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**Electric railway equipment –
Train bus –**

Part 1: Train Communication Network

Matériel électrique ferroviaire – Bus de train –

Partie 1: Réseau embarqué de train



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC RAILWAY EQUIPMENT –
TRAIN BUS –****Part 1: Train Communication Network****FOREWORD**

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JDP (a Joint Development Project executed by a group of designers from Siemens, Adtranz and FIREMA).

Lucent Technology : Ref: ASIC MBBD_3 and SDSP.

VLSI Technology GmbH: Ref. MVBC_01 Purchase terms and conditions.

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International Standard IEC 61375-1 has been prepared by IEC Technical Committee 9: Electric railway equipment.

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

FDIS	Report on voting
9/511/FDIS	9/524/RVD

Full information on the voting for the approval of this standard 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 3.

Annex A is for information only.

Annex B is part of this standard.

According to subclause 5.8 of Part 2 of the ISO/IEC Directives, the following items are to be taken into consideration:

- In France the needs of data communication between equipment in vehicles and between vehicles are dealt with using products covered by other standards or technical specifications (many trains introduced in the last 10 years are equipped with data communication systems; care has been taken to make use as much as possible of different relevant industrial standards) incompatible with the provisions of this standard and making it inapplicable in that country.

For instance, in modern rolling stock recently commissioned in France, technical specifications for train communication network comply with IEC 61158-2 and EN 50170, which are the field bus international standards. On the other hand, ISO/IEC 8802-4 has been used in technical specifications for data communication networks for the latest generation of high speed trains.

- In China, for closed trains and multiple units, the technical specifications of a train communication network may be based on an agreement between user and manufacturer alternatively to this standard.

The committee has decided that this publication remains valid until 2004. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

Withdrawn

INTRODUCTION

This International Standard defines interfaces so as to achieve plug-in compatibility:

- a) between equipment located in different vehicles, and
- b) between equipment located within the same vehicle.

This Standard defines these interfaces as connections to a data communication network, called the Train Communication Network (TCN).

The TCN has a hierarchical structure with two levels of busses, a Train Bus and a Vehicle Bus:

- a) for interconnecting vehicles in Open Trains (see definition) such as international UIC trains, this Standard specifies a Train Bus called the Wire Train Bus (WTB);
- b) for connecting standard on-board equipment, this standard specifies a Vehicle Bus called the Multifunction Vehicle Bus (MVB).

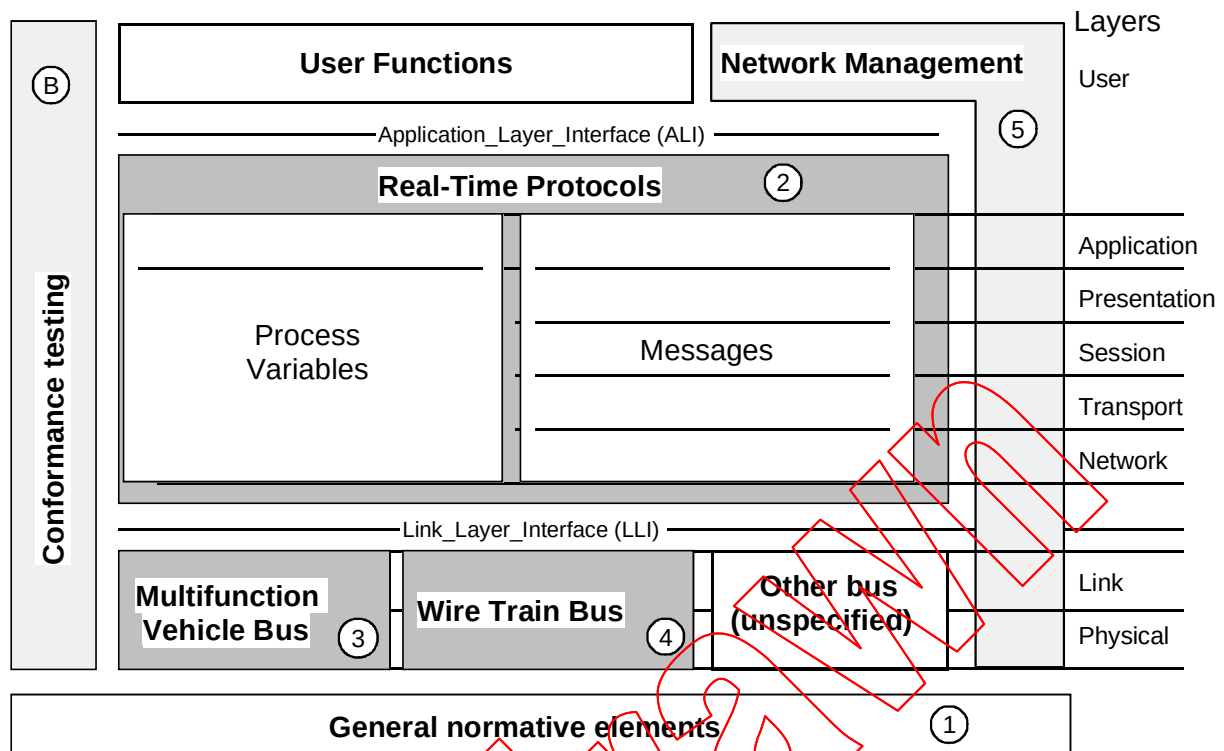
In the TCN architecture, all busses share the same Real-Time Protocols, which offer two communication services:

