may do so by pressing the HOLD key which will retain the operator access call, and operate another connecting circuit SPEAK key.

- (b) The supervisory lamps are extinguished when the call party answers.
- (c) Satellite night service switching - To enable night service conditions to be set up at a P.A.B.X. No. 4 satellite, the operator sets up a call via a satellite junction circuit to the final selector number chosen for night service switching.

When the final selector steps to the appropriate outlet, the connecting circuit BUSY supervisory lamp will light. The operator will now press the RECALL key which causes the night switching circuit to switch the satellite P.A.B.X. to night service working. By pressing the SPEAK TO EXTENSION key, the operator can determine the state of the night service circuit. If the circuit is switched to night service the operator will hear N.U. tone, if the circuit is normal no tone will be heard.

9.20 Assistance Circuit SA 8325

The circuit provides:-

- (a) Access from Level 0 of Group selector.
- (b) Calling signal displayed on all or as many of the cordless positions as required.
- (c) Returns N.U. Tone to caller when P.A.B.X. is switched to night service operation.
- (d) Returns Ring Tone to caller when P.A.B.X. is on Day Service.
- (e) Lights connect circuit supervisory lamp when caller clears.
- (f) Circuit can be held by operator pressing connect circuit HOLD KEY.
- (g) Circuit can be busied out by operating the appropriate key at the Out of Order Panel.
- (h) Priority answering of assistance calls when required.
- (j) Recalls the extension if the extension clears whilst the operator is in circuit.

9.21 Position Coupling XTW 80448 (SA 8319)

Provision is made for the coupling of positions in pairs e.g. Position No. 2 (EVEN) may be coupled to Position No. 1 (ODD).

The coupling circuit is brought into use by the act of the EVEN position operator "unplugging" her headset.

The ODD position operator now has access to the connect circuits on the EVEN position in addition to those of her own position.

Night Service Facilities

9.22 Dial 8 Night Service SA 8328

An incoming exchange line call causes the Night Service Bells to ring. These bells are distributed through the premises so that they can be heard by the staff on duty.

To answer the call, any person may lift the nearest telephone handset and dial 8, which in turn causes a night service finder uniselector to drive and test in to the calling exchange line. Conversation can now take place between the Public Exchange caller and the answering extension. The P.A.B.X. extension can hold for enquiry or transfer the Public Exchange caller to another extension (if necessary). Incoming interswitchboard calls can be answered in the same manner.

9.23 Direct Extension Night Service SA 8329

This method permits a P.A.B.X. extension to be directly connected to a particular exchange line during night service.

With this type of night service it is not possible to transfer Public Exchange calls to other P.A.B.X. extensions.

9.24 Designated Extension Night Service SA 8330

An incoming exchange line (or interswitchboard) call rings all the bells in the extension telephones that have designated for night service operation. Loud ringing bells installed throughout the premises can be fitted in addition if required.

The Public Exchange Call is answered by the first person to lift the telephone handset of a designated extension. This action will also stop the bells from ringing. Any subsequent exchange line (or interswitchboard) call will cause the bells of the remaining designated extensions to ring, and so on until all the designated extensions are engaged. A call arriving when all designated extensions are in use will cause WARN TONE to be superimposed on one of the designated extension line circuits to indicate a waiting call.

9.25 Out of Order Panel & Busy Line Display XTW 80449 SA 8345

This panel may be incorporated as part of the supervisor's desk, or fitted in the manual room as a separate cabinet.

One illuminated push-button type key is supplied for each Exchange line, interswitchboard and assistance circuit as an OUT OF ORDER key and lamp. Two more similar keys are fitted as BUSY and CALLING keys.

The circuit provides for Busying out faulty lines by pressing the OUT OF ORDER key.

This action lights the OUT OF ORDER LAMP and "busies" the circuit to the Group Selector level outlet, and in the case of Exchange and Interswitchboard lines, also busies the incoming route.

The operation of the CALLING key permits the operator to observe if the exchange or interswitchboard line is making an outgoing call whilst the operation of the Busy Key will indicate if the exchange or interswitchboard line is engaged on an incoming call.

If a panel is provided in the manual room it may be considered expedient to add the equipment required for the Manual Switchroom Alarm Panel.

