DIAGRAM NOTES (ISSUE 1)

concerning

GBW. 14451

titled

U.A.X. N.Z. 13 BOTHWAY JUNCTION TO PARENT EXCHANGE

LIMITED FACILITY TYPE

1. GENERAL.

1.1 The diagram shows a Bothway Junction Circuit designed for working between a U.A.X. N.Z. 13 and a Parent Manual Exchange.

For calls to the parent exchange, access is obtained via a level of the group selectors, and for calls incoming from the parent exchange, access is obtained via either level "9" or "8" of the Line Finder.

1.2 Typical diagrams to be considered in conjunction with this diagram include the following:-

GBW.13910 Subscriber's Line Circuit and Line Finder.
GBW.13890 Group Selector Circuit.
GBW.13990 I/C Junction From Dependent U.A.X.

1.3 All contacts not included under the operation or release of relays at a particular stage are ineffective at that stage.

2. FACILITIES.

The facilities provided by this circuit include:-

2.1 Seizure of the circuit from a group selector level and the automatic transmission of a ring-calling signal to the manual exchange.

2.2 The return of "ringing tone" to the calling subscriber.

2.3 A "ring-off" signal to be sent to the parent exchange when the subscriber clears or flashes his switch-hook.

2.4 Operator - hold of calling subscriber.

2.5 Suppression of the "ring-off" signal should the operator remove the plug from the jack before the calling or called subscriber clears.

2.6 Timed release of the junction under calling subscriber holding conditions.

2.7 Trunk offering.

2.8 Holding of the circuit under P.G. conditions.

2.9 A discriminating tone signal on calls originating from coin boxes.

2.10 Barring of calls originated over another junction.

2.11 Switching of calls originated from a dependent exchange ordinary or coin box subscriber.

3. OUTLINE CIRCUIT OPERATION.

When the circuit is seized by a call to the parent exchange, the subscriber's loop is extended via the group selector and causes a ringing signal of a short duration to be connected to the junction. At the same time ringing tone is returned to the calling subscriber.

REPRINTED BY N.Z.P.O. September, 1957.

Relay A operates when the operator answers, and the circuit cuts off the ringing tone and applies a hold condition to the calling subscriber. When the calling subscriber replaces his receiver or flashes his switch-hook, a short ringing signal is connected to the junction to attract the attention of the operator.

If the operator should remove the plug from the answering jack before the calling subscriber has cleared, this ringing signal is suppressed and after a timed delay, the circuit is forcibly released.

When a call is originated from the parent exchange, a start condition is applied to the appropriate control relay set and causes the circuit to be seized by a linefinder and associated group selector. Dial tone is returned to the operator and simplex dial impulses over the junction are converted to loop impulses for stepping the U.A.X. selectors. If the called subscriber is busy, the operator may "offer" the call by operating the ringing key and as soon as the parties hang up the operator receives a short ringing signal.

A further operation of the ringing key then causes ringing to be connected to the called subscriber's line. The operator receives a "ring off" signal when the called subscriber eventually hangs up on the termination of the call.

When a call is originated from a coin box, ringing tone continues after the plug has been inserted in the jack, and the operator must momentarily operate the ringing key in order to cut off this tone before speaking.

4. U.A.X. SUBSCRIBER CALLS PARENT EXCHANGE.

4.1 Subscriber Dials "0".

On seizure of the circuit, relay WS operates from 2000 ohm battery which is applied to the "M" wire via the vertical marking bank of the group selector.

WS relay operating.

WS1	prepares a hold circuit for relay WS.
WS2)	extend relay IC to the calling
WS3)	subscriber's loop.
WS4	prepares an operate circuit for relay CB.
WS5	prepares an operate cct. for relay DA.
WS6	disconnects an initial operate cct. for relay CD.
WS7	disconnects the P wire to the junction hunter.

IC relay operating.

IC1	operates relay B.
IC2	prepares a circuit for relay DB.
IC3	prepares a circuit for relay DC.

B relay operating.

B1	completes the hold circuit for relay WS.
B2	operates relay BY.
B3	earths the incoming P wire from Group Selector levels.
B4	completes the circuit for relay CB to the M lead. Relay CB will only operate on Coin Box calls.

BY relay operating (slowly).

BY1	operates relay DA.
BY2	operates relay BA.

DA relay operating.

DA1	completes the operate circuit for relay DB.
DA2	prepares an operate circuit for relay DC dependent on relay DB operating, and relay BY releasing.

