DIAGRAM NOTES (ISSUE 1)

concerning

DIAGRAM GBW.13750

U.A.X. N.Z.13

titled

LINE RELAY-SET M FOR 5-PARTY

C.B. LINES, LOOP DIALLING

1. GENERAL.

The diagram shows the circuit arrangement of the equipment used for the Line Relay-Set M for 5-Party C.B. Lines with loop dialling at a U.A.X. N.Z. 13.

The diagram should be considered in conjunction with the following diagrams:-

GBW.13760 or GBW.13761	Ringing Codes Circuit
GBW.13900	Final Selector Circuit
GBW.13910	Subscribers Line Circuit

2. FACILITY SCHEDULE.

Provision is made for:-

(1) Seizure of the associated line circuit to initiate linefinder hunting.

(2) The connection of any 5 final selector outlets to the party line, according to the number dialled.

(3) The connection of code ringing to the party line, one of 5 codes being chosen according to the number dialled.

(4) The circuit to prevent the mutilation of the ringing code should the subscriber answer while the code is being transmitted.

(5) The circuit to operate with loop signalling

(6) Guarding the circuit against intrusion during the progress and release of a call.

(7) Busying of the circuit if a P.G. "lockout" condition arises in the associated line circuit.

(8) Busying of the circuit for maintenance purposes.

3. CIRCUIT DESCRIPTION OUTLINE.

3.1 Outgoing Call.

When a party-line subscriber lifts the handset to make a call the line loop operates relay A. Relay A connects a calling loop to the line circuit which initiates linefinder hunting, and operates relay KR to busy the circuit against incoming calls. The linefinder having found the calling line, earth is returned on the P wire to operate relay K. Relay K extends the line loop to the line circuit and thence to the selector circuits.

The circuit is released when the caller replaces the handset and the line circuit restores to normal, disconnecting the P wire.

Reprinted by N.Z.P.O.
September, 1957

3.2 Incoming Call.

The seizure of the circuit by a final selector, via any of the 5 associated final selector outlets, operates the relevant P wire relay. The remaining associated final selector outlets and the line circuit are busied. Ringing current is connected to the line in the code appropriate to the wanted party-line subscriber. When the subscriber answers the ringing code is completed then relay A operates to the line loop and connects an answering loop to the final selector.

The circuit releases (provided the party-line handset has been replaced) when the final selector restores and disconnects the P wire. If a P.G. condition arises (that is, the party-line loop is present when the final selector releases) relay K operates to earth on the line circuit P wire. Relay K extends the line loop to hold the line circuit, which "locks out" until the handset is replaced.

4. CIRCUIT DESCRIPTION DETAIL.

4.1 Outgoing Call.

Relay A (both windings in series) operates to the line loop via PM3, PM4, K1 and K2 when the subscriber lifts the handset.

Relay A operating,

A1) Loop the + Out and -Out terminals via retard I, to seize
A3) the line circuit,
A2 operates relay KR.

Relay KR operating,

KR1 disconnects relay KA;
KR2 disconnects relay KB;
KR3 disconnects relay KC;
KR4 disconnects relay KD;
KR5 disconnects relay KE from the P wires to busy the circuit against incoming calls.

The line circuit connects a start signal to a linefinder, which on finding the calling line circuit, returns earth on the P wire to operate relay K via KK5.

Relay K operating,

K1) extend the calling loop to the line circuit, at the same time
K2) releasing relay A;
K3 holds relay KR when A2 restores.

Relay A releasing,

A1) disconnect retard I from the speech wires to facilitate loop
A3) signalling by the calling subscriber,
A2 leaves relay KR dependent on K3.

The calling loop is now connected to the first selector, via which the call proceeds.

4.2 Release (Outgoing Call)

Release of the circuit is effected when the calling subscriber replaces the handset, releasing the subsequent circuits, which disconnect the P wire to release relay K.

Relay K releasing,

K1)
K2) connect relay A to the line,
K3 releases relay KR.

Relay KR releasing,

KR1 prepares relay KA;
KR2 prepares relay KB;
KR3 prepares relay KC;
KR4 prepares relay KD;
KR5 prepares relay KE for incoming calls.

 The circuit is now ready to accept other calls.

4.3 Incoming Call.

The relays associated with the final selector P wires operate for incoming calls as follows:-

Call to 1st party - relay KA operates.
Call to 2nd party - relay KB operates.
Call to 3rd party - relay KC operates.
Call to 4th party - relay KD operates.
Call to 5th party - relay KE operates.

A call to the 1st party is described. The circuit operation for calls to other parties is readily inferred from the description given.

The final selector switches to battery at relay KA via KR1 and the P wire, then earths the P wire and relay KA operates.

Relay KA operating,

KA1 holds relay KA independent of KR1,
KA2 operates relay KK,
KA3 prepares ringing code A wire for connection to relay AC.

Relay KK operating,

KK1 operates relay KR;
KK2) prepare the transmission bridge;
KK3)
KK4 operates relay RR via A1 to the final selector positive wire potential;
KK5 busies the line circuit by earthing the P wire.

Relay KR operating,

KR1 no function;
KR2 disconnects relay KB;
KR3 disconnects relay KC;
KR4 disconnects relay KD;
KR5 disconnects relay KE to busy the circuit against other calls.

Relay RR operating,

RR1 prepares the circuit for relay PM,
RR2 connects a machine start earth.

The start of the ring code sequence is preceded by a 300mS earth on the Ring Start wire, which operates relay PM via rectifier MR1 and RR1. The ring start earth is followed by a 2.4 seconds earth on the Ring Hold wire, which holds relay PM via PM1 and RR1. During this 2.4 seconds period, ringing code pulses (earth) are connected to the Ringing Code wires A, D, M, R and S.

Relay PM operating,

PM1 provides a hold circuit for relay PM,
PM2 connects relay AC to the Ringing Code A wire via KA3,
PM3 connect the -ve line wire to Continuous Ringing via AC1 and R1,
PM4 connect the +ve line wire to Ring Return Earth.
Relay AC responds to the ringing code pulses.

Relay AC operating,

AC1 connects continuous ringing current to the -ve line wire.

Relay AC releasing,

AC1 disconnects ringing current and earths the -ve line wire.

At the end of the ringing code sequence the ring hold earth is disconnected and relay PM releases.

Relay PM releasing,

PM1 disconnects the Ring Hold wire,
PM2 disconnects relay AC from the Ring Code A wire,
PM3) re-connect the lines to relay A.
PM4)

The called party answers

When the called party lifts the handset, the answering loop operates relay A (both windings in series) via PM3, PM4, K1 and K2.

Relay A operating,

A1 releases relay RR;
A1) connect an answering loop to the final selector, loop the +Out
A3) and -Out terminals via retard I, and complete the transmission
) bridge circuit;
A2 provides a hold circuit for relay KR independent of K3.

Relay RR releasing,

RR1 disconnects relay PM from the Ring Start wire,
RR2 disconnects the machine start earth.

4.4 Release (Incoming Call)

(a) Caller restores first

The final selector restores when the caller replaces the handset. The final selector disconnects the P wire and relay KA releases.

Relay KA releasing,

KA1 no function,
KA2 releases relay KK,
KA3 no function.

Relay KK releasing,

KK1 leaves relay KR dependent on A2,
KK2)
KK3) no function,
KK4)
KK5 removes earth from the P wire and connects K. The loop via A1, I, & A3 engages the line circuit which then returns an earth on the P wire to operate K.

Relay K operating,

K1) extend the line loop to hold the line circuit, at the
K2) same time releasing relay A,
K3 holds relay KR when A2 restores.

Relay A releasing,

A1) disconnect retard I from the speech wires, leaving
A3) the line circuit dependent on the line loop,
A2 leaves relay KR dependent on K3.

The line circuit restores when the called subscriber replaces the handset, disconnecting the P wire earth and relay K releases.

Relay K releasing,

K1)
K2) connect relay A to the line,
K3 releases relay KR.

Relay KR releasing,

KR1 prepares relay KA;
KR2 prepares relay KB;
KR3 prepares relay KC;
KR4 prepares relay KD;
KR5 prepares relay KE for incoming calls.

The circuit is now ready to accept other calls.

(b) Called subscriber restores first

Relay A releases when the called subscriber replaces the handset.

Relay A releasing,

A1) disconnect the answering loop from the final selector
A3) speech wires;
A2 leaves relay KR dependent on KK1.

Depending on the circuit arrangements, the final selector releases at the disconnection of the answering loop; or at the subsequent operation of the time pulse release facility; or when the caller replaces the handset. When the final selector releases the P wire earth is disconnected, releasing relay KA.

Relay KA releasing,

KA1 no function;
KA2 releases relay KK;
KA3 no function.

Relay KK releasing,

KK1 releases relay KR;
KK2)
KK3) no function;
KK4)
KK5 releases the line circuit.

Relay KR releasing,

KR1 prepares relay KA;
KR2 prepares relay KB;
KR3 prepares relay KC;
KR4 prepares relay KD;
KR5 prepares relay KE for incoming calls.

The circuit is now ready to accept other calls.

5. BUSYING.

The insertion of a busying link into any of the associated M.D.F. busying strips connects earth to the final selector multiple P wire to busy the circuit by operating the P wire relay (KA, KB, KC, KD or KE). Assume that the first number is busied. Relay KA operates.

Relay KA operating,

KA1 holds relay KA independently of KR1;
KA2 operates relay KK;
KA3 no function.

Relay KK operating,

KK1 operates relay KR;
KK2)
KK3) no function;
KK4)
KK5 busies the line circuit by earthing the P wire.

Relay KR operating,

KR1 no function;
KR2 disconnects relay KB;
KR3 disconnects relay KC;
KR4 disconnects relay KD;
KR5 disconnects relay KE to busy the circuit against incoming calls.

The circuit is now busied against incoming and outgoing calls. Should an outgoing call be attempted relay A operates but is ineffective since the line circuit is busied.

Relay KA, KK and KR release when the busying link is removed.

6. CIRCUIT NOTES.

6.1 Relay A. Made high impedance to prevent leakage of speech currents to the battery.

6.2 Retard I. Made high impedance to prevent dissipation of speech potentials when connected across the speech wires.

6.3 Rectifier MR1. Prevents the connection of the ring hold earth to the Ring Start wire when PM1 operates.

END