9.26 Manual Switchroom Alarm Panel XTW 80447 (SA 8347)

This Panel comprises:-

AUDIBLE ALARM, RECEIVING ATTENTION, NIGHT SERVICE, EXTENDED ALARM, KEYS.

PROMPT DEFERRED, ALARM EXTENDED LAMPS.

If a satellite P.A.B.X. is connected, 4 additional lamps are fitted namely:-

SATELLITE PROMPT ALARM, RECEIVING ATTENTION, (SATELLITE PROMPT ALARM).

SATELLITE DEFERRED ALARM, RECEIVING ATTENTION, (SATELLITE DEFERRED ALARM).

The function of the key and lamps are self-explanatory, therefore no detailed description is necessary.

9.27 Int. Ring B. Generator SA 8341

This circuit supplies distinctive ringing current for local P.A.B.X. calls extension to extension, the Ring Tone however remains the same.

The reason for two different types of ringing current is that it is considered that a person is likely to answer a telephone more quickly knowing it to be an outside call. There is little evidence that this theory works out in practice.

9.28 Interswitchboard Circuit SA 8357
Bothway Auto-Auto (loop dialling)

This circuit is used to terminate a bothway loop dialling interswitchboard circuit at the P.A.B.X. No. 4. When working to a non-standard P.A.B.X. a suitable termination should be provided at the non-standard P.A.B.X. The interswitchboard has access to an incoming group selector via a selector finder circuit.

The circuit provides:-

- (a) Loop dialling-in from distant P.A.B.X.
- (b) Loop dialling out to distant P.A.B.X.
- (c) Access from the P.A.B.X. No. 4 manual switchboard.
- (d) Incoming calls to the P.A.B.X.4 operator seize an incoming 1st group selector, After the digit 0 is dialled the incoming selector is released and the calls waiting indicator registers that a call is waiting.
- (e) The circuit is marked busy to the group selector outlets when an incoming call is in progress.
- (f) Priority answering at the cordless manual position (if required).
- (g) The circuit is marked busy to the position circuit when an outgoing call is made via a selector level.
- (h) Hold for enquiry and automatic transfer facility is provided.
- (j) Backward Busyng facility i.e. any circuit that is faulty and busied out of service also prevents itself from being seized in the reverse direction from the distant end.

9.29 Interswitchboard Circuit SA 8362
A Wire Earth Signalling from P.M.B.X.

The circuit is used to terminate a bothway interswitchboard line from a P.M.B.X. The termination at the P.M.B.X. end should be arranged for one wire earth signalling. A dial key or jack must be inserted in the line side of the relay set at the P.M.B.X.

The circuit provides:-

- (a) Access to the P.A.B.X. No. 4 via selector finder and incoming group selector.
- (b) One wire earth calling to distant P.M.B.X.
- (c) Access from group selector levels.
- (d) Access from P.A.B.X. No. 4 manual position.

- (e) Circuit is marked busy to group selector outlets when an incoming call is in progress.
- (f) Circuit is marked busy to position circuit when an outgoing call is made via group selector level.
- (g) Hold for enquiry and automatic transfer facility is provided.
- (h) Backward Busying facility i.e. any circuit faulty and busied out of service, also prevents itself being seized in the reverse direction from the distant end.
- (j) An extension by dialling the interswitchboard access digit may call the distant P.M.B.X. operator without the assistance of the P.A.B.X. No. 4 operator.
- (k) Priority answering may be arranged at the cordless manual position.

9.30 Interswitchboard Circuit SA 8363
Bothway Auto-Auto S.C.D.C. Signalling

This circuit is used when the loop resistance of the line between the two switchboards exceeds the limit for the other types of interswitchboard. The S.C.D.2 interswitchboard circuit will respond to dialled impulse on lines with a loop resistance up to a maximum of 8.200 ohms.

