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English Version

Public transport - Road vehicle scheduling and control systems - Part 8: Physical layer for IP communication

Transport public - Systèmes de planification et de contrôle des véhicules routiers - Partie 8: Couche physique pour communication IP

Öffentlicher Verkehr - Planungs- und Steuerungssysteme für Straßenfahrzeuge - Teil 8: Physikalische Schicht für IP-Kommunikation

This Technical Specification (CEN/TS) was approved by CEN on 4 May 2025 for provisional application.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (CEN/TS 13149-8:2025) has been prepared by Technical Committee CEN/TC 278 “Intelligent Transport Systems”, the secretariat of which is held by NEN.

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

This document supersedes CEN/TS 13149-8:2013.

CEN/TS 13149-8:2025 includes the following significant technical changes with respect to CEN/TS 13149-8:2013:

— support for 1000 Base T connections (Gigabit Ethernet);

— description of power over ethernet mode B;

— Use of M12 Connector X;

— Adaptors between devices and vehicle network presented as M12 connectors.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document is Part 8 of a series of European Standards and Technical Specifications. The scope of this series is on-board data communication systems on public transport vehicles.

Public Transport (PT) vehicles have an increasing array of information and communications systems, including ticket machines, Automated Vehicle Location (AVL) systems, destination displays, passenger announcement systems, vehicle monitoring systems, etc. Other systems are beginning to be included such as advertising screens, tourist guides, WiFi “hotspots” and infotainment.

In addition, equipped PT vehicle will usually have a communications facility to enable voice and data to be exchanged with the control centre, other PT vehicles, PT infrastructure and roadside devices for instance in requesting priority at traffic signals. Many types of communication channel are used including public and private wireless communication networks.

These systems may be provided by a number of different suppliers and may need to be integrated. For instance:

— a ticket machine may need location information to update fare stages;

— next-stop and destination information may be drawn from schedule information held in the ticket machine;

— vehicle location systems may be used to drive signal priority requests.

As data exchange between functional units becomes more widespread, a networked approach begins to become efficient. With standardized underlying technology, the PT vehicle begins to look like a local area network: making use of IEEE 802 communications and the Internet Protocol (IP) suite.

Without a clear technology framework, integrating these systems would require complex technical discussions every time a device is procured. The existing EN 13149 standards recognized this long ago in respect of the core vehicle systems, but these have not been adapted to IP networking.

Six historical parts of EN 13149, namely Parts 1 to 6, have now been withdrawn in favour of the new IP-based approach. The core of this new approach was specified in two Technical Specifications (TS):

— CEN/TS 13149-7 specifies the Network and System Architecture for on board equipment. It describes basic principles of communications including a general description of the network topology, addresses schematics, basic network services, a system overview and basic module architecture.

— CEN/TS 13149-8 specifies the Physical Layer for IP-communication networks on board PT vehicles. This part specifies the cables, connectors and other equipment including pin assignment and environmental requirements.

Building on this, a series of specific services have been detailed:

— CEN/TS 13149-9, specifying the structure to be used by a service providing time data to the on-bus network;

— CEN/TS 13149-10, specifying the structure to be used by a service providing location data to the on-bus network, specifically relating to Global Navigational Satellite Systems (GNSS);

— CEN/TS 13149-11, specifying the structure to be used by a service providing data from the vehicle platform to the on-bus network, using the Fleet Management System (FMS) for source data.

These documents draw on large scale trials undertaken within European projects such as EBSF (the "European Bus System of the Future" project) and its successors, together with technical developments which have since been adopted by programmes such as the German IBIS-IP platform [1] and, more recently, the European platform ITxPT [2]. This has ensured not only that the CEN specifications are robustly proved in practice, but also that they have the support of many key system developers and operators.

With these Technical Specifications, it will be easier to achieve:

— more efficient development of PT components;

— lower cost, lower risks and a smoother on board integration of PT equipment;

— more efficient operation and maintenance of on board PT equipment;

— high quality intermodal passenger services based on intermodal PT information;

— integration of new PT services.

As an IP based solution, this document draws on a range of IETF Requests for Comment (RFCs), not all of which may be formal standards. A list of those cited is presented in the Bibliography.

1 Scope

This part 8 specifies the physical layer of an onboard data transmission bus between the different equipment for service operations and monitoring of the fleet. This applies to equipment installed on board vehicles that are operating as part of a public transport network, i.e. in operation under public service contracts. This equipment includes operation aid systems, automatic passenger information systems, fare collection systems, etc.

The use of IEEE 802.11 Wireless LAN communications is excluded from the scope of this Technical Specification; its use is not recommended for the service-based approach of CEN/TS 13149.

Equipment directly related to the safety-related functioning of the vehicle (propulsion management, brake systems, door opening systems, etc.) are excluded from the scope of this Technical Specification and are dealt with in other standardization bodies. Interfaces to such equipment or safety-critical networks can be provided through dedicated gateways.

This document covers the following:

— The link between equipment inside vehicles consisting of one carriage only, e.g. buses and trolleybuses, as well as a set of carriages, e.g. trams and trains;

— The Physical Layer for IP-communication networks onboard PT vehicles;

— The cables, connectors and other equipment including pin assignment and environmental requirements.

This document specifies wired communication networks onboard PT vehicles which are based on the Ethernet specification ISO/IEC/IEEE 8802-3-10 Base T, 100 Base Tx and 1000 Base T.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC/IEEE 8802-3, *Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks — Part 3: Standard for Ethernet*

EN 50328, *Railway applications — Fixed installations — Electronic power converters for substations*

EN 50155, *Railway applications — Rolling stock — Electronic equipment*

IEC 61156-6, *Multicore and symmetrical pair/quad cables for digital communications — Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz — Work area wiring — Sectional specification*

3 Terms and definitions

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

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

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

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