- a) Process Variables, a distributed, real-time database, periodically refreshed through broadcasting;
- b) messages, transmitted on demand either as:
 - unicast messages (point-to-point) or/and
 - multicast messages.

All busses in the TCN share a common Network Management, which allows debugging, commissioning and maintenance over the network.

Guidelines for conformance testing are included in this standard.

The TCN is structured similarly to the Open System Interconnection model defined in ISO/IEC 7498-1 (see Figure 1).



NOTE The circled numbers refer to the clauses and annexes of this standard.

Figure 1 – Layering of the TCN

This standard has been, for editorial reasons, divided into five clauses and two annexes:

Clause 1: General,

- definitions and informative overview;

Clause 2: Real-Time Protocols,

- Variables: Link Layer Interface and Application Layer Interface;
- Messages: Link Layer Interface, Protocols, Application Layer Interface;
- Data Representation;

Clause 3: Multifunction Vehicle Bus,

- Physical Layer, Link Layer and Link Layer Management;

Clause 4: Wire Train Bus,

- Physical Layer, Link Layer and Link Layer Management;

Clause 5: Train Network Management,

- configuration, supervision and control of the network;

Annex A: Tutorial on the Train Communication Network

Annex B: Guidelines for Conformance Test.

ELECTRIC RAILWAY EQUIPMENT – TRAIN BUS –

Part 1: Train Communication Network

1 General

1.1 Scope

This International Standard applies to data communication in Open Trains, i.e. it covers data communication between vehicles of the said open trains and data communication within the vehicles of the said open trains.

The applicability of this standard to the train communication bus (WTB) allows for interoperability of individual vehicles within Open Trains in international traffic. The data communication bus inside vehicles (MVB) is given as recommended solution to cope with the said TCN. In any case, proof of compatibility between WTB and a proposed vehicle bus will have to be brought by the supplier.

This standard may be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

NOTE 1 For a definition of Open Trains, Multiple Unit Trains and Closed Trains, see 1.3.

NOTE 2 Road vehicles such as buses and trolley buses are not considered in this standard.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61375. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61375 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 60096-1: *Radio-frequency cables - Part 1: General requirements and measuring methods*

IEC 60245-1: *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60304: *Standard colours for insulation for low-frequency cables and wires*

IEC 60332-1: *Tests on electric cables under fire conditions - Part 1: Test on a single vertical isolated wire or cable*

IEC 60571: *Electronic equipment used on rail vehicles*

IEC 60794-1-1: *Optical fibre cables - Part 1-1: Generic specification - General*

IEC 60807 (all parts): *Rectangular connectors for frequencies below 3 MHz*

IEC 60807-2, *Rectangular connectors for frequencies below 3 MHz - Part 2: Detail specification for a range of connectors, with assessed quality, with trapezoidal shaped metal shells and round contacts - Fixed solder contact types*

IEC 60870 (all parts), *Telecontrol equipment and systems*

IEC 60870-5-1, *Telecontrol equipment and systems - Part 5: Transmission protocols - Section 1: Transmission frame formats*

IEC 60874-6, *Connectors for optical fibres and cables - Part 6: Sectional specification for fibre optic connector - Type LSA*