The circuit provides:-

- (a) Dialling out from a P.M.B.X. to an automatic extension at the distant P.A.B.X.
- (b) Bothway dialling from an automatic extension at one P.A.B.X. to an automatic extension at another P.A.B.X.
- (c) Calling of operator at distant P.A.B.X. by dialling 0 after the initial routing digit, or the distant end operator may call the P.A.B.X. No. 4 operator by dialling 0 after the interswitchboard circuit has been seized.
- (d) The circuit is marked busy to the group selector when an incoming call is in progress.
- (e) The circuit is marked busy to the position circuit when an outgoing call is made via a selector level.
- (f) Hold for enquiry and automatic transfer facilities are provided.
- (g) Backward busy facility, i.e. any circuit faulty and busied out of service, also prevents itself being seized in the reverse direction from the distant end.
- (h) Incoming automatic calls are routed via a selector finder and incoming selector.

(k) Priority answering at the cordless manual position (if required).

9.31 Interswitchboard Circuit SA 8364

Bothway Automatic Generator or Balanced Battery

This circuit is used to provide manual to manual termination between P.A.B.X. No. 4 and a distant P.M.B.X. and is generally used when the resistance of the line between the two switchboards exceeds the limit for dialled impulses.

The circuit is operated by the transmission of Pulses of varying length to provide CALL, ANSWER, FORWARD CLEAR, RELEASE ACKNOWLEDGEMENT, BACKWARD CLEAR signals.

The system of signalling is similar to VF working, but the duration of the signal pulses are much longer and the operation of the circuit is slower.

Automatic Balanced Battery or Generator signalling is obsolescent, and is being superseded by the newly developed SSAC13 IVF signalling system.

The circuit provides:-

- (a) Bothway working from P.A.B.X. No. 4 manual position to distant P.M.B.X.
- (b) HOLD for enquiry and automatic transfer.
- (c) Outgoing calls can be made from group selector levels by dialling the appropriate interswitchboard access digit.
- d* Backward busyng facility i.e. any circuit that is faulty and busied out of service, also prevents itself from being seized in the reverse direction from the distant end.
- e* Priority answering may be arranged at the cordless manual position.

10. P.A.B.X. No. 4 Register Satellite

10.1 The P.A.B.X.4 Register satellite can be used for either three-digit or four-digit numbering scheme.

The following facilities are offered:-

- (a) Linked numbering scheme, i.e. the extension numbers have the same number of digits and are consecutive to those at the main, for example extensions 200 - 500 at main, extensions 600 at satellite.

- (b) The register satellite enables satellite extensions making a call to discriminate after the first or second digit dialled whether the call is intended for the main or satellite Exchange.
- (c) The satellite extension, by dialling 9, may obtain access to the Public Exchange via an outgoing exchange line direct, or alternatively seize a junction to the Main Exchange and the register will dial 9 to engage an Exchange Line connected to the main P.A.B.X.
- (d) Incoming Exchange line calls are received by the operator at the main P.A.B.X. end extended to the satellite. When necessary, the main P.A.B.X. will serve as a tandem switching centre to other satellite exchanges or P.A.B.X. and P.M.B.X. exchanges connected by interswitchboard lines.
- (e) It is not generally an economic proposition to provide a satellite P.A.B.X. for less than 50 extension lines.
- (f) The quantity of racks and the number of lines to be supplied are based on traffic figures supplied by the Post Office.
- (g) As a general rule the lines connecting main and satellite should not exceed a loop resistance of 1000 ohms (1200 ohms max.).

P.A.B.X. No. 4 Register Satellite - Description of the Circuits

10.2 Extension Line Circuit XTW 80431 (SA 8301)

This circuit together with the linefinder uniselector are the same as those used for main P.A.B.X. exchanges, but instead of the linefinder uniselector being directly connected to a local 1st group selector (main exchange practice) it is connected to a register finder circuit.

10.3 Register Finder Access SA 8349

A start signal from the extension line circuit causes the linefinder to hunt and find the calling extension. Subsequently an earth is connected to the Register start lead, resulting in the seizing of a free Register and its associated Register Finder, at the same time the Circuit Finder hunts and finds a Local 1st group (or Final Selector). The caller will now hear Dial Tone transmitted by the Register Circuit.

N.B. All these circuit operations occur as a result of the satellite caller lifting his telephone handset, the receipt of Dial Tone is almost instantaneous.