DB relay operating.

DB1	completes the operate cct. for relay DC.

BA relay operating (slowly).

BA1 completes relay TM cct. to the time pulse start equipment.
BA2 prepares a cct. for the O/G call count meter.
BA3 connects a guard earth to the P1 lead to the I.D.F. multiple.
BA5 prepares to extend a guard earth to the P wire from group selector level on the release of relay B.
BA6 completes a hold cct. for relay BA.
BA7 disconnects relay BY hold cct.

BY relay releasing.

BY1 disconnects relay DA hold cct. and completes an operate cct. for relay DC.
BY2 ineffective due to BA6 being operated.

DC relay operating.

DC1 completes a circuit for relay CD to the B1 earth.
DC2 connects an earth to the Bal. Ring Start lead.
DC3) DC6) connect balanced ringing to the junction.
DC4 is ineffective.
DC5 extends an alternative start earth to the "Ring Start" lead.

CD relay operating.

CD1) CD2) provide an alternative hold circuit for relay CD on release of relay DC.
CD3 completes the cct. for returning ringing tone to the caller.
CD6 disconnects relay TM cct.

DA relay releasing.

DA1 disconnects relay DB hold cct.
DA2 disconnects relay DC hold cct.

DC relay releasing.

DC2 disconnects the Bal. Ring Start earth.
DC3) DC6) disconnect balanced ringing from the junction.

DB relay releasing.

DB1 disconnects relay DC operating cct.

Relays operated at this stage (waiting the operator):-

WS, LC, B, BA, CD.

4.2 Operator Answers.

When a plug is inserted in the answering jack, an earth is connected to the centre point of the junction terminating transformer, to operate relay A via retard IA and resistor R4, to battery at 1SC50.

A relay operating.

A2 disconnects relay CD hold cct. and completes relay BX operate cct.

CD relay releasing.

CD1) CD2) disconnect relay CD hold cct.
CD3 disconnects the ringing tone to caller.
CD5 disconnects the ring start cct.
CD6 ineffective due to relay BX operating.

BX relay operating.

BX1 completes an operate cct. for relay DB.
BX3 disconnects relay TM cct.
BX4 completes a cct. for relay DD.
BX7 prepares a cct for relay CJ.

DD relay operating.

DD1 completes a hold cct. for relay DD.
DD2) only effective on I/C call from
DD3) dependent exchange.
DD5)
DD4 prepares a hold cct. for relay A.

DB relay operating.

DB1 prepares a cct for relay DC.
DB2 completes an operate cct. for relay CJ.

CJ relay operating (after its slow operate time).

CJ1 completes an operate cct. for relay CM.
CJ2 completes a cct. to operate the O/G call count meter.

CM relay operating.

CM1 releases relay CJ and completes a hold cct. for relay CM.

CJ relay releasing.

CJ1 disconnects relay CM initial operate cct.
CJ2 disconnects the cct. for the O/G call count meter.

Relays operated at this stage (talking):-

MS, IC, B, BA, A, BX, DD, DB, CM.

4.3 Release.

(a) Caller Clears First.

The caller clearing, disconnects the loop across the -ve and +ve leads, thus causing relay LC to release.

LC relay releasing.

LC1 disconnects relay B initial operate path.
LC2 disconnects relay DB.
LC3 operates relay DC.

DC relay operating.

DC2 connects a start earth to the "Bal. Ring Start". lead
DC3) connect balanced ringing to the
DC6) junction.
DC4 completes a hold cct. for relay A, via resistor R1 to earth at 1SC48.
DC5 connects a start earth to the "Ring Start" lead.

DB relay releasing (after its slow release period 450-675 m/s).

DB1 disconnects relay DC which releases slowly.

DC relay releasing (after its slow release period 180-270 m/s).

DC2 disconnects "Bal. ring start" lead cct.
DC3) disconnect balanced ringing.
DC6) from the junction.
DC5 disconnects ring start earth.

Relays operated at this stage:-

WS, B, BA, A, BX, DD, CM.

When the operator withdraws the plug, relay A releases followed in turn by relays BX, B, BA, WS, DD, CM and the circuit is again normal.

(b) Operator Clears First.

The operator withdrawing the plug from the jack, disconnects the earth on the -ve(B) and +ve(A) leads causing relay A to release.

A relay releasing.

A2 disconnects relay BX which releases slowly.

BX relay releasing (after its slow release period).

