

THE TOKENLESS BLOCK INSTRUMENT

The mode of signalling between adjacent boxes is as follows

A sending train to B

1. A - Calls attention to B with one beat of bell
A - "NORMAL" indication + galvo
B - "NORMAL" indication + galvo
2. B - Acknowledges call attention with one beat of bell
A - "NORMAL" indication + galvo
B - "NORMAL" " + galvo
3. A - Asks B - "Is line clear"
A - "NORMAL" indication + galvo
B - "NORMAL" " + galvo
4. B - Turns acceptance switch to "Reverse" and acknowledges "Is line clear" signal
A - "NORMAL" indication + galvo
B - "NORMAL" indication + galvo
RLR stuck up
RER down
5. A - Holds in ringing key for 5 secs
A - "NORMAL" indication + galvo
B - This picks up the RLR provided all proving (HNC, NG etc) is correct and it is held up over its own front contact. The RLR coming up causes the indicator to go to "TRAIN COMING FROM". The NLR and RLR are electrically interlocked. When the RLR comes up, it locks the shunting key for that section.
"T.C.F." indication + galvo
NLR goes to H
NPR picks up
If controls correct RLR picks up (and sticks up)
RLR picks up - to give "T.C.F." ind.
NPR drops when A releases plunger but RLR and RLR stuck up.
Note SR up and stays up all the time when B is accepting a train.
6. B - Replies with a 5 sec plunger
B - With the RLR up and hence the VLR down, B is pegging negative polarity line which causes the RLR in A to come up, giving a "TRAIN COMING TO" indicator and releasing the starting signal.

(6) Continued

A - "T.C.T." indication + galvo

B - "T.C.T." indication + galvo

LR goes to R
RPR picks up (and sticks up)
SR already up
RLR
RLPR still down
Starter (M) L released

(7) A - Sends "Train entering section" signal

(8) B - Acknowledges "Train entering section" signal in the normal manner

(9) Train entering section

Once a train has passed starting signal at A, it cannot be cleared off block (except as later explained) until it has arrived at B, occupied and cleared the overlap track of the home signal and operated the treadle with the home signal in the off position - picking up the ZSR in B loc.

A - When treadle occ SR drops (when CR2 drops)

B - ZSR picks up and sticks up.
SR stuck up.
RLR still stuck up.

(10) B - Calls attention to A with one beat

(11) A - acknowledges call attention with one beat

(12) B - Turns acceptance switch back to "NORMAL" and calls attention

A -

B - With the switch in this position, the ZSR up, and the overlap track of home signal clear, the NLR picks up and is held up over its own front contact. The NLR coming up causes B's indication to return to "NORMAL" and drops out the ZSR.

A - "T.C.T." indication

B - "NORMAL" indication

NLR picks up
RLR
RLPR drops

A - Acknowledges to B

ZSR drops
SR still stuck up

(13) B - Gives "Train out of section" signal holding in last beat for 5 secs. (clears back)

A -

B - With NLR now up, B is now pegging positive polarity to line which causes

A's NLR to come up which in turn causes indicator to return "NORMAL" and picking up the starting signal stick (which is a "one train" feature).

A - "NORMAL" indication

B - "NORMAL" indication

LR goes to N
NPR picks up
RPR drops - } "NORMAL" ind.
SR picks up }

- (14) A - Acknowledges "Train out of Section" signal again holding down last beat.

A - This last long beat is not required for circuitry but establishes a pattern of bell signalling.

- (15) With reference to (13) if the block indication at 'A' remains at 'Train going to', this is due to an insufficient length of beat, failing to pick up the SR. The signalman at 'A' must then request a further 5 seconds beat from 'B' which will then normalise his block.

The Open Cancel

The method is as previously up to the point of sending "Train entering section" signal.

The "Open Cancellation" arrangement is used when a train has not passed the starting signal into the forward section.

A - Sending

A replaces his signals and sends (3 - 5) to B

B - Receiving

B replaces acceptance switch to normal position and acknowledges (3 - 5).

