

DIAGRAM NOTES (ISSUE 1)

for

NZPO 31863 (ISSUE E)

titled

INCOMING LIMITED FACILITY JUNCTION RELAY SET N.Z. UAX 13

OUT-OF-BAND CARRIER SYSTEM

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

1. GENERAL.
2. FACILITY SCHEDULE.
3. OUTLINE CIRCUIT OPERATION.
4. OPERATIONAL DETAILS.
5. CIRCUIT DESIGN NOTES.

1. GENERAL.

1.1 This diagram shows the circuit of a relay set used between out-of-band system (MB Parent) and a UAX 13.

1.2 The diagram should be considered in conjunction with the following:

GBW 13980 or equivalent	UAX 13 I/C Junction from Parent
NZPO 29413 or equivalent	B/W Parent Term. RAX or UAX, OBS LS (Magneto) BMSB
NZPO 32548 or equivalent	B/W Parent Term. RAX or UAX, OBS, CB, BMSB.
NZPO 33001 or equivalent	G.S.3 Parent Exchange to UAX 13 (Central battery) B/W R/S OBS.

1.3 These notes describe the four-wire version (Sheet 5) which is a development of the original two-wire relay set (Sheet 1). While these notes apply directly to the four-wire type relay set, they will also give guidance as to the principle of operation of the two-wire relay set - bearing in mind possible changes in facilities or contact numbering, etc.

2. FACILITY SCHEDULE.

Provision is made for:

- (a) An included four-wire hybrid.
- (b) A 600-ohm hybrid two-wire termination.
- (c) Seizure in the incoming direction via the "E" wire.
- (d) Converting break-earth dial pulses on the "E" wire to loop disconnect pulses.
- (e) Supervision.
- (f) Converting "trunk offer" and "re-ring" pulses on the "E" wire to an earth of appropriate duration on the "-1" wire.
- (g) Operator "Manual Hold".
- (h) Pulsed or continuous earth signals via the "M" (send) wire.

(See Note 5.5, Sheet 5 of diagram).

3. OUTLINE CIRCUIT OPERATION.

An earth signal is received on the "E" wire and the circuit prepares to receive dial pulses.

When dialling pulses are received, they are converted and forwarded as loop-disconnect pulses.

Supervisory tones are heard without any change in this circuit.

When the called subscriber answers, the polarity of the "-1" and "+1" wires is reversed and if Note 5.5 (a) applies, a supervisory signal is forwarded to the distant CB type manual parent exchange.

When the called subscriber clears, the polarity on the "-1" and "+1" wires is restored and a clear pulse is sent on the "M" wire (magneto parent). In the case of a CB parent, the supervisory signal is removed from the "M" wire.

The operator clears and the earth signal is removed from the "E" wire to initiate the release of this circuit.

If the called subscriber is "busy" and the operator "trunk offers", a "trunk offer" timed dis-earth pulse is received on the "E" wire. This circuit prepares for supervision and unbalances the loop to the UAX equipment and the call may be offered.

When the called subscriber clears, the reversal on the "-1" and "+1" wires allows the supervisory lamp to glow in the operators cord circuit. The operator causes a "re-ring" dis-earth pulse to be received on the "E" wire and this circuit unbalances the loop again and ringing is sent to the subscriber.

The circuit now functions as already described.

4. OPERATIONAL DETAILS.

(NOTE: The absence of relay contacts signifies that they are ineffective at that stage, or are spare.

4.1 Seizure.

When an operator plugs into the line jack at the distant exchange, a "seize" earth signal is received on the "E" wire.

Relay A operates (to the "seize" signal).

A2 operates relay B.

Relay B operates.

B1 completes loop to the UAX equipment.

B2 operates relay IG, and prepares operate circuit of relay RP.

B3 prepares relay CD operate circuit.

Relay IG operates (slowly).

IG1 removes the short-circuit from contact A1 to allow pulsing.

IG2 prevents relay TC operating on first pulse.

Relays operated: A, B and IG.

4.2 Dialling.

By dialling, the operator causes break-earth pulses to be received on the "E" wire and contact A1 pulses the UAX equipment. Relay CD operates on the first pulse and contact CD4 short-circuits the hybrid transformer T1/T2.

Relay CD operates (during pulsing).
CD1 makes relay CD slow-releasing.
CD3 further prepares relay RP operate circuit.
CD4 short-circuits transformer T1/T2 to reduce pulse distortion.
As soon as contact A2 operates after the first break-earth pulse, the earth is removed from RPb and relay RP operates (via contact CD3).

Relay RP operates.
RP1 holds relay IG (IGs release lag prevents its release during the first dial pulse).
RP5 disconnects A2 earth from RPb, and makes relay RP slow-releasing.
At the end of the pulse train, relay A remains operated and relay CD releases slowly.

Relay A remains operated.
A1 holds the UAX loop.
A2 holds relay B.

Relay CD releases (slowly).
CD1 removes short-circuit from CD to give fast-operate feature.
CD3 disconnects relay RP and maintains IG.
CD4 removes short-circuit from transformer T1/T2.

Relay RP releases (slowly), but contacts have no function.
Relays operated: A, B and IG.
Supervisory Tones are heard without any change in this circuit.

4.3 Called Subscriber Answers.

When the called subscriber answers, the polarity of the "-1" and "+1" wires is reversed by the UAX final selector.

Relay DA operates.
DA1 operates relay DD.
DA2 opens the "M" wire (when required).
Relay DD operates (slowly).
DD1 (a) prepares the "M" wire (when magneto parent exchange), or
(b) connects an earth signal to the "M" wire (when central battery exchange).
Conversation takes place.
Relays operated: A, B, IG, DA and DD.