BX1 disconnects relay DB which releases slowly.
BX3 completes the cct. for relay TM to the "Time Pulse Start" lead.

TM relay operating.

TM1 connects relay TM to the "Time Pulse Hold" lead.
TM2 connects relay PR to the "Time Pulse Release" lead.

DB relay releasing, performs no useful function.

When the subscriber clears relay IC releases, followed in turn by the remaining relays and the circuit is restored to normal.

(c) Timed Out Release.

If in (b) above the subscriber fails to restore within 3 - 6 mins. approx., relay PR operates to earth on the Time Pulse Release wire.

PR relay operating.

PR1 disconnects the guard earth on the P wire causing the previous connections to restore and the subscriber is left on the PG condition.

(d) Subscriber "Flashes" Operator.

This is as described in 4.3(a) except that on re-establishment of the loop, relays IC, DB are re-operated.

5. OPERATOR CALLS U.A.X. SUBSCRIBER.

5.1 Operator Plugs In To Junction.

Both line wires are earthed (via the junction transformer at the parent exchange) to operate relay A via retard IA and resistor R4 to battery at 1SC50.

A relay operating.

A1 operates relay LS (to earth at K1).
A2 prepares a cct. for relay BX.

LS relay operating.

LS1 prepares a circuit for relay HA.
LS2 prepares a circuit for relay HB.
LS3 disconnects the incoming "P" wire to prevent seizure from a group selector.
LS5 disconnects the P wire to the junction hunter.

Depending on which control relay set is available either relay HA or HB will operate. It will be assumed that control relay set No. 1 is available, so that relay HA operates and the call proceeds via line finder level 9.

HA relay operating (to batt. on T1 lead, and earth on TA1 lead).

HA1 extends an earth via the 25 ohm winding of relay HA to the T1 lead (to operate relay JD in the control relay set).
HA2 prepares to extend a marking condition to the line finder vertical marking bank.
HA3 prevents relay HB operating to the battery and earth potentials returned from the second control relay set.
HA4 extends a loop over the -1 and +1 leads to the line finder control relay set.
HA5 extends a loop over the ST1 and HA2 leads seizing the control relay set and causing the allotter and linefinder to search for the calling cct.

The linefinder and associated group selector having found the calling cct., an earth is returned on the M lead from the group selector, causing relay K to operate.

K relay operating.

K1 prepares to short cct. the -1 and +1 wires to the line finder levels 8 and 9.
K2 extends relay K hold cct. to the P1 lead.
K4 completes a circuit for relay P.
K5 completes an operate cct. for relay BX.
K6 releases relay LS.
K7 connects Pos. Batt. to M1 lead as a discriminating signal to indicate it is a junction call.

P relay operating.

P1) extend the -1 and +1 leads to the loop via
P2) resistor R2, and rectifier MR2(c-b).
P3 further disconnects 150 ohm. batt. to P wire on I/C group selector level.
P4 further disconnects 150 ohm batt. to P wire on I/C junction hunter banks.
P5 completes an operate cct. for relay RC.
P6 further disconnects the cct. for relay LS.
P7 disconnects earth via HA1 and the 25 ohm winding of relay HA from the T1 lead.

RC relay operating is ineffective at this stage.

BX relay operating.

BX1 prepares an operate cct. for relay DB.
BX4 completes " " " " " DD.
BX7 prepares " " " " " CJ.

LS relay releasing.

LS1 disconnects the hold circuit for relay HA.
LS2 disconnects the hold circuit for relay HB (when operated).

DD relay operating is ineffective at this stage.

Dial tone is returned to the operator.

Relays operated at this stage:-

A, K, P, BX, RC, DD.

5.2 Operator Dials.

Relay A responds to dial impulses.

A1 repeats the pulses as loop disconnect pulses to the group selector via level 9 of the linefinder.
A2 on the first release operates relay CD.

CD relay operating.

CD1) complete an alternative hold circuit for relay CD
CD2) independent of WS6 and SK4.
CD4 presents a short circuit in place of the R2, MR2, loop to the group selector during impulsing.
CD5 extends an earth to the "Ring Start" lead.

At the end of dial impulse train.

CD relay releases.

CD4 disconnects the short circuit across the -1 and +1 leads outgoing to the linefinder levels and replaces it by the R2, MR2 loop.

5.3 Called Subscriber Answers.

Due to the reversal of polarity on the -1 and +1 leads relay D operates.

