

POST OFFICE ENGINEERING DEPARTMENT DIAGRAM NOTES

relating to DIAGRAM SA 81581

SPECIFICATION S 336

EXCHANGE LINE CCT. FOR P.A.B.X. NO. 3

1. GENERAL

The diagram shows the circuit of the relay-set used to terminate Public Exchange Lines at a P.A.B.X. No. 3.

The relay-set is suitable for working direct to Automatic and C. B. Exchanges, but when working to a C.B.S. Exchange an Adaptor Cot. Diagram SA 8154 is required, and when working to a Magneto Exchange an Adaptor Cot. Diagram SA 8155 is required.

The following diagrams should be considered in conjunction with this diagram: -

SA 8154 EXCHANGE LINE ADAPTOR CCT. FOR WORKING TO C. B. S. Exchanges.
SA 8155 " " " " " " MAGNETO "
SA 8152 1st GROUP SELECTOR.
SA 8159 ENQUIRY FINDER CCT.
SA 8160 ENQUIRY SELECTOR.
SA 8170 RACK COMMON SERVICES
SA 8135 CORD CIRCUIT.

2. FACILITY SCHEDULE Provision is made for:

- (1) Bothway working to public exchange.
- (2) Incoming calls to light the associated exchange line lamp on the P.A.B.X. No. 3 manual board and give an audible alarm if required.
- (3) Outgoing calls to be set up via the manual board.
- (4) Through dialling from the extension on calls set up via the P.A.B.X. manual board when the public exchange is automatic.
- (5) Direct Access from extensions.
- (6) Enquiry and Operator Recall facilities.
- (7) Through Clearing to the public exchange and at the same time giving a "clear" signal on the cord circuit supervisorys.
- (8) Busying the exchange line jack when the circuit is engaged on a direct access call.
- (9) Busying the 1st Group Selector bank contacts when the circuit is engaged via the P.A.B.X. manual board.
- (10) Maintaining a busy condition at the P.A.B.X. end until the exchange equipment reverts to normal. (Automatic and C. B. only). main Exchanges
- (11) A follow-on call trap (incoming and outgoing).
- (12) Direct extension night service.
- (13) Ancillary working if required.
- (14) Free line signalling if required.

2. CIRCUIT DESCRIPTION

Outline

When an incoming call occurs, the exchange line lamp on the P.A. B.X. manual board glows. The operator answers the call by inserting an answer plug in the associated exchange line jack. and completes the call via the extension multiple. When the extension replaces the: receiver on the completion of the call, a 'clearing' signal is given to the pulic exchange and both cord circuit

supervisory lamps glow on the P.A.B.X. manual board. In the event of an incoming call arriving before the operator has withdrawn the cord circuit plugs from the jacks, the ringing current is not extended to the extension line. The cord circuit supervisory lamps flicker and the operator answers the call by operating the cord circuit speak key and withdrawing the corresponding plug from the extension jack. The call is then completed in the normal manner.

Outgoing exchange calls may be set up via the manual board or by direct access via selector level if this facility is permitted. If the call is set up via the P.A.B.X. manual board the calling extension is connected to the exchange line circuit by means of a cord circuit. The operator may ask the public exchange for the required subscriber or in the case of an automatic exchange may dial the number required. If required the operator may retire from the connexion by restoring the cord circuit speak key and the extension may then ask for the required connexion or dial the required number in the case of an automatic exchange. On the completion of the call a 'clearing' signal is given to the public exchange and both cord circuit supervisory lamps glow on the P.A.B.X. manual board. If the extension is permitted direct access, connexion to a free exchange line is obtained by dialling digit '9'. The required connexion is then requested or dialled by the calling extension.

An extension connected to an exchange line via the manual board or selector level, may hold the public exchange connexion and make an enquiry call. The extension user depresses the instrument button which applies a hold condition on the public exchange connexion and extends the extension through to the enquiry finder and enquiry selector. Dial Tone is returned and the extension may dial any other extension to make an enquiry call. On the completion of the enquiry call, the originating extension again depresses the instrument button. The enquiry connexion is released and the extension is reconnected to the public exchange connexion. If the assistance of the P.A.B.X. operator is required, the extension depresses the instrument button twice. In the case of a call set up via the P.A.B.X. manual board the cord circuit supervisory lamps flicker, but in a direct access call the flicker signal is given on the exchange line lamps. The operator may enter the circuit to find out the extensions' requirements and may transfer the exchange call to any other extension if necessary.

