
**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

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

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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*.

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.

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);

- 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^[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 this document;
- 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 ODX^[10];
- lower OSI layers framework, which is composed of ISO 20794-3^[6], ISO 20794-4^[7], ISO 20794-6^[8] and ISO 20794-7^[9].

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.

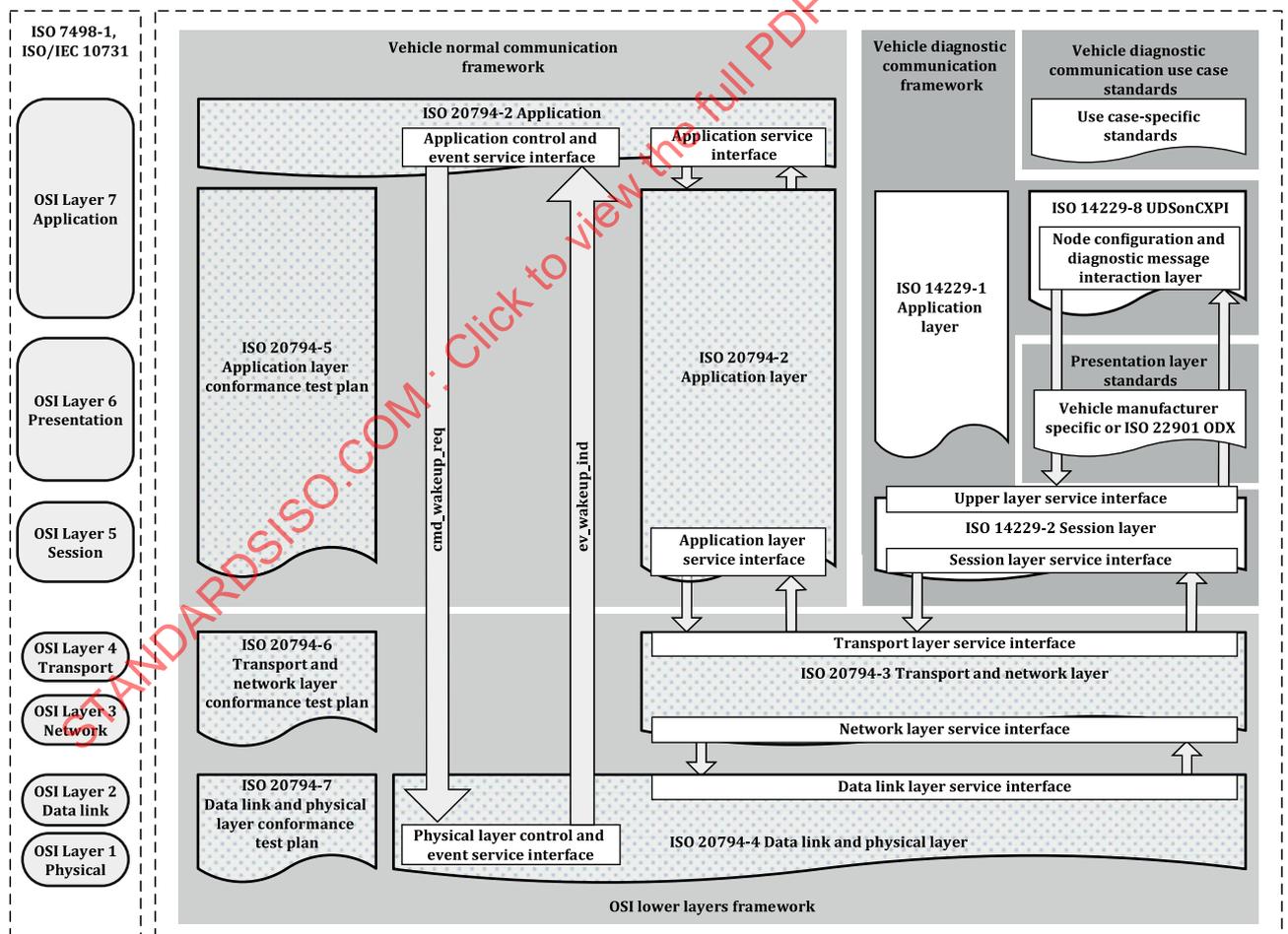


Figure 1 — ISO 20794 documents reference according to OSI model

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Road vehicles — Clock extension peripheral interface (CXPI) —

Part 5: Application layer conformance test plan

1 Scope

This document specifies the conformance test plan for ISO 20794-2:2020 implementations.

It specifies conformance test cases related to:

- concept of operation;
- network management;
- transfer management; and
- error management.

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 processing systems — Open systems interconnection — Basic reference model*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20794-2, 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/>

3.1

clock master

node that transmits *clock* (3.4) to the *lower OSI layers* (3.2)

3.2

lower OSI layer

OSI layer lower than application layer

3.3

master node

node that provides the *schedule* (3.10) master management (include ReqTypeId transmission), the *primary clock* (3.7) and optionally the sleep message transmission management

3.4

clock

function that synchronises all nodes on the CXPI network

3.5

initiator

node that transmits messages

3.6

passive

node that receives messages

3.7

primary clock

clock (3.4) that is provided by the *master node* (3.3)

3.8

REPEAT

pseudo code command for an iteration

3.9

REPEAT END

pseudo code command for ending an iteration

3.10

schedule

origin of periodic frame transmission

3.11

secondary clock

clock (3.4) that is provided by one dedicated *slave node* (3.13)

3.12

sequence

transmission and reception procedure of messages among two or more nodes

3.13

slave node

node other than *master node* (3.3) connected to the CXPI network

3.14

slave initiator node

node that is woken up by its own *slave node* (3.13)

3.15

slave passive node

node that is woken up by another *slave node* (3.13)

3.16

wake-up pulse

stimulus initiated by a node used for wake-up of other nodes on the CXPI network

4 Symbols and abbreviated terms

4.1 Symbols

---	empty cell/undefined
kbit/s	kilobit per second
$t_{\text{clock_start_m}}$	master node clock start time
$t_{\text{clock_stop_m}}$	master node clock stop time
$t_{\text{sleep_s}}$	slave node sleep state transition time
$t_{\text{wakeup_m}}$	master node wake-up time
$t_{\text{wakeup_recovery_s}}$	slave node wake-up recovery time
$t_{\text{wakeup_s}}$	slave node wake-up time
$t_{\text{wakeup_schedule_m}}$	master node wake-up schedule time

4.2 Abbreviated terms

ASP	abstract service primitive
AL	application layer
APP	application
CRC	cyclic redundancy check
DLC	data length code
ECU	electronic control unit
EMI	electro-magnetic interference
ErrDet	error detection
ETS	enhanced testability service
IUT	implementation under test
OSI	open systems interconnection
PDU	protocol data unit
PID	protected identifier
PCO	point of control and observation
ReqId	request identifier

ReqTypeId	request type identifier
SCT	sequence count
SUT	system under test

5 Conventions

This document is based on OSI service conventions as specified in ISO/IEC 10731^[2] and ISO/IEC 9646-1^[1] for conformance test system setup.

6 General test specification considerations

6.1 General

This document covers the conformance test cases (CTC) to verify the requirements described in ISO 20794-2 application layer document.

6.2 Test conditions

Tests can be performed at room temperature, if the temperature is in the range of 15° C to 35° C. Also, the tests shall be performed under room EMI (electro-magnetic interference) conditions.

6.3 IUT requirements

The occurrence of the error specified in ISO 20794-2:2020, 9.6.8 shall be notified to the application.

The IUT shall be initialised in the test case respectively.

6.4 CTC definition

The definition of each test case specifies, whether the IUT is a master or slave node. Each CTC is defined in the structure as defined in [Table 1](#).

Table 1 — CTC definition example

Item	Content
CTC # - Title	[OSI layer #].CTC_[number_name] E.g. 8.CTC_1.4 – State machine – Slave node – Sleep permission
Purpose	This CTC shall verify ... E.g. This CTC verifies the test for the slave node to transit into the sleep state with sleep permission. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	REQ document, REQ number – REQ name E.g. ISO 20794-2:2020, REQ 8.3 APP – NM – Normal, standby, and sleep states;
Prerequisite	The test system set-up shall be in accordance with Figure 2 . The clock master is implemented in the LT of the test system.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to default (see 6.6) and in addition support W/S_RdySleep configurations (see 6.6.6). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).

Table 1 (continued)

Item	Content
Step	<ol style="list-style-type: none"> 1. A short description of the test step e.g. LT shall transmit the wake-up pulse. 2. A short description of the test step e.g. LT shall observe any messages on the CXPI network and shall report to the UT.
Iteration	Definition of repetitions of test procedure steps. Example: REPEAT step 1 to step 2, 5 times; ...; REPEAT END.
Expected response	Define the expected behaviour of IUT by checking on the CXPI network when the test step is executed. Example: After step 1: the IUT shall receive a wake-up notification pulse, waits $t_{\text{cxpi_network_error}}$ time from the wake-up pulse. After step 2: the LT shall report the observation on the CXPI network to the UT.
Remark	E.g. either "---" if no remark or "Observation of $t_{\text{wakeup_schedule_m}}$ time and $t_{\text{wakeup_m}}$ time starts from second rising edge of clock."

6.5 Test system set-up

The test system set-up follows ISO/IEC 9646-1 and consists of a test system and a system under test (SUT) connected via the physical medium. The test system implements an upper tester (UT) and a lower tester (LT). The test system uses set-up parameters (see [Figure 2](#), key 1) for testing the communication with the IUT.