IEC 60874-10, *Connectors for optical fibres and cables – Part 10: Sectional specification – Fibre optic connector type BFOC/2,5*

IEC 61158-2, *Fieldbus standard for use in industrial control systems - Part 2: Physical layer specification and service definition*

ISO/IEC 3309, *Information technology – Telecommunications and information exchange between systems - High-level data link control (HDLC) procedures - Frame structure*

ISO/IEC 7498-1, *Information technology - Open Systems Interconnection - Basic Reference Model : the Basic Model*

ISO/IEC 8073, *Information technology - Open Systems Interconnection – Protocol for providing the connection-mode transport device*

ISO/IEC 8482, *Electrical characteristics of generators and receivers for use in balanced digital multipoint systems*

ISO/IEC 8802-2, *Local Area Networks - Logical Link Control*

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8824 (all parts), *Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8825 (all parts), *Information technology - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8859-1 *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

ISO/IEC 9506-1 *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO/IEC 9506-2 Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification

ISO/IEC 9646 (all parts) Information technology – Open Systems Interconnection – Conformance testing methodology and framework

ISO/IEC 10646-1 Information Technology - Universal Multiple - octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Planes

ITU-T V24, *List of definitions for interchange circuits between data terminal equipment (DTE) and data-circuit terminating equipment (DCE)*, CCITT Recommendations Fascicle VIII.1 Rec. V24

ITU Z100 Annexe D, *SDL predefined data*, 1993

UIC 556 ORE B 108.3 Fiche No. 556, *"Transmission d'informations dans le train - bus de train"*, 12th edition

UIC 557, *"Diagnosis Techniques for Coaches"*, 1st Edition Jan 1992

UIC 558, *"Information Cable of the RIC-Coaches"*, 4th Edition Dec 1994

IEEE 754, *Standard for Binary Floating-Point Arithmetic*, IEEE, 1985

1.3 Terms and definitions

For the purpose of this International Standard, the following definitions apply.

NOTE Keywords in this Standard are written with the first letter of each word in upper case and, when they are composed of two or several words, these are joined by an underscore. This convention allows keywords to be tracked in the documents.

1.3.1 address

identifier of a communication partner, of which several types exist, depending on the layer.

1.3.2 Agent

application process in a Station which accesses the local managed objects on behalf of the Manager

1.3.3 Aperiodic Data

transmission of Process Data on a demand basis. This service is not used

1.3.4 Application Layer

upper layer in the OSI model, interfacing directly to the Application

1.3.5 Application Layer Interface

definition of the services offered by the Application Layer

1.3.6

Application Messages Adapter

code directly called by the application implementing the Messages services

1.3.7

Application Messages Interface

definition of the Messages services

1.3.8

Application Process

communicating entity, implemented for instance by a task

1.3.9

Application Processor

processor which runs a communicating Application Process

1.3.10

Application Supervision Interface

definition of the Supervision services available in particular to the Agent

1.3.11

Application Variables Adapter

code directly called by the application implementing the Variables services

1.3.12

Application Variables Interface

definition of the Variables services

1.3.13

arbiter

device, or common protocol followed by several devices, which selects one of several devices competing for mastership

1.3.14

Auxiliary Channel

channel used for detecting additional Nodes

1.3.15

Basic Period

bus activity is divided into periods. The shortest is the Basic Period, which consists of a Periodic Phase (for Periodic Data) and of a Sporadic Phase (for Message Data and Supervisory Data)

1.3.16

big-endian

ordering scheme for storing or transmitting data in which the most significant part of a multiple-octet data is stored at the lowest octet address, and transmitted first

1.3.17

bit-stuffing

method specified by ISO/IEC 3309 to prevent Frame Data from being misinterpreted as a Flag, consisting of inserting an additional "0" symbol after each string of five "1" symbols and removing this "0" at reception

1.3.18**bridge**

device which stores and forwards frames from one bus to another on the base of their Link Layer addresses

1.3.19**broadcast**

nearly simultaneous transmission of the same information to several destinations. Broadcast in the TCN is not considered reliable, i.e. some destinations may receive the information and others not

1.3.20**bus**

communication medium which broadcasts the same information to all attached participants at nearly the same time, allowing all devices to obtain the same sight of its state, at least for the purpose of arbitration

