

DIAGRAM NOTES

concerning

DIAGRAM GBW.14680

titled

35 & 49 LINE P.A.B.X. - ENQUIRY CIRCUIT1. GENERAL.

This circuit is used by an extension engaged on an exchange line call, should it be necessary to:-

- (1) make an enquiry call to another extension.
- (2) transfer the call to another extension.
- (3) call in the attendant.
- (4) transfer the call to the attendant.

The facilities of calling in the attendant and transferring to the attendant are not available at night.

2. FACILITY SCHEDULE.

Provision is made for:-

- (1) Connecting an extension engaged on an exchange line call to the enquiry circuit (if free) by a single depression of the instrument push-button.
- (2) Recalling the attendant should the enquiry circuit be already engaged when the button is operated.
- (3) Extensions having seized the enquiry circuit to recall the attendant into circuit by dialling '0'.
- (4) Connection to the wanted extension by dialling the required number.
- (5) Marking the called extension for transfer purposes and releasing the circuit when the transfer is completed.
- (6) Recalling the attendant and releasing the enquiry circuit when a transfer is attempted to an extension that has not answered.
- (7) Access to the circuit for testing with Routine Test Set GBW.13290.
- (8) The connection of Ring Tone on operator re-call.

3. CIRCUIT DESCRIPTION.3.1 Outline.

An extension, engaged on an Exchange Line Call may, by a momentary depression of the sub-set button and dialling the appropriate number make an enquiry call to another extension while holding the main exchange call. When the enquiry has been completed the extension can return to the main exchange call, or alternatively, transfer the exchange call to the other extension.

To obtain the assistance of the attendant, the extension momentarily depresses the sub-set button once and then dials the digit '0'. The depression of the button connects the extension to the enquiry circuit. Dialling '0' steps the enquiry selector to the 10th level to call the attendant.

In the event of the enquiry circuit being engaged, the first depression of the button causes the attendant to be recalled.

3.2 Detail.3.2.1 Enquiry Call, Enquiry Circuit Free.

The extension momentarily depresses the sub-set button which connects an earth to the -ve line and operates the differentially wound relay DR in the exchange line circuit.

The operation of relay DR causes the ER relay, in the Exchange Line circuit, to operate to the earth extended over the ST lead.

When the extension releases his sub-set button, relay DR releases and allows the EB relay in the Exchange Line circuit to operate over the H "IN" and TR leads to earth on the front of H changeover contact in the Exchange Line circuit. Relays ER and EB operated hold the main exchange call, and switch the extension through to the Enquiry circuit via the repeating coil bridge in the Exchange Line circuit. Relay A operates to the repeating coil loop.

Relay A operating.

- A1 operates relay B to 125 ohm battery (R3A and B).
- A2 prepares operating circuit for relay Z.

Relay B operating

- B1 prepares operating circuit of relay CD.
- B2 prepares holding circuit for B from battery at vertical magnet on operation of relay CD during impulsing.
- B3 prepares operate circuit of relay E.
- B4 connects dial tone to calling extension.
- B5 prepares holding circuit for relay H.
- B6 earths ring start lead and disconnects earth from ST lead.

Extension dials the first digit.

At the first release of relay A, relay CD operates to earth at TR6 in series with the vertical magnet.

Relay CD operating

- CD3 removes battery shunt across the vertical magnet.

Other contacts ineffective at this stage.

Relay CD and B hold during impulsing and the switch steps vertically to the required level, operating the off-normal springs N. At the end of impulsing relay CD releases.

N springs operating

- N1 disconnects dial tone.
- N2 connects the release earth via the NPB springs to E or BT relays.
- N3 disconnects the ST lead and connects CR lead to back contact of B6, for attendant recall when a transfer is attempted to an extension who has not answered (see 3.5.2).

On non-working levels the NPB springs operate, disconnecting relay E and operating relay BT on release of CD.

Relay BT operating

- BT1 & 3 ineffective at this stage.
- BT2 disconnects the vertical magnet and prevents re-operation of CD relay, by short circuiting it.
- BT4 extends Busy Tone to the calling extension.

On working levels the NPB springs remain unoperated, and at the end of the first digit when relay CD releases, relay E operates via Release earth, TJ11-12, N2, B3, NR2, CD4, NPB1.

