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## Road vehicles — Clock extension peripheral interface (CXPI) —

### Part 5: Application layer conformance test plan

*Véhicules routiers — Interface périphérique d'extension d'horloge (CXPI) —  
Partie 5: Plan de test de conformité de la couche application*

ICS: 43.040.15

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94 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

97 A list of all parts in the ISO 20794 series can be found on the ISO website.

98 Any feedback or questions on this document should be directed to the user's national standards body. A  
99 complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

100 This document set specifies the use cases, the application layer, transport and network layer, data link  
101 and physical layer requirements of an in-vehicle network called "clock extension peripheral interface  
102 (CXPI)".

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

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

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

### — Application layer

110 — application measurement and control data communication to exchange information between  
111 applications in different nodes based on a deterministic schedule table-based message  
112 communication;

113 — two kinds of communication methods can be selected at system design by each node:

- 114 i) the event-triggered method, which supports application measurement- and control-based  
115 (event-driven) slave node communication; and
- 116 ii) the polling method, which supports slave node communication based on a periodic master  
117 schedule;

118 — error management, that provides error detection and reporting to the application.

### — Transport and network layer

120 — transforms a message into a single packet;

121 — adds protocol control information for diagnostic and node configuration into each packet;

122 — adds packet identifier for diagnostic and node configuration into each packet;

123 — performs transport protocol error detection.

### — Data link layer

125 — provides long and short data frames;

126 — adds a frame identifier into the frame;

127 — adds frame information into the frame;

128 — adds a cyclic redundancy check into the frame;

- 129 — performs byte-wise arbitration and reports the arbitration result to higher OSI layers;
- 130 — performs frame type detection in reception function;
- 131 — performs data link error detection and reports the result to higher OSI layers.
- 132 — Physical layer
- 133 — performs Carrier Sense Multiple Access (CSMA);
- 134 — performs Collision Resolution (CR);
- 135 — generates a clock, which is transmitted with each bit to synchronise the connected nodes on the
- 136 CXPI network;
- 137 — supports bit rates up to 20 kbit/s.

138

139 To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in  
 140 ISO/IEC 7498-1 0 and ISO/IEC 10731, which structures communication systems into seven layers.

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

- 143 — vehicle normal communication framework, which is composed of ISO 20794-2 and ISO 20794-5;
- 144 — vehicle diagnostic communication framework, which is composed of ISO 14229-1, ISO 14229-2 [1],  
 145 and ISO 14229-8 [2];
- 146 — presentation layer standards, e.g., vehicle manufacturer specific or ISO 22901 ODX [3];
- 147 — Lower OSI layers framework, which is composed of ISO 20794-3, ISO 20794-4, ISO 20794-6, and  
 148 ISO 20794-7 conformance testing.