1.3.21**Bus Administrator**

device capable of becoming Master of the MVB

1.3.22**Bus Controller**

processor or integrated circuit in charge of the Link Layer of communication

1.3.23**Bus Switch**

switch or relay within a WTB Node which connects electrically the cable sections of the two directions

1.3.24**Caller**

Application Process which initialises a message exchange

1.3.25**Check Sequence**

method of error detection based on appending to the transmitted useful data a checksum or a cyclic redundancy check (CRC) calculated on the useful data

1.3.26**Check Variable**

Process Variable of type antivalent boolean protecting another Process Variable

1.3.27**Check Offset**

bit offset of a Check Variable within a Dataset

1.3.28**Closed Train**

train consisting of a set of vehicles, where the composition does not change during normal operation, for instance metro, suburban train, or high-speed train units

1.3.29**composition**

number and characteristics of the vehicles forming a train

**1.3.30
configuration**

definition of the topology of a bus, the devices connected to it, their capabilities and the traffic they produce; by extension, the operation of loading the devices with the configuration information before going to regular operation

**1.3.31
Connect Confirm**

response of the Consumer to the Connect Request of the Producer

**1.3.32
Connect Request**

first packet of a message sent from Producer to Consumer

**1.3.33
consistency**

Dataset consisting of several elements is consistent if all elements are read or written in one indivisible operation

**1.3.34
Consumer**

receiver of a message at the Transport Layer (see: Producer)

**1.3.35
continuity vehicle**

vehicle without an operational Train Bus Node, but carrying a section of the bus to connect passively the Train Bus of its adjacent vehicles.

**1.3.36
conversation**

data exchange at the Application Layer, consisting of a Call Message and a Reply Message (the latter is missing in the multicast protocol). A conversation starts with the first Connect Request frame and ceases when the last acknowledgement for the Reply Message has been received or is no longer expected

**1.3.37
datagram**

frame containing all information necessary to forward it to its final destination, without knowledge of previous frame's contents. Datagrams do not use a previous connection establishment and they are not acknowledged at the Link Layer

**1.3.38
Dataset**

all Process Variables transmitted in one Process Data frame

**1.3.39
delimiter**

sequence of signals which includes code violation symbols (neither "1" nor "0") which is used to delimit the start (Start Delimiter) and the end (End Delimiter) of a frame, as defined for instance in IEC 61158-2

**1.3.40
Destination Device**

receiver of a frame at the Link Layer (see: Source Device)

1.3.41**device**

unit connected to one or more busses

1.3.42**Device Address**

Device Address identifies a device within a bus; On the MVB, the Device Address has 12 bits; On the WTB, the Device Address has 8 bits, the least significant 6 bits being the Node Address; A device connected to several busses may have a different Device Address for each bus. Special devices such as repeaters only participate at the Physical Layer and have no Device Address

1.3.43**Device Status**

16-bit word expressing the capabilities and status of an MVB device connection

1.3.44**Direction 1**

one direction of a WTB Node

1.3.45**Direction 2**

other direction of a WTB Node

1.3.46**Electrical Middle Distance**

one of the media of the MVB

1.3.47**Electrical Short Distance**

one of the media of the MVB

1.3.48**End Delimiter**

sequence which ends a frame before the medium returns to idle

1.3.49**End Node**

Node which terminates the two bus segments connected to it but does not establish continuity between them

1.3.50**Event Round**

sequence of polls in which all events pending at the start are read

1.3.51**extension box**

wiring box where the trunk cable is interrupted and passively extended by an extension cable to connect a device

1.3.52**extension cable**

cable inserting a Node in a trunk cable, consisting of two separate twisted wire pairs per line, possibly of smaller cross-section than the trunk cable itself

1.3.53

field device

device attaching simple sensors and actuators to the bus, outside a rack

1.3.54

final

receiver of a packet (data or acknowledgement) at the Network Layer. When two devices communicate within the same bus, the final is located in the destination device (see: origin)

1.3.55

Flag

sequence of "1" and "0" symbols which serves to delimit the beginning or the end of a frame. Flags which would appear in the transmitted data are modified by bit-stuffing, as defined for instance in ISO/IEC 3309

1.3.56

frame

sequence of consecutive symbols sent in one time slot by a transmitter, between two slots where the line is idle.

