POST OFFICE ENGINEERING DEPARTMENT DIAGRAM NOTES

DIAGRAM SA 8153/2

SPECIFICATION S 333

FINAL SELECTOR, (REGULAR) 100 LINE, FOR P.A.B.X. NO. 3

1. GENERAL

This diagram shows the circuit of the Final Selector, Regular, as used for a P.A.B.X. No. 3.

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

SA 8151 EXTENSION LATE AND LINEFINDER CIRCUIT.

SA 8152 1ST GROUP SELECTOR.

SA 8160 2ND INCOMING OR ENQUIRY SELECTOR.

SA 8170 RACK COMMON SERVICES.

SA 8244 SATELLITE FINDER CIRCUIT.

SA 8246 SATELLITE CONGESTION CIRCUIT.

2. FACILITY SCHEDULE

Provision is made for:

(1) Busying the final selector on the group selector multiple.

(2) Vertical and rotary stepping under the control of the dial impulses.

(3) Testing the wanted extension line.

(4) Ringing the instrument bell if the extension dialled tests "free" and returning Ring Tone to the calling extension.

(5) Returning Busy Tone 'to the calling extension if the extension dialled tests "busy".

(6) Returning NU Tone to the calling extension should an unequipped number or a PG extension be dialled.

(7) Reversing the battery and earth connexions on the incoming + and - leads and disconnecting the ringing when the called extension answers.

(8) First party release on the completion of the call.

(9) Calling party release when specified.

(10) Indicating to the Satellite Congestion Circuit whether the circuit is engaged or not.

3. CIRCUIT DESCRIPTION

This circuit follows the general principles of the normal 200 type 100 line Final Selector. The selector is designed for first party release on completion of the call in order to minimise the ineffective holding

time of the automatic equipment. In special circumstances calling party release is permitted and is obtained by means of a. minor wiring modification on the final selector shelf jacks. The following table indicates the various conditions which may be encountered on the H lead of an extension line circuit and the tone signals which are returned to the calling extension in each case.

The reversal of the battery and earth connexions on the + and - leads when the called extension answers is used for supervisory purposes on automatic interswitchboard circuits.

	Testing condition on H lead	Tone returned
Free extension line	250 ohm battery	Ring Tone
Busy " "	Earth	Busy "
Unequipped " "	Dis.	NU "
P.G. " "	900 ohm battery	NU "

Detail

The free condition of a final selector is indicated by the presence o£ a 250 ohm battery on the incoming H lead. When a final selector is seized from the preceding selector level, a loop is extended to the incoming + and - leads.

(A) Seizure and Impulsing

Relay A operates to the incoming; loop,

A1 operates relay B.

Relay B operating,

B1 busies the final selector by connecting an earth to the H lead which holds the preceding equipment.

B2 prepares an operate circuit for relay CD and the vertical B3) magnet.

B4 connects an earth to the Ringer Start lead.

B6 disconnects the release earth from the rotary magnet circuit and prepares an operate circuit for relay E.

B7 prepares a holding circuit for relay F and relay H, and disconnects earth from the CM1 lead.

Relay A responds to the dialled pulses. At each release of relay A during the first impulse train, the vertical magnet is energised in series with the 4 ohm coil of relay CD.

Relay B is short circuited and with relay CD holds during pulsing.

Relay CD operated,

CD1 disconnects the 250 ohm battery from the vertical magnet circuit.

CD2 prevents relay E operating during vertical stepping.

CD3/CD4 disconnects the D relay from the transmission bridge to avoid affecting the pulsing performance of relay A.

CD5 disconnects the testing circuit of relay HT.

When the selector steps off-normal the mechanical off-normal springs (N) operate.

N1 prepares the operate circuit of relay E.

N2 disconnects the 250 ohm battery from the incoming H lead. N3 see release of selector.

N4 prepares hold circuits for relays F and H.

At the end of the first impulse train the selector has been positioned to the required vertical level.

During the inter-digital pause relay A holds to the incoming loop.

Relay A holding,

A1 short circuits relay CD.

Relay CD releasing,

CD2 operates relay E.

