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Železniške naprave - Krmilnik vlakovnega prikazovalnika v strojevodjevem prostoru - 1. del: Splošna arhitektura

Railway applications - Driver's cab train display controller (TDC) - Part 1: General architecture

Bahnanwendungen - Display-Steuereinheit für Führerräume - Teil 1: Allgemeine Architektur

Applications ferroviaires - Contrôleur d'écrans de cabine (TDC) - Partie 1 : Architecture générale

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TECHNICAL REPORT

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English Version

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Bahnanwendungen - Display-Steuereinheit für Führerräume - Teil 1: Allgemeine Architektur

This Technical Report was approved by CENELEC on 2018-02-26.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (CLC/TR 50542-1:2018) has been prepared by CLC/TC 9X “Electrical and electronic applications for railways”.

This document supersedes CLC/TR 50542-1:2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

The significant technical changes with respect to CLC/TR 50542-1:2014 are listed below:

— The Scope has been shortened and synthetized;

— Some terms, definitions and missing abbreviations have been added;

— For consistency with CLC/TR 50542-2:2016 and CLC/TR 50542-3:2016, missing functions have been added and definition of functions have been improved to be consistent;

— Delays and failure modes have been deleted because they depend on the technical implementation of the system;

— Certification/validation section has been adapted;

— Informative Annex A has been adapted to be consistent with CLC/TR 50542-2:2016 and CLC/TR 50542-3:2016.

This document is the first one of a series of three documents:

— this document;

— CLC/TR 50542-2 *Railway applications — Driver's cab Train Display Controller (TDC) — Display systems FIS*;

— CLC/TR 50542-3 *Railway applications — Driver's cab Train Display Controller (TDC) — Other train systems FIS*.

— These documents shall not be interpreted as standards but as studies on the future view of the system. They do not describe an existing solution for the Train Display System (TDS).

Introduction

The purpose of this Technical Report is to propose harmonization for communication between the displays on the driver's desk and the train onboard systems.

The need for this harmonization has grown out of several trends.

One trend is that the rolling stock is being computerized more and more, enabling sophisticated functions within various train onboard systems.

Furthermore, the driver’s desk of such rolling stock is built around one or several computerized displays. These allow the driver to interact with rolling stock functions and train onboard systems. The user interfaces are typically user friendly, featuring e.g. graphics and colours.

In case of degraded situation (display failure) and with several displays available on the desk, it should be possible to relocate important information to a display that is still working. This improves operational availability.

A second trend is the ongoing harmonization of the interfaces on the train.

A third trend is that a European market is opened for onboard equipment.

Traditionally, some onboard equipment are linked to a country and/or to a rolling stock type. This has effectively limited the rolling stock to operate within a limited number of countries. The two trends above are useful to reduce this limitation.

The combination of the above trends leads to the conclusion that during train operation, train onboard systems need to have access to the displays on the desk. Furthermore, it is desirable to maintain the advantages of multi-display installations, allowing the ability to switch to another display in case of display failure. Thus a certain level of integration and harmonized communication is required.

Another motivation for this Technical Report is related to the Life-Cycle Cost. The recommendations written here support the easier replacement of displays and desk equipment during the lifetime of the vehicle, independently of the supplier.

In this document the Other Train Systems (OTS), the displays and the Train Display Controller (TDC) are considered only regarding their functionalities and not as physical devices.

The CLC/TR 50542 series are not standards but studies on the future view of the system. They do not describe an existing solution for the Train Display System (TDS).

1 Scope

In accordance with the ERTMS/ETCS specifications, Subset 121, UIC 612 leaflet, ERA_ERTMS_015560 document, EN 50126 and EN 61375 series requirements, this Technical Report describes the Train Display System (TDS) in the driver's cab, and the link between the TDS/TDC and some of its interfaces (Blue box and blue links only):