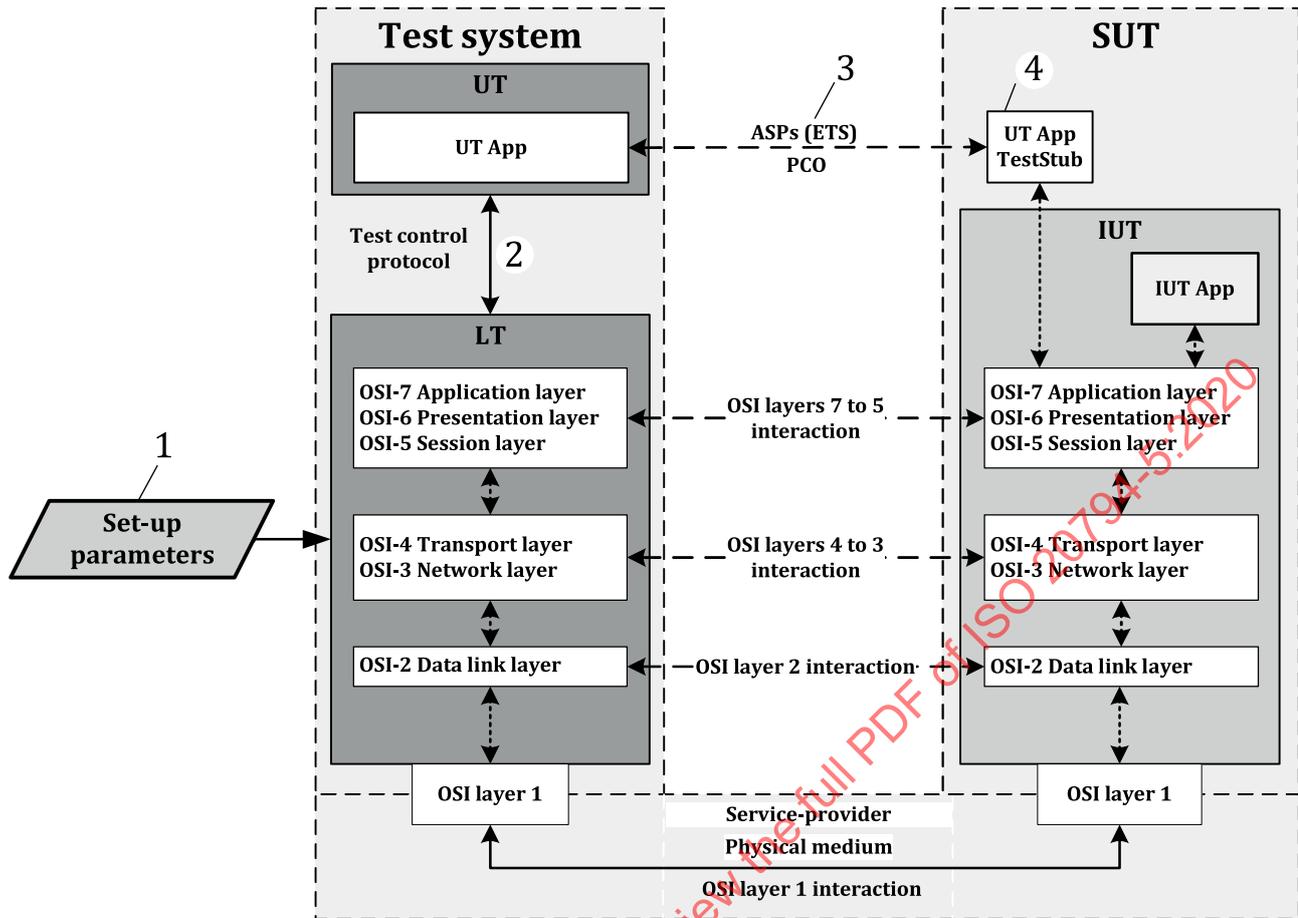
The UT uses the test control protocol (see [Figure 2](#), key 2) to control the LT.

The point of control and observation (PCO) functionality between the UT of the test system and the UT App test stub in the SUT is provided by direct logical access to the abstract service primitive interface [ASPs (ETs), PCO, see dashed line in [Figure 2](#), key 3] and the associated parameters of the OSI layer as specified in the ISO 20794 series.

The UT App test stub in the SUT (see [Figure 2](#), key 4) supports an equivalent part of the ASP (see [Figure 2](#), key 3) and the associated parameters to control and measure the state(s) of the IUT.

The UT App in the test system, which represents the conformance test controller, manipulates the service primitive interface parameters in the IUT App test stub via the ASPs (ETs) and PCO of the OSI layers to fulfil the purpose of each CTC.

If the IUT is a master node then the LT functions as a slave node. If the IUT is a slave node then the LT functions as a master node. The test system ensures the precision of the bit time and bit synchronisation of the master node as specified in ISO 20794-4:2020, 9.3.7.



Key

- 1 set-up parameters (CXPI node's electronic data sheet)
- 2 test control protocol
- 3 abstract service primitives (ASPs) based on enhanced testability services (ETS) and points of control and observation (PCO)
- 4 upper tester application test stub

Figure 2 — Test system set-up

6.6 Configuration of test system and IUT

6.6.1 General

The test system requires set-up parameters (see [Figure 2](#) key 1), which specify OSI layer properties of the IUT. The IUT-specific data sheet (see [Figure 2](#) key 1) includes set-up parameters, which the test system requires for the conformance test cases.

[Table 2](#) defines the configurations of the test system and the IUT.

Table 2 — Configuration of test system and IUT

Configuration item	Configuration of test system and IUT								
	W/S _Init	W/S _passive	W/S _Rdy Sleep	W/S _Not Rdy Sleep	A_WSSup	Non W/S	ErrDet	Event	Polling
Internal condition of wake-up	1 ₂	0 ₂	1 ₂	1 ₂	---	---	---	---	---
Transmission method	---	---	---	---	---	---	---	event	polling
Wake-up/sleep	1 ₂	1 ₂	1 ₂	1 ₂	0 ₂	---	---	---	---
TST_FRM_05_REQ_PID_ERRBIT	---	---	---	---	supported by IUT	---	supported by IUT	---	---
Condition of sleep permission (sleep_ind)	1 ₂	1 ₂	1 ₂	0 ₂	---	0 ₂	0 ₂	---	---

Table 3 specifies test message names which are used by the IUT and the test system in the CTCs. In each CTC description, the message setting is specified in the 'Definition' column. If there is no reference to Table 3, the settings are specified in the CTC.

Table 3 — Configuration of test messages used by IUT and test system

Name	Definition
TST_MSG_00_REQ_PTYPE	Test message 00 ₁₆ of master node including a ReqTypeId value (00 ₁₆) of A_ReqId.
TST_MSG_01_REQ_PID	Test message 01 ₁₆ of master or slave node including an A_PID value (01 ₁₆ to 7F ₁₆) of A_ReqId.
TST_MSG_02_REQ_PID_SLEEP	Test message 02 ₁₆ for master node including an A_PID value (1F ₁₆) of A_ReqId for diagnostic and node configuration requests or sleep message.
TST_MSG_03_REQ_PID_UNKNOWN	Test message 03 ₁₆ for master or slave node including a not defined A_PID value of A_ReqId (not defined for reception/transmission by IUT).
TST_MSG_04_REQ_PID_INVALID	Test message 04 ₁₆ for master or slave node including an A_PID value of A_ReqId (not defined for reception/transmission by IUT with an incorrect parity bit) determined by A_Length = 01 ₁₆ .
TST_MSG_05_REQ_PID_ERRBIT	Test message 05 ₁₆ of master or slave node including an error bit A_PID value (01 ₁₆ to 7F ₁₆) of L_ReqId. The value of this PID can use a supplier-specific ReqId.
TST_MSG_10_RESP_0-12	Test message 10 ₁₆ for master or slave node including FI field, DATA field and CRC field determined by 00 ₁₆ ≤ A_Length ≤ 0C ₁₆ .
TST_MSG_11_RESP_12	Test message 11 ₁₆ for master or slave node including FI field, DATA field and CRC field determined by A_Length = 0C ₁₆ .
TST_MSG_14_RESP_LONG_0-255	Test message 14 ₁₆ of master or slave node including FI field, DATA field and CRC field determined by 00 ₁₆ ≤ A_Length ≤ FF ₁₆ .
TST_MSG_17_RESP_SLEEP_8	Test message 17 ₁₆ of master node including FI field, fixed byte pattern of DATA field and CRC field fixed byte pattern is (00 ₁₆ , FF ₁₆) determined by A_Length = 08 ₁₆ .
TST_MSG_18_RESP_ERRBIT_0-12	Test message 18 ₁₆ of master node including FI field, DATA field with an error bit and CRC field determined by 00 ₁₆ ≤ A_Length ≤ 0C ₁₆ .

6.6.2 IUT-specific set-up parameters

The set-up parameters include at least the following information.

- The request identifier uses 01₁₆ to 7F₁₆ and uses 00₁₆ in the request protected type identifier field.
- The CXPI node wake-up uses a wake-up trigger based on the parameter wakeup_ind value 0₂ or 1₂.

- The transmission method is set to either the event-triggered method or the polling method.
- The condition of sleep permission uses the bit value 0_2 or 1_2 as sleep_ind.
- The bit rate is set to the default value of 20 kbit/s if not otherwise specified.
- The frame with request identifier $3F_{16}$ and the associated response field is reserved for supplier specific maintenance, enhanced testability services, and error bit status reporting.