The subsequent action of the circuit is now controlled by the Register as follows:-

(a) Calls to Another Satellite Extension

The first digit, or the first and second digit according to the numbering scheme (i.e. 3 or 4 digit), dialled into the register, provides a signal to the Register finder circuit (SA 8349) which causes the extension to be connected through to the selector (1st group or Final) that was seized by the extension line originating the call. The Register is now released and the remaining digits necessary to complete the call are dialled into the subsequent selector(s).

N.B. Some further explanation may help to make clear the reason for dialling either 1 or 2 digits into the Register.

Assuming that a four digit numbering system is in use at the main, to provide a linked numbering scheme four digits must also be dialled at the satellite.

If the total of extensions at the satellite is greater than 100, the 1st digit seizes local 1st group selector, the second digit steps the 1st group selector and the last two digits are dialled into the Final Selector.

If the total of extensions at the satellite are less than 100, no group selectors are supplied, consequently two digits are dialled into the register and the last two digits are dialled into the Final Selector.

(b) Direct Access Calls to Exchange Lines
(Outgoing from Satellite)

The digit 9 dialled as a first digit into the Register provides a start signal to the Register Finder circuit. The Circuit Finder Uniselector rotates to search for a free outlet to an Exchange Line, the satellite caller now receives Dial Tone from the Public Exchange, and may now dial the number required. The local selector that was seized in the first instance by the satellite caller, is released as soon as the Circuit Finder uniselector drives to search for the exchange line. The Register is released when the connection to the Public Exchange is established. The Register finder circuit and the line finder are held for the duration of the call.

(c) Calls to or via the Main P.A.B.X.

When no outgoing exchange line relay sets are fitted at the satellite exchange, access to the Public Exchange network is

gained via a satellite junction circuit to the exchange line relay sets at the main P.A.B.X.

If a satellite extension originating a call dials a 1st digit relevant to the main P.A.B.X., a start signal is given to the Circuit Finder Uniselector which hunts and finds a free junction circuit to the main. The Register will pulse out in succession 1, 2, 3 or 4 digit required to route the call and then release. The Register Finder circuit and the linefinder are held for the duration of the call.

(d) Satellite congestion Circuit (SA 8353)

The outlets of the Circuit Finder multiple are arranged in groups of local selectors, exchange lines and junction circuits, etc. The last circuit of each group is connected to a satellite congestion circuit, which operates when all the other outlets of the particular group are busy. When a congestion circuit is seized, the drive to the Circuit Finder uniselector is disconnected, and Equipment Engaged Tone is returned to the caller. After a minimum period of 30 seconds the circuit finder circuit is forcibly released and the extension line circuit will revert to a P.G. condition.

(e) Public Exchange barring may be applied to satellite extensions which prohibit access to Exchange lines at the main P.A.B.X.

10.4 Satellite Junction Circuits

Bothway and unidirectional circuits are available for connecting the P.A.B.X.4 satellite to the main P.A.B.X.

The unidirectional junctions are used by the P.A.B.X. operator for connecting Exchange and interswitchboard line calls to satellite extensions.

Hold for enquiry and automatic Transfer facility is available to satellitewextensions.

Bothway satellite junctions are used by extensions at the main and satellite to make and receive automatic calls.

The last two choices of the unidirectional junction may be used to extend satellite prompt and deferred alarms to an alarm panel at the main P.A.B.X.

Night Service Switching

By dialling a particular final selector outlet number at the main it is possible to switch apparatus at the satellite to

night service conditions, also restore the satellite to day working by dialling the same final selector number again.

10.5

The local group, local final incoming group and incoming final selectors are the same as used at the main P.A.B.X.

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FIG. 4 TRUNKING OF PABX MAIN WITH SATELLITE
(COMMON EQUIPMENT SIMILAR TO NORMAL MAIN PABX)

