



TECHNOLOGY MANAGEMENT

PROPOSAL

Train Cab System (TCS) for the 15E Locomotive

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1 SCOPE

This document specifies the configuration requirements for the Train Cab System (TCS) to be installed and delivered with the Class 15E locomotive on the Ore Line.

2 Applicable Documents

The following specifications, standards and drawings of the exact issue form a part of this specification to the extent shown herein. In the event of conflict between this and the relevant document, the contents of this specification shall be considered a superseding requirement.

2.1 Transnet Documents

Standard Specification for Documentation for Signals Equipment.	CSE-1159-001 CAT E48
Environmental Specification of Transnet Freight Rail Railway Signalling Systems.	CSE-1154-001 CAT E48
TRITON Data Communication Protocol	BBC4204 version 1
System Specification for Train Communication System (TCS) for Transnet Freight Rail	BBC8282 version 1
Telemeter/End Of Train (EOT) Equipment for Air and Vacuum Brake Trains	BBB1776 version 2
Spornet Locomotive Train Definition Unit	BBC2655 version 1
General Ergonomic Guideline for the Design of Visual Display Man – Machine – Interfaces	BBB0947 (Latest issue)

2.2 External Documents

QuadSoft "Specification for the Train Cab System (TCS-4) for the 15E Locomotive"	15ET-ASP-0000-04 Rev 4, 2008/06/09.
QuadSoft "Interfacing Of The Train Cab System 2 and a Telemeter"	TCS2-SRD-0004 Rev 1, 2004/01/07
QuadSoft "Technical Installation Manual for the Train Definition Module"	TDM-TIM-0000-01 Rev 1, 2007/03/14
QuadSoft "Technical Specification for the Train Definition Module / Unit (TDM / TDU)"	TDM-ASP-0000-02 Rev 2, 2007/02/14
QuadSoft "Message Format of the Train Definition Unit (TDU)"	TDU-MSG-0000-011 Rev 1, 2008/02/17
QuadSoft "Operators User Manual for the Train Definition Module / Unit (TDM / TDU)"	TDM-OUM-0000-01 Rev 1, 2007/02/28
QuadSoft "Acceptance Test Procedures for the Train Definition Module / Unit (TDM / TDU)"	TDM-ATP-0000-01 Rev 1, 2007/03/14

3 Requirements

3.1 System Definition

The configuration of the Train Cab System (TCS) to be installed and supplied as part of the 15E locomotive for the Ore Line shall be in accordance with the requirements set out in this document and depicted in the context diagram of Figure 1.