Relay E operating,

E1 disconnects the tone circuit during rotary stepping.

E2 connects the pulsing circuit through to the rotary magnet and disconnects the vertical magnet.

E3 prepares a holding circuit for relay E.

E4 prepares an operate circuit for relay II and a holding circuit for relay HT.

E6 prepares the testing circuit of relay HT.

E7 further prepares the operate circuit of relay H and holding circuit of relay HT.

Relay A responds to the dialled impulses of the last impulse train. At each release of relay A the rotary magnet is energised in series with the 4 ohm winding of relay CD. Relays B and CD retain during impulsing

Relay CD operates on the first release of relay A. CD2 completes the holding circuit for relay E. CD5 disconnects the testing circuit of relay HT during rotary stepping.

When the selector takes its first rotary step the mechanical rotary off-normal springs (NR) operate.

NR1 disconnects the operate circuit of relay E. NR2 prepares the tone circuit.

NR3 disconnects the vertical magnet from contact A1.

On the completion of the impulse train the selector is positioned on the required extension bank contacts and testing now takes place.

(B) Testing of required extension's line, ringing and answering, assuming the called extension tests free

Relay A holds to the incoming loop,

A1 short circuits relay CD.

Relay CD releasing,

CD1 provides a holding circuit for relay B. CD2 starts the releac.e of relay E.

CD3/CD4 connect relay D to the transmission bridge.

CD5 connects the earth from contact E6 through the 26 ohm coil of relay HT to the 11 wiper.

The testing of the called extension's H wire occurs during the slow release of relay E and if the extension line circuit is free a 250 ohm battery is connected to the H lead of the final selector multiple. The 250 ohm battery operates relay HT whilst the earth from the final selector operates relays LS and CO in the extension line circuit.

Relay HT operating,

HT1 operates relay H and provides a holding circuit for relay HT before relay E has fully released.

Relay H operating,

H1 operates relays LS & CO, busies the extension line and holds relay HT.

H2/H3 extend the + and - wipers through to F2 and F3 contacts.

H4 prepares the Ring Tone circuit.

H5 prepares an alternative busying circuit on the incoming H lead.

H7 provides a holding circuit for relay H, and further disconnects the rotary magnet.

Relay E releases,

E1 connects ring tone to the tone winding of relay A.' This tone is extended to the calling extension.

E2 short circuits relay CD, and prevents its operation during the release sequence.

E4/E7 disconnect the original operate circuit of relay H and the) holding circuit of relay HT.

E5 connects ringing current via the - wiper to the B line of the extension line circuit.

E6 holds relay HT.

The called extension's instrument bell is rung and when the call is answered, the called extension's loop operates relay F.

Relay F operating,

F1(x) removes the short circuit from the hold winding of relay F.

F2/F3 disconnect the ringing current and ring return earth from the extension line and extend the extension loop through to relay D.

F4 disconnects the earth from the ringer start lead.

F5 releases relay HT.

F6 disconnects the ring tone from the tone coil of relay A.

Relay D operates to the called extension's loop,

D1/D2 reverse the battery and earth connexions to the incoming – and + leads to give supervisory conditions on a dialled-in interswitchboard line call.

D4 disconnects the rotary magnet release circuit.

The calling extension is now connected to the called extension via the transmission bridge of the final selector.

(C) Called extension tests busy

If the called extension is busy, there will be an earth present on the H lead of the final selector multiple. Testing occurs after the release of relay CD and during the slow release of relay E when relay HT is extended to the H wiper. Relay HT will not operate at this stage and relay E releases as described in para. (B).

Relay E releasing,

E1 prepares the busy tone circuit.

E6 operates relay HT to earth on the busy extension line circuit.

E4/E5/E7 prepare an operating circuit for relay F.

Relay HT operating,

HT1 operates relay F.

Relay F operating,

F1 removes the short circuit from the hold winding of relay F.

F5 releases relay HT.

F7 returns busy tone to the calling extension.

Relay HT releasing,

HT1 disconnects the operate winding of relay F.

Relay F holds via N4 and B7.