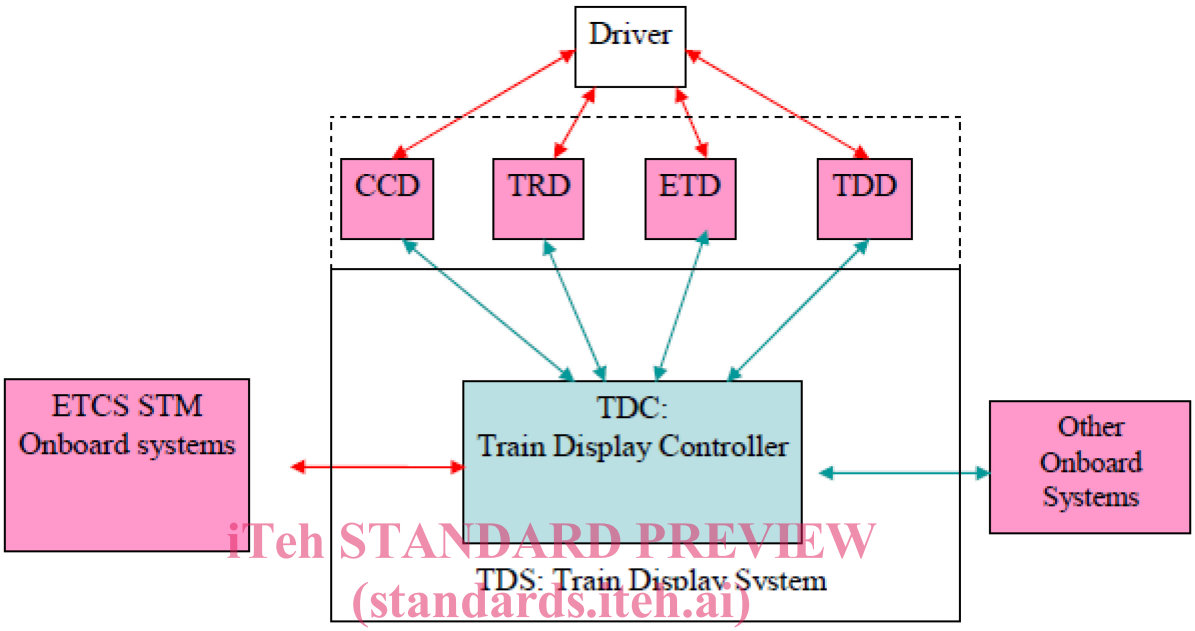

Figure 1 — Functional architecture

The scope of this document is to define the functional architecture around the TDC.

This Technical Report excludes the following items:

- Communication protocols (e.g. EN 61375 series);
- Ergonomic aspects;
- Interface with ETCS (Subset 121);
- Train functions;
- GSM-R EIRENE functions;
- Use of the displays as terminals for maintenance purpose.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
Driver Machine Interface
display used to give information to the driver

Note 1 to entry: Information is carried through this interface in the form of visual, acoustic and tactile (driver's pressing of buttons).

Note 2 to entry: It contains the hardware and software means to support or to inform the driver

3.2
button event
pressing or releasing a button

3.3
button
operating element for interaction with the cab display (hard key, soft key, sensitive area)

[SOURCE: EN 16186-3:2016, 3.5]

3.4
cab display
hardware device or system that shows text and/or graphic information to the user

3.5
hard key
physical key with permanent marking outside the screen area

Note 1 to entry: This permanent marking may be alpha and/or numeric and/or a symbol.

[SOURCE: EN 16186-3:2016, 3.18]

3.6
Indicator <in cab display>
element designed to draw attention to train onboard system status which requires a response

3.7
sensitive area
enabled area on a touchscreen on which a physical action is possible in order to give input to the display

3.8
soft key
context-dependent key consisting of a combination of a hard key and an associated screen label (text or symbol)

Note 1 to entry: This key is for multifunctional use.

[SOURCE: EN 16186-3:2016, 3.29]

3.9
Label <in cab display>
symbol or text indication on or close to an indicator or a button

[SOURCE: EN 16186-3:2016, 3.20, modified – The example has been removed]

3.10
Train Display Controller
(TDC)
equipment used to manage information between displays on the driver's desk and the train

Note 1 to entry: TDC is called DCU (Display Control Unit) in UIC 612 leaflet series. See Bibliography.

