

Supplement Notice

Information for users

The attached standard:

RT/E/S/17004

Issue 1

has essential supplementary information

Instructions for use

It is essential that you first read and understand the supplement pertaining to the standard before proceeding to the standard. You must then apply the requirements of the supplement to the standard.

Proceed to supplement ►**I have read & understand the supplement.
Proceed to standard ►**

Ref	NR/SP/SIG/I 7004
Issue	I
Date	February 1999

Requirement Specification for the SSI Technical Terminal (formerly RT/E/S/I 7004)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

This document is the property of Network Rail. It shall not be reproduced in whole or part nor disclosed to a third party without the written permission of the Standard Owner.

© Copyright 2004 Network Rail

Uncontrolled copy once printed from its electronic source.

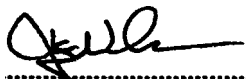
Published & Issued by: Network Rail; 40 Melton Street, London NW1 2EE



RAILTRACK LINE SPECIFICATION

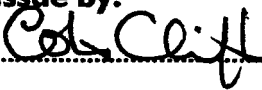
REQUIREMENT SPECIFICATION FOR A SSI TECHNICIAN'S TERMINAL

Approval and Authorisation

Endorsed by: 

J F Wilson, Professional Head of Control Systems
Engineering

Accepted for Issue by:


C Clifton, Head of Corporate Standards

Authorised by:



A Doherty, Technical Services & Innovation
Director

This publication, including the data and information relating thereto, is not to be used, disseminated, stored in a retrieval system, reproduced, copied or adapted either in whole or in part without the express written permission of RAILTRACK Plc.

Published and issued by
Railtrack plc
Railtrack House
Euston Square
LONDON
NW1 2EE

©1999 RAILTRACK PLC

SUMMARY

This document specifies a Technician's Terminal (TT) for the Solid State Interlocking system. The system specified may be used as a replacement terminal for existing SSI schemes (currently using a TT built to the specification BR1960A) or for installation in new schemes.

ISSUE RECORD

This Specification will be updated when necessary by the distribution of a complete replacement. Amendments will be marked by a vertical black line in the adjacent right hand margin. The latest issue of this specification shall be implemented immediately upon receipt.

Issue	Date	Comments
I	February 1999	New issue

RESPONSIBILITIES AND DISTRIBUTION

This specification shall be complied with by suppliers of the SSI Technician's Terminal and by those engaged in the acceptance or type approval thereof.

IMPLEMENTATION

The requirements specified in this document are mandatory for signalling installations on schemes for which the Signalling Scheme Plan is approved on or after 3 April 1999. The Infrastructure Controller shall determine the need for retrospective action on a site by site basis.

DISCLAIMER

Railtrack PLC has used its best endeavours to ensure that the content, layout and text of this document is accurate, complete and suitable for its stated purpose. It makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems of work or operation. Railtrack PLC will not be liable to pay compensation in respect of the content or subsequent use of this document for any purpose other than its stated purpose or for any purpose other than that for which it was prepared except where it can be shown to have acted in bad faith or there has been wilful default.

SUPPLY

Paper copies of this document will be available by printing from electronic copy or, where this is not possible, may be issued on request to the document controller.

CONTENTS

Section	Description	Page
1. INTRODUCTION		6
1.1	Purpose.....	6
1.2	Scope.....	6
1.3	Background	6
1.4	Overview of Technician's Terminal	6
1.5	Safety Requirements	8
2. DEFINITIONS		9
3. MANDATORY FUNCTIONAL REQUIREMENTS		11
3.1	System Configuration	11
3.2	Controls	11
3.3	Displays and Indications	11
3.4	Remote Access	12
3.5	Interlocking Controls	12
3.6	System Display Functions	13
3.7	Telegram monitoring.....	13
3.8	Panel request monitoring	14
3.9	CI monitoring.....	14
3.10	SSI Fault Reporting.....	14
3.11	SSI Message Logging.....	16
3.12	Replay of Logged Data	17
3.13	Simulation	17
3.14	Performance.....	18
3.15	Time Marking	18
3.16	System Diagnostics and Failure.....	18
3.17	System Security	18
4. DESIRABLE FUNCTIONAL REQUIREMENTS		20
4.1	System Security.....	20
4.2	Condition Monitoring.....	20
4.3	Multi-User Operation.....	20