6.6.3 User_Specific configurations

The User_Specific parameters include at least the following information:

- internal condition of wake-up: don't care;
- transmission method: don't care;
- wake-up/sleep: don't care;
- condition of sleep permission (sleep_ind): don't care.

6.6.4 W/S_Init configurations

The W/S_Init parameters include at least the following information:

- internal condition of wake-up: 1_2 ;
- transmission method: don't care;
- wake-up/sleep: 1_2 ;
- condition of sleep permission (sleep_ind): 1_2 .

6.6.5 W/S_Passive configurations

The W/S_Passive parameters include at least the following information:

- Internal condition of wake-up: 0_2 ;
- transmission method: don't care;
- wake-up/sleep: 1_2 ;
- condition of sleep permission (sleep_ind): 1_2 .

6.6.6 W/S_RdySleep configurations

The W/S_RdySleep parameters include at least the following information:

- internal condition of wake-up: 1_2 ;
- transmission method: don't care;
- wake-up/sleep: 1_2 ;
- condition of sleep permission (sleep_ind): 1_2 .

6.6.7 W/S_NotRdySleep configurations

The W/S_NotRdySleep parameters include at least the following information:

- internal condition of wake-up: 1_2 ;

- transmission method: don't care;
- wake-up/sleep: 1₂;
- condition of sleep permission (sleep_ind): 0₂.

6.6.8 A_WSSup configurations

The A_WSSup parameters include at least the following information:

- transmission method: don't care;
- wake-up/sleep: 0₂;
- TST_FRM_05_REQ_PID_ERRBIT: supported by the IUT;
- condition of sleep permission (sleep_ind): don't care.

6.6.9 NonW/S configurations

The NonW/S parameters include at least the following information:

- internal condition of wake-up: not applicable;
- transmission method: don't care;
- wake-up/sleep: not applicable;
- TST_FRM_05_REQ_PID_ERRBIT: supported by the IUT;
- condition of sleep permission (sleep_ind): 0₂.

6.6.10 ErrDet configurations

The ErrDet parameters include at least the following information:

- internal condition of wake-up: don't care;
- transmission method: don't care;
- wake-up/sleep: don't care;
- condition of sleep permission (sleep_ind): 0₂.

6.6.11 Event configurations

The event parameters include at least the following information:

- internal condition of wake-up: don't care;
- transmission method: event;
- wake-up/sleep: don't care;
- condition of sleep permission (sleep_ind): don't care.

6.6.12 Polling configurations

The polling parameters include at least the following information:

- internal condition of wake-up: don't care;
- transmission method: polling;

- wake-up/sleep: don't care;
- condition of sleep permission (sleep_ind): don't care.

6.7 SUT initialisation

6.7.1 General

An initialisation of the IUT shall be performed before each CTC.

6.7.2 Default initialisation

The IUT shall be reset so that the transmission/reception of an A_ReqIds shall be configured and the error counter value is reset (0). If the IUT is a master node, it shall be ready to transmit the request field to the lower OSI layers. If the IUT is a slave node, it shall be ready to transmit the response PDUs upon the reception of A_ReqId from the master node.

6.7.3 Sleep initialisation

IUT shall support wake-up/sleep function and be in the sleep state specified in ISO 20794-2:2020, 9.3.4.

6.7.4 Power-off initialisation

The IUT shall be in the state of power-off.

6.7.5 Transmission prohibition initialisation

IUT shall be in the transmission prohibition specified in ISO 20794-2:2020, 9.6.6.

6.7.6 Clock supply of secondary clock master initialisation

IUT with secondary clock master function shall be in the state of supplying clock.

7 Application conformance test plan

7.1 General

The application conformance test evaluates the operation sequence of each message according to ISO 20794-2.

The CTCs specified in this document cover the protocol functionality specified in ISO 20794-2. Such parameters and features are:

- A_ReqTypeId;
- A_ReqId;
- A_PDU (Response field);
- system state.

7.2 Network management

7.2.1 General

The wake-up/sleep function is an optional feature. Transmission and reception of messages by each node can be started or stopped. After the master node confirms the sleep prohibition of each slave node,

it directs the stop of the transmission and reception of the message. The restart of the transmission and reception of the message is achieved by putting a trigger onto the CXPI network, which is received by each node.

7.2.2 State transition definition

State transitions that occur between wake-up and sleep for each node are specified in ISO 20794-2:

- a) sleep state;
- b) standby state; and
- c) normal state.

7.2.3 State transition CTCs

7.2.3.1 8.CTC_1.1 – State machine – Master node – Wake-up/Sleep supported

[Table 4](#) specifies this CTC.

Table 4 — State machine – Master node – Wake-up/Sleep supported

Item	Content
CTC # - Title	8.CTC_1.1 – State machine – Master node – Wake-up/Sleep supported
Purpose	This CTC verifies that the master node transits into the sleep state. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: — REQ 8.3 APP – NM – Normal, standby, and sleep states; — REQ 8.10 APP – NM – Sleep state (optional); — REQ 8.11 APP – NM – Wake-up/sleep supported.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	— The IUT shall be configured as a master node. — The IUT shall be configured to support W/S_Passive configurations (see 6.6.5). — The bit rate shall be set to the default value (see 6.6). The IUT shall be initialised to the power-off (see 6.7.4).
Step	1. The IUT shall be powered.
Iterations	Not applicable
Expected response	After step 1: The IUT shall not transmit or receive any messages. The LT shall report no message and request transmission to the UT.
Remark	---

7.2.3.2 8.CTC_1.2 – State machine – Master node – Wake-up/Sleep not supported

[Table 5](#) specifies this CTC.

Table 5 — State machine – Master node – Wake-up/Sleep not supported

Item	Content
CTC # – Title	8.CTC_1.2 – State machine – Master node – Wake-up/Sleep not supported
Purpose	This CTC verifies that the master node transits into the normal state. This CTC is applicable only to an IUT, which does not support the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.3 APP – NM – Normal, standby, and sleep states; — REQ 8.4 APP – NM – Event-triggered method in normal state – Wake-up/sleep not supported; — REQ 8.43 APP – Measurement and control data – Assignment of ReqId; — REQ 7.3 AL – Request protected type identifier field; — REQ 7.4 AL – Request protected type identifier field – General.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support NonW/S configurations (see 6.6.9), TST_MSG_00_REQ_PTYPE, and TST_MSG_01_REQ_PID. — The bit rate shall be set to the default value (see 6.6). — The IUT shall be initialised to the power-off (see 6.7.4).
Step	<ol style="list-style-type: none"> 1. The IUT shall be powered. 2. The UT shall control the IUT to transmit the clock. 3. The UT shall control the IUT to transmit the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	<p>After step 2: The LT shall detect the clock.</p> <p>After step 3: The LT shall receive the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID and shall report to the UT.</p>
Remark	---

7.2.3.3 8.CTC_1.3 – State machine – Slave node – Wake-up/Sleep supported

[Table 6](#) specifies this CTC.

Table 6 — State machine – Slave node – Wake-up/Sleep supported

Item	Content
CTC # – Title	8.CTC_1.3 – State machine – Slave node – Wake-up/Sleep supported
Purpose	This CTC verifies that the slave node transits into the sleep state. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.

Table 6 (continued)

Item	Content
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.3 APP – NM – Normal, standby, and sleep states; — REQ 8.10 APP – NM – Sleep state (optional); — REQ 8.11 APP – NM – Wake-up/sleep supported; — REQ 8.13 APP – NM – Wake-up/sleep supported.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_passive configurations (see 6.6.5). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the power-off initialisation (see 6.7.4).
Step	1. The IUT shall be powered.
Iterations	Not applicable
Expected response	After step 1: The LT shall report no message and request transmission to the UT.
Remark	---

7.2.3.4 8.CTC_1.4 – State machine – Slave node – Sleep permission

[Table 7](#) specifies this CTC.

Table 7 — State machine – Slave node – Sleep permission

Item	Content
CTC # - Title	8.CTC_1.4 – State machine – Slave node – Sleep permission
Purpose	This CTC verifies that the slave node transits into the sleep state with sleep permission. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.3 APP – NM – Normal, standby, and sleep states; — REQ 8.15 APP – NM – Master node wake-up request/notification – Internal event notification; — REQ 8.16 APP – NM – Master node wake-up request/notification – Transit from standby state into normal state; — REQ 8.17 APP – NM – Master node wake-up request/notification – Master node wake-up sequence; — REQ 8.18 APP – NM – Master node wake-up request/notification – Master node wake-up sequence – $t_{\text{clock_start_m}}$ time; — REQ 8.39 APP – NM – Measurement and/or control data types – Single publisher.
Prerequisite	The test system set-up shall be in accordance with Figure 2 . The clock master is not available in the SUT.

Table 7 (continued)

Item	Content
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_RdySleep configurations (see 6.6.6). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit wake-up pulse. 2. The LT shall not transmit the clock.
Iterations	Not applicable
Expected response	<p>After step 1: The LT shall receive the wake-up pulse and shall report to the UT.</p> <p>After step 2: The IUT shall transit into the sleep state after $t_{\text{cxpi_network_error}}$ elapsed.</p>
Remark	<p>The UT is connected to a multi-meter to measure current consumption of the IUT.</p> <p>After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.</p>

7.2.3.5 8.CTC_1.5 - State machine - Slave node - Sleep prohibition

Table 8 specifies this CTC.

