BS ISO 20794-3:2020

BSI Standards Publication

Road vehicles — Clock extension peripheral interface (CXPI)

Part 3: Transport and network layer

Documents
Document Sharing Hub

Full document details: BS ISO 20794-3:2020

National foreword

This British Standard is the UK implementation of ISO 20794-3:2020.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 580 97225 6

ICS 43.040.15

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 February 2020.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO 20794-3:2020

INTERNATIONAL STANDARD

ISO 20794-3

First edition
2020-02

Road vehicles — Clock extension peripheral interface (CXPI) —

Part 3: Transport and network layer

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

Partie 3: Transport et couche réseau

Reference number
ISO 20794-3:2020(E)

Documents
Document Sharing Hub

© ISO 2020

Full document details: BS ISO 20794-3:2020

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO 20794-3:2020

Contents

Page

Foreword ... **v**

Introduction ... **vi**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 Symbols and abbreviated terms ... **2**
4.1 Symbols ... 2
4.2 Abbreviated terms ... 2

5 Conventions ... **3**

6 Overview of transport layer and network layer ... **3**
6.1 Properties ... 3
6.2 Packet types ... 3
6.3 Error detection and indication ... 3

7 Service interface parameters (SIP) ... **3**
7.1 SIP — General ... 3
7.2 SIP — Data type definitions ... 4
7.3 SIP — TA, target address ... 4
7.4 SIP — SA, source address ... 4
7.5 SIP — Ptype, packet type ... 4
7.6 SIP — ReqId, request identifier ... 4
7.7 SIP — ReqTypeId, request type identifier ... 5
7.8 SIP — PDU, protocol data unit ... 5
7.9 SIP — Length, length of PDU ... 5
7.10 SIP — NMInfo, network management information ... 5
7.11 SIP — SCT, sequence count ... 5
7.12 SIP — Result, result ... 6

8 Transport layer (TL) ... **6**
8.1 SI — T_Data.req and T_Data.ind service interface ... 6
8.2 SI — T_Data.req and T_Data.ind service interface parameter mapping ... 7
8.3 TL — Service interface with T_Ptype parameter mapping ... 8
8.3.1 TL — T_Data.req and T_Data.ind with T_Ptype = NormalCom (T_Length = NULL) ... 8
8.3.2 TL — T_Data.req and T_Data.ind with T_Ptype = NormalCom (T_Length ≥ '0') ... 9
8.3.3 TL — T_Data.req and T_Data.ind interface with T_Ptype = DiagNodeCfg ... 10
8.4 TL — Internal operation ... 11
8.5 TL — T_PDU ... 11
8.5.1 TL — T_PDU definition ... 11
8.5.2 TL — T_PCI definition ... 11
8.6 TL — Function models ... 12
8.6.1 TL — Transmission logic ... 12
8.6.2 TL — Reception logic ... 13
8.7 TL — Error detection ... 14

9 Network layer (NL) ... **14**
9.1 SI — N_Data.req and N_Data.ind service interface ... 14
9.2 SI — N_Data.req and N_Data.ind service interface parameter mapping ... 15
9.3 NL — Service interface with N_Ptype parameter mapping ... 16
9.3.1 NL — N_Data.req and N_Data.ind with N_Ptype = NormalCom (N_Length = NULL) ... 16
9.3.2 TL — N_Data.req and N_Data.ind with N_Ptype = NormalCom (N_Length ≥ '0') ... 17
9.3.3 NL — N_Data.req and N_Data.ind interface with N_Ptype = DiagNodeCfg ... 18
9.4 NL — Internal operation ... 19
9.5 NL — N_PDU ... 19

AVA Documents
Document Sharing Hub

© ISO 2020 – All rights reserved

Full document details: BS ISO 20794-3:2020

9.5.1 NL — N_PDU definition 19
9.5.2 NL — N_NAD definition 19
9.6 NL — Function models 20
9.6.1 NL — Transmission logic 20
9.6.2 NL — Reception logic 20
9.7 NL — Timing definition 21
9.7.1 NL — General 21
9.7.2 NL — Timing constraints 21
9.7.3 NL — Timing parameters 22
9.8 NL — Error detection 22

Bibliography **23**

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 20794-3:2020

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.

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 20794-3:2020

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 Conditioning) 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);

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 20794-3:2020

— 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 and ISO/IEC 10731[1], 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;

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

— presentation layer standards, e.g. vehicle manufacturer specific or ISO 22901-1 ODX[7];

— lower OSI layers framework, which is composed of ISO 20794-3, ISO 20794-4, ISO 20794-6, and ISO 20794-7 conformance testing.