D relay operating.

D1 completes an operate circuit for relay DB.
D2 prepares an alternative circuit for maintaining loop over the -1 and +1 leads on the release of relay A.

DB relay operating.

DB1 prepares an operate circuit for relay DC on the release of relay D.
DB2 completes the operate circuit for relay CJ via earth K5, CM1, BX7, DB2, 200CCJ to batt.

CJ relay operating.

CJ1 completes an operate circuit for relay CM.
CJ2 completes a circuit for operating the I/C call count meter.

CM relay operating.

CM1 disconnects relay CJ operate circuit and completes a hold cct. for relay CM.

CJ relay releasing.

CJ1 ineffective as relay CM holds via its own contact CM1.
CJ2 disconnects I/C call count meter circuit.

Relays operated during talking:-

A, K, P, BX, RC, DD, D, DB, CM.

5.4 Release.

(a) Called Subscriber Clears First.

D relay releasing due to the polarity of the -1 and +1 leads being restored.

D1 disconnects relay DB hold cct. and completes an operate cct. for relay DC.

DC relay operating.

DC1 prepares an alternative operate circuit for relay CD on release of relay A.
DC2 connects a start earth to the "Bal. Ring Start" lead.
DC3) connect balanced ringing to the
DC6) junction.
DC4 completes a hold cct. for relay A, via resistor R1.
DC5 connects a start earth to the "Ring Start" lead.

DB relay releasing after its slow release period (450-675 m/s).

DB1 disconnects relay DC.

DC relay releasing after its slow release period (180-270m/s).

DC2 disconnects start eth from "Bal. Ring Start" lead.
DC3) disconnects balanced ringing
DC6) from the junction.
DC4 disconnects relay A hold circuit.
DC5 disconnects start earth from "Ring Start" lead.

Relays operated at this stage:-

A, K, P, BX, RC, DD, CM.

Operator withdraws plug from jack.

When the operator removes the plug from the jack, relay A releases, due to the earth being removed from both -ve and +ve leads.

A relay releasing.

A1 disconnects the loop to the linefinder levels.
A2 disconnects relay BX and operates relay CD.

The loop being disconnected at A1 causes the selector at the U.A.X. to release and in so doing, the earth present on the P lead is disconnected, and relay K therefore releases.

K relay releasing.

K1 re-connects the earth to the +1 lead.
K2) re-connect the K relay
K3) to the M1 lead.
K4 releases relay P.
K5 disconnects the earth holding relays CD, DD, & CM.

Relays CD, DD, & CM release.

P relay releasing.

P5 releases relay RC.

The circuit is now back to normal.

Should the operator fail to release the junction, or relay A be held operated due to an earth fault the equipment is forcibly released after a delay period.

The earth present on the P1 (& P2) lead is disconnected causing relay K at this exchange to be released. Relay P now holds via Batt, 1500P, P6, K6, A1, P2, TR1, SK2, WS2, 600R2, MR2 (c-b), WS3, SK3, TR1, P1, K1 ,earth.

Relay P holding disconnects the P leads to the group selector and junction hunter, thus preventing this equipment from being seized.

(b) Operator clears first.

The operator withdrawing the plug from the jack disconnects the earth from both -ve and +ve leads causing relay A to release.

A relay releasing.

A1 prepares to disconnect the O/G loop on the release of relay BX.
A2 disconnects relay BX and operates relay CD.

CD relay operating.

CD1) provide an alternative hold circuit
CD2) for relay CD.

BX relay releasing after its slow release period (180-270 m/s).

BX1 disconnects relay DB hold circuit.
BX2 disconnects the O/G loop to the distant U.A.X.

The loop being disconnected the selectors at the distant U.A.X. release and the earth present on the P1 or P2 lead is disconnected causing relay K to release.

K relay releasing.

K4 disconnects relay P which releases.
K5 disconnects relays D^D, CD & CM.

P relay releasing.

P3 restores the 150 R9 batt. to the P wire of Group Selector levels.
P4 restores the 150 R3 batt. to the P wire of Junction Hunter banks.
P5 releases relay RC.

The circuit is now back to normal.

6. TRUNK OFFERING.

If the operator desires to offer a call to an engaged subscriber, the operator throws the Ring Key momentarily causing ringing to be applied to the junction, which operates relay RR.

RR relay operating.

RR1 operates relay RS.

RS relay operating.

RS1 completes a hold circuit for relay A.
RS2 disconnects relay RC which releases.
RS3) disconnect relay A initial operate circuit
RS6)
RS4 prepares to connect earth via RC1 to the -ve lead.

NOTE.- In the present instance it is assumed that the simplex earth at the parent is disconnected when the key is thrown. When non ring through cord cots are used, this earth is not disconnected and relay RC remains held over both windings. In this latter case NOTE 11 on the diagram is applied.

RC relay releasing.

RC1 connects an earth to the -ve lead and in so doing unbalances the loop circuit causing the operation of the trunk offering relay in the U.A.X. final selector.

The final selector now causes a reversal of polarity to be applied to the -(B) and +(A) leads causing relays D & DB to operate. The operator can now "offer" the trunk call.

When the parties clear relay D releases and operates relay DC which applies a "ring off" to the junction to signal the operator that the two parties have released. The operator can now throw the ring key which unbalances the line as described above, and causes ringing to be applied to the called subscriber from the final selector.

7. COIN BOX CALL.

7.1 As described in 4.1 except that in this case, instead of a 2000 ohm battery, a 150 ohm battery is connected to the "M" wire. This 150 ohm battery operates relay CB.

CB relay operating.

CB1 provides a hold circuit for relay CB.
CB2 maintains a circuit for the inter. ring tone earth after the release of relay CD.
CB3 connects a start earth to the "ring start" lead.

The rest of the call is as described in para. 4.1.

7.2 Operator Answers.

As described in 4.2 except that relay CB remains operated and at CB2 maintains the inter. ring tone circuit so as to indicate to the operator that the call is from a coin box.

Before speaking the operator must ring on the junction in order to operate relay RR which in turn operates relay RS.

RS relay operating.

RS1 provides a hold circuit for relay A.
RS2 disconnects relay RC operate circuit.
RS5 disconnects relay CB which releases.

CB relay releasing.

CB1 disconnects relay CB.
CB2 disconnects inter. ring tone circuit.
CB3 disconnects start earth from "Ring Start" lead.

When the operator restores the ring key, relays RR & RS release and the call proceeds in the normal manner.

8. BARRING OF CALLS ORIGINATED OVER ANOTHER JUNCTION (NOTE 4).

On seizure of the circuit relays WS, LC, B, BA, & DA function as described in (4.1) but on release of relay CC in the group selector a positive battery is applied to the I/C M wire, which causes relay WA to operate.

WA relay operating.

WA1 completes a hold circuit for relay WA.
WA2 disconnects relay DC operate circuit thus preventing ringing being applied to the junction.
WA3 disconnects the P wire to the group selector levels.

This disconnection of the P wire releases the linefinder and group selector and the circuit then restores to normal.

9. CALLS FROM DEPENDENT EXCHANGE (TANDEM WORKING)

The standard signalling arrangements for combined routes are used between the dependent and the tandem U.A.X., which are as follows:-

(a) A battery on the +ve(A) wire indicates a call from an ordinary subscriber to the parent switchboard.

(b) An earth on the -ve(B) wire indicates a call from a coin box subscriber to the parent switchboard.

9.1 Call From Ordinary Subscriber To The Parent.

An earth is extended via the 11 ohm winding of relay KA in GBW.13990, and the junction hunter to operate relay SK.

SK relay operating.

SK1 prepares an operate circuit for relay DA.
SK2 extends a battery via relay LB, MH2, DD2 to the -ve(B) wire.
SK3 completes an operate circuit for relay LA to the battery extended via the junction hunter.
SK4 disconnects relay CD operate circuit.
SK5 disconnects 150 ohm R9 battery present on the I/C P wire from group selector level.
SK6 provides an alternative hold cct. for relay SK.

LA relay operating.

LA1 completes an operate circuit for relay BB.

BB relay operating.

BB1 provides an alternative hold earth for relay BB.
BB2 completes an operate circuit for relay IC.
BB3 prepares to extend relay CH on the operation of relay DD to the -ve wire.
BB4 provides an alternative hold cct. for relay SK.
BB5 prepares a circuit for the re-operation of relay LA when relay CH operates.

IC relay operating.

IC1 completes an operate circuit for relay B.
IC2 prepares " " " " " DB.
IC3 prepares " " " " " DC.

B relay operating.

B1 completes an operate cct. for relay CD when relay DC operates.
B2 completes an operate circuit for relay BY.
B3 connects a guard earth on I/C P wire on group selector levels.
B5 prevents relay A from operating on the operation of relay DC.
B6 prevents a loop to line finder level when relay A operates later.

BY relay operating.

BY1 operates relay DA.
BY2 " " BA.

DA relay operating.

DA1 completes an operate cct for relay DB.
DA2 prepares " " " " " DC.

DB relay operating.

DB1 prepares an operate cct for relay DC.

BA relay operating.

BA1 prepares an operate cct for relay TM.
BA2 " " " " " the call count meter.
BA3 earths the P wire to M.D.F. multiple.
BA6 holds relay BA independant of relay BY contacts.
BA7 releases relay BY.

BY relay releasing.

BY1 releases relay DA and completes an operate cct. for relay DC.

DC relay operating.

DC1 completes an operate cct. for relay CD.
DC2 connects a start earth to the "Balanced Ring Start" equipment.
DC3) DC6) apply balanced ringing to the junction.
DC4 prepares a hold cct. for relay A.
DC5 connects a start earth to the "Ring Start" lead.

CD relay operating.

CD1) CD2) complete a hold circuit for relay CD.
CD3 returns inter. ring tone back to caller.
CD5 connects an alternative start earth to the "Ring Start" lead.
CD6 disconnects relay TM operate circuit.

DA relay releasing.

DA1 disconnects relay DB hold cct.
DA2 " " DC " "

DB relay releasing.

DB1 further disconnects relay DC.
DB2 disconnects relay CJ operate cct.

DC relay releasing.

DC2 disconnects earth start from "Bal. Ring Start" lead.
DC3) DC6) disconnects balanced ringing from the junction.
DC5 ineffective due to relay CD still being operated.

Relays operated at this stage:-

SK, LA, BB, LC, B, BA, CD.

9.2 Operator Answers.

When a plug is inserted in the answering jack an earth is extended via the centre point of the junction terminating transformer, to the -ve and +ve leads of the junction, and both coils of the retard IA to relay A, which operates.

"A" relay operating.

A1 ineffective due to the (linefinder) loop being disconnected at B6.
A2 completes an operate circuit for relay BX while at the same time causing relay CD to release.

CD relay releasing.

CD3 disconnects the inter. ring tone cct.
CD5 disconnects start earth from "Ring Start" lead.
CD6 prepares an operate circuit for relay TM.

BX relay operating

BX1 completes an operate circuit for relay DB.
BX3 completes a hold circuit for relay B.
BX4 completes an operate circuit for relay DD.
BX5 prepares an alternative operate cct for relay LB when relay CH operates.
BX6 prepares an alternative operate cct for relay LA when relay CH operates.
BX7 prepares an operate circuit for relay CJ.

DB relay operating.

DB1 prepares a circuit for relay DC.
DB2 completes an operate circuit for relay CJ.

CJ relay operating.

CJ1 completes an operate circuit for relay CM.
CJ2 completes a circuit for the operation of the O/G "Call Count Meter".

CM relay operating.

CM1 holds relay CM and releases CJ.

DD relay operating.

DD1 holds relay DD.
DD2 disconnects relay IB and applies a batt. via 500 ohm relay CH to the -ve(B) wire.
DD3 disconnects earth via 500 ohm relay LA. to the +ve wire.
DD5 disconnects relay CO operate circuit.

Relays LA & LB release but perform no useful function.

This disconnection of earth on the +ve wire is returned to the adjacent dependent exchange equipment (GBW.13990) as a supervisory signal to indicate that the operator has answered. On receipt of this disconnection, the adjacent equipment applies an earth on the -ve(B) as an acknowledgement signal causing relay CH in parent exchange equipment to operate.

CH relay operating.

CH2 re-applies the earth via 500 ohm relay LA to the +ve line.
CH3 completes an operate circuit for relay IB.
CH4'x' completes a hold circuit for relay CH.
CH5 prepares a hold circuit for relay BB for manual hold purposes.

LA relay re-operating.

LA1 completes relay BB hold cct.

LB relay operating.

LB1 disconnects relay BB initial operate cct; leaving relay BB hold cct. dependent on relay LA.

Relays operated at this stage:-

SK, LA, BB, LC, B, BA, CM, A, BX, DB, DD, CH, LB.

9.3 Call From Coin Box Subscriber To The Parent.

An earth is extended on the P wire, via the junction hunter, causing relay SK to operate.

SK relay operating.