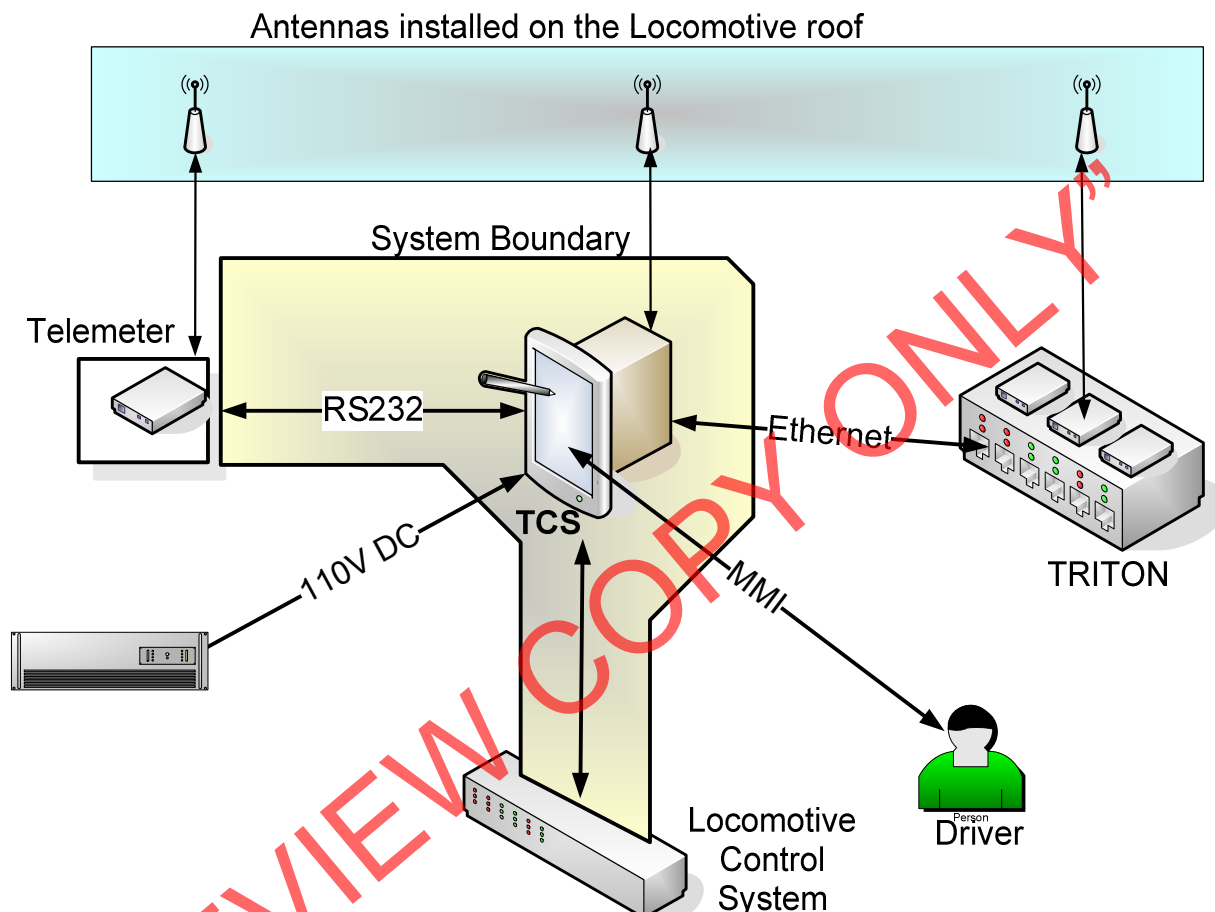


Figure 1: 15E Locomotive Context Diagram

3.2 System Functional Requirements

The functional requirements for the 15E TCS system shall conform to the requirements as set out in System Specification BBC8282.

3.2.1 Exclusions

The TCS system proposed for deployment with the 15E locomotive fleet on the Ore line shall contain a subset of the BBC8282 specified TCS requirements. Current voice communication requirements for operations at the Ore Line are sufficiently addressed by the existing radio network deployed throughout the Ore Line. Furthermore, data communication requirements are being addressed with the deployment of TRITON in the 15E locomotive fleet. The TCS system as specified in BBC8282 has a complete set of

functionalities, some of which cannot be implemented on the Ore Line. A description of the required functionality to be excluded from the 15E TCS system is presented.

3.2.1.1 All Voice Communication functionality

The TCS is used at the Coaline primarily as a communication system between the Train Control Officers and Train Drivers over the GSM network. This functionality however, with all its related interfaces and components is not a requirement for the 15E locomotive fleet at this stage. This decision to omit this requirement may be reviewed in the future.

3.2.1.2 Back Office

Specification BBC8282 specifies TCS communication functionality that requires BOF interfaces and components. The BOF shall not be required at the Ore Line as a result of the limited GSM coverage and the exclusion of Voice communication functionality.