In the case of exchange lines on automatic exchanges and manual exchanges of the C B. type, "Disconnect Clearing" is provided. This facility ensures that the exchange line circuit at the P.A.B.X. end is held busy until the public exchange connexion has been released. On exchange lines to automatic exchanges where this facility can be given an additional relay set is required on the subscribers line circuit. Details of these exchanges are given in E.I. Teles. General M 3902.

Detail

Incoming Call to P.A.B.X.

Ringing is connected to the line at the public exchange and relay AC operates at the P.A.B.X. end.

Relay AC operating,

AC1 operates relay CR.

Relay CR operating,

CR1 prepares the lamp and pilot relay cct.

CR2 connects an earth via the 2000 ohm coil of relay CR to the bush of the exchange line jacks to busy the circuit on the manual board.

CR3 operates relay ST.

CR4 connects an earth to the pulse start lead.

CR5 completes a holding circuit for relay CR.

CR6 prevents the operation of relay ER.

Relay ST operating,

- ST1 disconnects the battery from the H lead of the group selector multiple for busying purposes.
- ST3 lights the exchange line lamp on the manual board or operates the lamp lighting relay if ancillary working is provided. The pilot relay in the position operates in series with the lamp or lamp lighting relay to give an audible alarm if required.
- ST4 steps on the free line signal if necessary.

The operator answers the call by inserting a cord circuit plug into the calling exchange line's jack. When the plug is inserted the earth on the auxiliary jack springs is disconnected from the hold circuit of relay CR and operates relay SR.

Relay SR operating,

- SR1 maintains the disconnexion on the incoming H lead.
- SR2 disconnects the lamp and pilot relay circuit.
- SR3 prepares the audible clearing circuit.
- SR5 disconnects relay ST.
- SR7 maintains the disconnexion on the F.L.S. lamp.

Relay ST releases.

A loop is extended from the cord circuit to the tip and ring of the jack. This loop operates relay LG.

Relay LG operating,

- LG1 trips the ringing in the case of a call from an automatic exchange or darkens the supervisory on a call from a manual exchange. Relay LS operates to the battery and earth connected at the public exchange. LG2 operates relay CL.
- LG4 disconnects relay AC from the A line.
- LG5 disconnects the audible clear circuit.

Relay AC releases,

- AC1 releases relay CR if still operated.

Relay LS operating,

- LS1 prepares the operating circuit of relay Z.

Relay CL operating,

- CL1 disconnects the 250 ohm battery from relay H.
- CL2 prepares a future holding circuit for relay MH. CL4. operates relay Z.
- CL5 discharges capacitor C3.
- CL6 maintains the disconnexion on the H lead.
- CL7 prepares the cord circuit supervisory circuit and short circuits relay DT.

Relay CR releasing,

- CR2 extends earth via R9 to the bushes of the exchange line jacks.
- CR4 disconnects the earth from the Pulse Start lead.
- CR6 prepares the operate circuit of relay ER.

Relay Z operating,

- Z1 prevents the main exchange battery and earth from operating relay DM when relay LG releases.
- Z2 operates relay ZR.

Z3 prepares the pilot relay cot. to give an audible alarm if "Operator Recall" conditions are set up later.

Z4/Z5 disconnect relay LG and provide a holding circuit for relay LS via the loop applied by the answering cord circuit.

Relay ZR operating,

ZR1 operates relay MH.

ZR3 disconnects the full earth from the bush of the exchange line jack to prevent a clearing signal being given on the cord circuit supervisory lamp.

ZR4 connects an earth to the Enquiry Finder T lead.

Relay LG releasing,

LG1 makes the holding circuit of relay LS and the public exchange supervisory relays dependent on the loop applied in the cord circuit.

LG2 places relay CL under the control of relay MH. -

LG3 prepares a holding circuit for relay MH when relay Z releases.

LG4 reconnects the A line to relay AC.

LG5 prepares the pilot relay circuit for audible clearing at the completion of the call.

Relay MH operating,

MH1 holds relay CL.