B's RLR is now up and locked up and although he replaces his switch to normal, the NLR will not pick up since the ZSR has not come up.

A holds down his "Open Cancel" key and pushes his bell plunger at the same time. The circuit proves that a train has in fact been accepted from B (NFR up) and that the train has not passed the starting signal (SR up) and that the starting signal has been replaced and is locked (LCS² proved made). Providing these controls are correct, the depression of the cancel key causes A to send negative polarity to line (i.e. equivalent to him accepting a train).

AB

The NLR is already up since B has accepted the train and with A sending a reverse polarity to line, B's RFR comes up. This gives a circuit to pick up the CSR which is then held up over the NFR down (thus CSR will stick up until blocks are again normal) and CSR up. The CSR front contact bridges the ZSR contact in the NLR circuit and with the acceptance switch normal, the NLR picks up and replaces block indicator to "NORMAL"

The CSR back contact is proved in the starting signal lock circuit.

B gives a long plunge to A and since NLR is up, now plunges positive to line.

A's NFR will now pick up which drops out RFR and causes his indicator to return to "NORMAL".

A then plunges back to B which causes

CSR to drop out at B when NFR picks up.

The blocks are now back to normal ready for a train to be sent in either direction.

The Sealed or Co-operative Cancel

The method is as for (1), up to B acknowledging "Train Entering Section" signal.

The sealed cancelling arrangement is used when a train has passed the starting signal into the forward section and for some reason (i.e. breakdown etc) has to be drawn back to the sending box.

If a disabled train is drawn forward to receiving box by engine under regulation, then no cancel is required.

A - Sending

A phones B and inform him that train has been drawn back into his station area behind his starting signal, then sends B (3 - 5)

A - On receipt of (3 - 5), holds in his ringing key

A - The plunge from B picks up NPR and SR thus dropping out RPR and returning indicator to "NORMAL".

The NPR coming up also picks up the starting stick.

The blocks are now back to normal ready for a train to be sent in either direction. The sealed release glass must be replaced immediately.

B - Receiving

B after replacing his signals to danger, replaces his acceptance switch to "NORMAL", smashes his sealed cancel plunger glass and sends (3 - 5) to A on ringing key.

When B notices his galvo deflect, he presses his sealed cancel plunger. The NPR is up (since A is holding in) and with back contact of sealed plunger made, a circuit is again made to by-pass the ZSR contact and pick up the NLR.

The NLR coming up, drops out the RLR and causes B's indicator to return to "NORMAL".

B then plunges back to A (normal polarity since NLR is up).

Shunting or Single-Line Possessions

The shunting key is provided for shunting into the single line or Engineers possessions in the single line, without the train being accepted on the block.

A train must not be allowed to shunt etc. into the single line unless the driver is in possession of the shunting key.

The shunting key is released under two conditions :-

1) Section ClearA - SendingB - Receiving

A Calls attention

B Replies

A Sends (5 - 2) requesting withdrawal of shunting key.

B Replies with (5 - 2) holding down the last beat for 10 secs.

A The long plunge from B picks NPR for duration of plungs to allow A to withdraw shunting key.

When shunting key is withdrawn, A gives B a short bell to indicate that shunting key has been obtained.

2) Behind Train

When a train has left A going towards B and has passed the starting signal (SR down) with indicator showing "TRAIN GOING TO" XRPR up), A is free to withdraw a shunting key.

When train is cleared back from B, A must intimate that he has withdrawn a shunting key.

ReplacementAB

A Replaces shunting key in interlocked circuit controller, block at "T.G.T." and calls attention with one beat.

B Replies with one beat.

A Sends (2 - 5) holding down on last beat.

This last beat is not required for circuitry but merely to maintain a pattern of belling.

B Replies with (2 - 5) holding down on last beat.

The long beat from B is required to pick up the starting signals SR and normalise the block.

✓ The blocks are now back to normal.

When a shunting key is withdrawn, the block is locked and a train can neither be sent nor accepted until the shunting key is replaced and cleared off.

