

TECHNICAL SPECIFICATION



Electronic railway equipment – On-board multimedia and telematic subsystems
for railways –
Part 2: Video surveillance/CCTV services

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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TECHNICAL SPECIFICATION



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRONIC RAILWAY EQUIPMENT – ON-BOARD
MULTIMEDIA AND TELEMATIC SUBSYSTEMS FOR RAILWAYS –****Part 2: Video surveillance/CCTV services**

FOREWORD

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62580-2, which is a Technical Specification, has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

The text of this specification is based on the following documents:

Enquiry draft	Report on voting
9/2112/DTS	9/2151A/RVC

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62580 series, published under the general title *Electronic railway equipment – On-board multimedia and telematic subsystems for railways*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
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INTRODUCTION

The IEC 62580 series defines on-board multimedia and telematic sub-systems (OMTS) for railways, so as to achieve interoperability between subsystems in the same vehicle and between subsystems in different vehicles of the same train.

The on-board video surveillance/CCTV system is a subsystem of OMTS, providing services for on-board surveillance and the security issue of the train and passengers. It serves as the crucial source of information for train operator, security organizations and first responders. The basic system functionality contains video/audio capture, recording, retrieval, replay, display, etc.

This Technical Specification will be useful to those responsible for establishing operational requirements, writing specifications, selecting devices, installing, commissioning, using and maintaining the on-board video surveillance/CCTV system. This specification is divided into the following sections:

- a) system breakdown: divides the on-board video surveillance/CCTV system into four components based on their functionality, including video capture component, video storage component, video display component and video analysis component;
- b) function breakdown: gives the function list that system may offer from the user's point of view, and presents the function blocks of system according to the functional breakdown, which includes video environment, system management and system security. Within video environment, it contains the basic functions that system could provide, such as to capture video, to record video, to retrieve video, to export video, to replay video, to display video, to analyse video and manage interconnection;
- c) requirements: describes the requirements of video environment, system management and security as well as video transmission in which transmission performance, protocol and IP interoperability implementation based on Web service have been introduced;

Some use cases of the on-board video surveillance/CCTV system are given in Annex A.

ELECTRONIC RAILWAY EQUIPMENT – ON-BOARD MULTIMEDIA AND TELEMATIC SUBSYSTEMS FOR RAILWAYS –

Part 2: Video surveillance/CCTV services

1 Scope

This part of IEC 62580, which is a Technical Specification, specifies the on-board video surveillance/CCTV system functionality and requirement for the purpose of interoperability between components of on-board video surveillance/CCTV systems in the same vehicle and subsystems in different vehicles of the same train, which means two levels of interoperability are considered, one is interoperability between components and another is between subsystems.

This specification gives guidelines for:

- system breakdown structure of the on-board video surveillance/CCTV system;
- function breakdown structure of the on-board video surveillance/CCTV system, and
- requirement of the on-board video surveillance/CCTV system.

This specification is applicable to any type of train, for example open trains, multiple unit trains and closed trains.

As illustrated in Figure 1, this part of IEC 62580 provides video surveillance/CCTV services of monitoring, recording and retrieval of data, etc. This specification follows the general OMTS requirement defined in IEC 62580-1. The communication network of on-board video surveillance/CCTV system is based on the network defined by the IEC 61375 series, in which IEC 61375-2-5 and IEC 61375-3-4 define communication between and within consists, respectively, IEC 61375-2-3 lays out the communication profile for the backbone which is used for the train coupling, and IEC 61375-2-6¹ provides the support for the communication between on-board system and ground wayside infrastructures. The general system requirement of on-board video surveillance/CCTV system is developed based on IEC 62676 series with supplementing the special requirement for railway application. For interoperability implementation between components of system and subsystems, this specification makes reference to IEC 62676-2-3, which specifies a compliant IP video protocol and interface based on Web services. Special requirements for railway, such as device discovery between consists and within a consist, as well as network compliant to the IEC 61375 series are also defined here. In addition, IEC 62676-4 gives recommendations and requirements for the selection, planning, installation, commissioning, maintaining and testing for use in security applications. Finally, the requirement of exported data of on-board video surveillance/CCTV system is compliant with ISO 22311 if system is for security purpose.