Table 8 — State machine - Slave node - Sleep prohibition

Item	Content
CTC # - Title	8.CTC_1.5 - State machine - Slave node - Sleep prohibition
Purpose	<p>This CTC verifies that the slave node with sleep prohibition does not transit into the sleep state.</p> <p>This CTC is applicable only to an IUT which supports the wake-up/sleep feature.</p>
Reference	<p>ISO 20794-2:2020:</p> <ul style="list-style-type: none"> — REQ 8.3 APP - NM - Normal, standby, and sleep states; — REQ 8.10 APP - NM - Sleep state (optional); — REQ 8.12 APP - NM - Standby state (optional).
Prerequisite	<p>The test system set-up shall be in accordance with Figure 2.</p> <p>The clock master is not available in the SUT.</p>
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_NotRdySleep configurations (see 6.6.7). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit wake-up pulse. 2. The LT shall not transmit the clock.
Iterations	Not Applicable
Expected response	<p>After step 1: The LT shall receive the wake-up pulse and shall report to the UT.</p> <p>After step 2: The IUT shall stay in the standby state after $t_{\text{cxpi_network_error}}$ elapsed.</p>
Remark	<p>The UT is connected to a multi-meter to measure current consumption of the IUT.</p> <p>After the IUT transits into the standby state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.</p>

7.2.3.6 8.CTC_1.6 – State machine – Slave node – Transition into the normal state

[Table 9](#) specifies this CTC.

Table 9 — State machine – Slave node – Transition into the normal state

Item	Content
CTC # - Title	8.CTC_1.6 – State machine – Slave node – Transition into the normal state
Purpose	This CTC verifies that the slave node transits into the normal state. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: — REQ 8.3 APP – NM – Normal, standby, and sleep states; — REQ 8.4 APP – NM – Event-triggered method in normal state – Wake-up/sleep not supported; — REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	— The IUT shall be configured as a slave node. — The IUT shall be configured to support NonW/S configurations (see 6.6.9), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the power-off (see 6.7.4).
Step	1. The IUT shall be powered. 2. The LT shall transmit the clock. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	After step 3: The IUT shall transmit the TST_MSG_10_RESP_0-12 with NMInfo as sleep_ind = 0 ₂ and wakeup_ind = 0 ₂ . The LT shall receive the TST_MSG_10_RESP_0-12 with NMInfo as sleep_ind = 0 ₂ and wakeup_ind = 0 ₂ and shall report to the UT.
Remark	---

7.2.4 Wake-up request/notification of master node trigger CTCs

7.2.4.1 8.CTC_2.1 – Master node wake-up sequence – Master node trigger

[Table 10](#) specifies this CTC.

Table 10 — Master node wake-up sequence - Master node trigger

Item	Content
CTC # - Title	8.CTC_2.1 - Master node wake-up sequence - Master node trigger
Purpose	This CTC verifies that the master node transits into the normal state by a master node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.12 APP - NM - Standby state (optional); — REQ 8.15 APP - NM - Master node wake-up request/notification - Internal event notification; — REQ 8.16 APP - NM - Master node wake-up request/notification - Transit from standby state into normal state; — REQ 8.17 APP - NM - Master node wake-up request/notification - Master node wake-up sequence; — REQ 8.18 APP - NM - Master node wake-up request/notification - Master node wake-up sequence - $t_{\text{clock_start_m}}$ time; — REQ 8.33 APP - NM - Wake-up/sleep sequence parameter.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3), TST_MSG_01_REQ_PID, and TST_MSG_00_REQ_PTYPE. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the clock. 2. The UT shall control the IUT to transmit the TST_MSG_01_REQ_PID or the TST_MSG_00_REQ_PTYPE.
Iterations	Not applicable
Expected response	<p>After step 2: The IUT shall transmit the TST_MSG_01_REQ_PID or the TST_MSG_00_REQ_PTYPE within $t_{\text{wakeup_schedule_m}}$ time after $t_{\text{wakeup_m}}$ time.</p> <p>The LT shall receive the TST_MSG_01_REQ_PID within $t_{\text{wakeup_schedule_m}}$ time after $t_{\text{wakeup_m}}$ time and shall report to the UT.</p>
Remark	Observation of $t_{\text{wakeup_schedule_m}}$ time and $t_{\text{wakeup_m}}$ time starts from the second rising edge of the clock.

7.2.4.2 8.CTC_2.2 - Slave node wake-up sequence - Master node trigger

[Table 11](#) specifies this CTC.

Table 11 — Slave node wake-up sequence - Master node trigger

Item	Content
CTC # - Title	8.CTC_2.2 – Slave node wake-up sequence – Master node trigger
Purpose	This CTC verifies that the slave node transits into the normal state by a master node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.25 APP – NM – Slave node wake-up request/notification – Wake-up sequence by dominant pulse and clock notification – Transit from standby state into normal state; — REQ 8.27 APP – NM – Slave node wake-up sequence – Wake-up sequence by wake-up pulse notification – Transit to normal state; — REQ 8.28 APP – NM – Slave node wake-up sequence – Wake-up sequence by wake-up pulse notification – Response field (PDU) transmission.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_Passive configurations (see 6.6.5), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the clock. 2. The LT shall transmit the TST_MSG_01_REQ_PID after $t_{\text{wakeup_m}}$ elapsed.
Iterations	Not applicable
Expected response	After step 2: The IUT shall transmit the TST_MSG_10_RESP_0-12. The LT shall receive the TST_MSG_10_RESP_0-12 and shall report to the UT.
Remark	---

7.2.4.3 8.CTC_2.3 – Master node wakeup_ind value verification, master node trigger

[Table 12](#) specifies this CTC.

Table 12 — Master node wakeup_ind value verification, master node trigger

Item	Content
CTC # - Title	8.CTC_2.3 – Master node wakeup_ind value verification, master node trigger
Purpose	This CTC verifies that the master node behaves as indicated in the wakeup_ind value by a master node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).

Table 12 (continued)

Item	Content
Step	1. The UT shall control the IUT to transmit the clock. 2. The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12.
Iterations	Not applicable
Expected response	After step 2: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ . The LT shall receive the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ and shall report to the UT.
Remark	---

7.2.4.4 8.CTC_2.4 – Slave node wakeup_ind value verification, master node trigger

Table 13 specifies this CTC.

Table 13 — Slave node wakeup_ind value verification, master node trigger

Item	Content
CTC # – Title	8.CTC_2.4 – Slave node wakeup_ind value verification, master node trigger
Purpose	This CTC verifies that the slave node behaves as indicated in the wakeup_ind value by a master node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	— The IUT shall be configured as a slave initiator node. — The IUT shall be configured to support W/S_Passive configurations (see 6.6.5), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	1. The LT shall transmit the clock. 2. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	After step 2: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with wakeup_ind = 0 ₂ . The LT shall receive the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_012 with wakeup_ind = 0 ₂ and shall report to the UT.
Remark	---

7.2.5 Wake-up request/notification of slave node trigger CTCs

7.2.5.1 8.CTC_3.1 – Slave node wake-up request – Slave node trigger

Table 14 specifies this CTC.

Table 14 — Slave node wake-up request – Slave node trigger

Item	Content
CTC # - Title	8.CTC_3.1 – Slave node wake-up request – Slave node trigger
Purpose	This CTC verifies that the slave node transmits the wake-up pulse by a slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020 REQ 8.24 APP – NM – Slave node wake-up request/notification – Internal event notification.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — IUT shall be configured as a slave initiator node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	1. The UT shall control the IUT to transmit the wake-up pulse.
Iterations	Not applicable
Expected response	After step 1: The IUT shall transmit the wake-up pulse. The LT shall receive the wake-up pulse and shall report to the UT.
Remark	---

7.2.5.2 8.CTC_3.2 – Slave node wake-up pulse retransmission sequence – Slave node trigger

[Table 15](#) specifies this CTC.

Table 15 — Slave initiator node wake-up pulse retransmission sequence – Slave node trigger

Item	Content
CTC # - Title	8.CTC_3.2 – Slave node wake-up pulse retransmission sequence – Slave node trigger
Purpose	This CTC verifies that the slave node retransmit the wake-up pulse by a slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.24 APP – NM – Slave node wake-up request/notification – Internal event notification; — REQ 8.31 APP – NM – Slave node re-request of wake-up pulse; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — IUT shall be configured as a slave initiator node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the wake-up pulse. 2. The LT shall not transmit the clock and shall wait $t_{\text{wake-up recovery}_s}$ time (see Figure 3).
Iterations	Not applicable

Table 15 (continued)

Item	Content
Expected response	After step 2: The IUT shall retransmit the wake-up pulse once. The LT shall receive the wake-up pulse and shall report to the UT.
Remark	---

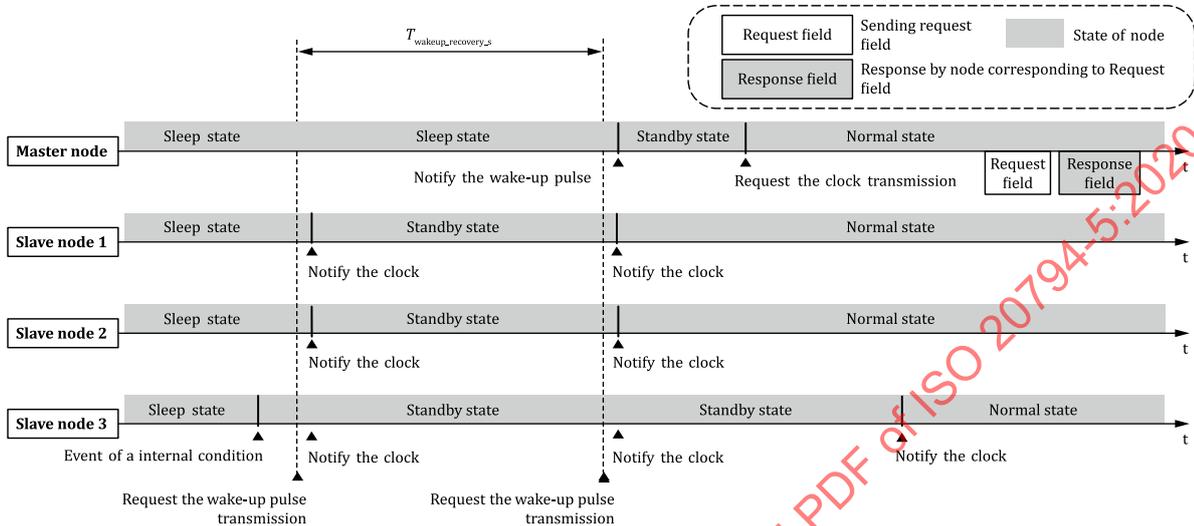


Figure 3 — Re-request sequence of wake-up pulse transmission

7.2.5.3 8.CTC_3.3 – Slave node wake-up notification – Slave node trigger

Table 16 specifies this CTC.