4.4 Networked Operation.....	21
4.5 Displays and Indications	21
4.6 Remote Access	21
4.7 SSI Message Logging	21
5. INTERFACES	22
5.1 Panel Processor Module	22
5.2 Diagnostic MPM.....	22
5.3 Remote Terminal	22
5.4 Radio Clock	22
5.5 Power Supply.....	22
5.6 User Interface	23
6. SAFETY.....	24
6.1 Safety Integrity Level	24
6.2 Safety Performance Target.....	24
6.3 Health & Safety Issues	24
6.4 Safety Management and Approval.....	24
7. RELIABILITY, AVAILABILITY AND MAINTAINABILITY.....	25
7.1 Reliability and Availability.....	25
7.2 Maintainability.....	25
8. DESIGN METHOD AND DOCUMENTATION.....	26
8.1 System.....	26
8.2 System Functional Software.....	26
8.3 Geographic Data.....	26
8.4 Hardware	27
8.5 Design Authority and Hand-over	27
9. TRAINING AND DOCUMENTATION.....	28
9.1 Training.....	28
9.2 Documentation.....	28
10. TESTING AND COMMISSIONING.....	29
10.1 Documentation.....	29
10.2 Commissioning	29
11. LIFE	30

11.1 Operational Life.....	30
11.2 System Life.....	30
11.3 Whole Life Costs.....	30
12. CONSTRAINTS	31
12.1 Year 2000 Compliance	31
12.2 Compatibility With Current SSI.....	31
12.3 Replacement TT	31
12.4 Workstation Functionality	31
13. ENVIRONMENTAL CONDITIONS.....	32
13.1 Operating Environment.....	32
13.2 Electromagnetic Compatibility.....	32
13.3 Storage and Transport Environment.....	32
14. ACCEPTANCE	33
15. DEVELOPMENT POTENTIAL	34
15.1 Replacement of Diagnostic MPM Functions.....	34
16. LIST OF REFERENCED DOCUMENTS	35

1. INTRODUCTION

1.1 Purpose

The purpose of this specification is to define the requirements for a Solid State Interlocking (SSI) Technician's Terminal (TT) for use with Railtrack's SSI-equipped infrastructure.

The format of this specification is similar to that described in 'Work Instruction for Preparing a PES Requirement Specification' ^[1].

1.2 Scope

This specification shall apply to Technician's Terminals for use in signalling schemes using SSI on Railtrack infrastructure.

1.3 Background

The SSI system was developed jointly by BR Research, Westinghouse Signals Ltd, and GEC ALSTHOM Signalling Ltd for the British Railways Board. SSI is used extensively on the Railtrack network, and continues to be used for new signalling schemes.

The principal elements of signalling system using SSI are as follows:

- A signaller's control and display system. This may be a hardware panel fed by a multiplexer, an Integrated Electronic Control Centre (IECC), or, in future, other forms of control and display system.
- Other control and information systems such as train describers, automatic route setting, etc.
- One or more Central Interlockings (CIs), which perform the central control and interlocking functions of the signalling system. The number of CIs will be dictated by the complexity of the signalling scheme.
- One or more Technician's Terminals (TT). Each TT can service up to six CIs, and provides the interface for the technician to the CIs, and a means of logging interlocking and data link activity.
- A number of Trackside Functional Modules (TFMs) (maximum 63 per CI) connected to each CI by a pair of data links.

The current (as at January 1998) SSI design uses a TT with a VDU and keyboard, a processor system based on the STE bus standard, and a Penny and Giles dual tape data logger. This equipment is now obsolescent, and this specification is for a replacement TT subsystem for both existing and new SSI schemes.

1.4 Overview of Technician's Terminal

The principal elements of the TT System are as follows:

- A computer system which performs the TT functions.
- A means of synchronising with an external time standard.
- One or more visual display units (VDU) for the display of textual and graphical information.
- A keyboard and pointing device for user input.
- A printer.
- Serial interfaces to each CI connected.
- A non-volatile storage medium for system logging.
- An easily removable storage medium for removal of system logs which may constitute evidence at an inquiry.
- Facilities for remote or networked user access.
- An on-site simulation facility.

A block diagram of the TT is shown in Figure 1. Note that the boxes denote functional elements, which need not be physically separate entities.