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

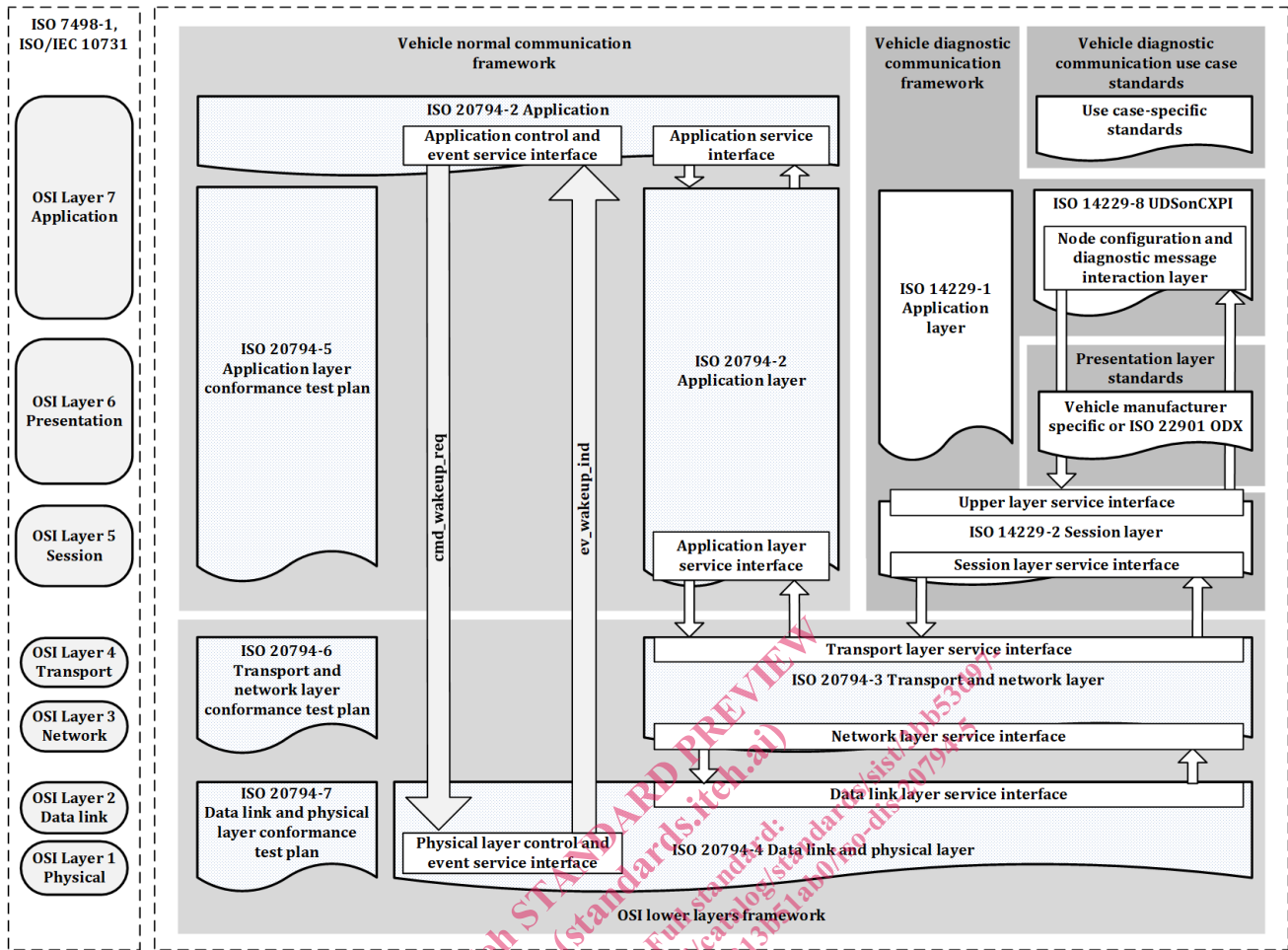


Figure 1 — ISO 20794 documents reference according to OSI model



# Road vehicles — Clock extension peripheral interface (CXPI) — Part 5: Application layer conformance test plan

## 1 Scope

This document shall provide all necessary technical information to ensure that test results will be identical even on different test systems, provided that the particular test suite and the test system are compliant to the content of this document.

The application layer conformance test plan contains the following descriptions:

- concept of operation conformance test plan;
- network management conformance test plan;
- transfer management conformance test plan; and
- error management conformance test plan.

## 2 Normative references

The following referenced documents are indispensable for the application 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 7498-1:1994 (Ed. 1), *Information processing systems — Open systems interconnection — Basic reference model*

ISO/IEC 10731:1994, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

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

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

174 **3 Terms and definitions**

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

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

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

179 — ISO Online browsing platform: available at <http://www.iso.org/obp>

180 **3.1**  
181 **clock master**

182 node that transmits clock to the lower OSI layers

183 **3.2**  
184 **lower OSI layers**

185 OSI layers lower than application layer

186 **3.3**  
187 **master node**

188 node that provides the schedule master management (include ReqTypeId transmission), the primary  
189 clock, and optionally the sleep message transmission management

190 **3.4**  
191 **clock**

192 function that synchronises all nodes on the CXPI network

193 **3.5**  
194 **initiator**

195 node that transmit messages

196 **3.6**  
197 **passive**

198 node that receive messages

199 **3.7**  
200 **primary clock**

201 clock that is provided by the master node

202 **3.8**  
203 **schedule**

204 origin of periodic frame transmission

205 **3.9**  
206 **secondary clock**

207 clock that is provided by one dedicated slave node

208 **3.10**  
209 **sequence**

210 transmission and reception procedure of messages among two or more nodes

- 211 **3.11**  
212 **slave node**  
213 node other than master node connected to the CXPI network
- 214 **3.12**  
215 **slave initiator node**  
216 node that wakes up from the slave node itself
- 217 **3.13**  
218 **slave passive node**  
219 node that is wake-up from another slave node
- 220 **3.14**  
221 **wake-up pulse**  
222 stimulus initiated by a node used for wake-up of other nodes on the CXPI network
- 223

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224 **4 Symbols and abbreviated terms**

225 **4.1 Symbols**

226	kbit/s	kilobit per second
227	$T_{\text{clock\_start\_m}}$	time that the master node transmits the clock on the CXPI network at the latest
228	$T_{\text{clock\_stop\_m}}$	time that the master node stops to transmit the clock after master node receives the sleep message
229		
230	$T_{\text{sleep\_s}}$	time that each slave node transits to sleep state after the node receives the sleep message
231		
232	$T_{\text{wakeup\_m}}$	minimum time that master node starts the transmission of any Request field (ReqId) or Request field (ReqTypeId) first for the wakeup sequence
233		
234	$T_{\text{wakeup\_recovery\_s}}$	time that slave node starts the transmission of the second wakeup pulse after transmits the first wakeup pulse
235		
236	$T_{\text{wakeup\_s}}$	maximum time until the slave node wakes up by the wakeup sequence
237	$T_{\text{wakeup\_schedule\_m}}$	maximum time until master node starts the transmission of any Request field (ReqId) or Request field (ReqTypeId) first for the wakeup sequence
238		

239 **4.2 Abbreviated terms**

240	AL	application layer
241	APP	application
242	CRC	cyclic redundancy check
243	DID	diagnostic data identifier
244	DLC	data length code
245	ECU	electronic control unit
246	EMI	electro-magnetic interference
247	IUT	Implementation under test
248	OSI	open systems interconnection
249	PDU	protocol data unit
250	PID	protected identifier
251	ReqId	request identifier
252	ReqTypeId	request type identifier
253	SCT	sequence count

254 SUT system under test

255 **5 Conventions**

256 This document is based on the conventions discussed in the OSI Service Conventions as specified in [ISO/IEC 10731](#).

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