The operator may now speak to the public exchange operator or subscriber and ascertain to which extension connexion is required. The call is completed via the cord circuit in the normal manner. The cord circuit changes to "through clearing" and relay LS is held in series with the called extension's loop.

Outgoing Call via P.A.B.X. Manual Board.

If an extension dials "0" and asks for connexion to a public exchange line, the operator inserts the calling plug of the cord circuit into a free exchange line jack. If free line signalling is not provided, the operator applies the engaged test to the bush of the exchange line jack. The presence of an earth on the bush of the jack indicates the engaged condition. The insertion of the cord circuit plug operates the auxiliary jack springs which in turn operate relay SR, and also connects a loop to the tip and ring of the jack to operate relay LG.

Relay SR operating,

SR1 busies the exchange line circuit on the group selector multiple.

SR3 prepares the audible clearing circuit.

SR4 connects an earth to the bush of the jack to light the cord circuit supervisory lamp.

SR5 prepares the operate circuit of relay ST.

SR7 disconnects the free line signal lamp

Relay LG operating,

LG1 connects a loop via relays LS and D to the exchange line. This loop operates the exchange line calling equipment in the case of an automatic public exchange, and extends a calling signal from the adaptor circuit, when the public exchange is C.B.S. or Magneto. Relay LS operates. LG2 operates relay CL.

LG3 connects an earth to the loop applied to the exchange line by LG1. This earth operates the line relay in the case of a C.B. Public Exchange. Relay LS does not operate until the main exchange operator answers the call.

LG5 disconnects the pilot relay circuit to prevent an audible clear from being given.

Relay CL operating,
CL3 maintains the disconnexion on the from the free-line signal lamp.
CL4 prepares an operate circuit for relay Z.
CL5 disconnects relay AC from the B line.
CL6 maintains the busy condition on the group selector multiple. CL7 short circuits relay DT.

Relay LS operating,

LS1 operates relay Z.

Relay Z operating,

Z1 prevents the hold coil of relay MH from being connected to the exchange line when relay LG releases.

Z2 operates relay ZR.

Z3 prepares the pilot relay cot. to give an audible alarm if "Operator Recall" conditions are set up later.

Z4/Z5 disconnect relay LG and provide a holding circuit for relay LS via the cord circuit and the calling extension's loop.

Relay ZR operating,

ZR1 operates relay MH.

ZR3 disconnects the full earth from the bush of the jack to darken the cord circuit supervisoryies.

ZR4 connects an earth to the Enquiry Finder T lead.

Relay LG releasing,

LG1 disconnects the calling "Loop from relay LS.

LG2 places relay CL under the control of relay MH.

LG3 disconnects the calling earth from the B line if the public exchange is CB.

LG5 prepares the audible clear circuit.

Relay MH operating,

MH1 holds relay CL.

The P.A.B.X. operator is now connected to the public exchange and in the case of an automatic exchange dial tone is received. The operator may now retire from the circuit by restoring the cord circuit speak key and leave the calling extension to dial or ask for the required connexion. If desired the operator may remain in circuit and dial or ask for the required number.

When dialling takes place, relay LS responds to the dialled impulses, but relay Z is made slow to release and holds during impulsing.

Direct Access Call from Extension

An extension permitted direct access exchange calls may originate an outgoing exchange call by dialling the digit "9". The 1st Group Selector hunts for a free exchange line circuit, the free condition being indicated by a 250 ohm battery on the H lead. Relay H operates to the earth applied in the 1st Group Selector.

Relay H operating,

H1 prepares the busying and holding circuit for the group selector.

H2/H3 connect the tip and ring of the manual board jack through to the line side of the D relay.

H4 connects an earth to the bush of the manual board jack for busying purposes.

H5 prepares a holding circuit for relay H.

The calling extension's loop is extended to the - and + leads and relay LG operates.

Relay LG operating,

LG1 connects a loop via relays LS and D to the exchange line. This loop operates the exchange line calling equipment in the case of an automatic public exchange, and extends a calling signal from the adaptor circuit when the public exchange is C.B.S. or Magneto.

LG2 operates relay CL.

LG3 connects an earth to the loop applied to the exchange line by LG1. This earth operates the line relay in the case of a C.B. public exchange. Relay LS does not operate until the main exchange operator answers the call.

LG5 disconnects the pilot relay circuit to prevent an audible clear from being given.

LG6 holds relay H.