1.3.57

Frame Check Sequence

16-bit FCS specified in ISO/IEC 3309

1.3.58

Frame Data

data transmitted between the Start Delimiter and the End Delimiter (on the MVB) or between the Preamble and the End Delimiter (on the WTB)

1.3.59

fritting

electrical cleaning of oxidised contacts by applying a breakdown voltage over the contact

1.3.60

Function

Application Process which exchanges messages with another Application Process

1.3.61

Function Directory

directory which maps a Function Identifier to a Station Identifier and vice-versa

1.3.62

Function Identifier

8-bit identifier of a Function

1.3.63

F code

in a Master Frame, indicates the request and the expected response Slave Frame size

1.3.64

gateway

connection between different busses at the Application Layer requiring application-dependent data analysis and protocol conversion

1.3.65**Group Address**

address of a multicast group to which a Node belongs

1.3.66**Group Directory**

directory which indicates to a Node to which multicast group it pertains

1.3.67**hamming distance**

minimum number of bits of a given correct bit sequence, which, if inverted, create a false bit sequence indistinguishable from a correct one

1.3.68**HDLC**

High-level Data Link Control, a set of standardised protocols, including ISO/IEC 3309 for data transmission

1.3.69**HDLC Data**

data transmitted in an HDLC frame

1.3.70**Inauguration**

operation executed in case of composition change, which gives all Nodes of the WTB their address relative to the Master, their orientation and the descriptor of all named Nodes on the same bus

1.3.71**Individual Period**

interval between two successive transmissions of the same Process Data from the same source. The Individual Period is a power-of-2 multiple of the Basic Period

1.3.72**instance**

a) one of several objects which share the same definition (object instance)

b) one of several (simultaneous or not) executions of the same program (process instance)

1.3.73**integrity**

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

1.3.74**Intermediate Node**

Node which establishes continuity between two bus sections connected to it, but does not terminate them

1.3.75**jumper cable**

cable connecting the trunk cables of two consecutive vehicles, possibly of a larger cross-section than the trunk cable, and which is plugged by hand in the case of the UIC-cable. There are generally two jumper cables between vehicles

1.3.76**Line**

non-redundant bus. A dual-thread bus consists of two lines

1.3.77

Line Unit

all circuits providing the electrical attachment to a line

1.3.78

Link Address

address supplied to the Link Layer to identify to which Bus and to which Device Address a packet is sent or received

1.3.79

Link Control

field in the HDLC frame which indicates the type of frame

1.3.80

Link Data

data transported by the Link Layer, but not relevant to it

1.3.81

Link Header

part of a Message Data frame relevant to the Link Layer

1.3.82

Link Layer

layer in the OSI model establishing point-to-point and broadcast connections between devices attached to the same bus

1.3.83

Link Layer Interface

interface between Link Layer and higher communication layers

1.3.84

Link Layer Management

interface controlling the Link Layer for management purposes

1.3.85

little-endian

ordering scheme for storing or transmitting data in which the least significant part of a multiple-octet data is stored at the lowest octet address, and transmitted first

1.3.86

local area network

part of a network characterised by a common medium access and address space

1.3.87

logical link control

protocols and associated frame formats which serve to control the Link Layer

1.3.88

Logical Address

address which is not bound to a specific device (e.g. the Process Data address)

1.3.89

Logical Port

ports of a device used for the Process Data traffic and addressed by the Logical Address

1.3.90**Macro Cycle**

number of Basic Periods corresponding to a Macro Period

1.3.91**Macro Period**

longest Individual Period, after which the periodic traffic returns to the same pattern, counted in milliseconds

1.3.92**Main Channel**

channel over which the main bus traffic is received

1.3.93**Management Message**

message exchanged between a Manager and an Agent for Network Management.

1.3.94**Manager**

Function in a Station which is dedicated to Network Management and which send management Call Messages through System Addresses

1.3.95**marshalling**

allocation of application addresses or names to the Process Variables of a dataset, that, on the WTB, depends on the Node Type and Version.

1.3.96**Master**

device which spontaneously sends information on a bus to a number of slave devices. It may give a Slave the right to transmit for one Slave Frame only within a limited time

1.3.97**Master Frame**

frame sent by a Master

1.3.98**Master Start Delimiter**

Start Delimiter of a Master Frame

1.3.99**medium access control**

sublayer of the Link Layer, which controls the access to the medium (arbitration, mastership transfer, polling)

1.3.100**medium dependent interface**

mechanical and electrical interface between the transmission medium and a Medium Attachment Unit

1.3.101**medium**

physical carrier of the signal: electrical wires, optical fibres, etc.

1.3.102

Medium Attachment Unit

device used as a coupler to the transmission medium

1.3.103

message

data item transmitted in one or several packets

1.3.104

Messages

transmission service of the TCN

1.3.105

Message Data

data transmitted sporadically by the Link Layer in relation to message transmission; the corresponding Link Layer service

1.3.106

messenger

communication stack caring for end-to-end message communication and interfacing to the application

1.3.107

multicast

transmission of the same message to a group of Repliers, identified by their Group Address. The word "multicast" is used even if the group includes all Repliers

1.3.108

Multifunction Vehicle Bus (MVB)

Vehicle Bus to be used for connecting programmable stations and simple sensors/actors.

1.3.109

Multiple Unit Train:

train consisting of a set of closed trains, where the composition of the set may change during normal operation

1.3.110

network

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

1.3.111

Network Address

address which identifies a Function or a Station within the network. It can be either a User Address or a System Address

1.3.112

Network Header

part of a Message Data frame relevant to the Network Layer

1.3.113

Network Layer

layer in the OSI model responsible for routing between different busses

1.3.114**Network Management**

operations necessary to remotely configure, monitor, diagnose and maintain the network

1.3.115**Node**

device on the Wire Train Bus, which may act as gateway between Train Bus and Vehicle Bus

1.3.116**Node Address**

address of a Node on the Train Bus (6 bits). It is equal to the least significant 6 bits of the 8-bit Device Address on the WTB

1.3.117**Node Descriptor**

24-bit data structure which indicates for a Node its Node Period and its Node Key

1.3.118**Node Directory**

directory which maps the Node Address to the Device Address (one-to-one mapping in WTB)

1.3.119**Node Key**

16-bit identifier selected by the application to identify a Node's type and version. The Master distributes it to all other Nodes after each composition change and before exchanging data

1.3.120**Node Period**

on the WTB, desired Individual Period of a Node (identical to Individual Period except if overload occurs)

1.3.121**octet**

8-bit word stored in memory or transmitted as a unit *

1.3.122**Open Train**

train consisting of a set of vehicles where the configuration may change during normal operation, for instance international UIC trains

1.3.123**Optical Glass Fibre**

one of the media of the MVB

1.3.124**origin**

sender of a packet (data or acknowledgement) at the Network Layer. When two devices communicate within the same bus, the Origin is located on the source device (see: final)

* IEC prescribes 'octet' instead of 'byte'

1.3.125

packet

unit of a message (information, acknowledgement or control) transmitted in exactly one Message Data frame

1.3.126

period

time unit after which a periodic pattern repeats itself

1.3.127

Periodic Data

Process Data transmitted periodically, at an interval which is the Individual Period

1.3.128

Periodic List

list of Nodes, addresses or devices to be polled in each period of a Macro Cycle

1.3.129

Periodic Phase

phase during which the Master polls for Periodic Data, according to its Periodic List

1.3.130

Physical Address

Device Address on the MVB and the Node Address on the WTB which identify communicating devices on the same bus

1.3.131

Physical Port

Port used for the Message Data or the Supervisory Data traffic and addressed by the Device Address

1.3.132

pitch

distance between adjacent devices on the same electrical bus required to avoid clustering of bus loads

1.3.133

polling

sending of a Master Frame in order to receive a Slave Frame

1.3.134

Port

memory structure which contains data for transmission or reception, and in which a new value overwrites the former value (buffer, not queue). A Port provides means for simultaneous access by the bus and the application(s)

1.3.135

Port Index Table

look-up table which deduces the memory address of a port from the Logical Address of the Process Data

1.3.136**Preamble**

sequence of signals heading a frame for the purpose of synchronising the receiver, used on the WTB

1.3.137**Presentation Layer**

layer in the OSI model responsible for data representation and conversion

1.3.138**Process Data**

source-addressed data broadcast periodically by the link layer in relation with Process Variables transmission; the corresponding Link Layer service

1.3.139**Process Variable**

variable expressing the state of a process (e.g. speed, brake command)

