International Standard

ISO 17987-2

Road vehicles — Local Interconnect Network (LIN) —

Part 2: Transport protocol and network layer services

Véhicules routiers — Réseau Internet local (LIN) —

Partie 2: Protocole de transport et couches de services réseau

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 17987-2:2016), which has been technically revised.

The main changes are as follows:

— master and slave terms used for the LIN node types in the ISO 17987 series are replaced within this document with inclusive language terms commander and responder. This also applies for abbreviations and file formats NCF and LDF;

— updates in the network layer error handling (7.6.3);

— LDF and NCF format are adapted and extended to cover the same functional scope and allowing a lossless format transition for responder nodes;

— editorial updates and several statements improved to avoid ambiguities.

A list of all parts in the ISO 17987 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The LIN protocol as proposed is an automotive focused low speed universal asynchronous receiver transmitter (UART) based network. Some of the key characteristics of the LIN protocol are signal based communication, schedule table-based frame transfer, commander/responder communication with error detection, node configuration and diagnostic service transportation.

The LIN protocol is for low-cost automotive control applications as, for example, door module and air conditioning systems. It serves as a communication infrastructure for low-speed control applications in vehicles by providing:

— signal based communication to exchange information between applications in different nodes;

— bitrate support from 1 kbit/s to 20 kbit/s;

— deterministic schedule table-based frame communication;

— network management that wakes up and puts the LIN cluster into sleep mode in a controlled manner;

— status management that provides error handling and error signalling;

— transport layer that allows large amount of data to be transported (such as diagnostic services);

— specification of how to handle diagnostic services;

— electrical physical layer specifications;

— node description language describing properties of responder nodes;

— network description file describing behaviour of communication;

— application programming interface.

The ISO 17987 series is based on the open systems interconnection (OSI) basic reference model as specified in ISO/IEC 7498-1 which structures communication systems into seven layers.

The OSI model structures data communication into seven layers called (top down) application layer (layer 7), presentation layer, session layer, transport layer, network layer, data link layer and physical layer (layer 1). A subset of these layers is used in the ISO 17987 series.

The ISO 17987 series distinguishes between the services provided by a layer to the layer above it and the protocol used by the layer to send a message between the peer entities of that layer. The reason for this distinction is to make the services, especially the application layer services and the transport layer services, reusable also for other types of networks than LIN. In this way, the protocol is hidden from the service user and it is possible to change the protocol if special system requirements demand it.

The ISO 17987 series provides all documents and references required to support the implementation of the requirements related to the following.

— ISO 17987-1: provides an overview of the ISO 17987 series and structure along with the use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.

— ISO 17987-2 (this document): specifies the requirements related to the transport protocol and the network layer requirements to transport the PDU of a message between LIN nodes.

— ISO 17987-3: specifies the requirements for implementations of the LIN protocol on the logical level of abstraction. Hardware related properties are hidden in the defined constraints.

— ISO 17987-4: specifies the requirements for implementations of active hardware components which are necessary to interconnect the protocol implementation.

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— ISO/TR 17987-5: specifies the LIN application programming interface (API) and the node configuration and identification services. The node configuration and identification services are specified in the API and define how a responder node is configured and how a responder node uses the identification service.

— ISO 17987-6: specifies tests to check the conformance of the LIN protocol implementation according to ISO 17987-2 and ISO 17987-3. This comprises tests for the data link layer, the network layer and the transport layer.

— ISO 17987-7: specifies tests to check the conformance of the LIN electrical physical layer implementation (logical level of abstraction) according to ISO 17987-4.

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Road vehicles — Local Interconnect Network (LIN) —

Part 2:
Transport protocol and network layer services

1 Scope

This document specifies a transport protocol and network layer services tailored to meet the requirements of LIN-based vehicle network systems on local interconnect networks. The protocol specifies an unconfirmed communication.

The LIN protocol supports the standardized service primitive interface as specified in ISO 14229-2.

This document provides the transport protocol and network layer services to support different application layer implementations such as:

— normal communication messages, and

— diagnostic communication messages.

The transport layer defines transportation of data that is contained in one or more frames. The transport layer messages are transported by diagnostic frames. A standardized API is specified for the transport layer.

Use of the transport layer is targeting systems where diagnostics are performed on the backbone bus (e.g. CAN) and where the system builder wants to use the same diagnostic capabilities on the LIN sub-bus clusters. The messages are in fact identical to ones in ISO 15765-2 and the PDUs carrying the messages are very similar.

The goals of the transport layer are:

— to have low load on commander node,

— to provide full (or a subset thereof) diagnostics directly on the responder nodes, and

— to target clusters built with powerful LIN nodes (not the mainstream low cost).

A typical system configuration is shown in Figure 1.

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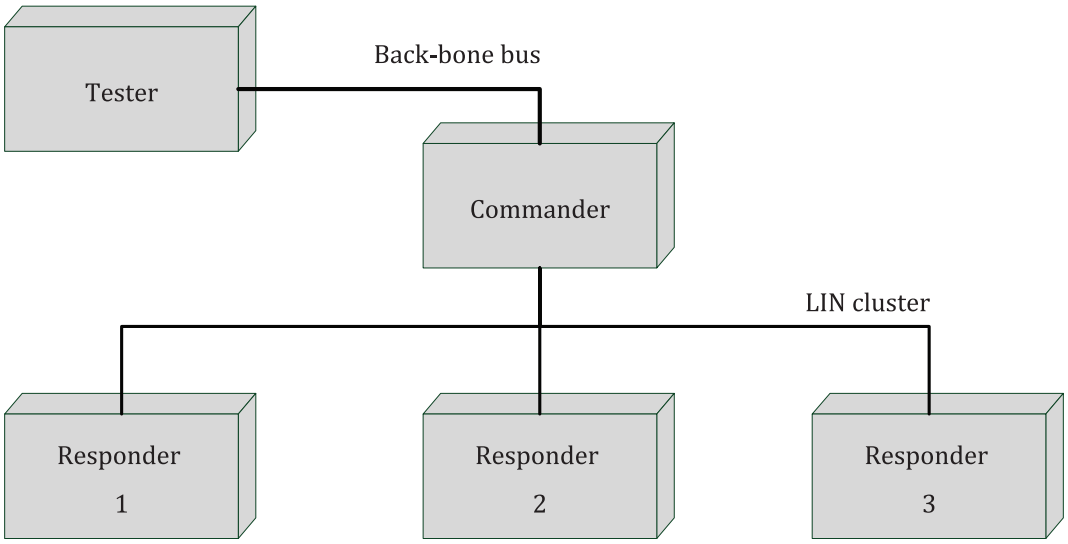


Figure 1 — Typical system setup for a LIN cluster using the transport layer

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 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Application layer*

ISO 14229-2, *Road vehicles — Unified diagnostic services (UDS) — Part 2: Session layer services*

ISO 14229-7, *Road vehicles — Unified diagnostic services (UDS) — Part 7: UDS on local interconnect network (UDSonLIN)*

ISO, 17987-1, *Road vehicles — Local Interconnect Network (LIN) — Part 1: General information and use case definition*

ISO, 17987-3:2025, *Road vehicles — Local Interconnect Network (LIN) — Part 3: Protocol specification*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17987-1, ISO/IEC 7498-1 and the following 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/

3.1.1
broadcast NAD
NAD of value $7F_{16}$, used in requests which are received and processed by all responder nodes

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