Table 16 — Slave node wake-up notification – Slave node trigger

Item	Content
CTC # – Title	8.CTC_3.3 – Slave node wake-up notification – Slave node trigger
Purpose	This CTC verifies that the slave passive node transits into the normal state by a slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: — REQ 8.25 APP – NM – Slave node wake-up request/notification – Wake-up sequence by dominant pulse and clock notification – Transit from standby state into normal state; — REQ 8.26 APP – NM – Slave node wake-up sequence – Wake-up sequence by wake-up pulse notification – t_{wakeup_s} time; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	— IUT shall be configured as a slave passive node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID, TST_MSG_00_REQ_PTYPE and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).

Table 16 (continued)

Item	Content
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the wake-up pulse. 2. The LT shall transmit the clock within $t_{\text{clock_start_m}}$ time. 3. The LT shall transmit the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	<p>After step 3: The IUT shall transmit either or both of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12.</p> <p>The LT shall receive either or both of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 and shall report to the UT.</p>
Remark	---

7.2.5.4 8.CTC_3.4 – Master node wake-up sequence – Slave node trigger

Table 17 specifies this CTC.

Table 17 — Master node wake-up sequence – Slave node trigger

Item	Content
CTC # - Title	8.CTC_3.4 – Master node wake-up sequence – Slave node trigger
Purpose	<p>This CTC verifies that the master node transits into the normal state by a slave node trigger.</p> <p>This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.</p>
Reference	<p>ISO 20794-2:2020:</p> <ul style="list-style-type: none"> — REQ 8.16 APP – NM – Master node wake-up request/notification – Transit from standby state into normal state; — REQ 8.17 APP – NM – Master node wake-up request/notification – Master node wake-up sequence; — REQ 8.18 APP – NM – Master node wake-up request/notification – Master node wake-up sequence – $t_{\text{clock_start_m}}$ time; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter; — REQ 8.49 APP – Sequence count (SCT) error (Err_APP_SCT) (optional).
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID, and TST_MSG_00_REQ_PTYPE. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the wake-up pulse.
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall transmit the clock within $t_{\text{clock_start_m}}$ time (see Figure 4).</p> <p>The LT shall detect the clock within $t_{\text{clock_start_m}}$ time and shall report to the UT.</p> <p>The IUT shall transmit the TST_MSG_01_REQ_PID or the TST_MSG_00_REQ_PTYPE after $t_{\text{wakeup_m}}$ time, before the $t_{\text{wakeup_schedule_m}}$ time (see Figure 4) elapse.</p> <p>The LT shall receive the TST_MSG_01_REQ_PID or the TST_MSG_00_REQ_PTYPE after $t_{\text{wakeup_m}}$ time, before the $t_{\text{wakeup_schedule_m}}$ time (see Figure 4) elapse and shall report to the UT.</p>

Table 18 (continued)

Item	Content
Expected response	After step 2: The IUT shall not transmit any messages or requests. The IUT shall transit into the sleep state.
Remark	The UT is connected to a multi-meter to measure current consumption of the IUT. After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.

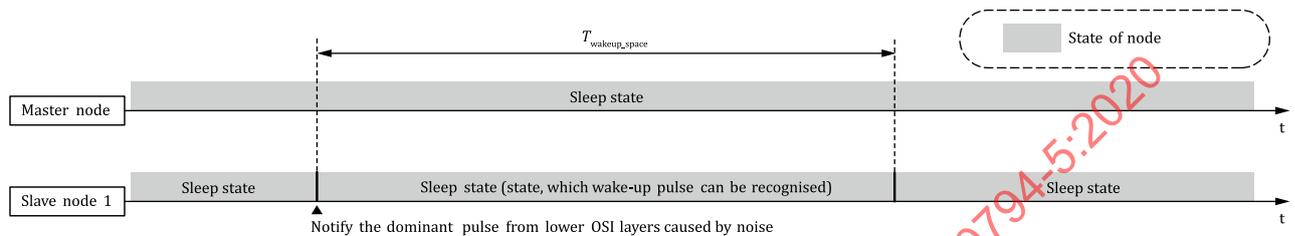


Figure 5 — Sleep sequence of no clock after dominant pulse received

7.2.5.6 8.CTC_3.6 – Master node wakeup_ind value verification, slave node trigger

Table 19 specifies this CTC.

Table 19 — Wakeup_ind value verification, IUT as slave

Item	Content
CTC # - Title	8.CTC_3.6 – Master node wakeup_ind value verification, slave node trigger
Purpose	This CTC verifies that the master node behaves as indicated in the wakeup_ind value by the slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management;
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the wake-up pulse. 2. The LT shall transmit the TST_MSG_01_REQ_PID after the clock received.
Iterations	Not applicable
Expected response	After step 2: The IUT shall transmit the TST_MSG_10_RESP_0-12 with wakeup_ind = 0 ₂ . The LT shall receive the TST_MSG_10_RESP_0-12 with wakeup_ind = 0 ₂ and shall report to the UT.
Remark	---

7.2.5.7 8.CTC_3.7 – Slave node wakeup_ind value verification, slave node trigger

Table 20 specifies this CTC.

Table 20 — Slave node wakeup_ind value verification, slave node trigger

Item	Content
CTC # – Title	8.CTC_3.7 – Slave node wakeup_ind value verification, slave node trigger
Purpose	This CTC verifies that the slave node behaves as indicated in the wakeup_ind value by a slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave initiator node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the wake-up pulse. 2. The LT shall transmit the clock. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	After step 3: The IUT shall transmit the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ . The LT shall receive the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ and shall report to the UT.
Remark	---

7.2.5.8 8.CTC_3.8 – Slave node wakeup_ind value verification upon wake-up pulse transmission

[Table 21](#) specifies this CTC.

Table 21 — Slave node wakeup_ind value verification upon wake-up pulse transmission

Item	Content
CTC # – Title	8.CTC_3.8 – Slave node wakeup_ind value verification upon wake-up pulse transmission
Purpose	This CTC verifies that the slave node behaves as indicated in the wakeup_ind value by simultaneously the master node trigger and the slave node trigger. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the wake-up pulse. 2. The LT shall transmit the clock within 2.5 ms from the first rising edge of the wake-up pulse. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable

Table 21 (continued)

Item	Content
Expected response	After step 3: The IUT shall transmit the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ . The LT shall receive the TST_MSG_10_RESP_0-12 with wakeup_ind = 1 ₂ and shall report to the UT.
Remark	---

7.2.6 Sleep request/notification CTCs

7.2.6.1 8.CTC_4.1 – Master node sleep_ind verification

Table 22 specifies this CTC.

Table 22 — Master node sleep_ind verification

Item	Content
CTC # - Title	8.CTC_4.1 – Master node sleep_ind verification
Purpose	This CTC verifies that the master node behaves as indicated in the sleep_ind value. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12. 2. The UT shall control the IUT to set the condition of sleep permission (sleep_ind = 1₂). 3. The UT shall control the UT to transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12.
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with sleep_ind = 0₂. The LT shall receive the TST_MSG_01_PID and the TST_MSG_10_RESP_0-12 with sleep_ind = 0₂ and shall report to the UT.</p> <p>After step 3: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with sleep_ind = 1₂. The LT shall receive the TST_MSG_01_PID and the TST_MSG_10_RESP_0-12 with sleep_ind = 1₂. and shall report to the UT.</p>
Remark	---

7.2.6.2 8.CTC_4.2 – Slave node sleep_ind verification

Table 23 specifies this CTC.

Table 23 — Slave node sleep_ind verification

Item	Content
CTC # - Title	8.CTC_4.2 - Slave node sleep_ind verification
Purpose	This CTC verifies that the slave node behaves as indicated in the sleep_ind value. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.47 APP - NM - Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the TST_MSG_01_REQ_PID. 2. The UT shall control the IUT to set the condition of sleep permission (sleep_ind = 1₂). 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall transmit the TST_MSG_10_RESP_0-12 with sleep_ind = 0₂. The LT shall receive the TST_MSG_10_RESP_0-12 with sleep_ind = 0₂ and shall report to the UT.</p> <p>After step 3: The IUT shall transmit the TST_MSG_10_RESP_0-12 with sleep_ind = 1₂. The LT shall receive the TST_MSG_10_RESP_0-12 with sleep_ind = 1₂ and shall report to the UT.</p>
Remark	---

7.2.6.3 8.CTC_4.3 - Sleep message reception

[Table 24](#) specifies this CTC.