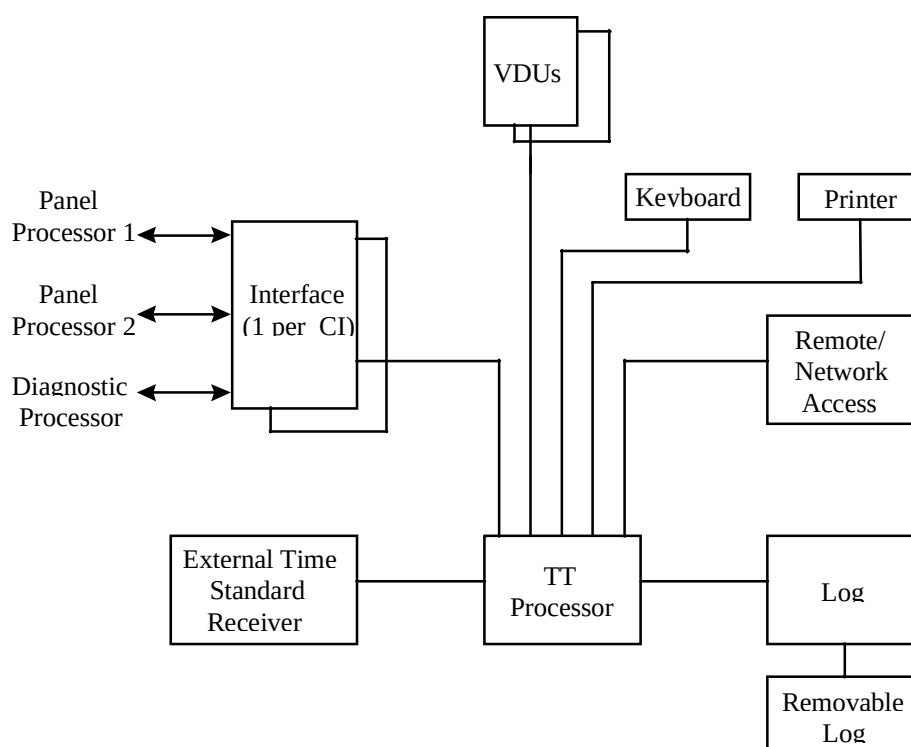


Figure 1 Technician's Terminal Block Diagram

The prime functional requirements for the TT are:

- To provide a means of applying and removing Technician's Controls on the connected CIs, including:
 - Start/Stop Interlocking
 - Track Circuit Occupy
 - Route Bar
 - Aspect Disconnect
 - Points Disable
 - Temporary Approach Control
 - Disable Interlocking MPM
 - To print and log fault messages originating from the Diagnostic Multi-Processor Module (Diagnostic MPM) in each CI.
 - To log data link messages as reported by the Diagnostic MPM in each CI.
 - On demand, to display the following:
 - Data link telegram contents (selectively by address)
 - Panel Requests
 - PPM Memory Contents
 - The state of signals, points and track circuits
 - To provide a graphical display of the current state of trackside equipment
 - To provide a means of controlling a SSI on-site simulator.
 - To include a means of configuration to match a specific SSI installation.
- The system as defined in this specification may also incorporate enhanced facilities not incorporated in the existing design, including:
- Improved user interface
 - Capacity for larger number of interlockings
 - Improved graphical display
 - Improved logging and replay facilities
 - To provide a facility for the replay of recorded data (in the original system this is provided by a separate off-line system, for the system as specified this feature may be integral).
 - Condition monitoring features
 - Capacity for future expansion/enhancement

1.5 Safety Requirements

Throughout this document, Functional Safety Requirements are identified by an **(S)** at the end of the requirement statement.

2. DEFINITIONS

All terms and abbreviations used in this specification are defined below:-

Control Centre	The control equipment for an entire controlled area, comprising up to 31 CIs.
Diagnostic MPM	The MPM which monitors all messages from a CI to/from, data links and reports changes and faults to the TT.
Graphical Display	A display of signalling equipment states in a graphical format, similar to that used for a Signaller's diagram on a control panel.
Interlocking MPM	The MPM which performs the Central Interlocking function. Each CI contains 3 Interlocking MPMs arranged as a 2 out of 3 redundant fail safe system.
Log	An electronic record (on tape, disk, or similar medium) of SSI data link transactions, panel requests from the PPM and SSI system fault indications.
Maintainer	The person or organisation responsible for the maintenance of the TT.
Telegram	The individual message between a CI to/from trackside equipment or between CIs.
System Functional Software	The software used within the TT to control its operation, as distinct from Geographic Data which may be used to configure the software for a particular application.
User	The technician who uses the TT to monitor SSI Interlockings and apply Technician's Controls.
CI	Central Interlocking The rack of equipment which forms the central control element of SSI. Contains 2 x PPMs, 3 x Interlocking MPMs, 1 x Diagnostic MPM.