1.3.140**Producer**

sender of a message at the Transport Layer (see: Consumer)

1.3.141**Publisher**

source of a Dataset for broadcasting (see: Subscriber)

1.3.142**PV Name**

identifier of a Process Variable

1.3.143**PV Set**

set of Process Variables belonging to the same Dataset

1.3.144**queue**

memory storing an ordered set of frames in a first-in, first-out fashion

1.3.145**rack**

equipment containing one or more devices, attached to the same segment

1.3.146**reassembly**

act of regenerating a long message from several packets generated by segmentation

1.3.147**receiver**

electronic device which may receive signals from the physical medium

1.3.148**Receive Queue**

queue for receiving Message Data in a device

1.3.149

regular operation

normal bus activity as opposed to Inauguration (WTB) or configuration (MVB)

1.3.150

repeater

connection at the Physical Layer between bus segments, providing an extension of the bus beyond the limits permitted by passive means. The connected segments operate at the same speed and with the same protocol. The delay introduced by a repeater is in the order of one bit duration

1.3.151

Replier

Application Process which has been requested by the Caller to receive a Call Message and to reply with a Reply Message

1.3.152

residual error rate

probability of integrity breach (unrecognised wrong bit) per transmitted bit

1.3.153

router

connection between two busses at the Network Layer, which forwards datagrams from one bus to another on the base of their Network Address

1.3.154

scan

polling of devices in a certain sequence for supervisory purposes

1.3.155

section

part of a segment, which is passively connected to another section without terminator in between

1.3.156

segment

piece of cable to which devices are attached, terminated at both ends by its characteristic impedance. Segments may consist of several sections (non-terminated) connected by connectors

1.3.157

segmentation

division of a long message into several shorter frames for transmission

1.3.158

Send Queue

queue for sending Message Data in a device

1.3.159

service

capabilities and features of a sub-system (e.g. a communication layer) provided to a user

1.3.160

Session Header

part of a Message Data frame relevant to the Session Layer

1.3.161**Session Layer**

OSI layer in charge of establishing and closing communication

1.3.162**Side A**

one side of a vehicle with respect to a WTB Node

1.3.163**Side B**

other side of a vehicle with respect to a WTB Node

1.3.164**Slave**

device which receives information from the bus or sends information on the bus in response to a request (also called a poll) from the Master

1.3.165**Slave Frame**

frame sent by a Slave

1.3.166**Slave Start Delimiter**

Start Delimiter of a Slave Frame on the MVB

1.3.167**Source Device**

sender of a frame at the Link Layer (see: destination device)

1.3.168**sporadic transmission**

transmission which is made upon demand, when an event external to the network requires it (also called aperiodic, event-driven, demand-driven transmission)

1.3.169**Sporadic Data**

data frames transmitted on demand to carry Message Data or Supervisory Data

1.3.170**Sporadic Phase**

second half of a Basic Period, dedicated to the demand-driven transmission of messages and bus management data

1.3.171**star coupler**

device which takes the light of an optical fibre and redistributes it to several other fibres

1.3.172**Start Delimiter**

delimiter which announces the beginning of a frame on the MVB

1.3.173

Station

device capable of message communication, by contrast to simple devices, and which supports an Agent Function

1.3.174

Station Directory

directory which maps a Station Identifier to a Link Address and vice-versa

1.3.175

Station Identifier

8-bit identifier of a Station

1.3.176

Station Status Word

16-bit descriptor of the status and capabilities of a Station

1.3.177

Strong Master

Strong Node is currently Master and will not relinquish mastership until demoted to Weak Node status

1.3.178

Strong Node

Node selected by the application to become Strong Master. There may be only one Strong Master on a bus segment

1.3.179

stub

T-connection branching from an electrical bus line (at the tap), connecting a device to the line

1.3.180

Subscriber

one of the sinks of a broadcast Dataset (see: Publisher)

1.3.181

Supervisory Data

data transmitted within one bus only for the purpose of Link Layer supervision (e.g. arbitration on the MVB or Inauguration on the WTB)

1.3.182

System Address

Network Address of a Management Message exchanged between Manager and Agent, consisting of Node Address and Station Identifier

1.3.183

tap

place where a segment is tapped. A tap is a three-way electrical fork

1.3.184

Telegram

Master Frame and the corresponding Slave Frame, treated as a whole