The calling extension receives busy tone and must originate another call to obtain the required number.

(D) Called extension test PG or is Y an unequipped number

If the called extension is in the PG condition a 900 ohm battery is present on the H lead of the extension line circuit. During the slow release of relay F the current is insufficient to operate relay HT. On an unequipped extension the H lead is disconnected and in either case on the release of relay E, relay HT will not operate.

NU Tone is returned from the final selector to the calling extension.

(E) Release of final selector

On extension to extension calls, under normal conditions the first extension to replace the telephone instrument releases the final selector.

Should the calling extension be the first to clear, the loop is disconnected from the incoming - and + leads and relay A releases.

Relay A releasing,

Al releases relay B.

Relay B releasing,

B6 prepares the rotary magnet release circuit.

B7 releases relays H and F and short circuits relay B until N3 springs restore.

Relay H releasing,

H2/H3 disconnect relay D from the called extensions loop.

H5 disconnects the earth from the incoming H lead to release the preceding equipment.

H7 prepares the rotary magnet circuit.

Relay F releases slowly.

F5 ensures that relay F is released before marking battery is applied to the H lead.

Relay D releases,

D4 connects the rotary magnet to the release earth. The selector restores to its normal position and when this is reached the N springs restore.

N2 connects the 250 ohm battery to the incoming H lead, provided relay F has released, and the final selector is now available for further calls.

N3 removes the short circuit from relay B, and connects earth to the CM1 lead.

When the called extension is the first to replace the telephone instrument, the loop is disconnected from the - and + wipers and relay D releases.

Relay D releasing,

D1/D2 connect normal battery and earth potentials to the incoming - and + leads.

D3 short circuits and releases relay B.

D4 prepares the release circuit.

Relay B releases,

B7 maintains the short circuit across relay B via N3 springs until the selector shaft restores to normal

Other contract functions and release of the selector are the same as for calling extension release from this stage onwards.

If first party release is not required and the release of the final selector is to be under the control of the calling extension, the strap between U

points 26 and 28 is disconnected. Relay B will not release on the release of relay D and is held under the control of the calling extension. The release of contacts D1 and D2 connect normal battery and earth potentials to the incoming - and + leads to give a clearing signal in the case of a dialled call over an interswitchboard line.

4. DESIGN DETAILS

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

Relay B — To enable it to hold during impulsing. The slow release feature is obtained by short-circuiting the relay via the break contact of Al or D3.

Relay CD — To enable it to hold during impulsing. (It must also release during the inter-digital pause.) The slow release feature is obtained by shunting the relay with its 50 ohm non-inductive winding.

Relay E — To allow relays HT and H to operate when switching to a free extension. (See also "slow operate" function).

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

Relay E — To ensure a satisfactory operation of relay E at the end of the 'tens' train of impulses. The lag ensures the relay being fully fluxed during the time between the release and re-operation of relay CD and its maximum release lag is thereby obtained.

Relay F — To prevent it vibrating to ringing current.

The reason for the use of a high speed relay:

Relay HT — To enable both relays HT and H to operate before relay E has fully released. The 26 ohm winding of relay HT in series with R4 400 ohms will operate when testing the 250 ohm battery, on the H lead of a free extension but will not operate when testing the 900 ohm battery on the H lead of a PG extension.

Resistors

R2 — prevents the connexion of full battery to the incoming H lead and limits the current through the testing relay of the previous selector. It also limits the current' through the 26 ohm winding of relay HT when a busy extension has been tested.

R3 — prevents a full earth from being connected to the battery during the bunching time of Al contracts.

R4 — limits the current in the operate winding of relay HT and also prevents a 26 ohm earth from being connected to the II lead of an engaged extension during the testing period of the final selector. A 426 ohm earth applied to the H lead will not interfere with an established call.

R5 — prevents a full earth from being connected to the battery during the period relay F is short-circuited

R6 — limits the current in the tone winding of relay A.

5. HISTORY

Issue 1 - September 1966 - (Dgm SA 8153/2 introduced for Register Satellite working)

Engineering Department

Ref:- 53/5/501/8153

END OF DIAGRAM NOTES