Switching Out

The switching slide proves that no train is approaching from either side; that there are no trains in the station area; that any trains which are going away from the box have passed the starting signal and are in the forward sections clear of all track circuits; and that the road is set for the UP and DOWN main line. When these conditions are met, the switching slide is free to be pulled to the reverse position.

In most cases there is a proper switching lever - after the above is proved, the lever is drawn to the 'C' position which releases the signals for the UP and DOWN main line which in turn releases the switching lever to the reverse position.

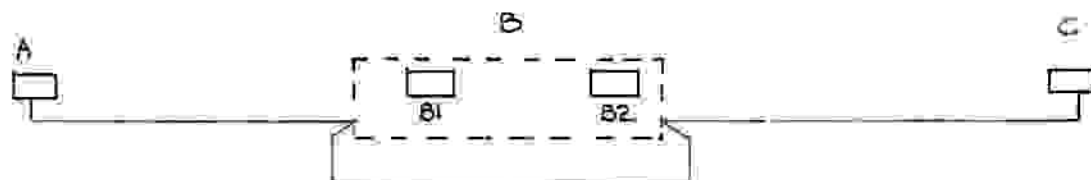
Once the switching slide is in the reverse position, the signals for the UP and DOWN main line are released and pulled. The box is then properly switched out and the boxes on either side may exchange 16 bells in accordance with Regulation 26.

When this has been carried out satisfactorily, the middle box signaller may go off duty.

When a box is switched out, it remains operative inasmuch as it serves as a repeater station - i.e. bell signals etc. which are received on one half of the instrument are transferred to the other half of the instrument, pick up the local battery, and peg out to the opposite line. All manual functions (i.e. Ringing Key, Cancel Key etc) are undertaken by relay contacts. The switching slide reverse picks up KL(A) relays to bridge certain conditions when box is switched. The indicators continue to show line occupation.

Assume three consecutive boxes A, B, and C with B switched out and further assume that B's instrument be made up of B1 (working to A) and B2 (working to C).

The sequence of operations for passing a train is as follows:-



| A | B1 | B2 | C |
|---------------------------------|---|--|---|
| A calls attention with one beat | | | |
| | XR and LR pick up | | |
| | | B1 ^S XR front contact pegs local battery to line to C | |
| | | | C replies to call attention with one beat |
| | | XR and LR pick up | |
| | B2 ^S XR front contact pass local battery | | |

A

B1

B

C

A sends "Is Line Clear" signal. Pulses transmit through B1 and B2 to C

C turns acceptance switch and acknowledges "Is Line Clear" signal which is again pulsed through B2 and B1 to A

A gives long plunge to C. This plunge is transmitted through B1 and B2 to pick up C's NLR.

NPR picks up NPR coming up with switch reverse picks up RLR, giving "Train Coming From" ind. C then plunges back to A but this time sending reverse polarity to line.

RFR picks up and sticks up giving "Train Going To" ind. XR also comes up ready to pass a pulse via B1 to A.

B2's NFR coming up picks up RLR giving "Train Coming From" ind. RLR coming up drops out NLR and via B2 XR front contact pegs reverse polarity to A.

RFR comes up giving "Train Going To" ind. and freeing starting signal. When train is ready to depart, A sends "Train Entering section" which is transmitted through B1 and B2 to C.

C acknowledges.

When train reaches switched-out box, passes starting signal and clears overlap track (or tracks) -

NLR picks up and drops out RLR. Therefore indicator returns to NORMAL behind train.

B2 indication still maintains the "Train Going To" indication

Train arrives at C and picks up ZSR. C Restores acceptance switch, picking up NLR and give "Train out of Section to A holding in last beat (C is again pegging normal polarity to line).

Plunge from C picks up NFR and drops out RFR which sticks up returning indicator to NORMAL. The MFR coming up also picks up the starting signal stick. XR also picks up to transmit pulses to A.

B2^s XR transmits pulses to A via NLR which is already up (i.e. normal polarity to line).

NFR picks up and drops out RFR and returns indicator to NORMAL and picks up starting signal stick.

A acknowledges "Train Out of Section" signal holding in last beat. This is transmitted through B1 and B2 to C.