Relay CL operating,

CL1 disconnects the 250 ohm battery from the H relay cot.

CL3 disconnects the free-line signal lamp.

CL4 prepares the operate circuit for relay Z.

CL5 disconnects relay AC from the B line.

CL6 completes the holding and busying circuit for the group selector.

Relays Z, SR, LS and MH operate and relay LG releases as described for an "Outgoing Call via the P.A.B.X. Manual Board". Relay H holds to the earth applied by ZR3 contact when LG6 contact restores.

Busy Flash returned from Automatic Exchange

If the number dialled is engaged and busy flash is returned from the public exchange, during the period that the earth is disconnected from the A line in the public exchange, relays LS, Z and ZR release. Relay LG re-operates to the extension or cord circuit loop, and LG1 holds the public exchange connexion when the earth is reconnected. Relays LS, Z and ZR then re-operates and the extension or P.A.B.X. operator hears the busy tone.

In the case of a call set up via the P.A. B.X. Manual Board, if the operator has retired from the circuit, the operation and release of ZR3 contact causes the cord circuit supervisory lamps to flash. The lamps will light during the period that the busy flash is connected in the public exchange.

On a direct access call, busy tone is returned to the calling extension. Relay ZR releases, and although contact ZR3 disconnects the earth from relay H, relay H holds to the earth applied by LG6 when relay LG re-operates. The slow-release lag of relay ZR covers the operate time of relay LG.

Extension Makes an Enquiry Call

An extension when connected through to an exchange line may obtain access to an enquiry selector to make an enquiry call by depressing the instrument button once. The extension loop is then earthed and the differential relay D operates over one winding.

Relay D operating,

D1 operates relay ER.

Relay ER operating,

ER1 connects an earth to the enquiry finder start lead.

ER2 connects a 250 ohm battery to the enquiry finder T lead. ER3 prepares the "operator recall" circuit if all the enquiry finders are engaged.

ER4 provides a holding circuit for relay ER.

When the enquiry finder finds the required exchange line, an earth is returned on the HF lead to operate relay RH.

Relay RH operating,

RH1 releases relay ER.

RH2/RH3 disconnect the extension loop from the exchange line and apply a 200 ohm loop to hold the public exchange connexion. RH4 disconnects the full earth from the bush of the jack in case transfer is required later.

Relay ER releasing,

ER1 disconnects the earth from the enquiry finder start lead. ER2 maintains a holding earth for the enquiry finder circuit on the T lead.

Dial Tone is returned from the enquiry selector and the extension may dial the number required. On completion of the enquiry call the instrument button is again depressed. The enquiry finder circuit is released and the earth is disconnected from relay RH.

Relay RH releasing,

RH2/RH3 reconnect the extension line through to the exchange line and disconnect the holding loop.

In the event of the extension abandoning the enquiry call by replacing the receiver, relays LS, Z and ZR release. ZR4 contact disconnects the holding earth of the enquiry finder circuit which in turn releases relay RH. This prevents the locking up of the exchange line circuit to the enquiry finder circuit when this mis-operation occurs.

Extension Sets up Operator Recall Conditions

If an extension engaged on an exchange call wishes to obtain the assistance of the P.A.B.X. operator, the instrument button is depressed twice. The first depression of the button switches the extension through to the enquiry selector and dial tone is received. The second depression of the button causes an earth to be connected to the C lead in the enquiry finder circuit which in turn operates relay CR in the exchange line circuit.

Relay CR operating,

CR1 gives an audible alarm in the case of a call set up via the P.A. B.X. manual board, but prepares the exchange line lamp and audible alarm circuit on a direct access call. CR2 connects the 2000 ohm winding of relay CR to the bush of the jack. Relay CR holds in series with the battery on the sleeve of the cord circuit on a call set up via the P.A.B.X. manualboard. The cord circuit supervisory lamps will not operate but the engaged test is maintained. CR3 connects relay ST through to the Flicker Earth Supply.

CR4 connects an earth to the pulse start lead.

CR5 provides a holding circuit for relay CR on a direct access call.

CR6 prevents the re-operation of relay ER when relay RH releases.

Relay ST operates and releases to the flicker earth supply.