Relay E operating

- E1 prepares a test circuit for relay H and an operate circuit for relay BT.
- E2 disconnects short circuit across H relay test winding.
- E3 disconnects the tone winding of relay A.
- E4 prepares a hold circuit for relay E when relay CD operates during second digit.
- E5 switches impulsing circuit from Vertical to Rotary magnet.

The extension dials the second digit.

At the first release of relay A, CD relay operates to earth at TR6 in series with the Rotary magnet.

Relay CD operating

- CD3 removes battery shunt across Rotary magnet.
- CD4 prepares hold circuit for relay E.
- CD5 operates relay BT.

Relay BT operating

- BT1 prepares a locking circuit for relay F.
- BT2 ineffective at this stage.
- BT3 locks relay BT to release earth via B3, N2.
- BT4 prepares tone circuit.

Relays CD and B hold during impulsing and the switch steps round to the required outlet, operating the rotary off-normal springs NR.

NR springs operate

- NR1 prepares operate circuit for relay CD on transfer.
- NR2 completes hold circuit for relay E during impulsing.

At the end of dialling relay CD releases and at CD4 breaks the holding circuit of relay E. During the release time of relay E the H relay tests the Called extensions line circuit via H wiper and Bank.

3.2.2 Called Extension Free

If the called extension is free, H relay operates to the CO relay battery in the extension line circuit.

Relay H operating

- H1 applies interrupted ringing to the extension's -ve line.
- H2 applies ring return to the extension's +ve line.
- H3 further prepares ring tone circuit to calling extension.
- H4 locks H over d-e winding to B5 earth.
- H5 earths the called extensions's H lead, thereby busying the outlet.
- H6 opens rotary magnet circuit.

Relay E releasing

- E1 disconnects relay H testing circuit.
- E2 short-circuits winding of relay H.
- E3 applies ring tone to tone coil of relay A.
- E4 further disconnects holding circuit for relay E.
- E5 further disconnects rotary magnet.

When the called extension answers, relay F operates to called extension's loop.

Relay F operating

- F1 disconnects hold circuit of relay H (see operation of D)
- F2 disconnects ring tone.
- F3 removes ringing and closes -ve line to D relay.
- F4(x) locks relay F to earth on B5 by removing its short circuit.
- F5 disconnects the earth on the Ring Start lead.
- F6 removes ringing return and closes +ve line to D relay.

The D relay operates to the called extension's loop.

Relay D operating

- D1 provides an alternative hold circuit for relay H, which is made slow to release by reason of the short-circuit applied to its a-b winding by contact E2. Relay H holds until above hold circuit has been established.
- D2 prepares a locking circuit for relay Z.
- D3 prepares a locking circuit for relay TR.
- D4 provides alternative hold circuit for relay B.

The connection is now complete, and the circuit is prepared for a transfer if required.

3.2.3 Called Extension Busy

In this case, when the H relay tests the H lead during the release time of relay E relay H does not operate as there is an earth returned on the H lead from the busy connection. Busy tone is returned to the caller via contact H3.

3.3 Extension Reverts to the Original Exchange Line Call

When the extension has completed the enquiry call it is possible to revert to the exchange line call by once more momentarily depressing the subset button. Depressing the button operates the exchange line DR relay as described in 3.2.1. Earth from the exchange line circuit is fed via the DR lead to the enquiry circuit and operates relay Z via A2.

Relay Z operating

- Z1 connects the RP lead to the B relay in order to short circuit relay B and release the circuit if the called extension does not clear.
- Z2 earths the Ring Start lead.
- Z3 locks Z to earth at D2 (if the called extension has not cleared) or to earth extended from the exchange line circuit over the TR lead (if the called extension has already cleared).
- Z4 disconnects the alternative hold circuit for relay H.
- Z5 further disconnects the ringing to the -ve lead.
- Z6 removes holding earth for relays EB and ER in the exchange line circuit on the H 'in' lead and holds relays EB and ER, until relay DR releases, to earth on DR lead.

The release of relays EB and ER in the exchange line circuit follows the release of the press button and restores the calling extension's +ve and -ve lines to the exchange lines and releases relay A.

When the called extension clears relay D releases.

Relay D releasing

- D1 releases relay H.
- D2 releases relay Z (slow release).
- D4 releases relay B.

If the called extension does not clear, the Release Pulse from the Pulse Circuit short circuits the B relay.

Relay B releasing

- B3 releases relay BT and prepares release circuit to rotary magnet.
- B5 releases relays H and F.

