INTERNATIONAL STANDARD

ISO 20794-7

First edition
2020-10

Road vehicles — Clock extension peripheral interface (CXPI) —

Part 7: Data link and physical layer conformance test plan

Véhicules routiers — Interface périphérique d'extension d'horloge (CXPI) —

Partie 7: Plan de test de conformité des couches de liaison de données et physique

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Reference number
ISO 20794-7:2020(E)

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Published in Switzerland

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

A list of all parts in the ISO 20794 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

ISO 20794 (all parts) specifies the application (partly), application layer, transport layer, network layer, data link layer, and physical layer requirements of an in-vehicle network called clock extension peripheral interface (CXPI).

CXPI is an automotive low-speed single wire network. It is an enabler for reducing vehicle weight and fuel consumption by reducing wire counts to simple devices like switches and sensors.

CXPI serves as and is designed for automotive control applications, for example door control group, light switch and HVAC (Heating Ventilation and Air Condition) systems.

The CXPI services, protocols and their key characteristics are specified in different parts according to the OSI layers.

— Application and application layer:
  — application measurement and control data communication to exchange information between applications in different nodes based on message communication;
  — wake-up and sleep functionality;
  — two kinds of communication methods can be selected at system design by each node:
    i) the event-triggered method, which supports application measurement- and control-based (event-driven) slave node communication; and
    ii) the polling method, which supports slave node communication based on a periodic master schedule;
  — performs error detection and reports the result to the application;
  — application error management.
— Transport layer and network layer:
  — transforms a message into a single packet;
  — adds protocol control information for diagnostic and node configuration into each packet;
  — adds packet identifier for diagnostic and node configuration into each packet;
  — performs error detection and reports the result to higher OSI layers.
— Data link layer and physical layer:
  — provides long and short data frames;
  — adds a frame identifier into the frame;
  — adds frame information into the frame;
  — adds a cyclic redundancy check into the frame;
  — performs byte-wise arbitration and reports the arbitration result to higher OSI layers;
  — performs frame type detection in reception function;
  — performs error detection and reports the result to higher OSI layers;
  — performs Carrier Sense Multiple Access (CSMA);
  — performs Collision Resolution (CR);

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— generates a clock, which is transmitted with each bit to synchronise the connected nodes on the CXPI network;

— supports bit rates up to 20 kbit/s.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in ISO/IEC 7498-1[1] and ISO/IEC 10731[2], which structures communication systems into seven layers.

Figure 1 illustrates an overview of communication frameworks beyond the scope of this document including related standards:

— vehicle normal communication framework, which is composed of ISO 20794-2, and ISO 20794-5[7];

— vehicle diagnostic communication framework, which is composed of ISO 14229-1[3], ISO 14229-2[4], and ISO 14229-8[5];

— presentation layer standards, e.g. vehicle manufacturer specific or ISO 22901-1 ODX[9];

— lower OSI layers framework, which is composed of ISO 20794-3[6], ISO 20794-4, ISO 20794-5, ISO 20794-6[8] and this document.

ISO 20794 (all parts) and ISO 14229-8[5] are based on the conventions specified in the OSI Service Conventions (ISO/IEC 10731[2]) as they apply for all layers and the diagnostic services.

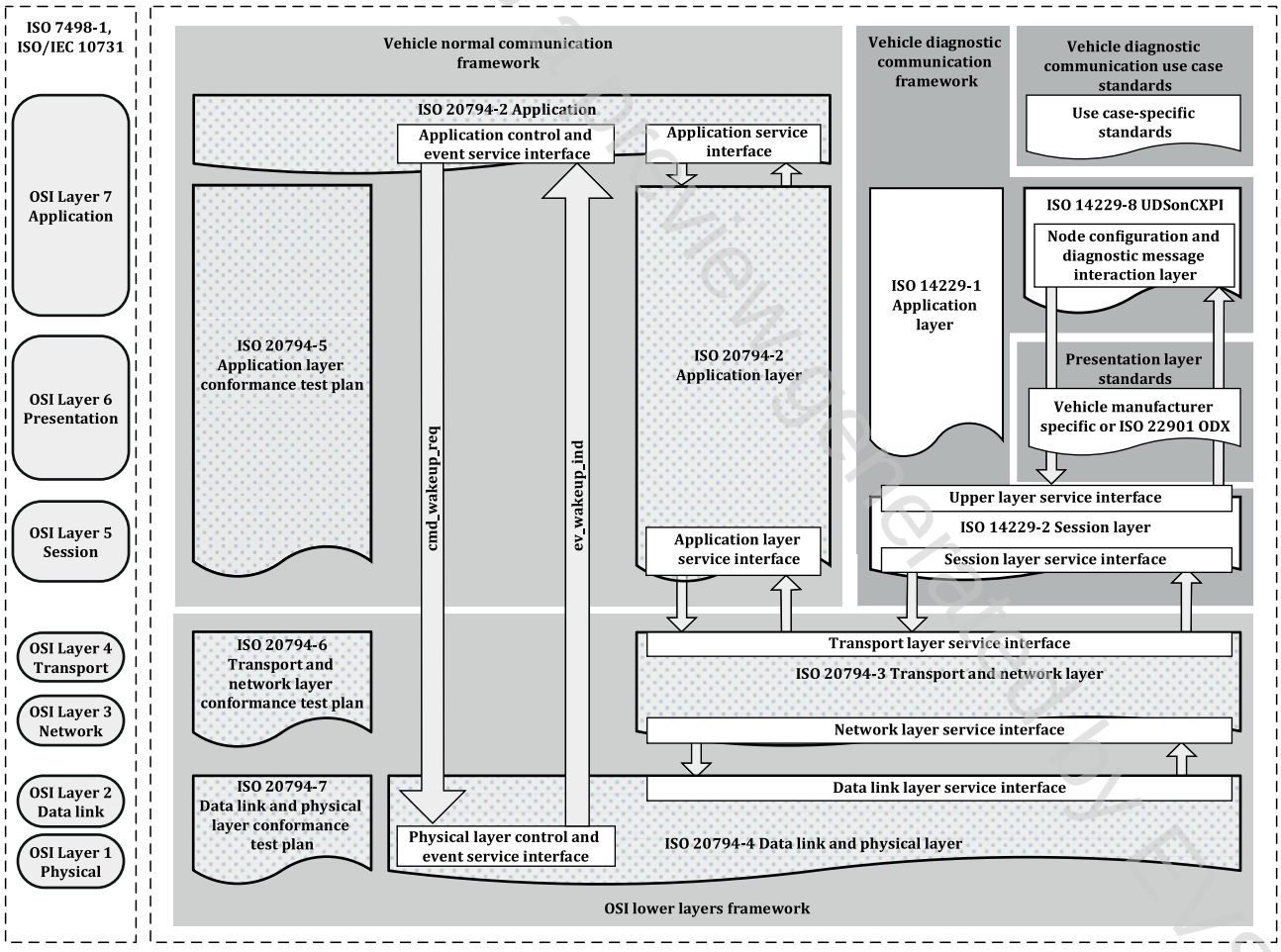

Figure 1 — ISO 20794 documents reference according to OSI model

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Road vehicles — Clock extension peripheral interface (CXPI) —

Part 7: Data link and physical layer conformance test plan

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1 Scope

This document specifies the conformance test plans for the CXPI data link layer and the CXPI physical layer. It also specifies the conformance test plan for error detection.

Additionally, this document describes the concept of conformance test plan operation.

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 7498-1:1994, *Information processing systems — Open systems interconnection — Basic reference model*

ISO 20794-2:2020, *Road vehicles — Clock extension peripheral interface (CXPI) — Part 2: Application layer*

ISO 20794-4:2020, *Road vehicles — Clock extension peripheral interface (CXPI) — Part 4: Data link layer and physical layer*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20794-2, ISO 20794-4 and ISO/IEC 7498-1 apply.

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

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

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

4 Symbols and abbreviated terms

4.1 Symbols

---	empty cell/undefined
C_{BUS}	total bus capacitance
C_{PG}	capacity of pulse generator/data generator
C_{SLAVE}	capacity of slave node
kbit/s	kilobit per second

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