¹ Under consideration.

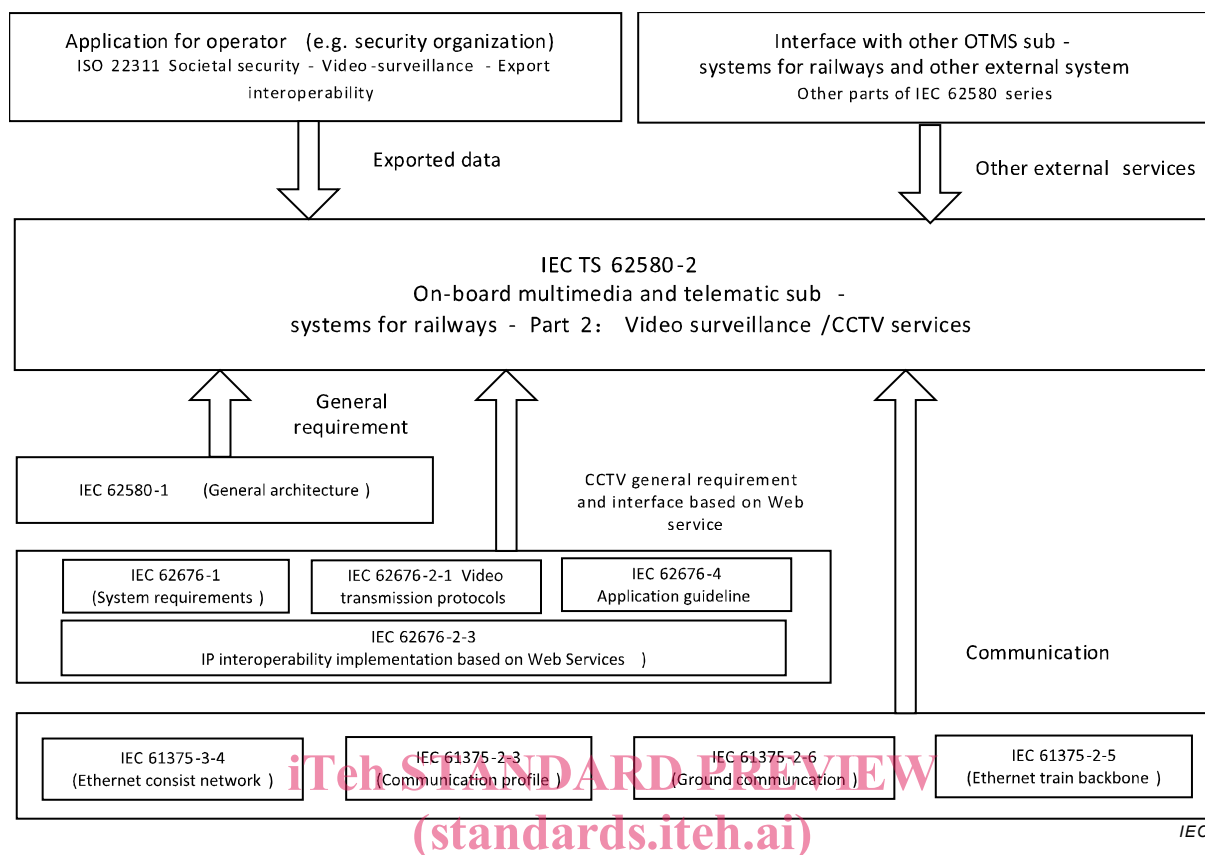


Figure 1 – Relation of IEC TS 62580-2 with other standards

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2 Normative references

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61375 (all parts), *Electronic railway equipment – Train communication network (TCN)*

IEC 61375-2-3:2015, *Electronic railway equipment – Train Communication Network (TCN) – Part 2-3: TCN communication profile*

IEC 61375-2-5, *Electronic railway equipment – Train Communication Network (TCN) – Part 2-5: Ethernet Train Backbone*

IEC 61375-2-6², *Electronic railway equipment – Train Communication Network (TCN) – Part 2-6: On-board to ground communication*

IEC 61375-3-4, *Electronic railway equipment – Train Communication Network (TCN) – Part 3-4: Ethernet Consist Network (ECN)*

IEC 62580-1:2015, *Electronic railway equipment – On-board multimedia and telematic subsystems for railways – Part 1: General architecture*

² Under consideration.