Table 24 — Sleep message reception

Item	Content
CTC # - Title	8.CTC_4.3 - Sleep message content
Purpose	This CTC verifies that the slave node transits into the sleep state by the sleep message. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	<p>ISO 20794-2:2020:</p> <ul style="list-style-type: none"> — REQ 8.21 APP - NM - Wake-up/sleep function (optional) - Condition of receive sleep message reception; — REQ 8.32 APP - NM - Slave node sleep function - Reception of sleep message; — REQ 8.33 APP - NM - Wake-up/sleep sequence parameter; — REQ 8.47 APP - NM - Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .

Table 24 (continued)

Item	Content
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_02_REQ_PID_SLEEP, and TST_MSG_17_RESP_SLEEP_8. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the TST_MSG_02_REQ_PID_SLEEP and the TST_MSG_17_RESP_SLEEP_8, which is specified in Table 25. 2. The LT shall stop the clock transmission within $t_{\text{clock_stop_m}}$ time and shall wait $t_{\text{sleep_s}}$ time.
Iterations	REPEAT step 1 to step 2, 2 times; The LT shall set (TC_Number = TC_Number + 1); REPEAT END.
Expected response	After step 2: The IUT shall transit into the sleep state.
Remark	The UT is connected to a multi-meter to measure current consumption of the IUT. After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.

Table 25 specifies the data field structure of the TST_MSG_17_RESP_SLEEP_8.

Table 25 — Data field structure of TST_MSG_17_RESP_SLEEP_8

TC_Number	Data field structure
#1	00 ₁₆ , FF ₁₆
#2	00 ₁₆ , 02 ₁₆ , 03 ₁₆ , 04 ₁₆ , 05 ₁₆ , 06 ₁₆ , 07 ₁₆ , 08 ₁₆

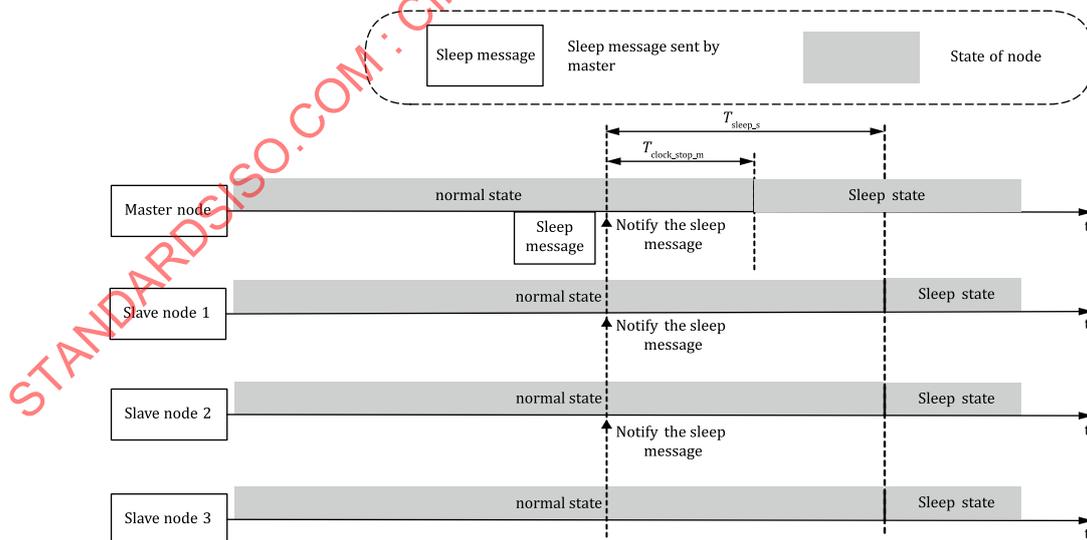


Figure 6 — Slave node receives sleep message

7.2.6.4 8.CTC_4.4 - Sleep message transmission

Table 26 specifies this CTC.

Table 26 — Sleep message transmission

Item	Content
CTC # – Title	8.CTC_4.4 – Sleep message transmission
Purpose	This CTC verifies that the master node transmits the sleep message. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.19 APP – NM – Master node wake-up request/notification – Master node sleep request/notification; — REQ 8.20 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – Sleep conditions; — REQ 8.22 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – $t_{\text{clock_stop_m}}$ time; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter; — REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_02_REQ_PID_SLEEP, and TST_MSG_17_RESP_SLEEP_8. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the TST_MSG_02_REQ_PID_SLEEP and the TST_MSG_17_RESP_SLEEP_8. 2. The UT shall control the IUT to stop the clock transmission.
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall transmit the TST_MSG_02_REQ_PID_SLEEP as 1F₁₆ and the TST_MSG_17_RESP_SLEEP_8 as 00₁₆ FF₁₆ FF₁₆ FF₁₆ FF₁₆ FF₁₆ FF₁₆ FF₁₆.</p> <p>The LT shall receive the sleep message and shall report to the UT.</p> <p>After step 2: The IUT shall stop the clock transmission within $t_{\text{clock_stop_m}}$ time (see Figure 6).</p> <p>The LT shall detect stop the clock within $t_{\text{clock_stop_m}}$ time and shall report to the UT.</p>
Remark	Step 1 is executed with sleep condition established.

7.2.6.5 8.CTC_4.5 – Abort sleep message transmission by losing arbitration 1

[Table 27](#) specifies this CTC.

Table 27 — Abort sleep message transmission by losing arbitration 1

Item	Content
CTC # – Title	8.CTC_4.5 – Abort sleep message transmission by losing arbitration 1
Purpose	This CTC verifies that the master node stops the clock transmission with aborts the sleep message transmission by losing arbitration at the sleep message transmission. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.

Table 27 (continued)

Item	Content
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.20 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – Sleep conditions; — REQ 8.22 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – $t_{\text{clock_stop_m}}$ time; — REQ 8.23 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – $t_{\text{clock_stop_m}}$ time; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter; — REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID, TST_MSG_02_REQ_PID_SLEEP, and TST_MSG_17_RESP_SLEEP_8. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<p>1. The UT shall control the IUT to transmit the TST_MSG_02_REQ_PID_SLEEP and the TST_MSG_17_RESP_SLEEP_8.</p> <p>The LT shall transmit the TST_MSG_01_REQ_PID with higher priority than the TST_MSG_02_REQ_PID_SLEEP to generate arbitration and the TST_MSG_10_RESP_0-12 with $\text{sleep_ind} = 1_2$.</p>
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall abort the sleep message.</p> <p>The IUT shall stop the clock transmission within $t_{\text{clock_stop_m}}$ time (see Figure 6).</p> <p>The LT shall detect no clock on the CXPI network within $t_{\text{clock_stop_m}}$ time and shall report to the UT.</p>
Remark	Step 1 is executed with sleep condition established.

7.2.6.6 8.CTC_4.6 – Abort sleep message transmission by losing arbitration 2

[Table 28](#) specifies this CTC.

Table 28 — Abort sleep message transmission by losing arbitration 2

Item	Content
CTC # - Title	8.CTC_4.6 – Abort sleep message transmission by losing arbitration 2
Purpose	<p>This CTC verifies that master node aborts the sleep message transmission in case of losing arbitration during the sleep message transmission.</p> <p>This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.</p>
Reference	ISO 20794-2:2020: <ul style="list-style-type: none"> — REQ 8.20 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – Sleep conditions; — REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .

Table 28 (continued)

Item	Content
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_01_REQ_PID, TST_MSG_10_RESP_0-12, TST_MSG_02_REQ_PID_SLEEP and TST_MSG_17_RESP_SLEEP_8. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<p>1. The UT shall control the IUT to transmit the TST_MSG_02_REQ_PID_SLEEP and the TST_MSG_17_RESP_SLEEP_8.</p> <p>The LT shall transmit the TST_MSG_01_REQ_PID with higher priority than the TST_MSG_02_REQ_PID_SLEEP to generate arbitration and the TST_MSG_10_RESP_0-12 with sleep_ind = 0₂.</p>
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall abort the sleep message.</p> <p style="padding-left: 40px;">The IUT shall not stop the clock transmission.</p> <p style="padding-left: 40px;">The LT shall detect the clock on the CXPI network and shall report to the UT.</p>
Remark	Step 1 is executed with sleep condition established.

7.2.6.7 8.CTC_4.7 – Abort sleep message transmission by transmission error

Table 29 specifies this CTC.

Table 29 — Abort sleep message transmission by transmission error

Item	Content
CTC # – Title	8.CTC_4.7 – Abort sleep message transmission by transmission error
Purpose	<p>This CTC verifies that the master node aborts the sleep message transmission by the transmission error, when the sleep message is transmitted.</p> <p>This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.</p>
Reference	<p>ISO 20794-2:2020:</p> <ul style="list-style-type: none"> — REQ 8.20 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – Sleep conditions; — REQ 8.22 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – $t_{\text{clock_stop_m}}$ time; — REQ 8.23 APP – NM – Wake-up/sleep function (optional) – Master node sleep function – $t_{\text{clock_stop_m}}$ time; — REQ 8.33 APP – NM – Wake-up/sleep sequence parameter; — REQ 8.47 APP – NM – Network management.
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support A_WSSup configurations (see 6.6.8), TST_MSG_02_REQ_PID_SLEEP, and TST_MSG_17_RESP_SLEEP_8. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).

