

Track Circuit Block

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Synopsis:

This standard sets out the signalling requirements to ensure the safe movement of trains where the Track Circuit Block system is employed.

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Track Circuit Block

Contents

	Description	Page
Part A	Issue record	2
	Responsibilities	2
	Compliance	2
	Health and Safety Responsibilities	2
	Supply	2
Part B	1 Purpose	3
	2 Scope	3
	3 Definitions	3
	4 Application	3
	5 Principles of Operation	4
	6 System Requirements	4
	7 Permissive and Shunt Working	6
	8 Switching Out of Signal boxes	6
	9 Ground Frames	6
	10 Level Crossings	7
	11 System Failures	7
References	8	

Track Circuit Block

Part A

Issue record This standard will be updated when necessary by distribution of a complete replacement.

Amended or additional parts of revised pages will be marked by a vertical black line in the adjacent margin.

Issue	Date	Comments
I	July 97	New standard. Supersedes SSP24 and GS/ST0068 which are cancelled. Supersedes SSP 80 section 4.2, 4.3, 5.1 and 5.9.

Responsibilities Railway Group Standards are mandatory on all members of the Railway Group* and apply to all relevant activities which fall within the scope of each individual's Railway Safety Case. If any of those activities are performed by a contractor, the contractor's obligation in respect of Railway Group Standards is determined by the terms of the contract between the respective parties. Where the contractor is himself a duty holder of a Railway Safety Case then Railway Group Standards apply directly to the activities described in his Railway Safety Case.

*The Railway Group comprises Railtrack and the duty holders of Railway Safety Cases accepted by Railtrack.

Compliance The provision of this Railway Group Standard are mandatory for design and implementation work undertaken on schemes for which the Signalling Scheme Plan is approved on or after 6th December 1997. Retrospective action is not required in respect of existing layouts and Signalling Scheme Plans approved prior to 6th December 1997. Railtrack shall consider the need to meet the requirements of this standard when a Signalling Scheme Plan approved prior to 6th December 1997 is altered on or after 6th December 1997.

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Track Circuit Block

Part B

1 Purpose

To define the signalling requirements to ensure the safe movement of trains on running lines where a system of train detection is specifically provided throughout each signal section.

2 Scope

The contents of this standard apply to all lines where the trains are signalled in accordance with the Regulations for Train Signalling by the Track Circuit Block System

3 Definitions

Block Signal A stop signal that controls the entrance to or signifies the termination of a block or signal section (and any other stop signal within station limits).

Non-block Signal - A mid-section stop signal specifically provided for the protection of a level crossing, or other hazard, and without block or signal section controls.

Overlap - The distance ahead of a stop signal up to which the line must be clear, and where necessary locked, before the signal next in rear can clear

Signal Section - In a track circuit block area, the line between two consecutive block signals (whether or not these are within the area of control of the same signal box) in the same direction of travel.

Track Circuit - A portion of railway line having fixed boundaries and providing information on its state of occupancy to the signalling system. Within this standard, this traditional name does not preclude alternative forms of train detection.

4 Application

Track circuit block signalling may be employed on any line (uni-directional or bi-directional) where the level of traffic and the types of vehicles are suitable to reliably operate the train detection system employed (reference [GK/RT001 I](#)) . Appropriate arrangements shall be made for the passage of any train which does not meet these requirements. The integrity level shall be sufficient for the application.

It is not necessary for the signaller to directly observe trains and there is no restriction on the location of signal boxes.

Block signals may be arranged to work as automatic, semi-automatic or controlled signals. Controlled signals may be arranged to work automatically on selection by the signaller .

The following facilities, amongst others, may be used in conjunction with track circuit block:

- mechanically operated controlled signals and associated mechanically operated distant signals
- permissive and shunt working
- automatic stepping-up of warning facilities

Track Circuit Block

- train operated route release
- automatic route setting
- automatic working of distant signals and/or aspects
- fixed distant signals and (reflectorised) distant boards.

5 Principles of Operation

Signals shall be provided for all normal train movements. Where trains are required to reverse a signal shall be provided at the point of reversal to control the movement in the reverse direction.