ST2 connects and disconnects the 50 ohm winding of relay CR in parallel with its 2000 ohm winding. In the case of a call set up via the P.A.B.X. manual board, the cord circuit supervisory lamps light when the 50 ohm winding is connected.

ST3 operates and disconnects the exchange line lamp and pilot relay circuit in the case of a direct access call.

The cord circuit supervisory lamps flicker on a call set up via the manual board whilst in the case of a direct access call the line lamp flickers. The

enquiry finder circuit and enquiry are released and the hold condition for relay RH is disconnected.

Relay RH releasing,

RH2RH3 reconnect the extension through to the exchange line and disconnect the 200 ohm holding loop.

In the case of a call set up via the manual board, the operator enters the circuit by operating the appropriate cord circuit speak key, and ascertains the extensions' requirements. The holding circuit for relay CE is broken when the speak key is operated and relay ST releases.

On a direct access call the operator enters the circuit by inserting a cord circuit plug into the appropriate exchange line jack. The earth on the sleeve of the cord circuit plug operates the sleeve relay in the cord circuit and relay RH in the exchange line circuit. The hold circuit for relay CR is disconnected by the auxiliary jack springs and relay ST releases.

Relay RH operating,

RH2/RH3 disconnect the extension line from the public exchange connexion and connect a 200 ohm loop to the exchange line for holding purposes.

RH4 prepares to disconnect the full earth from the bush of the jack if transfer is later required.

Battery and earth are fed from the cord circuit via H2 and H3 contacts relays D and LS to the calling extension. Relay LS holds and in turn holds relays Z, ZR, etc. The operator may speak to the extension and give the required assistance. If the extension wishes to return to the public exchange connexion the operator withdraws the cord circuit plug from the exchange line jack and relay RH releases. Relay RH releasing, restores the circuit to its normal condition.

If the extension wishes the call to be transferred to another extension the operator sets up the required connexion. In the case of a call originally completed via the manual board, the operator withdraws the cord circuit plug from the original extension's jack and inserts it in the jack of the extension to whom the call is to be transferred. The call is then completed in the normal manner. When a direct access call is to be transferred to another extension the extension originating the call is requested to replace the telephone instrument. Relay LS releases.

Relay LS releasing,

LS1 short circuits relay Z.

Relay Z releasing,

Z2 releases relay ZR.

Z4 prepare an operate circuit for relay LG. z5)

Relay ZR releasing,

ZR3 releases relay H and connects an earth to contact RH4

Relay H releasing,

H1 releases the 1st Group Selector.

H2/H3 reconnect the tip and ring of the jack to relay LG.

H4 releases relay RH and the sleeve relay in the cord circuit. H5 disconnects the hold circuit of relay H for when relay ZR re-operates.

Relay RH is slow to release, and RH4 disconnects the full earth from the bush of the jack to prevent the cord circuit sleeve relay from being shunted during release. The battery and earth feed is replaced by a loop in the cord circuit which operates relay LG.

Relay LG operating,

LG1 applies a loop to hold the exchange line connexion when contacts RH2 and 3 release

Relay RH releasing,

RH2/RH3 connect the exchange line to the LG1 loop and operate 3 relay LS.

Relay LS operating, operates relays Z and ZR. The exchange line is extended to the loop in the cord circuit and relay LG releases. The connexion to the required extension is then completed in the normal manner.

If at the time an extension tries to make an enquiry call all the enquiry finder circuits are engaged, operator recall conditions are set up automatically. Relays D and ER operate as previously described and

since all the enquiry finders are engaged, an earth is connected to the B lead. This earth is extended via contact ER3 to operate relay CR and operator recall conditions are set up as previously described.

Release of Connexion Completed via the P.A.B.X. Manual Board

On the completion of the call, when the extension replaces the telephone instrument, the loop which holds relay LS and the public exchange equipment is disconnected.

Relay LS releasing,

LS1 short circuits relay Z.

Relay Z releasing,

Z1 connects the hold winding of relay MH across the exchange line when the public exchange is automatic or C.B. Z2 releases relay ZR.

Z3 operates the pilot relay to give an audible clearing signal.

Z4 disconnect the tip and ring of the jack from the exchange Z5) line.

Relay ZR releasing,

ZR1 disconnects the operate circuit for relay MH.

ZR3 connects earth to the bush of the jack to light the cord circuit supervisory lamps and prepares the operate circuit of relay DT.