3.2.2 Additions

Implementation of the TCS in the 15E locomotives that shall operate on the Ore Line necessitates the integration of other in cab functionality that is not specified in BBC8282. The 15E locomotive TCS shall perform TDU functionality that enables TRITON to identify the locomotive it is installed in as well as link it to Train Identification information that is entered by the Train Driver. The TCS shall utilise alternatives to handset tags for identification and logging in of a train driver at the start of a train trip as well as logging off at the end of his shift or train trip. The design of the TCS shall also accommodate for secure means of configuring the embedded TDU module for all relevant TDU parameters by authorised personnel only.

Maintenance personnel also use the TDU as a diagnostics tool for TRITON. The technicians access the display of specific TRITON generated messages through TDU menus. The 15E TCS design shall accommodate the integration of this TDU functionality.

3.2.2.1 TDU functionality

3.2.2.1.1 The TDU product specification containing the description of all the TDU functionality in the units deployed at Transnet Freight Rail is specified in the supplier document TDM-ASP-0000-02 Rev 2 and Transnet Freight Rail Specification BBC2655.

3.2.2.1.2 The TDU transmits two (2) messages to a central Track and Trace server when a train driver executes specific functions on the TDU at the Start and End of a train trip.

3.2.2.1.3 The TDU can also be polled for specific information by other devices connected on the TRITON network.

3.2.2.1.4 The exact data structure of all the message packets that the TDU transmits are specified in the supplier document TDU-MSG-0000-011 Rev 1.

3.2.2.1.5 It should be noted that the TDU functionality is only accessed by a train driver at the beginning and end of his train trip and by a technician for configuration of parameters.

3.2.2.1.6 The TDU performs automatic remote software updates. This functionality is described in detail in the TDU supplier document TDM-TIM-0000-01 Rev 1. The 15E TCS design shall accommodate the automatic remote software update functionality of the embedded TDU facility.

3.2.2.1.7 The TDU displays the current Train Identification number as entered by the Train Driver and the locomotive number when it is in the standby mode as specified in the supplier document TDM-OUM-0000-01 Rev 1. If possible this should be carried through to the TCS display.

3.2.2.2 TRITON data communication

The 15E TCS shall interface fully with the TRITON system as specified in BBC8282 paragraph 2.1. TRITON enables devices in a locomotive to communicate with each other and also to and from applications and databases on the Transnet Freight Rail WAN. Furthermore TRITON broadcasts GPS strings on its ports and also publishes messages with the availability status of all its communication channels. A full messaging protocol and a list of messages broadcast on the TRITON bus is specified in document BBC4204.

3.3 Interfaces

3.3.1 Telemeter interface

The TCS shall interface with the Transnet Freight Rail telemeters employed on the Ore Line. The Cab Units employed shall be EMS type PTS 102 conforming to Transnet Freight Rail Specification BBB1776.

3.3.2 TRITON interface

The TCS shall interface with the TRITON system for data communication as specified in BBC8282 using the protocols defined in BBC4204. Furthermore, TRITON broadcasts GPS NMEA strings on all its local Switch ports in the format described in BBC4204. The TCS deployed in the 15E locomotive fleet shall obtain its GPS data string from TRITON.

3.3.3 Driver Interface

The system shall present the driver with the normal TCS display. In addition the TCS shall display the EOT and TDU information.

3.3.3.1 The EOT screen display layout shall be carried through to the TCS as closely as possible to present the driver with the same “look and feel”.

3.3.3.2 All EOT controls and indications shall also be available on the Man Machine Interface.

3.3.4 Locomotive control System Interface

The 15E locomotives are equipped with a control system that continuously monitors and controls the operation of the locomotive. Where the locomotive control system has an interface with the TCS for communication, the TCS shall function as an interface between the control system and TRITON.

3.3.5 Power Supply interface

The TCS unit shall be powered from the locomotive battery supply. The locomotive battery supply varies over a range of 0.7Un to 1.25Un. Brownout at 100ms is 0.6Un. 1 second Transient at 1.4Un where:

3.3.5.1 Un = Diesel Locomotive = 74V

3.3.5.2 Un = Electric Locomotive = 110V

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