Table 29 (continued)

Item	Content
Step	<ol style="list-style-type: none"> The UT shall control the IUT to transmit the TST_MSG_02_REQ_PID_SLEEP and the TST_MSG_17_RESP_SLEEP_8. The LT shall invert any bit in the TST_MSG_17_RESP_SLEEP_8 transmitted by the IUT to generate the bit error.
Iterations	Not applicable
Expected response	<p>After step 2: The IUT shall abort the TST_MSG_17_RESP_SLEEP_8.</p> <p>The IUT shall stop the clock transmission within $t_{\text{clock_stop_m}}$ time.</p> <p>The LT shall not receive the TST_MSG_17_RESP_SLEEP_8 and shall detect no clock on the CXPI network and shall report to the UT.</p>
Remark	Step 2 is performed in conjunction with step 1.

7.2.7 Network Management multi clock master processing CTCs

7.2.7.1 8.CTC_5.1 - Multi clock master sequence - Wake-up/Sleep supported

Table 30 specifies this CTC.

Table 30 — Multi clock master sequence - Wake-up/Sleep supported

Item	Content
CTC # - Title	8.CTC_5.1 - Multi clock master sequence - Wake-up/Sleep supported
Purpose	<p>This CTC verifies that the slave node behaves as the secondary clock master.</p> <p>This CTC is applicable only to an IUT, which supports the multi clock master feature.</p>
Reference	<p>ISO 20794-2:2020:</p> <ul style="list-style-type: none"> REQ 8.24 APP - NM - Slave node wake-up request/notification - Internal event notification; REQ 8.31 APP - NM - Slave node re-request of wake-up pulse; REQ 8.33 APP - NM - Wake-up/sleep sequence parameter; REQ 8.34 APP - Multi clock master sequence processing - Clock condition of secondary clock master.
Prerequisite	<p>The test system set-up shall be in accordance with Figure 2.</p> <p>The clock master is available in the SUT.</p>
Set-up	<ul style="list-style-type: none"> IUT shall be configured as a slave node (with the secondary clock master function). The IUT shall be configured to support W/S_Init configurations (see 6.6.3). The bit rate shall be set to the default value (see 6.6). The SUT shall be initialised to the sleep state (see 6.7.3).
Step	<ol style="list-style-type: none"> The UT shall control the IUT to transmit the wake-up pulse. The LT shall wait for 2nd cycle of $t_{\text{wakeup_recovery_s}}$ elapsed (see Figure 7).
Iterations	Not applicable
Expected response	<p>After step 2: The IUT shall transmit the clock within $t_{\text{check_clock}}$ time.</p> <p>The LT shall detect the clock and shall report to the UT.</p>
Remark	---

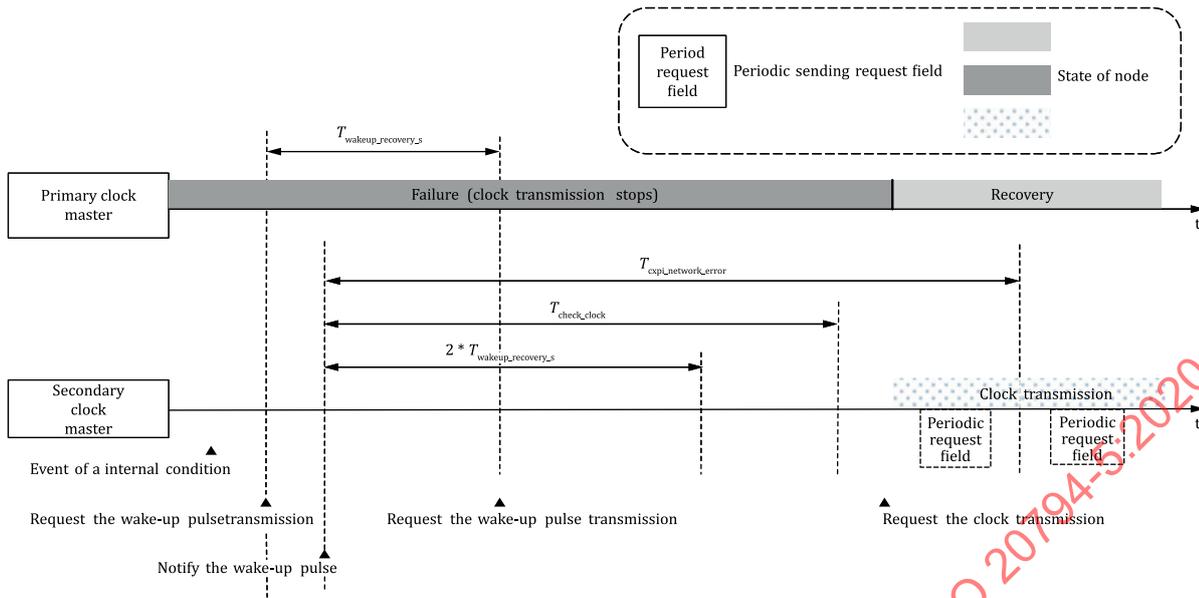


Figure 7 — Sequence of clock master switch

7.2.7.2 8.CTC_5.2 - Multi clock master sequence - Wake-up/Sleep not supported

Table 31 specifies this CTC.

Table 31 — Multi clock master sequence Wake-up/Sleep not supported

Item	Content
CTC # - Title	8.CTC_5.2 - Multi clock master sequence - Wake-up/Sleep not supported
Purpose	This CTC verifies that the slave node behaves as secondary clock master. This CTC is applicable only to an IUT, which supports the multi clock master feature.
Reference	ISO 20794-2:2020: — REQ 8.33 APP - NM - Wake-up/sleep sequence parameter; — REQ 8.34 APP - Multi clock master sequence processing - Clock condition of secondary clock master.
Prerequisite	The test system set-up shall be in accordance with Figure 2. The clock master is available in the SUT.
Set-up	IUT shall be configured as a slave node (with the secondary clock master function). — The IUT shall be configured to support NonW/S configurations (see 6.6.9). — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the power-off (see 6.7.4).
Step	1. The IUT shall be powered. 2. The LT shall wait for 2 nd cycle of $t_{wakeup_recovery_s}$ elapsed (see Figure 7).
Iterations	Not applicable
Expected response	After step 2: The IUT shall transmit the clock within t_{check_clock} time. The LT shall detect the clock and shall report to the UT.
Remark	---

7.2.7.3 8.CTC_5.3 – Clock supply stop of secondary clock master 1

Table 32 specifies this CTC.

Table 32 — Clock supply stop of secondary clock master 1

Item	Content
CTC # - Title	8.CTC_5.3 – Clock supply stop of secondary clock master 1
Purpose	This CTC verifies that the slave node stops the secondary clock master by error detection. This CTC is applicable only to an IUT, which supports the multi clock master feature.
Reference	ISO 20794-2:2020, REQ 8.34 APP – Multi clock master sequence processing – Clock condition of secondary clock master
Prerequisite	The test system set-up shall be in accordance with Figure 2 . The clock master is available in the SUT.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the clock. 2. The LT shall periodically transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with an inverted CRC value every 200 ms.
Iterations	Not applicable
Expected response	<p>After step 2: The IUT shall stop the clock transmission after 1 s from the first reception of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with inverted CRC.</p> <p>The LT shall detect no clock on the CXPI network after 1 s from the first reception of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 and shall report to the UT.</p>
Remark	---

7.2.7.4 8.CTC_5.4 – Clock supply stop of secondary clock master 2

Table 33 specifies this CTC.

Table 33 — Clock supply stop of secondary clock master 2

Item	Content
CTC # - Title	8.CTC_5.4 – Clock supply stop of secondary clock master 2
Purpose	This CTC verifies that the slave node stops the secondary clock master by error detection and normal reception. This CTC is applicable only to an IUT, which supports the multi clock master feature.
Reference	ISO 20794-2:2020, REQ 8.34 APP – Multi clock master sequence processing – Clock condition of secondary clock master.
Prerequisite	The test system set-up shall be in accordance with Figure 2 . The clock master is available in the SUT.

Table 33 (continued)

Item	Content
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the clock. 2. The LT shall periodically transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 every 100 ms. 3. The LT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with an inverted CRC value every 100 ms with 50 ms offset from step 2.
Iterations	Not applicable
Expected response	<p>After step 3: The IUT shall stop the clock transmission after 1 s from the first reception of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with an inverted CRC.</p> <p>The LT shall detect no clock on the CXPI network after 1 s from reception of the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 with an inverted CRC value and shall report to the UT.</p>
Remark	---

7.3 Fault management

7.3.1 Error detection/recovery CTCs

7.3.1.1 8.CTC_6.1 - Transmission prohibition 1 as master

Table 34 specifies this CTC.

Table 34 — Transmission prohibition 1 as master

Item	Content
CTC # - Title	8.CTC_6.1 - Transmission prohibition 1 as master
Purpose	This CTC verifies that the master node stays in the transmission prohibition state and increments the error count value based on error detection.
Reference	ISO 20794-2:2020, REQ 8.50 APP - Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_00_REQ_PTYPE, TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID or the TST_MSG_10_RESP_0-12. 2. The LT shall invert the bit in Bit_{pos} in the TST_MSG_00_REQ_PTYPE or TST_MSG_01_REQ_PID or TST_MSG_10_RESP_0-12 which is transmitted by the IUT.

Table 34 (continued)

Item	Content
Iterations	$Bit_{pos} = 0;$ REPEAT step 1 to step 2, 32 times; $Bit_{pos} = Bit_{pos} + 1;$ REPEAT END.
Expected response	After step 2: The IUT shall not transmit any messages and shall not stop the clock transmission.
Remark	The LT only inverts the stop bit in the TST_MSG_01_REQ_PID.