IEC 62676-1-1:2013, *Video surveillance systems for use in security applications – Part 1-1: System requirements – General*

IEC 62676-1-2:2013, *Video surveillance systems for use in security applications – Part 1-2: System requirements – Performance requirements for video transmission*

IEC 62676-2 (all parts), *Video surveillance systems for use in security applications – Part 2: Video transmission protocols*

IEC 62676-2-3:2013, *Video surveillance systems for use in security applications – Part 2-3: Video transmission protocols – IP interoperability implementation based on Web services*

ISO 22311, *Societal security – Video-surveillance – Export interoperability*

IEEE 802.1Q, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*

RFC 2326, *Real Time Streaming Protocol (RTSP)*

RFC 3016, *RTP Payload Format for MPEG-4 Audio/ Visual Streams*

RFC 3550, *RTP: A Transport Protocol for Real-Time Applications*

RFC 3551, *RTP Profile for Audio and Video Conferences with Minimal Control*

RFC 3984, *RTP Payload Format for H.264 Video*

FERRIS, C., KARMARKAR, A., YENDLURI, P., WS-I, *Basic Profile Version 2.0 – Working Group Draft, October 2007* (available at [http://www.ws-i.org/Profiles/BasicProfile-2_0\(WGD\).html](http://www.ws-i.org/Profiles/BasicProfile-2_0(WGD).html)).

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61375-1, IEC 62580-1 and IEC 62676-1-1, as well as the following apply.

3.1.1

alarm

warning of the presence of any hazard to life, property or the environment

3.1.2

camera IO

video capturing devices involved in analogue capture devices with Codec and IP capture devices (digital capture devices)

3.1.3

compression

reduction in the number of bits used to represent an item of data

3.1.4

control plane

media control functions, such as device control, and media configuration commands

**3.1.5
consist**

single vehicle or group of vehicles which are not separated during normal operation, and which contains no, one or several consist networks

**3.1.6
data identification**

capability to find, retrieve or delete specific data without ambiguity

**3.1.7
data integrity**

condition when data has not been modified or altered from its source either maliciously or by accident and in which data are maintained during any operation, such as transmission, storage, and retrieval, in order to preserve data for their intended use

**3.1.8
data management**

management of user-actions, audio-/video-data and general information that are not part of the activity management

**3.1.9
event**

incident in the real world

**3.1.10
frame rate**

numbers of frames per second

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**3.1.11
function**

application process which exchanges messages with another application process

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**3.1.12
gateway**

connection between different communication technologies

**3.1.13
train location**

specific location of a train defined by one of several means to represent its latitude, longitude, altitude as well as relative coordinates in a rail network

**3.1.14
image**

visible representation of a frame as rectangular grid of pixels

**3.1.15
image handling**

any activity that transforms an input image into an output image with as little changes as possible

**3.1.16
incident**

occurrence or activity of interest that on-board video surveillance/CCTV system is intended to view or record and which may need a response by an operator

**3.1.17
integrity**

property of a system to recognize and to reject wrong data in case of malfunction of its parts

3.1.18**JPEG**

common standard for image compression

Note 1 to entry: This common standard for image compression was defined by the Joint photographic experts group.

3.1.19**latency time**

time delay between the moment something is initiated, and the moment one of its effects begins

Note 1 to entry: The time from the source sending a signal to the destination receiving it.

3.1.20**media plane**

media stream, such as video, audio and metadata

3.1.21**network**

set of possibly different communication systems which interchange information in a commonly agreed way

3.1.22**open train**

train composed of a set of consists, where the configuration may change during operation

Note 1 to entry: International UIC trains are an example of open trains.