Except where permissive or shunt working is allowed, the signal controls shall only permit one train in a signal section at any time. The controls shall promote the correct sequence of events. It is not necessary for a block signal without a separate overlap track circuit to prove its own overlap clear, provided the overlap is proved clear in the proceed aspects of the block signal(s) in rear.

Where there are automatic or semi-automatic signals for both directions, opposing signals shall only be clear for one direction at any one time. The clear direction may be selected by the operation of controlled signals or, where there is more than one signaller, by the operation of direction or acceptance controls.

6 System Requirements

The following requirements supplement the interlocking principles in Railway Group Standard [GK/RT0060](#).

Train detection - The train detection system shall, in addition to controlling the block signals, indicate to the signaller(s) the presence or absence of trains in each signal section. The track circuit indications shall match the actual controls applied to signals, especially where overlaps at automatic signals are effectively part of the rear section. Where part of a signal section is in a tunnel, as defined in the Sectional Appendix, the train detection boundaries shall additionally satisfy the requirements of Railway Group Standard [GK/RT0011](#). A signal section may be indicated in portions where there are other signalling, level crossing or operational reasons. To avoid delay at controlled signals there shall be appropriate indication of approaching and conflicting trains.

Bi-directional controls - Where more than one signaller is involved in the control of a bi-directional line, Railtrack shall determine the need for control by additional switches or levers and interlocking. These controls may be co-operative or they may give overall control to a single signaller. The switches or levers may be a directional control for an unlimited number of trains or, if appropriate, may be restricted to the acceptance of a single train. Supplementary directional or acceptance controls shall not inhibit the clearance of signals at any exit from the bi-directional line. Bi-directional controls shall be suitably indicated to all associated signallers .

Signal controls - Except for shunt or permissive working when the signal section is occupied, block signal controls shall prove that the signal

Track Circuit Block

section and any required overlap at the exit signal is clear. The required overlap is specified in Railway Group Standard [GK/RT0078](#) and is dependent on the type of signal. To ensure that block signals (and any separate distant signals) are replaced after each train, automatic replacement of signal aspects shall be provided where practicable. Except for mechanical operation, signal sticks shall be provided for all controlled block signals but may be overridden by the selection of automatic working. Where there is not prompt, automatic and guaranteed replacement of the signal aspect, the replacement shall be proved before the clearance of any block signal in rear. This replacement proving shall be lever or control plus aspect but may be lever only where :

- a signal is mechanically operated, and
- an arm repeater is not provided, and
- the signal does not give entry to a bi-directional line worked by any non-token system (unless protection by points is assured), and
- the block signal(s) in rear is controlled by the same signal box, and
- the block signal(s) in rear cannot work automatically.

Semaphore signals - Where there are semaphore stop signals at either end of a signal section or semaphore distant signals that apply to these stop signals, the following arrangements shall apply (in order of preference):

- the overlap controls shall be suitable for fog conditions, or
- the signaller shall be in a position to determine when there is fog in the vicinity of the signals or be reliably advised and:
 - the signaller shall have a facility to select overlap controls appropriate to normal conditions or fog conditions, or
 - the overlap controls shall be suitable for normal conditions and the signaller shall have sufficient indications, control facilities for the signal(s) in rear and instructions in order to safely control trains during fog conditions.

Note: The required overlap controls are specified in Railway Group Standard [GK/RT0078](#).

Communication between signal boxes - An emergency alarm facility and voice communication shall be provided between adjacent signal boxes, supplemented by a means of describing trains as necessary.

Stop signal communications - All stop signals shall be equipped with a signal post telephone unless:

- the signal is close to the controlling signal box or gate box and the signal is only cleared when the signal box or gate box is open; or
- the signal has an automatic signal sign and a telephone if provided would be in a position with limited clearance; or
- alternative communication facilities are provided and Railtrack has considered the need for back-up communications where there are controlled signals:
 - at strategic locations (e.g. junctions without suitably located point zone telephones); or

Track Circuit Block

- protecting a level crossing that is equipped with CCTV; or
- protecting a tunnel.

Signal Identification - Signal Identification Plates (including combined Sign and Identification Plates) shall be provided in accordance with Railway Group Standard GK/RT0009.