4.4 Called Subscriber Clears.

When the called subscriber clears, the reversal is removed from the "-1" and "+1" wires.

Relay DA releases.
DA1 releases relay DD.
DA2 completes the "clear" earth pulse to the M wire (when required).
Relay DD releases (slowly).
DD1 (a) disconnects the "clear" pulse from the "M" wire (if magneto parent exchange), or
(b) disconnects the earth signal from the "M" wire (if central battery exchange).

The distant manual board supervisory lamp "glows" and this circuit remains in this "Manual Hold" condition until the operator releases.

Relays operated: A, B and IG.

4.5 Operator Clears.

The operator removes the cord circuit plug from the line jack at the distant exchange. The earth signal is removed from the "E" wire.

Relay A releases.

A1 opens the loop to the UAX equipment.

A2 releases relay B; operates CD, and short-circuits RP.

Relay CD operates.

CD3 releases relay IG.

CD5 prevents a pulse to the "M" wire if the operator clears first (if magneto parent exchange).

Relay IG releases (slowly), but its contacts have no function.

Relay B releases (slowly).

B3 releases relay CD.

Relay CD releases (slowly), but its contacts have no function.

The circuit is now normal.

4.6 Trunk Offer.

Relays operated at this stage: A, B and IG.

If the called subscriber is "busy" and the operator "trunk offers", a "trunk offer" timed dis-earth pulse is received on the "E" wire. This pulse is sufficient to release relay IG but not B.

Relay A releases.

A2 operates relay CD and short-circuits RP.

Relay CD operates.

CD1 makes relay CD slow-releasing.

CD2 prepares relay TC operate circuit.

CD3 prepares relay RP operate circuit and releases IG.

Relay IG releases (slowly).

IG1 maintains loop to UAX.

IG2 completes circuit to operate relay TC.

Relay TC operates.

TC1 prepares hold circuit for relay TC.

TC3 prepares to earth the "-1" wire.

As soon as the times dis-earth pulse ceases, relay A operates.

Relay A operates.

A1 completes the "trunk offer" earth path to "-1" wire (see A2).

A2 earths the "-1" wire (earth, A2, diode D5, TC3, A1, B1 to "-1" wire), and holds relay B; removes the earth from RPb and allows relay RP to operate, and releases CD.

Relay RP operates.

RP1 reoperates relay IG.

RP3 completes relay TC hold circuit.

RP5 makes relay RP slow-releasing.

Relay IG operates (slowly), but its contacts have no function.

Relay CD releases (slowly).

CD3 releases relay RP and holds IG.

Relay RP releases (slowly).

RP3 releases relay TC.

RP5 removes short-circuit from RP to give fast-operate feature.

Relay TC releases.

TC3 disconnects earth from the "-1" wire.

The earth on the "-1" wire unbalances the loop to the UAX final selector and causes it to "trunk offer". Relays DA and DD will operate due to the reversed polarity from the UAX final selector on the "-1" and "+1" wires.

Relays operated: A, B, IG, DA and DD.

The operator offers the call.

4.7 Re-ring.

When the subscriber clears, the reversal is removed on the "-1" and "+1" wires.

Relay DA releases.

DA1 releases relay DD.

DA2 completes the "clear" earth pulse to the "M" wire (when required).

Relay DD releases (slowly).

- DD1 (a) disconnects the "clear" pulse from the "M" wire
(if magneto parent exchange) or
- (b) disconnects the earth signal from the "M" wire
(if central battery exchange).

The distant manual board supervisory lamp "glows" and this circuit is now in "Manual Hold" condition.

The "ring" key is operated again and a "re-ring" timed dis-earth pulse is received on the "E" wire. As before, this pulse is sufficient to release relay IG but not B. Relay A operates.

The circuit functions as already described in para. 4.6 (Trunk Offer).

The earth on the "-1" wire unbalances the loop to the UAX final selector and causes it to "re-ring".

The circuit proceeds as already described in para. 4.3, etc.

5. CIRCUIT DESIGN DETAILS.

Relay B

Slow releasing, to hold during pulsing.

Relay CD

Slow releasing (due to short-circuit winding), to hold during pulsing.

Relay IG

Slow operating, to prevent pulses being forwarded to the UAX in the event of the seize pulse being missed.

Slow releasing, to guard against release of exchange equipment on "trunk offer" and "re-ring" without unnecessarily "clipping" dial pulses.

Relay RP

Slow releasing (due to short-circuit winding), to time "trunk offer" and "re-ring" pulse to exchange equipment (in conjunction with relay CD release lag).

Fast operate (without short circuit) to guard against release of IG due to a series of pulses.

Relay DD

Slow operating (and slow releasing), to prevent its operation (or release) during any flicks of relay DA.

Diodes D1 and D2.

Allow the passage of current for seizure and holding purposes while short-circuiting relay DA (D2); and allows the operation of relay DA because of the reversed potential on the "-1" and "+1" wires when the called subscriber answers (D1).

Diode D4 and D5.

Isolates TC3 circuit from relay B when contact A2 is unoperated.

RX1 and RX2.

Non-linear resistors; provided to reduce sparking on contacts A2.

Design Line Limit.

The maximum resistance of the Rec ("E") wire is 1,200 ohms.

The maximum resistance of the four-wire "send" and "receive" speech wires and the "send" ("M") wire is determined by the carrier equipment.

END OF DIAGRAM NOTES.