3.11
Train Display System
(TDS)
TDS consists of the TDC and the displays.

Note 1 to entry: Dotted line in Figure 1 — Functional architecture, represents the boundary between driver and ETCS/OTS

3.12
Display <in cab display>
hardware device or system that shows text and/or graphic information to the user combined with input device

Note 1 to entry: The sounds may be played by a separated sound generator

Note 2 to entry: It may include the sound interface

[SOURCE: EN 16186-3:2016, 3.8; modified - "combined with input device" has been added at the end of the definition]

3.13
Other Train Systems
train onboard systems interfaced with the TDC excluding ETCS/STM onboard, class B ATP systems, and the displays

EXAMPLE Trainborne systems could be the train systems interacting with the driver through the TDC (e.g. brake system, HVAC systems, traction system, CCTV).

Note 1 to entry: The interface between the TDC and the ETCS/STM onboard is described in Subset 121 (see Bibliography).

Note 2 to entry: The interface between the TDC and the displays is described in CLC/TR 50542-2.

[SOURCE: CLC/TR 50542-3:2016, 3.1, modified – The note 3 to entry has been added]

Note 3 to entry: To reach the goal of TDC interchangeability including some already existing class B ATP systems not using the STM interface as specified in the CCS TSI, the interfaces of these systems should be standardized.

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

CAN	Control Area Network
CCD	Control Command Display
CCS	Control Command Signalling
CCTV	Close Circuit TV
CPU	Central Processor Unit
EIRENE	European Integrated Railway Radio. Enhanced Network
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
ETD	Electronic Timetable Display
FMEA	Failure Mode and Effects Analysis
FIS	Functional Interface Specification
FSV	Function/Task Supervision
GSM-R	Global System for Mobile communications - Railways
HW	Hardware
LAN	Local Area Network
LCC	Life Cycle Cost
MTBF	Mean Time Between Failures
MVB	Multipurpose Vehicle Bus
OTS	Other Train Systems
SIL	Safety Integrity Level
STM	Specific Transmission Module
SW	Software
TDC	Train Display Controller
TDD	Technical and Diagnostic Display
TDS	Train Display System
THR	Tolerable Hazard Rate
TRD	Train Radio Display
TSI	Technical Specification for Interoperability
UIC	Union Internationale des Chemins de fer (International Union of Railways)
UML	Unified Modelling Language
USB	Universal Serial Bus

5 Functions

5.1 Definitions

5.1.1 General

The functions described in this document are managed by the TDC as defined in the scope. The following subclauses give the list of these functions.

The functions below should be supported by the interfaces between the TDC and the displays, and between the TDC and the OTS.

5.1.2 Button management

Button request: the train onboard system requests the display to give the driver access to the related button.

Button Deletion Request: the train onboard system requests the display to delete the related button.

Button event report: the display reports button event to the train onboard system.

Ack: the display reports (driver) acknowledgement to the TDC. Ack can be performed by acknowledgement of a text message, or by pressing a button, depending on the context.

The button management is covered by the function Display Button in CLC/TR 50542-2 and by the functions State and Command in CLC/TR 50542-3. See Annex A.

5.1.3 Indicator management

Indicator request: the train onboard system requests the display to show the related indicator.

Indicator Deletion Request: the train onboard system requests the display to delete the related indicator.

Picture request: the train onboard system requests the display to display the related picture. The picture can consist of a reference to a pre-loaded picture in the display, or a description of the picture itself, or a file.

Picture deletion request: the train onboard system requests the display to delete the related picture.

The Indicator management is covered by the function Display Indicator in CLC/TR 50542-2 and by the function State in CLC/TR 50542-3. See Annex A.

5.1.4 Text management

Text message request: the train onboard system requests the display to show a text message. The request can consist of a reference to a text, or it can include the text itself.

Text message deletion: the train onboard system requests the display to delete a text message.

The Text management is covered by the function Display Text Message in CLC/TR 50542-2 and by the function State in CLC/TR 50542-3. See Annex A.

5.1.5 Sound management

Sound on request: the train onboard system requests the display to start playing acoustic information to the driver.

Sound off request: the train onboard system requests the display to stop playing acoustic information to the driver.

The Sound management is covered by the function Play Sound in CLC/TR 50542-2 and by the function State in CLC/TR 50542-3. See Annex A.