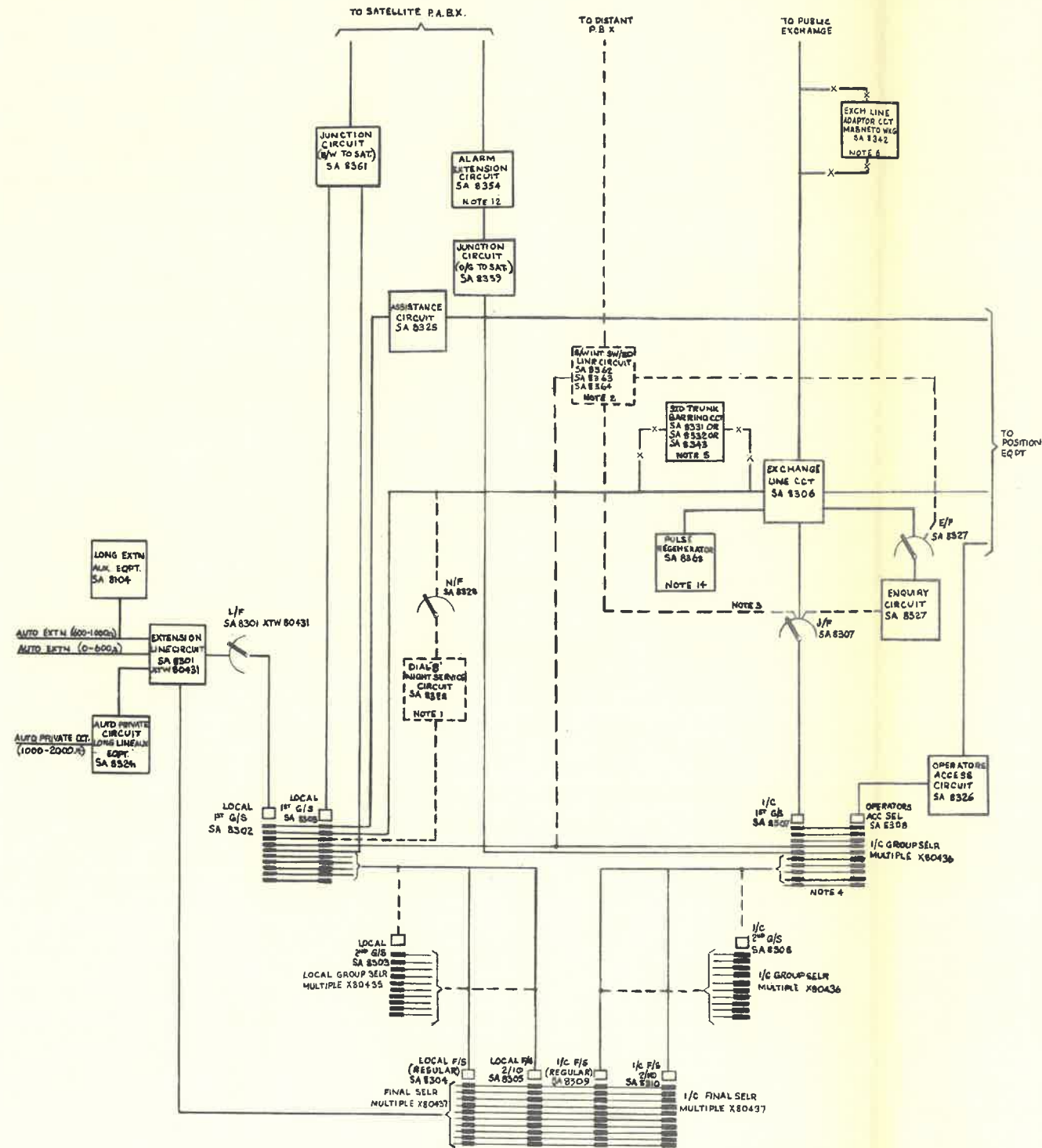
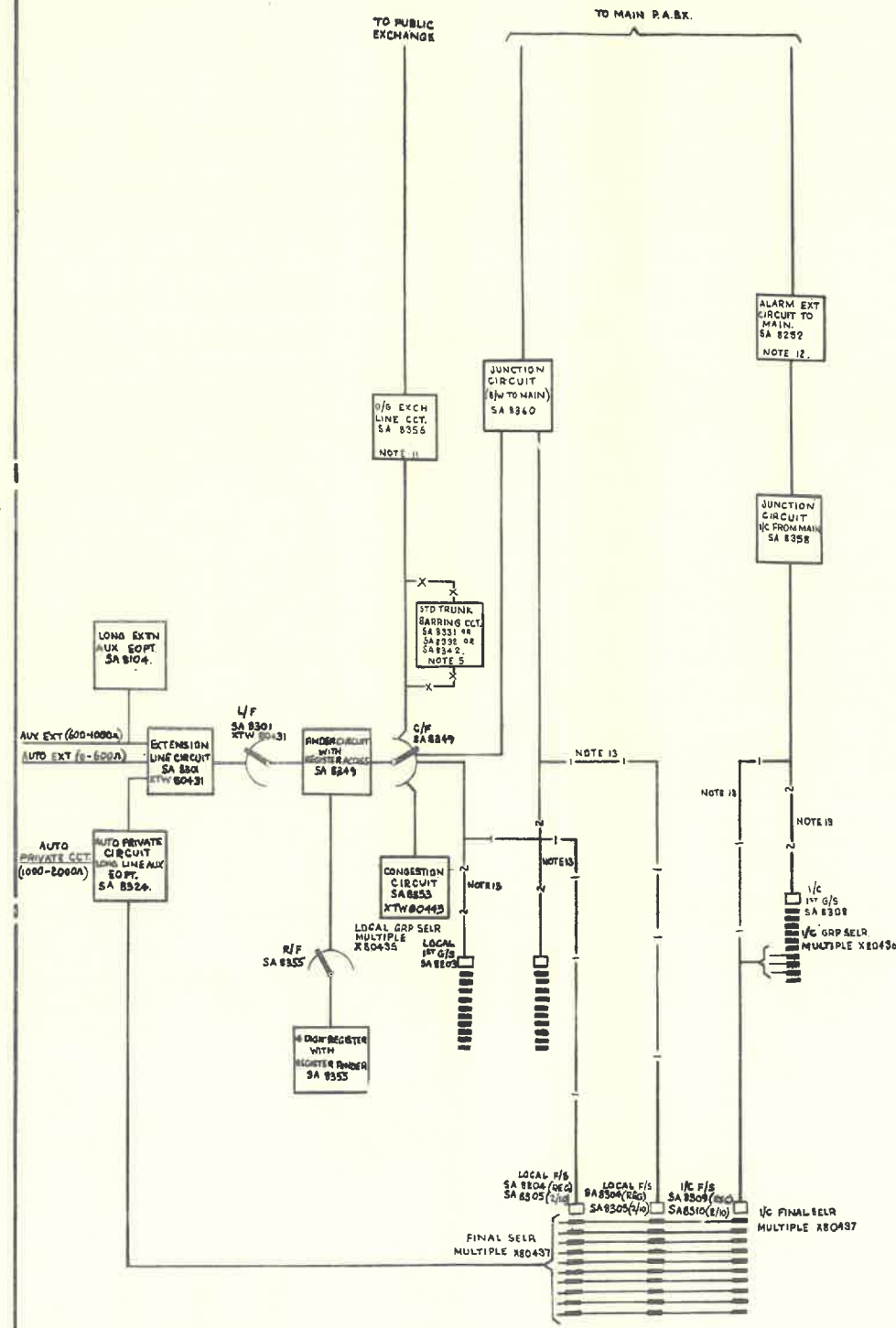


FIG. 5 TRUNKING OF SATELLITE



CHANGES	APP
ISSUE 1	

DIAGRAM	TITLE	PROVISION	AEI DIAGRAM
SA 8333	RINGER RACK CIRCUIT	PER EXCHANGE	XTW 80444
SA 8334	RINGER CONTROL CIRCUIT	PER RINGING	SAW 83340
SA 8335	A & Z PULSE GENERATOR	PER EXCHANGE	SAW 83350
SA 8338	TEST PULSE GENERATOR	"	SAW 83380
SA 8341	INT RING B GENERATOR	AS REQUIRED	SAW 83410
SA 8348	COMMON SERVICES	PER EXCHANGE	XTW 80443
SA 8350	MISC. ALARMS & NS SWITCHING CCTS	"	XTW 80445
SA 8367	DISTRIBUTION OF TONES ETC	"	XTW 80459

P.A.B.X. 4
TYPICAL
TRUNKING DIAGRAM

X80450

DRN	APPROVED
TRD	
CHK	

AEI-TELECOM DIVISION - WOOLWICH