The blocks are now normal.

All other functions of the block are passed A to C or C to A through any number of switched-out boxes in the same manner.

Switching In

The box can be switched in at any time and it is only regulations which determine when it in fact does switch in.

All indications which are on the indicators when box is switched out, will be maintained when box switches in.

If a box opens after passage of train, it is in order for that train to be cleared back to the next open box in rear without affecting the indications in the boxes in advance.

Transferring Indications

Assume three consecutive boxes A, B, and C and further assume that B is going to switch out with a train going towards C. At this time, A's indicator is showing NORMAL and he is in fact unaware of the train going towards C. Using the same notation that B consists of B1 and B2 we have a means of transferring an indication to A when B is switched out.

When B switches out, the following takes place :-

B2^S RRR and NLR are up (train going towards C). With this set-up and a contact of the switching lever reverse relay made, a feed is sent out to A using the block line and earth return. This feed picks up a ZBKR relay in A which bridges out the RPR contact in the indicator circuit giving a "Train Going To" indication.

Should B have switched out with train going to A, then C would have received the "Train Going To" indication. This indication is transferred through as many boxes as are switched out in the same way that bell plunges are transmitted (viz B1^S ZBKR coming up picks up local feed and sends out to C picking up C1^S and giving "Train Going To" indication and hence passing a local feed to D etc).

Treadles

The Silec treadles in use are directional :-

A train passing from single line into station area picks up QR1.

A train passing from station area to single line drops out QR2.

THE OPEN CANCEL

GIRVAN

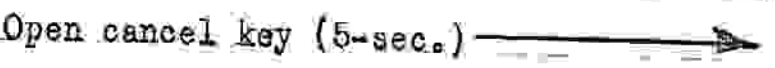
KILKERRAN

RPR up
GREEN in
3-5 signal

RLR up
RED in



Acknowledges and replaces switch
to NORMAL



Open cancel key (5-sec.)