3.1.23**operator**

authorized user operating on-board video surveillance/CCTV system for intended purpose

3.1.24**receiver**

electronic device which may receive signals from the physical medium

3.1.25**resolution**

pixels per inch or number of pixels of a video-frame, monitoring device or print out

3.1.26**recording**

container for a set of audio, video and metadata tracks

Note 1 to entry: A recording can hold one or more tracks. A track is viewed as an infinite timeline that holds data at certain times.

3.1.27**service**

capabilities and features of a component of subsystem or subsystem provided to a user

3.1.28**streaming**

process of sending video over a network to allow instant operation as the video is received, rather than requiring the entire file to be downloaded prior to operation

3.1.29**system security**

protection of the system against failures as tampering, illegal access, vandalism.

Note 1 to entry: The system security controls physical or electronic access to on-board video surveillance/CCTV system or any component to prevent unauthorised access.

3.1.30

topology

possible cable interconnection and number of devices a given network supports

3.1.31

track

individual data channel consisting of video, audio or metadata

3.1.32

train communication network

TCN

data communication network for connecting programmable electronic devices on on-board rail vehicles

3.1.33

train backbone

bus connecting the vehicles of a train and which conforms to the TCN protocols

3.2 Abbreviations

CCTV	closed circuit television
DHDP	dynamic host configuration protocol
CS	consist switch
ECN	ethernet consist network
ETB	ethernet train backbone
ETBN	ethernet train backbone node
HTTP	hypertext transfer protocol
ICMP	Internet control message protocol
IGMP	Internet group management protocol
IP	Internet protocol
I/O	input/output
JPEG	Joint photographic experts group
MCG	mobile communication gateway
MPEG	Moving picture experts group
NAT-ALG	network address translation-application layer gateway
NTP	network time protocol
OMTS	on-board multimedia and telematic sub-systems
RTCP	RTP control protocol
RTP	real-time transport protocol
RTSP	real time streaming protocol
SOAP	simple object access protocol
SSL	secure sockets layer
TBN	train backbone network
TCMS	train control and management system
TCN	train communication network
TCP	transmission control protocol
TLS	transport layer security

UDP	user datagram protocol
UIC	International union of railways (the international railways operators association)
URI	uniform resource identifier
URL	uniform resource locator
WS	Web service
WS-I	Web service interoperability
XML	extensible markup language

4 System breakdown structure

An on-board video surveillance/CCTV system usually consists of the capturing device, storage devices, display devices, analysis devices, etc. A single device may perform more than one functionality. For example, an IP camera can capture the image, handle it, and transmit it via the network. It may also provide analysis function on the data and store it temporarily. Therefore, it is possible that an on-board video surveillance/CCTV system only consists of a single camera at a minimum physically. Alternatively, other devices in an on-board video surveillance/CCTV system can perform several functions. Thus, single physical device and its requirements are not defined in this specification.

Instead, this specification defines the system components which perform a specific function and may consist of one or several devices. In addition, the relationship between system components is described in this specification.

The major components of an on-board video surveillance/CCTV system are classified into four categories based on their functionality, including video capture component, video storage component, video display component and video analysis component.

- Video capture component
A component (an IP network camera or analog camera with encoder device, for example) that captures visual information, encodes it digitally, compresses it and transmits it over the network to other components.
- Video storage component
A component (a network video recorder, for example) that records media and metadata received from a video capture component over the network, to a storage medium, and also enables operator to search and retrieve the stored data.
- Video display component
A component (an IP network video monitor, for example) that receives media data and metadata from the network, and presents them.
- Video analysis component
A component that performs analysis on live data received from video capture component or on recorded data from video storage component.

Each component can perform both the service consumer and service provider depending on its capabilities. The video display and analysis component can be regarded as the service consumer of video capture and storage component. Besides the service exchanges between these components within an on-board video surveillance/CCTV system, the system also provides interfaces for other external system such as TCMS, OMTS and ground CCTV, as well as user such as train operator or security organization. For instance, it communicates with TCMS for obtaining time and location, and it enables the driver to visually detect the passengers and security staff to retrieve the recorded data when necessary. Figure 2 shows the typical structure of an on-board video surveillance/CCTV System and interface with other systems.