SK1 prepares an operate circuit for relay DA.
SK2 completes an operate circuit for relay LB to the earth extended via the junction hunter.
SK3 extends an earth via relay LA to the +ve(A) wire.
SK4 disconnects relay CD operate circuit.
SK5 disconnects 150 ohm R9 battery to the I/C P wire from group selector levels.
SK6 provides an alternate hold for relay SK.

LB relay operating.

LB1 completes an operate circuit for relay CO.

CO relay operating (via earth, LB1, DD5, 15000O to batt.).

CO1 prepares a hold circuit for relay CO.
CO2 completes an operate circuit for relay BB.
CO3 prepares a re-operate circuit for relay LB.
CO4 prepares an operate circuit for relay CB.
CO5 prepares an operate circuit for relay CH.

BB relay operating (via earth, LB1, CO2, LA1, 800BB to batt.).

BB1 prepares a hold cct. for relay BB on relay LA operating.
BB2 completes an operate cct. for relay LC.
BB3 prepares a hold cct. for relay LB in conjunction with CO3.
BB4 provides an alternate hold cct. for relay SK.
BB5 prepares an operate cct. for relay CH.

LC relay operating.

LC1 completes an operate circuit for relay B.
LC2 prepares an operate circuit for relay DB.
LC3 prepares an operate circuit for relay DC.

B relay operating.

B1 prepares an operate circuit for relay CD, and operates relay CB.
B2 completes an operate circuit for relay BY.
B3 connects a guard earth to the P wire from group selector level.
B5 disconnects relay A hold cct.
B6 disconnects outgoing loop to Line Finder.

CB relay operating.

CB1 holds relay CB.
CB2 connects inter. ring tone back to caller.
CB3 connects start earth to ring start lead.

BY relay operating.

BY1 completes an operate cct. for relay DA.
BY2 completes an operate cct. for relay BA.

DA relay operating.

DA1 completes an operate cct. for relay DB.
DA2 prepares an operate cct. for relay DC.

DB relay operating.

DB1 prepares an operate cct. for relay DC.

BA relay operating.

BA1 prepares an operate cct. for relay TM.
BA2 prepares an operate cct. for the O/G call count meter.
BA3 earths the P wire to M.D.F.
BA6 holds relay BA.
BA7 releases relay BY.

BY relay releasing.

BY1 disconnects relay DA hold cct. and completes an operate cct. for relay DC.

DC relay operating.

DC1 completes an operate cct. for relay CD.
DC2 connects a start earth to the Balanced Ring Start equipment.
DC3) DC6) applies ringing to the junction.
DC4 prepares a hold cct. for relay A.
DC5 connects a start earth to the Ring Start lead.

CD relay operating (earth, B1, A2, DC1, 10/500CD to batt.).

CD1) CD2) provide a hold path for relay CD independent of contact DC1.
CD3 prepares a cct. for connecting ring tone back to caller.
CD5 similar to DC5.
CD6 disconnects relay TM operate cct.

DA relay releasing.

DA1 disconnects relay DB operate cct.
DA2 disconnects relay DC operate cct.

DB relay releasing Its contacts are ineffective.

DC relay releasing.

DC1 ineffective due to relay CD being operated.
DC2 disconnects start eth from "Balanced Ringing".
DC3) DC6) disconnect balanced ringing from the junction.
DC5 ineffective due to contact CB3 being operated, on extending an earth to the Ring Start lead.

Relays operated at this stage:-

SK, LB, CO, BB, LC, B, CB, BA, CD.

9.4 Operator Answers.

The series of operations are similar to para. 9.2 except that the ring tone is not disconnected, so that before the operator can speak to the Coin Box subscriber the Ring Key must be momentarily operated; this causes relay RR to operate.

RR relay operating.

RR1 completes an operate circuit for relay RS.

RS relay operating.

RS1 completes a hold circuit for relay A.
RS3) RS6) connect relay RC across the junction.
RS5 disconnects relay CB which releases.

CB relay releasing.

CB1 disconnects relay CB hold path.
CB2 disconnects the ring tone cct.
CB3 disconnects start earth from the "Ring Start" lead.

With the disconnection of ring tone the operator can now speak to the coin box subscriber by operating the Speak Key associated with cord.

Relays operated at this stage:-

SK, LB, CO, BB, LC, B, BA, CM, A, BX, DB, DD, CH, LA.

9.5 Release.

(a) Caller Clears First.

At the end of the conversation, should the calling subscriber release, and the plug be still in the jack, then LA, IB release and the 500 ohm earth via LA is replaced by a 200 ohm R12 battery on the +ve lead causing the Manual Hold relay to operate in cct. GBW.13990.

LA relay releasing.

LA1 disconnects relay BB. (IB1 for coin box call).

BB relay releasing.

BB1 disconnects BB hold cct.
BB2 releases relay IC.
BB3 connects manual hold relay MH to the -ve leg of the I/C junction.
BB5 connects 200 ohm R12 batt. to the +ve leg of the I/C junction.

LC relay releasing.

LC2 releases relay DB.
LC3 completes an operate circuit for relay DC.

DC relay operating.

DC2 connects a start earth to the "Bal. Ring Start" lead.
DC3) connect balanced ringing to junction.
DC6)
DC4 completes a hold cct. for relay A, via DD4.
DC5 connects a start earth to the "Ring Start" lead.

DB relay releasing.

DB1 releases relay DC.

DC relay releasing.

DC2 disconnects "Balanced ring start" eth.
DC3) disconnect balanced ringing
DC6) from junction.
DC4 disconnects relay A hold cct.
DC5 disconnects start earth from "Ring Start" lead.

Relays operated at this stage:-

SK, B, BA, CM, A, DD, CH, BX, (CO for coin box call).

The operator withdrawing the plug from the jack disconnects the earth present on the -ve and +ve leads of the junction thereby causing relay A to release.

A relay releasing.

A2 releases relay BX.

BX relay releasing.

BX3 releases relay B.

B relay releasing.

B1 releases relay DD.
B2 releases relay BA.
B3 extends guard earth from BA3 to the P wire from group selector level.

BA relay releasing.

BA1 disconnects the time pulse cct.
BA5 disconnects the guard earth to the I/C P wire from group selector levels.
BA3 disconnects the earth from the P wire to the M.D.F.

DD relay releasing.

DD2 replaces relay LB on the -ve(B) line.
DD3 replaces relay LA on the +ve(A) line.

With the replacing of earth via relay LA instead of the 200 R12 batt., on the +ve wire of the junction, relay MH in GBW.13990 releases causing the earth on the P wire to be removed, and relay SK to release.

SK relay releasing.

SK2 disconnects relay LB from the -ve(B) wire.
SK3 disconnects relay LA from the +ve(A) wire.
SK4 reconnects relay CD initial operate path ready for another call.
SK5 reconnects 150 ohm R9 battery to the P wire from group selector levels.
SK6 reconnects 150 ohm R8 battery in parallel with 1500SK relay to the I/C P wire from junction hunter levels.

The circuit is now back to normal and ready to receive further calls.

(b) Subscriber "Flashes" Operator.

If, in (a) above, the subscriber re-lifts his receiver before the operator withdraws the plug, then relay MH will operate to earth on the -ve lead from GBW.13990.

MH relay operating.

MH1 completes a re-operate circuit for relay BB.

BB relay operating.

BB1 prepares a hold cct. for relay BB.
BB2 completes a re-operate path for relay LC.
BB3 disconnects relay MH and re-operates relay LB.
BB5 completes a re-operate path for relay LA.

Relays LC, DB, LB and LA re-operating the circuit is now back to the same state, prior to the subscriber hanging up.

(c) Operator Clears First.

The operator withdraws the plug from the jack and releases relay A.

A relay releasing.

A2 releases relay BX.

BX relay releasing.

BX1 releases relay DB.
BX3 connects earth to the Time Pulse Start.
BX5 releases relay LB.

Relays operated at this stage:-

SK, LA, BB, LC, B, BA, CM, DD, CH (CO for coin box call).

When the subscriber clears relay LA is released followed by the remaining relays, and the cct. is restored to normal.

(d) Timed Out Release.

If the subscriber does not clear within 3 - 6 mins approx., after the operator has cleared, earth is returned on the Time Pulse Release wire, to operate relay PR via TM2 in the junction cct. GBW.13930 at the dependent exchange. Preceding connections are released and the subscriber holds to the PG condition. The remaining relays in GBW.14451 are released as in 9.5(a).

11. BUSYING THE CIRCUIT.

Insertion of a link in TJA 1 & 2 or TJB 1 & 2 operates relay PR.

PR relay operating.

PR1 disconnects the P wire from the group selector level.
PR2 " " " " " " junction hunter.

The junction must be busied at the parent exchange also, to prevent seizure from I/C parent calls.

END.