

Ref	SSI8003-80
Issue	One
Date	August 2004

SSI Applications Manual

One Train System Without Staff

Endorsement, Authorisation and Issue Record

For endorsement authorisation and issue record of this document,
please refer to the SSI Applications Manual Contents,
RT/E/S/I7002.

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Published & Issued by: Network Rail 40 Melton Street, London NW1 2EE



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I Introduction

GK/RT0051 (ref. 1) describes various signalling methods of ensuring that only one train is present in a singled-ended single line section at any one time, such as tokens, staffs and axle counters. However, this paper is confined to the method known as "One-train System Without Train Staff" (OTW).

The type of OTW described in SSI8003-80 is limited to that employing Intermediate Train Detection (as defined in GK/RT0051) at the section exit, this being used where the Signaller is located remote from the exit and comprehensive train detection covering the whole section is not provided. Intermediate Train Detection employs three train detection devices, a sequence of operations of which are used to prove a train has exited the section.

Only panel operated OTW is currently covered - non-panel operation will be added later.

OTW can only be used where there are no train-shut-in facilities on the single line. An alternative method using a single ended axle counter section is the preferred option for such a line as this permits Track Circuit Block regulation on the adjacent lines to be extended to the single line section. However, OTW has to be used where the number of vehicles in the train may change whilst the train is on the single line, i.e. as occurs with freight trains.

2 Principles

2.1 Train Entry & Exit

The stop signal that controls the exit from the OTW section is known as the Home Signal. The signal that controls the entrance to the OTW section is known as the Section Signal. TORR, automatic working and automatic route setting are not permitted on these signals.

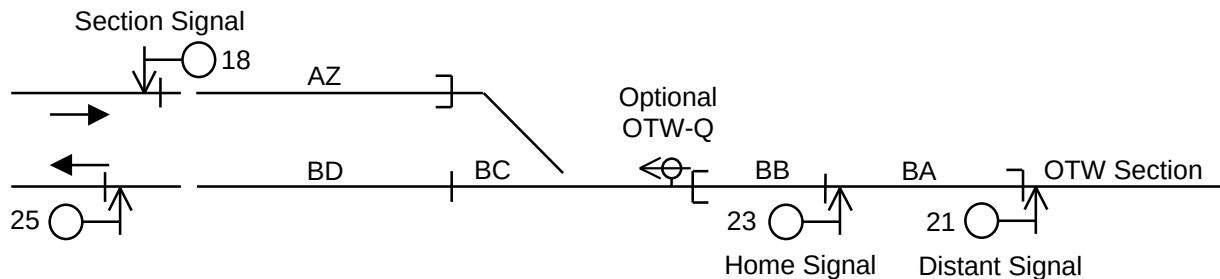
The required intermediate level of train detection normally consists of:

- the Home Signal berth track circuit,
- the first track circuit beyond the Home Signal, and
- either the second track circuit beyond the Home Signal or a directional treadle (or equivalent device) located beyond the Home Signal effective for outbound movements

The OTW section has two states, "Line Clear" and "Line Occupied". Occupation of either of the first two track circuits mentioned above by a train entering the OTW section puts the section to Line Occupied. The section then stays in this state until the correct sequential operation of the three track circuits (or two track circuits and the

treadle) proves that the train has exited the OTW section. The section then stays in this Line Clear state until it is put to Line Occupied by the above, thus these two states of the OTW section have to be "remembered" by a suitable system.

A typical arrangement at the entry/exit point of the OTW section is as follows.



This is often expanded into an arrangement where the single line leaves a double track line at a junction with/without provision for holding an entering or exiting train clear both of the main line and the single line section.

For a three track circuit sequence, track circuits BA, BB and BC are used. For the exit sequence to be satisfied these have to be operated in the correct order as follows:

BC clear, BB clear, BA occupied;

then (with BC having remained clear)

BC clear, BB occupied;

then (with BB having remained occupied until BC was occupied)

BC occupied, BB clear, BA clear;

then the OTW section is declared clear.

The conditions in brackets provide protection against irregular sequencing.

For a two track circuit plus directional treadle sequence, track circuits BA and BB and directional treadle OTW-Q are used. For the exit sequence to be satisfied these have to be operated in the correct order as follows:

OTW-Q not operated, BB clear, BA occupied;

then (with OTW-Q having remained not operated)

OTW-Q not operated, BB occupied;

then (with BB having remained occupied until OTW-Q was operated)

OTW-Q having been operated, BB clear, BA clear;

then the OTW section is declared clear.

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The conditions in brackets provide protection against irregular sequencing. The positioning of directional treadle OTW-Q at the beginning of track circuit BC, and its damping, should be such that track circuit BB is still occupied when the treadle is first operated, but the "OTW-Q having been operated" state is retained long enough for track circuit BB to clear.

These sequences are based on the relay circuits shown in BRS-SW67 Sheet 52 (ref. 3).

2.2 Signal Controls

The OTW section is proved at Line Clear in the route(s) from the Section Signal(s) controlling access to the section, both at the time of route setting and in the aspect controls. Any track circuits used in the sequencing have to be proved clear in the aspect controls.

GK/RT0051 requires that the Home and Distant Signals are "on" and lit before the Section Signal(s) is cleared. (The "on" proving is inherently achieved in SSI through the opposing route locking.) This Standard also requires that an override with incremental counter is provided that will permit the Section Signal to clear in the event of lamp failure of the Home or Distant Signals. When in use the override will need to be operated for each clearance of the Section Signal.

This override is applied as shown in SSI8003-79 Section 5 "Override of Signal Lamp Proving", except that the lamp proving control (or its override) is proved in the Section Signal's aspect at time-of-clearing only, rather than continuously.

If the Distant Signal works automatically, the controlling signal box must have a replacement facility for this signal, as shown in SSI8003-62.

2.3 Isolating, Resetting & Restoration

Isolation, resetting and restoration to service is in accordance with GK/RT0027 (ref. 2).

GK/RT0027 Section 4.3 requires that systems shall normally be designed to incorporate a specific means of isolating them from the signalling system while they are being worked upon. For OTW, isolation by the Technician of the Sequencing System, thus setting and maintaining the section to Line Occupied, is required in the event of maintenance of the train detection used for sequencing. This is required to avoid an inadvertent simulation of the sequence wrongly changing the recorded state of the section from Line Occupied to Line Clear.

After isolation or an incorrect operating sequence or relevant equipment failure, the section is automatically reset to the safe, i.e. Line Occupied, state. Hence GK/RT0027 Section 4.5 first paragraph is satisfied, thus specific action by the Technician is not required.

With the Technician's isolation not applied, restoration to service can be either by: