

DIAGRAM NOTES (ISSUE 1)

concerning

NZPO 36887, ISSUE C

titled

TWO WIRE INTERMEDIATE PULSE REPEATER

WITH MANUAL HOLD

This equipment is considered under the following headings:

1. GENERAL
2. FACILITY SCHEDULE
3. OUTLINE OF OPERATION
4. CIRCUIT DESCRIPTION
5. DESIGN DETAILS
- 5.8 Busying Details

## 1. GENERAL.

1.1 This diagram shows the circuit of a relay set used at an intermediate exchange to permit the maximum D.C. signalling limit for UAX level 1 outgoing S.F.D. junctions to be extended beyond the present limit of 2000 ohms loop cable resistance.

1.2 Typical diagrams to be considered in conjunction with this circuit are -

GBW 10760 or equivalent Group Selector

GBW 13970 Outgoing junction to non-dependent auto exchanges.

## 2. FACILITY SCHEDULE.

Provision is made for -

2.1 Operation with an amplifier.

2.2 Pulse repetition.

2.3 Manual hold of the calling subscriber.

2.4 Transmission bridge.

2.5 Reversal of the potential on the incoming junction line when the called party answers.

2.6 The use of outgoing junction with up to 2000 ohm loop cable resistance.

2.7 Future busying of the circuit by placing a reversal on the outgoing junction + and - leads.

## 3. OUTLINE OF OPERATION.

The circuit is seized by a loop across the junction from the preceding equipment. Dialed pulses are received and relayed via the outgoing junction loop to the selector at the distant exchange. When the called party answers the polarity of lines is reversed for supervisory purposes. Release occurs when the calling or called party clears. For calls to an operator the circuit is held until the operator clears.

## 4. CIRCUIT DESCRIPTION.

### 4.1 Seizure.

Relay A operates to the calling loop extended from the preceding equipment.

#### Relay A Operating.

A1 extends the loop, and at a later stage, repeats the dialled pulses to the junction.

A2 Operates Relay B.

#### Relay B Operating

B1 prepares a circuit for Relay C.D.

B2 is ineffective.

### Relay B Operating (Cnt'd)

- B3 applies battery to S.W. lead to switch on amplifier if equipped.
- B4 Spare.

### 4.2 Dial pulses received.

Relay A functions under the control of the received pulses.

- A1 repeats the pulses to the junction loop.
- A2 operates Relay C.D.

Relay CD operates on the first dialled pulse and remains operated throughout the pulse train.

- CD1 short circuits the transmission bridge and provides a non-inductive path for the pulse currents.
- CD2 disconnects the battery from S.W. lead.
- CD3 short circuits relay DA to prevent its operation during dialling.
- CD4 Spare.

At the end of pulse transmission relay C.D. release.

### 4.3 Called party free. When the called party answers:

Relay DA is operated by the reversed line potential.

- DA1 operates Relay DD.
- DA2 Spare.

### Relay DD Operating

- DD1 )  
DD2 ) <sup>verse</sup> reserve the potentials to the calling party.
- DD3 prepares a circuit to provide a 25 volt potential to R7.
- DD4 prepares a circuit to provide a potential to relay DA during manual hold condition.

4.4 Called party engaged. Should the called party be engaged busy tone is returned to the calling party from the succeeding selectors.

4.5 Manual Hold. On a call to an operator, provision is made for the calling party to be held if necessary. On the release of the calling party -

### Relay A Releases

- A1 disconnects the loop to the Outgoing junction.
- A2 releases Relay B and removes the earth short from R7.

Relay DA remains operated to the earth on the -1 lead from succeeding selector and the 25 volt potential being applied to R7. The relay in the succeeding selector which is providing the earth on the -1 lead through its coil will not hold as there is insufficient current available in the circuit.

### Relay B Releasing

- B1 is ineffective.
- B2 provides an additional circuit to hold relay DA to the battery on the + lead.
- B3 disconnects R4 battery from SW lead.
- B4 Spare.

The relay in the succeeding selector which is providing the earth and battery on the Outgoing junction though its coil will not operate as there is insufficient current in the circuit. The calling subscribers' connection is thus held until the operator withdraws the answering plug, but should the subscriber recall before the plug is withdrawn Relays A and B re-operate as described in par. 4.1.

4.6 Release of Manual Hold. When the operator clears down, Relay DA will release due to a restoration of polarity on the Outgoing junction when the supervisory relay in the succeeding selector releases.

### Relay DA Releasing

- DA1 releases Relay DD.
- DA2 Spare.

### Relay DD Releasing

- DD1 )  
DD2 ) restores the polarity to the Incoming leads.
- DD3 removes the 25 volt potential from R7.
- DD4 short circuits R10 to reduce the resistance in the + lead so that Relay DA can be operated when the circuit is normal by reversing the polarity on the Outgoing junction. This will busy the circuit providing the Incoming Junction can be busied by a reversal of potential on the + and - leads.

## Relay DD Releasing (Cnt'd)

On a call to a subscriber, Relay DA will not be held if the calling party only clears, as the succeeding selector would have cleared due to the earth-dis-earth condition on the P-wire of the final selector, this restoring line polarity.

4.7 Called party clears down first. When the called party clears down relays DA and DD release. Relay A remains operated until the Incoming junction is timed released at the originating exchange. Relays A and B will then release and the circuit is restored to normal.

### 5. DESIGN DETAILS.

5.1 Diodes are used for the following reasons:

- D1 prevents DA Relay operating to the potential from the outgoing junction until the potential is reversed.
- D2 prevents DA Relay operating to the earth from the outgoing junction when the circuit is normal.
- D3 To block A2 earth from short circuiting Relay DA during talking.
- D4 To block R8 earth from short circuiting Relay CD when A releases.
- D5 To make Relay DD slow to release. See par. 5.2.

5.2 The reasons for the following relays to be slow to release:

Relay B is made slow to release by a short circuit of A2 contact to ensure its retention during pulsing.

Relay CD is made slow to release by a earth to earth short circuit to guard all pulse disconnection periods.

Relay DD is made slow to release to prevent an interaction between relays DA and A which could be obtained when the calling party answers.

5.3 The reason Relay DD is made slow to operate is to prevent an interaction between Relays DA and A which could be obtained when the calling answers.

5.4 The reason why R7 is to be short circuited when the Outgoing junction excess 1000 ohm loop cable resistance is to ensure that there is sufficient current in the circuit to hold relay DA during manual hold condition.

5.5 Test jacks are provided for monitoring purpose.

5.6 Battery drain.

Circuit normal - Nil

Signalling 300 mA

Talking 400 mA

5.7 Line Limits.

Incoming and Outgoing junctions up to 2000 ohm loop cable resistance.

Leakage - maximum 50,000 ohms.

Earth potential difference - maximum 6 volts.

5.8 How to busy.

- (a) The preceding equipment at the UAX is to be busied.
- (b) By placing a reversal on the outgoing junction leads which will operate relays DA, DD and reverse the polarity on the incoming junctions leads. This will busy the preceding equipment at the UAX if the facility is provided.

END