ZR4 disconnects the earth from the enquiry finder T lead.

The operator withdraws the cord circuit plug from the exchange line jack, and the auxiliary jack springs disconnect the hold circuit of relay SR.

Relay SR releasing,

SR3 disconnects the audible clear signal.

SR4 disconnects the operate circuit of relay DT.

When the public exchange is Magneto or C.B.S. the strap between shelf jack points 63-65 is not inserted and relay MH releases when ZR1 contact releases.

If the public exchange is C.B. or automatic the strap between shelf jack points 63-65 is inserted. When contact Z1 connects the hold winding of relay MH across the exchange line, relay MH will hold until the public exchange apparatus restores to normal. The resistance of relay MH is too high to operate the public exchange relays. In the C.B. exchange the earth is disconnected from the A line on the calling equipment and when the cord circuit plug is removed by the public exchange operator the hold circuit for relay MH is disconnected, as described for C.B.S. and Magneto Exchanges. In the case of an automatic public exchange, a 600 millisecond disconnexion occurs when the selector train releases. This disconnexion releases relay MH.

Relay MH releasing,

MH1 releases relay CL.

Relay CL releasing,

CL1 connects the 250 ohm battery in parallel with relay H.
CL3 lights the free line signal lamp if appropriate.
CL5 connects relay AC <^cross the A and B lines.
CL6 disconnects the busy condition from the H lead of the selector multiple.
CL7 disconnects the engaged test earth from the bush of the jack.

The exchange line circuit is now available for further calls.

If the clearing down of the connexion on the manual board is delayed until after the release of relay MH, release of contact CL7 will operate relay DT in series with the cord circuit supervisory lamps which continue to glow.

Relay DT operating,

DT1 disconnects the operate circuit of relay LG.

The disconnexion of the operate circuit of relay LG prevents the extension user whilst still connected to the exchange line relay set from making a further outgoing call to the public exchange without the assistance of the P.A.B.X. operator.

Operation of the cord circuit speak key or the removal of the plug from the exchange line jack releases relay DT, and the operator can then originate a further call. If the operator restores the cord circuit speak key, the extension can make a further call.

Follow-on Call

If after receiving a clearing signal on the cord circuit supervisory lamps, the P.A. B.X. operator delays the withdrawal of the cord circuit plugs from the jacks, the exchange line circuit may be seized for a follow on incoming call. The ringing current applied to the exchange line operates relay AC, but the ringing current is prevented from reaching the extension's bell duo to the disconnexion of the circuit by Z4 and Z5 contacts.

Relay AC operating,

AC1 operates relay CR.

The operation of relay CR and the operation of relay ST under the control of flicker earth causes the cord circuit supervisory lamps to flicker as described for operator recall conditions. The operator enters the circuit by operating the appropriate cord circuit speak key and withdraws the corresponding plug from the extension jack. The call can then be treated as a new incoming call. If the cord circuit plug is withdrawn from the exchange line jack before the follow-on call is answered, the exchange line lamp will light as for a normal incoming call.

Release of a Direct Access Connexion

On the completion of the call the extension replaces the receiver and relays LS, Z and ZR release as described for "Release of Connexion, Completed via the P.A.B.X. Manual Board". In this case ZR3 contact disconnects the holding circuit of relay H.

Relay H releasing,

H1 releases the 1st Group Selector.

H2/H3 reconnect the tip and ring of the jack to relay LG. H4 disconnects the NS4. earth from the bush of the jack and places the engaged test earth under the control of CL7 contact.

Relays MH and CL release as described for "Release of Connexion Completed via the P.A.B.X. Manual Board". The circuit is then available for further calls.

Night Service Working

Under night service working selected exchange lines are connected to selected extensions via a cord circuit and the extension night service jack. On the selected exchange lines the strap is inserted between shelf jack points 68-70. When the Night Service Key is operated, Relay NS operates.

Relay NS operating,

NS1 busies the circuit on the group selector multiple.

NS2 prepares the operate circuit of relay H.

NS3 disconnects relay SR and prevents its operation to an earth connected to the KNS1 common which occurs in the case of an incoming call on an exchange line not plugged through for night service.

NS4 prevents an earth being connected to the bush of the jack when relay H or CR operates.