With relays B and H released, the rotary magnet is energised via the rotary interrupter RM1, N2, TJ11-12 to release earth, and the switch releases.

Upon the release of the switch, and the release of the Z relay, earth is re-connected to the ST lead leaving the circuit free to receive another call.

3.4 Extension Transfers Call to Enquiry Extension

Having obtained the required enquiry extension (see par. 3.2.1) the originating extension may transfer the call by simply replacing the receiver,

In this case the earth at B5 in the enquiry circuit continues to hold the EB and ER relays in the exchange line circuit via the H 'in' lead.

The following sequence of relay operations takes place in the exchange line and the enquiry circuits.

When the extension replaces the receiver, the LS relay in the exchange line circuit is released thereby operating relay A in the exchange line circuit, which opens the line loop and releases relay A in the enquiry circuit. The release of relay A, operates relay CD from earth at TR6 to 125 ohm battery at R3. In the exchange line circuit relay B releasing releases relays CA and H. The release of relays CA and H prepare the drive circuit of the EF switch. The release of relay H opens the +ve and -ve lines to the originating extension and removes the earth from the H lead, thus releasing the originating extension. A contact of relay H removes the earth from the TR lead and connects this lead to the ST relay. Battery at the ST relay operates TR in the enquiry circuit, as CD relay, previously operated, removes the short-circuit on relay TR at CD2.

Relay TR operating

- TR1 disconnects alternative hold circuit for relay H.
- TR2 prepares to connect a 1050 ohm battery to the J lead on release of relay CD via R5, J wiper, and bank contact, and disconnects the AS and BS lead.
- TR3 closes locking circuit of relay TR.
- TR4 disconnects the RP lead to the B and TR relays.
- TR5 disconnects earth from relay D thereby leaving a 1000 ohm earth connected, this in order to ensure the operation of the LS relay in the exchange line circuit on transfer.
- TR6 short circuits relay CD which releases slowly.

On release of relay CD an earth from B5 is applied to the TR lead, via CD2, and ST relay in the exchange line circuit is operated. Relay ST operating completes the drive circuit of the EF switch, which drives until the contact marked on the J (EF) bank by a 1050 ohm battery from the enquiry J bank, is reached. Relay ET in the exchange line circuit operates to the 1050 ohm battery and cuts the drive circuit of the EF switch. Relay LS re-operates in the exchange line circuit to the extension's loop and releases relay A which re-connects the loop to the enquiry circuit, operating relays A and Z in that circuit. Relay Z operating disconnects the holding earth from relay H, which releases, thereby releasing relay D. Relay D releasing, releases relays TR and Z, contact TR5 disconnects earth from the ER and EB relays in the exchange line circuit and they release. The loop circuit to the enquiry circuit being disconnected releases relay A thereby short-circuiting relay B which in turn releases, and at B3 connects the rotary magnet to earth, and the selector is returned to normal.

3.5 Attendant Re-call

An extension may recall the attendant by momentarily depressing the subset button once, waiting for dial tone from the enquiry circuit and then dialling the digit '0'.

Pressing the button once seizes the enquiry circuit as described in 3.2.1. Dialling '0' steps the selector to the 10th level where the NPA springs operate. The NPA springs place an earth (during the day-time only) on the CR lead, which operates the CR and OR relays in the exchange line circuit. Contacts of these relays connect flicker earth to the line lamp on the attendant's cabinet, and release the EB relay in the exchange line circuit, thereby releasing the enquiry circuit as already described in par. 3.3.

Ring Tone is returned to the caller. The attendant answers by operating the speak key associated with the calling exchange line circuit, and the CR, OR and ER relays are released. The attendant, after having dealt with the query, may retire from the call by restoring the speak key, leaving the extension still connected to the main exchange call. If, however, the extension wishes the attendant to deal with the call, on replacing the receiver, the exchange line circuit relay LS releases, causing relay CR to re-operate and release relay H which opens the originating extension's loop, allowing the extension to release. The attendant then proceeds as for an incoming call.

3.5.1 If an attempt is made to re-call the attendant at night, the extension receives busy tone as the BT relay is operated directly the switch steps to level 'O' and closes the NPA springs.

3.5.2 If an attempt is made to transfer a call to an extension who has not answered, the enquiry circuit extends an earth via B6 and the CR lead to operate the exchange line circuit OR relay and the attendant is called into the circuit as described above.

It should be noted that an exchange line call is not lost by either of these mis-operations.

END