Can R up

RPR up
CSR up
NLR up
RLR down RED out



NPR up
RPR down
GREEN out
WHITE in

Acknowledges 5-second ring



5-second plunge

NPR up
RPR down
CSR down
WHITE in

THE CLOSED CANCEL

GIRVAN

KILKERRAN

RPR up

RLR up

GREEN in

RED in

SR down

3-5 sent

Replaces switch to NORMAL

3-5 signal holding in last beat

Acknowledges by 5-second push

Breaks glass

At same time presses sealed cancel plunger

NPR up & back contact of S.C.P. made

NLR up

RLR down

RED out

WHITE in

5-second plunge

NPR up

RPR down

SR up

GREEN out

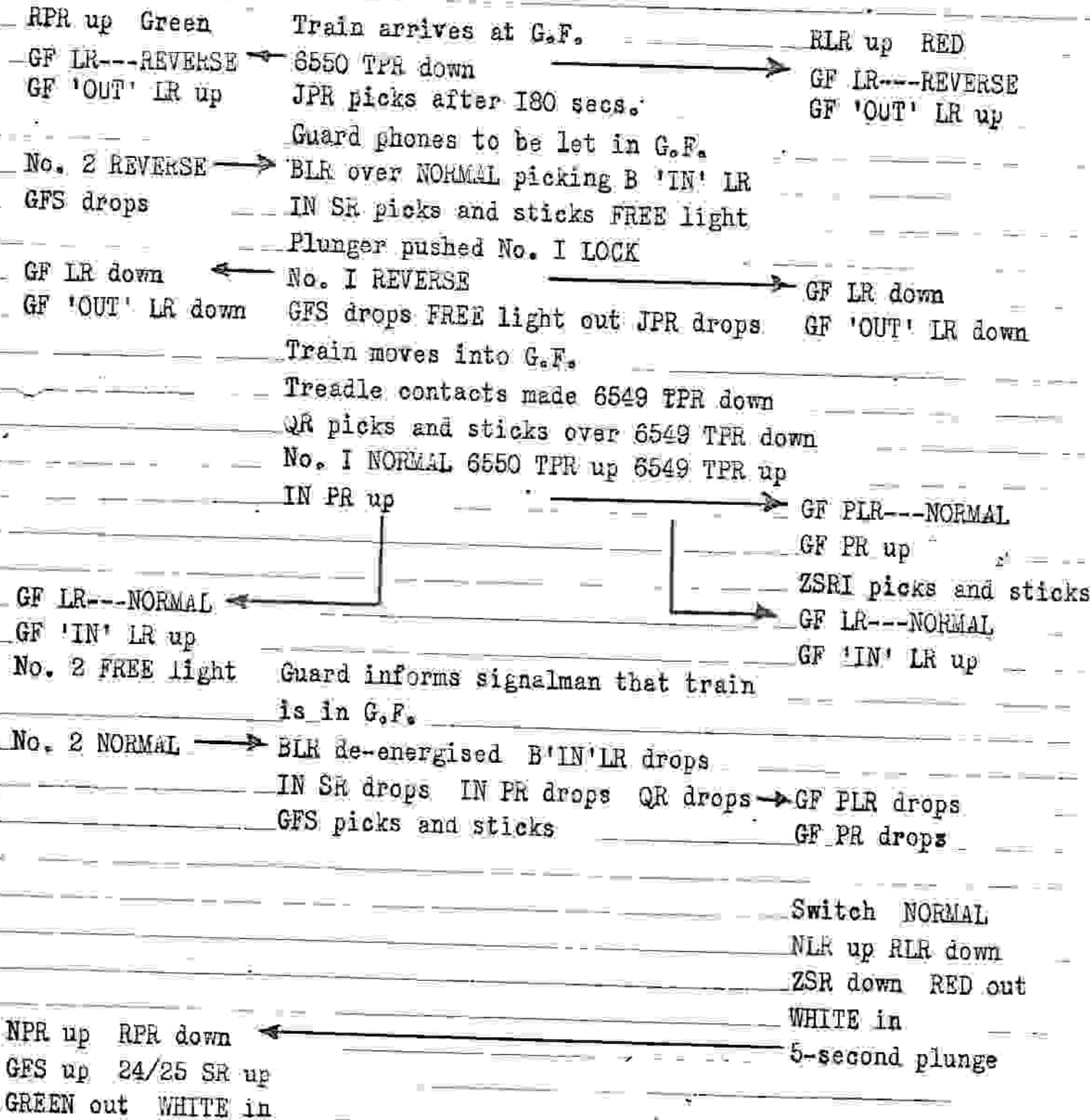
WHITE in

TOKENLESS BLOCK - GROUND FRAME OPERATION

GIRVAN

BARGANY

KILKERRAN



TOKENLESS BLOCK - GROUND FRAME OPERATION

GIRVAN

BARGANY

KILKERRAN

RPR up GREEN
GF LR---NORMAL
GF 'IN' LR up

RLR up RED
GF LR---NORMAL
GF 'IN' LR up

Guard informs signalman that train
is ready to go to Kilkerran

No. 2 REVERSE → BLR over REVERSE picking B 'OUT' LR
GFS drops FREE light and No. 1 LOCK

GF LR de-energised ← No. 1 REVERSE GFS drops → GF LR de-energised
GF 'IN' LR down FREE light out GF 'IN' LR down

Train moves out of G.F.
Treadle contacts made
6549 TPR down QR up Train sits
on 6550 6550 TPR down
6549 TPR up QR down

GF LR---REVERSE ← No. 1 Normal → GF LR---REVERSE
GF 'OUT' LR up GF 'OUT' LR up

No. 2 FREE light Guard informs signalman that
train is out of G.F.

No. 2 NORMAL → BLR de-energised B'OUT' LR down
GFS picks and sticks

GF LR---NORMAL ← Train goes to Kilkerran 6550 TPR up → GF LR---NORMAL
GF 'IN' LR up GF 'IN' LR up

Train arrives ZSR up
Switch NORMAL
NLR up RLR down
ZSR down RED out
WHITE in
5-second plunge

NPR up RPR down ←
GFS up GREEN out
WHITE in