On an outgoing call from an extension, the instrument loop operates relay LG in the exchange line circuit. Relay LG operating extends the calling condition to the public exchange or adaptor circuit and relays

CL, LS, Z, ZR and MH operate as described for an "Outgoing Call via P.A.B.X. Manual Board". Relays LS, Z and ZR release when the extension replaces the receiver on the completion of the call and the exchange line circuit becomes free for further calls when the public exchange equipment restores to normal and relays MH and CL release.

In the case of an incoming call, relay AC operates to ringing at the public exchange or adaptor circuit.

Relay AC operating,

AC1 operates relay H.

Relay H operating,

H2/H3 connect the ringing current through to the extension.

If the public exchange is C.B.S. or C.B. without automatic ringing facilities, relay AC releases when the ringing current is disconnected.

Relay AC releasing,

AC1 releases relay H.

Relay H releasing,

H2/H3 disconnect the ringing from the extension line and complete the operate circuit for relay LG.

The extension loop operates relay LG and the extension line is connected to the exchange line in the same manner as for an outgoing call.

When the public exchange is automatic or C.B. with automatic ringing, as soon as the extension answers the call the instrument loop is connected via H2 and H3 contacts to the exchange line to trip the ringing. In the case of interrupted ringing from the public exchange, should the extension answer the call during a silent period, the LG1 loop may trip the ringing. The extension telephone is then connected to the exchange line in the manner previously described.

On all exchange lines, the earth connected to the auxiliary jack springs is disconnected when the night service key is operated. The absence of this earth prevents the holding circuit for relay CR from being completed if an incoming call should occur on an exchange line not plugged through for night service working.

Ancillary Working

If more than one lamp appearance is required, shelf jack point U8 is wired to a lamp lighting relay as shown on Diagram SA 8970 Rack Common Services. The

primary lamp circuit is fed from the 50V P.A.B.X. battery, whilst 6V A.C. is used to light all other appearances.

4.

DESIGN DETAILS

The reasons for the use of slow-operate relays are as follows:

Relay AC to prevent false operation of the relay due to the charging of capacitor C3.

The reasons for the use of slow-release relays are as follows:

Relay CL to ensure that it remains operated during the period that its operate circuit is disconnected at LG2 contact and its hold circuit is completed by MH1 contact. On the release of a connexion relay CL is the last relay to release and maintains the busy condition on the exchange line circuit until all other relays have released.

Relay Z to enable the relay to hold during impulsing. The slow release feature is obtained by short-circuiting the winding. It also ensures that a disconnexion occurs on the exchange line when the P.A. B.X. extension or operator clears. The hold circuit of relay MH is not connected across the exchange line until contact Z1 is normal.

Relay ZR to ensure that the hold circuit of relay MH is completed before its original operating circuit is disconnected. The slow release feature also ensures that relay H is held by ZR3 contact until contact LG6 operates when busy flash is returned from the public exchange on a direct access call.

Relay RH to ensure that when the operator transfers an exchange connexion originally set up by direct access, the cord circuit sleeve relay has released and a loop is applied by the cord circuit to hold the exchange connexion before contacts RH2 and RH3 disconnect the previous holding loop via resistor R1.

Relay LG to ensure that contact LG1 does not disconnect the operate circuit for relay LS before its hold circuit is completed via contacts Z4 and Z5. It also ensures that the hold circuit for relay H is completed by ZR3 contact before LG6 contact releases on a direct access call. The relay is made slow to release by resistor R8.

Resistors not fully explained previously

- R1 provides a satisfactory holding loop for the exchange connection when the enquiry or operator recall facility is used.
- R2 discharge resistor for capacitor C3.
- R3 indicates the marking condition for relay FR in the enquiry finder circuit.
- R4 indicates the free condition to relay FT in the 1st Group Selector.
- R5 prevents full earth from being connected to the battery when relay Z is short-circuited by LS1 contact.
- R6 prevents the calling earth from short-circuiting relay LS when the public exchange operator answers the call. (Only when earth calling is used.
- R7 limits the current in the 6V lamp circuit.
- R9 prevents the operation of the cord circuit supervisory lamps but provides an engaged test on the bush of the jacks.

5

HISTORY

Open Issue.
Issue 1

END OF DIAGRAM NOTES

Engineer-in-Chief's Office, S1/2/501/8158 February, 1954. .