DIAGRAM NOTES (ISSUE 1)

concerning

GBW.14450

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.

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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 LC to the calling
WS3) subscriber's loop
WS4 prepares an operate circuit for relay CB
WS5 operates relay DA
WS6 disconnects an initial operate cct. for relay CD
WS7 disconnects the P wire to the junction hunter

LC relay operating

LC1 operates relay B
LC2 prepares a circuit for relay DB
LC3 prepares a circuit for relay DC

B relay operating

B1 completes the hold circuit for relay WS
B2 operates relay BA
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.

DA relay operating

DA1 completes the operate circuit for relay DB
DA2 prepares an operate circuit for relay DC dependent on relay DB operating

DB relay operating

DB1 completes the operate cct. for relay DC

BA relay operating (slowly)

BA1 prepares the circuit for returning inter ring tone to the caller.
BA2 prepares a circuit for the O/G call count meter.
BA3 completes relay TM cct. to the time pulse start equipment, and releases relay DA.

BA5 prepares to extend a guard earth to the P wire from the group selector level on the release of relay B

BA6 connects a guard earth to the P1 lead to the I.D.F. multiple

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) connect balanced ringing to the junction
DC6)

DC4 is ineffective
DC5 extends an alternative start earth to the "Ring Start" lead

CD relay operating

CD1) provide an alternative hold circuit for relay CD on
CD2) release of relay DC
CD3 completes the cct. for returning inter 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) disconnect balanced ringing
DC6) from the junction

DB relay releasing

DB1 disconnects relay DC operating cct

Relays operated at this stage (awaiting 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 1SC 50

A relay operating

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

CD relay releasing

CD1) disconnect relay CD hold cct
CD2)
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):- WS, LC, 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 1SC 48
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 LC 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 LC, 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 1SC 50.

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.

Relay HA 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 operates relay P
K2 prepares to short cct. the -1 and +1 wires to the linefinder levels
K3 extends relay K hold circuit to the P1 lead
K4 completes an operate circuit for relay BX
K6 releases relay LS
K7 connects Pos. Batt. to the M1 lead as a discriminating signal to indicate that 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, and 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 K4, CM1, BX7, DB2, 2000CJ 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 (180-270 m/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 releases relay P
K2 re-connects the earth to the +1 lead
K3) re-connect the K relay to the M1 lead
K5)
K4 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, K2 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

K1 disconnects relay P which releases
K4 disconnects relays DD, 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 ccts 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 par. 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 operates 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 LC
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

LC relay operating

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

B relay operating

B1 completes an operate cct. for relay CD when relay DC operates
B2 operates relay BA
B3 connects a guard earth on the 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

DA relay operating

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

DB relay operating

DB1 operates relay DC

BA relay operating

BA1 prepares to return inter. ring tone to the caller
BA2 prepares an operate cct. for the O/G call count meter
BA3 completes relay TM cct. to the time pulse start equipment, and releases relay DA
BA6 earths the P wire to the I.D.F. multiple

DC relay operating

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

CD relay operating

CD1) complete a hold circuit for
CD2) relay CD
CD3 returns inter. ring tone to the 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) disconnects balanced ringing from the junction
DC6)
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 LA 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 LB 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 LB
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

LB 1 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 operates 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, 1500CO 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 alternative 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 operates relay BA
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

DA relay operating

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

DB relay operating

DB1 operates relay DC

BA relay operating

BA1 prepares to return ringing tone to the caller
BA2 prepares an operate cct. for the O/G call count meter
BA3 completes relay TM cct. to the time pulse start equipment, and releases relay DA
BA6 earths the P wire to the I.D.F. multiple

DC relay operating

DC1 completes an operate cct. for relay CD
DC2 connects a start earth to the Balanced Ring Start equipment
DC3) applies ringing to the junction
DC6)
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) provide a hold path for relay CD independent
CD2) of contact DC1
CD3 returns inter. ring tone 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) disconnect balanced ringing from
DC6) 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 par. 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) connect relay RC across the junction
RS6)
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, LB 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 (LB1 for coin box call)

BB relay releasing

BB1 disconnects BB hold cct.
BB2 releases relay LC
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) DC6) connect balanced ringing to junction
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) DC6) disconnect balanced ringing 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

BA3 disconnects the time pulse cct.
BA5 disconnects the guard earth to the I/C P wire from group selector levels
BA6 disconnects the earth from the P wire to the I.D.F. multiple

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 minutes 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 TJA1 & 2 or TJB1 & 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