IDL	Internal Data Link	The communication link between CIs in a Control Centre.
IECC	Integrated Electronic Control Centre	VDU based control system which forms the signaller interface for some SSI Schemes.
MPM	Multiprocessor Module	The physical hardware which is used to perform the Interlocking and Diagnostic functions (as the Interlocking and Diagnostic MPMs).
PPM	Panel Processor Module	The interface between the Interlocking MPMs and the Signaller's Control System. Each CI contains 2 PPM.
SSI	Solid State Interlocking	The electronic signalling interlocking system of which the Technicians Terminal forms a part.
TFM	Trackside Functional Module	Generic term for Signal Modules and Points Modules which form the interface between SSI and trackside equipment.
TT	Technician's Terminal	The system which is the subject of this specification, and is used to monitor and control the operation.
VDU	Visual Display Unit	System used for the display of textual and graphical Information.

3. MANDATORY FUNCTIONAL REQUIREMENTS

This section provides a statement of the mandatory system features, functionality and levels of performance.

3.1 System Configuration

- 3.1.1 The system shall be configurable to meet the needs of a specific SSI installation and other operational parameters as specified below.
- 3.1.2 The system shall provide a means for the user to define a Terminal Name in plain English (e.g. Liverpool Street Terminal 1) for the system.
- 3.1.3 The system shall provide a means for the user to define the names allocated to each Central Interlocking, and the input/output ports to which it is connected.
- 3.1.4 The system shall incorporate a means of setting the date and time. If connected to a radio clock (see requirement 5.4), the date and time shall be automatically synchronised to that clock without user interaction.
- 3.1.5 The system shall incorporate means of setting such other configurable parameters as may be necessary according to the system design (e.g. user names, access privileges, passwords, interfaces for remote access and/or networking).
- 3.1.6 The system configuration shall be stored within the TT in such a manner that it is correctly maintained under power failure conditions (including loss of uninterruptible power supply) for a period not less than 24 hours.

3.2 Controls

Note: One of the functions performed by the TT is to apply controls to the Interlocking. Any such operations are referred to in this document as “Interlocking Controls”. The use in this document of the words “control” or “controls” without this qualification is used to denote any input function from the user to the TT.

- 3.2.1 The control interface from the user shall be by keyboard and pointing device (mouse, trackerball, or equivalent).
- 3.2.2 The TT shall also respond to controls to cancel alarm indications operated by the signaller, and sent to the TT via the PPMs ^[2].

3.3 Displays and Indications

- 3.3.1 The primary display to the technician shall be one or more visual display screens, which shall be capable of displaying:

- a) Textual information
- b) Graphical information

- 3.3.2 The TT shall include a printer for logging fault messages and for printing system information at the request of the user.
- 3.3.3 The TT shall be capable of controlling alarm indications via the links to the PPMs for display to the signaller as defined in the Message Format specification^[2] (or a superset). The alarm indication to be controlled is defined within the format of messages received from the Diagnostic MPM^[3].
- 3.3.4 The TT shall continuously display the time and the name of the terminal on all active display screens.
- 3.3.5 When setting or clearing interlocking controls, the TT shall show the identity of the interlocking being controlled.

3.4 Remote Access

- 3.4.1 The TT shall have a facility for dial-up access from a remote console.
- 3.4.2 When connected, the remote console shall have the same user interface as the local VDU.
- 3.4.3 Operation of interlocking controls as per requirement 3.5 shall be inhibited when the user is connected via the remote access facility. This requirement shall not apply if a strategy for the remote application of interlocking controls is implemented as per requirement 4.6.1.

3.5 Interlocking Controls

- 3.5.1 The TT shall provide a facility to apply and remove Interlocking Controls.
- 3.5.2 The protocol between the TT and each CI shall be as defined in the message format between the terminal processor and the interlocking^[4] (or a superset).
- 3.5.3 The following interlocking control facilities shall be provided:
- Controls applicable to an interlocking as a whole:
 - Select CI to which controls are to be applied/removed
 - Start/Stop Interlocking
 - Disable Interlocking MPM
 - Controls applicable and removable to/from individual equipment memories within a selected interlocking: