

DIAGRAM NOTES (ISSUE 3)

concerning

NZPO 36602, FIG. 3.

titled

SUBSCRIBER'S TERMINATING RELAY SET

FOR C.B., AUTO, M & R LINES

RURAL AND OOB CARRIER SYSTEMS

An explanation of the above circuitry is covered under the following headings:

1. GENERAL
2. FACILITY SCHEDULE
3. OUTLINE CIRCUIT OPERATIONS
 - 3.1 Outgoing Call from Subscriber.
 - 3.2 Incoming Call to Subscriber.
4. OPERATIONAL DETAILS
 - 4.1 Outgoing Call from Subscriber.
 - 4.2 Incoming Call to Subscriber.
5. CIRCUIT DESIGN NOTES

1. GENERAL

1.1 The diagram shows the circuit of a subscriber's terminating relay set for C.B., Auto, M & R lines for use with Rural or OOB Carrier.

1.2 These notes are for the 50 volt Rural and OOB versions of the relay set (sheets 2 and 4). However, these notes will provide guidance in principle to the operation of the 24 volt versions of the relay set (sheets 1, 3 and 5).

1.3 Typical circuits to be considered in conjunction with this diagram are:

Subscriber's telephone.

PABX Exchange Line Circuit GBW 15220 or equivalent.

Rural Carrier TO-1F or OOB Carrier.

1.4 The Rural Carrier idle mode condition is:

(1) Subscriber's terminating relay set to exchange: off in the idle mode.

(2) Exchange to subscriber's terminating relay set: on in the idle mode.

1.5 The OOB Carrier tone-off and tone-on conditions in the following directions are:

(1) Subscriber's terminating relay set to exchange: tone-on when relay set is not in use; tone-off when relay set seized; pulse interrupted tone-on when subscriber dialling; tone-off during speech condition (tone-off talking).

(2) Exchange to subscriber's terminating relay set: tone-on when relay set not in use; interrupted tone-off during ringing; tone-off during speech condition (tone-off talking); in addition when connected to NZPO PABX Exchange Line Circuit tone-off for the immediate busy facility and the release guard.

2. FACILITY SCHEDULE

Provision is made for:

2.1 Bothway working

2.2 Operation with Rural or OOB Carrier systems.

2.3 50 volts or 24 volts battery supply.

2.4 Internal ringing supply or a common ringing supply.

2.5 Disconnection of carrier channel during signalling and dialling.

2.6 Operation with C.B., Auto, M & R subscribers' lines.

3. OUTLINE CIRCUIT OPERATIONS

3.1 Outgoing Call from the Subscriber.

3.1.1 The circuit is seized by a loop across the A and B wires from the subscriber's line or an earth in the case of NZPO PABX or a simplex "R" line. Dialed pulses are received and relayed via the "M" wire to the Rural Carrier.

3.2 Incoming Call to the Subscriber.

3.2.1 Relay RA responds to the signal on the "E" wire from the carrier and converts it to alternating current signal on the A and B wires. During this signal period the carrier channel is disconnected. When the subscriber answers, a signal is transmitted via the "M" wire to the carrier.

4. OPERATIONAL DETAILS

4.1 Outgoing Call from the Subscriber.

4.1.1 Seizure.

Relay A operates to the looped line wires when the calling subscriber lifts the handset or in the case of simplex R lines or a NZPO PABX line to an earth on the line

A1 for Rural Carrier removes a battery or earth from M wire and operates relay B. See Note 2.10. For OOB Carrier connects an earth to the M wire and operates relay B

A2 disconnects relay CD

Relay B operating

B1 connects carrier receive channel

B2 operates relay RA

Relay RA operating

RA1 is ineffective

RA2 connects earth to A wire if connections are strapped in for NZPO PABX line. See Sheet 6.

4.1.2 Dial pulses received. Relay A functions under the control of the received pulses and A1 contact repeats them via the M wire to the carrier. On the first release of relay A in each digit relay CD operates and remains operated until after the end of the digit.

Relay CD operating

CD1 to CD3 is ineffective

CD4 disconnects carrier send channel

At the end of the digit relay CD releases. The same process is repeated for each digit dialled. At the completion of the last digit dialled, a tone indicating the condition of the called line is returned to the calling subscriber. When the called party answers, conversation can take place.

4.1.3 Release. Release is only effected when the calling subscriber restores.

Relay A releasing

A1 for Rural Carrier connects a battery or earth to the M wire and also releases relay B. For OOB Carrier removes an earth from the M wire and also releases relay B

A2 ~~operates~~ relay CD

Relay CD operating

 CD3 is ineffective

 CD4 disconnects carrier send channel

Relay B releasing

 B1 disconnects carrier receive channel

 B2 releases relay RA providing there is no signal on the E wire

Relay RA releasing

 RA1 release relay CD

 RA2 disconnects earth from A wire if connections are strapped in for NZPO PABX line. See Sheet 6

Relay CD releasing

CD2 to CD3 is ineffective

 CD4 connects carrier send channel

The circuit is now completely released and is available for subsequent calls.

4.2 Incoming Call to the Subscriber.

4.2.1 Seizure. A pulsing earth signal is received on the "E" wire which operates relay RA. Note that for NZPO PABX working an immediate earth is received independent of the ringing cadence.

Relay RA operating

 RA1 locks relay RA independently of signal and also operates relay CD

 RA2 connects an earth to the A wire for immediate busy facility if connections are strapped in for NZPO PABX line

Relay CD operating

 CD3 prepares a circuit for relay RB

 CD2 unlocks relay RA

Relay CD remains operated until after the end of the signal. On the first release of RA relay, relay RB operates and remains operated until relay CD releases.

In Fig. 3 two ringing supply conditions are available. In the OOB version Fig. 9 only common ringing supply is provided.

(1) If common ringing supply is used.

Relay RB operating

RB1 & RB2 connects continuous ringing and ring return to A and B wires

 RB3 connects an earth to ring start lead

 RB4 is ineffective

(2) If internal ringing supply (Fig. 4) is used.

Relay RB operating

RB1 connects an earth to the A wire

RB2 connects the output of T3 to the B wire

RB3 connects RA2 earth to one half side of the primary winding of T3

RB4 prepares a circuit for the other half of the primary winding of T3

On the re-operation of RA relay, RA2 earth is connected to the other half of the primary winding of T3. This sequence of alternately connecting an earth to the two halves of the primary winding, which has the centre point connected to 24 volts, produces an output of not less than 70 VMS into a resistive load of 1500 ohms at the ringing frequency applied to relay RA.

4.2.2 ANSWER

Ring trip is provided in the Fig. 3 version of the relayset either in the silent period or by the provision of an optional Ring Trip relay as per Fig. 5 which allows for answering during the ringing cycle. The Fig. 9 O.O.B version of the relay set provides for both conditions of Ring Trip. These conditions are explained as follows:

4.2.2.1 Called Party Answers During The Silent Period

Relay A operates during the period relay RB is released to the looped line wires or to an earth if a simplex R line

A1 for Rural Carrier disconnects a battery or earth from M wire to signal to the carrier that the called subscriber has answered and also operates relay B. For OOB Carrier connects an earth to the M wire and also operates relay B

A2 releases relay CD

Relay B operating

B1 connects carrier receive channel

B2 locks relay RA independently of signal on the E wire

Relay CD releasing

CD3 disconnects circuit for relay RB

CD2 provides an additional circuit to hold relay RA

CD4 connects carrier send channel

4.2.2.2 Called Party Answers During The Ringing Period

Relay F operates

F1 operates relay A

F2 x-contact, provides immediate locking circuit for F

Relay A operating

A1 for Rural Carrier disconnects a battery or earth from M-wire to signal to the carrier that the called sub has answered and also operates relay B

For OOB Carrier connects an earth to the M-wire and also operates relay B

A2 disconnects relay CD which releases slowly

Relay B operating

B1 connects carrier receive channel

B2 locks RA independently of the signal on the E wire

Relay CD releasing

CD3 disconnects relay RB

CD2 provides an additional circuit to hold relay RA

CD4 connects carrier send channel

Relay RB releasing

RB 1&2 disconnect ringing and connect the A-relay to the subscribers loop

RB3 releases F relay

Relay F releasing

F1 disconnects the ring trip operate circuit of relay A

F2 is ineffective

Conversation now takes place.

4.2.3 Release. Release is only effected when the calling subscriber restores. The release proceeds as explained in Section 4.1.3.

5. CIRCUIT DESIGN NOTES

Reasons for the following relays to be slow to release are:

Relay B is made slow to release to ensure its retention during pulsing.

Relay CD is made slow to release by two methods.

(1) By a short circuit to guard all pulse disconnection periods.

(2) By a shunt resistor to ensure its retention during the incoming ring cycle.

Relay F is made slow to operate to ensure it does not operate to the ringing (Test as in BPO EC 1717 applies).

Current Drain

	<u>50 Volts</u>	<u>24 Volts Sht 1</u>	<u>24 Volts Sht 3</u>
Normal	Nil (50 mA)	Nil (50 mA)	Nil (50 mA)
Intermittently during signalling	330 mA	600 mA	220 mA
Intermittently during signalling with Fig. 2	550 to 900 mA	660 to 1580 mA	510 to 1480 mA
Talking	180 mA	140 mA	140 mA

Bracket figures denote battery signalling system used. See diagram Note 1.10, 2.10 and 3.10.

Signalling Design Line Limits

Entry point A and B wires	50 volts	24 volts
Loop C.R.	1750 ohms	600 ohms
Total Simplex Earth Resistance	1750 ohms	600 ohms

NOTE: The simplex resistance is the resistance of both conductors of the subscribers line in parallel and the earth return circuit.