ISO 20794 (all parts) and ISO 14229-8[4] are based on the conventions specified in the OSI Service Conventions (ISO/IEC 10731)[1] as they apply for all layers and the diagnostic services.

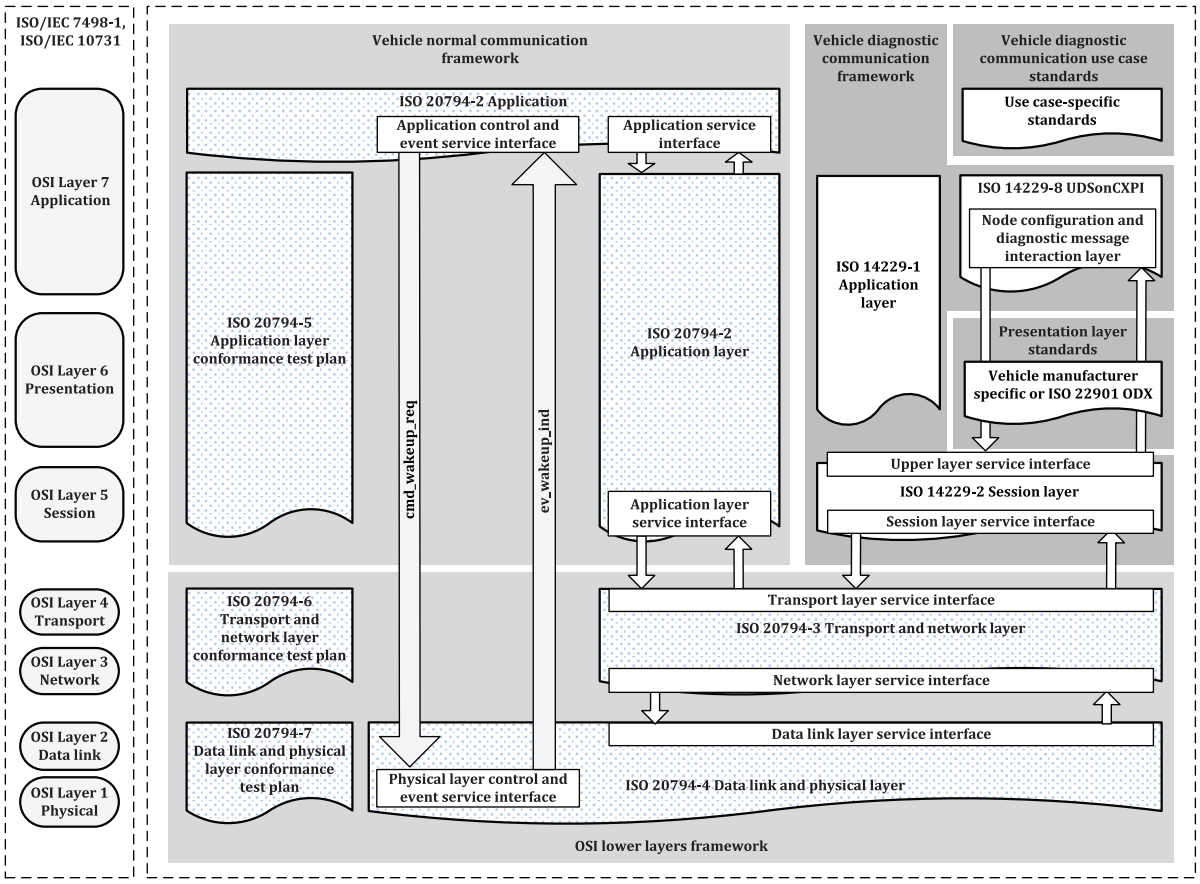

Figure 1 — ISO 20794 documents reference according to OSI model

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 20794-3:2020

Documents
Document Sharing Hub

Road vehicles — Clock extension peripheral interface (CXPI) —

Part 3: Transport and network layer

1 Scope

This document specifies the OSI transport layer and network layer by means of services and protocols. They can be used by different applications.

The transport 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; and

— performs transport protocol error detection.

The transport layer protocol is not used for normal communication except to map the service interface parameters between lower and upper OSI layers.

The network layer:

— adds a node address for diagnostic and node configuration into each segment; and

— observes timing for diagnostic and node configuration of each segment.

The network layer is not used for normal communication except to map the service interface parameters between lower and upper OSI layers.

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*

3 Terms and definitions

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

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 20794-3:2020