7 Permissive and Shunt Working

Where authorised by Railtrack, signalling shall be provided to permit trains to enter an occupied signal section under the authority of a position light signal, semaphore subsidiary signal or a semaphore shunting signal. The interlocking and controls shall be in accordance with Railway Group Standard [GK/RT0060](#).

8 Switching Out of Signal boxes

If a signal box controlling track circuit block lines is switched out and the lines remain open for traffic, control shall be transferred to another signal box. This transfer of control shall, as a minimum, include the ability to replace each or all block signals and the transfer of all relevant indications and communications. The indications and communications to be transferred shall be appropriate to the operating requirements and risks during the period of closure. Point detection shall continue to be in accordance with the relevant chart in section 5 of Railway Group Standard GK/RT0039.

9 Ground Frames

The following requirements supplement section 4 of Railway Group Standard [GK/RT0061](#).

Signals - On running lines block signals shall protect the ground frame when it is released. The block signals shall be controlled or semi-automatic signals. On other than running lines Railtrack shall consider the need for appropriate protection. When released ground frames may work additional signals which may or may not be slotted by the signal box.

To avoid inhibition of a proceed aspect at the section signal(s), a separate non-block signal may be provided in order to satisfy the requirements of the relevant detection chart in section 5 of Railway Group Standard GK/RT0039. A remote ground frame marker may be used in lieu of a non-block signal and if a marker is provided the relevant detection requirements shall apply to the associated distant signal.

Release - Ground frames shall be released from the signal box. The following requirements shall be satisfied before the signaller releases a ground frame:

- the protecting signal(s) on and free of approach locking (using individual signal replacement facilities); and
- the line between the protecting signal(s), any appropriate block signal ahead and any required overlap
 - clear of trains; or
 - occupied by a train safely at a stand for duties at the ground frame; and

Track Circuit Block

- the portion of line between the ground frame, any appropriate block signal ahead and any required overlap, route locked and detected. This requirement and associated train detection may be omitted where there is an additional signal(s) to safely control all departing trains.

Normalisation - The following requirements shall be satisfied before the

signaller normalises a ground frame release:

- an assurance from the ground frame operator that it is safe to normalise; and
- proof from the ground frame that the release lever or control and associated equipment is normal, as specified in Railway Group Standard [GK/RT006 I](#).

Signal controls - On running lines the protecting signal(s) shall be controlled as block signals in accordance with section 6 of this standard and shall additionally require:

- at the signal box, the signaller's ground frame release normal (i.e. restored); and
- where there is not a separate non-block signal at the ground frame, the ground frame points detected normal in accordance with the relevant detection chart in section 5 of Railway Group Standard [GK/RT0039](#).

10 Level Crossings

The following requirements supplement the gate box and level crossing requirements in Railway Group Standards [GK/RT006 I](#) and [GK/RT0070](#).

Signals - Where running line signals are required for the protection of a level crossing these may be block or non-block signals. Where a block signal protects a manned level crossing it shall be a controlled signal or alternatively, where the roadway and controlling gate/signal box can be closed, a semi-automatic signal. On other than running lines Railtrack shall consider the need for appropriate protection.

Signal controls - Block signals, where provided, shall additionally be controlled in accordance with section 6 of this standard.

11 System Failures

The system shall be so designed that no credible failures shall result in the clearance of a signal or where practicable the maintenance of a clear aspect, when the conditions are not safe to do so.

Railtrack shall ensure that suitable operating procedures are available to ensure safe working of trains during all credible failure modes. Where the train detection does not generate continuous information about the state of the railway, the operating procedures shall include resetting and restoration to service in accordance with Railway Group Standard [GK/RT0027](#).

Track Circuit Block

References

BR 30062/1	Regulations for Train Signalling by the Track Circuit Block System
GK/RT0009	Identification of Signalling and Related Equipment
GK/RT 001 I	Train Detection
GK/RT 0027	Resetting and Restoration to Service of Signalling Equipment and Systems
GK/RT 0039	Semaphore and Mechanical Signalling
GK/RT0060	Interlocking Principles
GK/RT 006 I	Shunters Releases, Ground Frames, Switch Panels and Gate Boxes
GK/RT0070	Signalling Requirements for Level Crossings
GK/RT0078	Overrun Protection and Mitigation