7.3.1.2 8.CTC_6.2 – Transmission prohibition 1 as slave

Table 35 specifies this CTC.

Table 35 — Transmission prohibition 1 as slave

Item	Content
CTC # - Title	8.CTC_6.2 – Transmission prohibition 1 as slave
Purpose	This CTC verifies that the slave node stays in the transmission prohibition state and increments the error count value based on error detection.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_00_REQ_PTYPE, TST_MSG_01_REQ_PID, and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the TST_MSG_01_REQ_PID. 2. The LT shall invert the bit in Bit_{pos} in the TST_MSG_10_RESP_0-12 which is transmitted by the IUT. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	$Bit_{pos} = 0;$ REPEAT step 1 to step 2, 32 times; $Bit_{pos} = Bit_{pos} + 1;$ REPEAT END.
Expected response	After step 3: <p style="text-align: center;">The IUT shall not transmit any messages. The LT shall report no messages to the UT.</p>
Remark	The LT only inverts the stop bit in the TST_MSG_01_REQ_PID.

7.3.1.3 8.CTC_6.3 – Transmission prohibition 2 as master

Table 36 specifies this CTC.

Table 36 — Transmission prohibition 2 as master

Item	Content
CTC # - Title	8.CTC_6.3 – Transmission prohibition 2 as master

Table 36 (continued)

Item	Content
Purpose	This CTC verifies that the master node stays in the transmission prohibition state and increments the error count value based on error detection and normal reception.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_00_REQ_PTYPE, TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The UT shall control the IUT to transmit the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID or the TST_MSG_10_RESP_0-12. 2. The LT shall invert the bit in Bit_{pos} in the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID or the TST_MSG_10_RESP_0-12 which is transmitted by the IUT. 3. The UT shall control the IUT to transmit the TST_MSG_00_REQ_PTYPE or the TST_MSG_01_REQ_PID or the TST_MSG_10_RESP_0-12. 4. The LT shall invert the bit in Bit_{pos} in the TST_MSG_00_REQ_PTYPE, the TST_MSG_01_REQ_PID or the TST_MSG_10_RESP_0-12 which is transmitted by the IUT.
Iterations	$Bit_{pos} = 0;$ REPEAT step 1 to step 2, 31 times; $Bit_{pos} = Bit_{pos} + 1;$ REPEAT END; REPEAT step 3, 8 times; REPEAT END; REPEAT step 3 to step 4, 2 times; $Bit_{pos} = Bit_{pos} + 1;$ REPEAT END.
Expected response	After step 4: The IUT shall not transmit any messages and shall not stop the clock transmission. The LT shall report no messages to the UT.
Remark	The LT only inverts the stop bit in the TST_MSG_01_REQ_PID.

7.3.1.4 8.CTC_6.4 – Transmission prohibition 2 as slave

[Table 37](#) specifies this CTC.

Table 37 — Transmission prohibition 2 as slave

Item	Content
CTC # - Title	8.CTC_6.4 – Transmission prohibition 2 as slave
Purpose	This CTC verifies that the slave node stays in the transmission prohibition state and increments the error count value based on error detection and normal reception.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .

Table 37 (continued)

Item	Content
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the default state (see 6.7.2).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the TST_MSG_01_REQ_PID. 2. The LT shall invert the bit in Bit_{pos} in the TST_MSG_10_RESP_0-12 which is transmitted by the IUT. 3. The LT shall transmit the TST_MSG_01_REQ_PID. 4. The LT shall invert the bit in Bit_{pos} in the TST_MSG_10_RESP_0-12 which is transmitted by the IUT. 5. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	<p>$Bit_{pos} = 0$;</p> <p>REPEAT step 1 to step 2, 31 times;</p> <p style="padding-left: 40px;">$Bit_{pos} = Bit_{pos} + 1$;</p> <p>REPEAT END;</p> <p>REPEAT step 3, 8 times;</p> <p>REPEAT END;</p> <p>REPEAT step 3 to step 4, 2 times;</p> <p style="padding-left: 40px;">$Bit_{pos} = Bit_{pos} + 1$;</p> <p>REPEAT END.</p>
Expected response	<p>After step 5: The IUT shall not transmit any messages.</p> <p style="padding-left: 100px;">The LT shall report no messages to the UT.</p>
Remark	The LT only inverts the stop bit in the TST_MSG_01_REQ_PID.

7.3.1.5 8.CTC_6.5 – Master node recovery from transmission prohibition by system reset

Table 38 specifies this CTC.

Table 38 — Master node recovery from transmission prohibition by system reset

Item	Content
CTC # - Title	8.CTC_6.5 – Master node recovery from transmission prohibition by system reset
Purpose	This CTC verifies that the master node recovers from the transmission prohibition by a system reset.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the prohibit transmission state (see 6.7.5).

Table 38 (continued)

Item	Content
Step	<ol style="list-style-type: none"> The UT shall control the SUT to execute a system reset. The UT shall control the IUT to transmit the clock. The UT shall control the IUT to transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12.
Iterations	Not applicable
Expected response	After step 3: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12. The LT shall receive the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 and shall report to the UT.
Remark	---

7.3.1.6 8.CTC_6.6 – Master node recovery from transmission prohibition by sleep/wake-up

Table 39 specifies this CTC.

Table 39 — Master node recovery from transmission prohibition by sleep/wake-up

Item	Content
CTC # - Title	8.CTC_6.6 – Master node recovery from transmission prohibition by sleep/wake-up
Purpose	This CTC verifies that the master node recovers from the transmission prohibition by sleep/wake-up. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition;
Prerequisite	The test system set-up shall be in accordance with Figure 2.
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a master node. — The IUT shall be configured to support W/S_Init configurations (see 6.6.3), TST_MSG_01_REQ_PID, and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the prohibit transmission state (see 6.7.5).
Step	<ol style="list-style-type: none"> The UT shall control the IUT to execute a CXPI network error. The UT shall control the IUT to transmit the clock after $t_{\text{cxpi_network_error}}$ elapsed. The UT shall control the IUT to transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12.
Iterations	Not applicable
Expected response	After step 1: The IUT shall transit into the sleep state after $t_{\text{cxpi_network_error}}$ elapsed. After step 3: The IUT shall transmit the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12. The LT shall receive the TST_MSG_01_REQ_PID and the TST_MSG_10_RESP_0-12 and shall report to the IUT.
Remark	The UT is connected to a multi-meter to measure current consumption of the IUT. After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.

7.3.1.7 8.CTC_6.7 – Slave node recovery from transmission prohibition by sleep/wake-up

Table 40 specifies this CTC.

Table 40 — Slave node recovery from transmission prohibition by sleep/wake-up

Item	Content
CTC # - Title	8.CTC_6.7 – Slave node recovery from transmission prohibition by sleep/wake-up
Purpose	This CTC verifies that the slave node recovers from the transmission prohibition by sleep/wake-up. This CTC is applicable only to an IUT, which supports the wake-up/sleep feature.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support User_Specific configurations (see 6.6.3), TST_MSG_01_REQ_PID and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the prohibit transmission state (see 6.7.5).
Step	<ol style="list-style-type: none"> 1. The LT shall stop to transmit the clock. 2. The LT shall transmit the clock after $t_{\text{cxpi_network_error}}$ elapsed. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable
Expected response	<p>After step 1: The IUT shall transit into the sleep state after $t_{\text{cxpi_network_error}}$ elapsed.</p> <p>After step 3: The IUT shall transmit the the TST_MSG_10_RESP_0-12.</p> <p>The LT shall receive the the TST_MSG_10_RESP_0-12 and shall report to the UT.</p>
Remark	<p>The UT is connected to multi-meter to measure current consumption of the IUT.</p> <p>After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.</p>

7.3.1.8 8.CTC_6.8 – Slave node recovery from transmission prohibition by system reset

[Table 41](#) specifies this CTC.

Table 41 — Slave node recovery from transmission prohibition by system reset

Item	Content
CTC # - Title	8.CTC_6.8 – Slave node recovery from transmission prohibition by system reset
Purpose	This CTC verifies that the slave node recovers from the transmission prohibition by system reset.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition.
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node. — The IUT shall be configured to support W/S_passive configurations (see 6.6.5) and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the prohibit transmission state (see 6.7.5).
Step	<ol style="list-style-type: none"> 1. The LT shall transmit the clock. 2. The UT shall control the SUT to execute a system reset. 3. The LT shall transmit the TST_MSG_01_REQ_PID.
Iterations	Not applicable

Table 41 (continued)

Item	Content
Expected response	After step 2: The IUT shall transit into the sleep state. After step 3: The IUT shall transmit the TST_MSG_10_RESP_0-12. The LT shall receive the TST_MSG_10_RESP_0-12 and shall report to the UT.
Remark	The UT is connected to multi-meter to measure current consumption of the IUT. After the IUT transits into the sleep state, the UT measures that the current consumption of the IUT is less than the value specified in the IUT data sheet.

7.3.1.9 8.CTC_6.9 – Recovery from transmission prohibition by normal reception

Table 42 specifies this CTC.

Table 42 — Recovery from transmission prohibition by normal reception

Item	Content
CTC # – Title	8.CTC_6.9 – Recovery from transmission prohibition by normal reception
Purpose	This CTC verifies that the IUT recovers from the transmission prohibition by the normal reception.
Reference	ISO 20794-2:2020, REQ 8.50 APP – Transmission prohibition;
Prerequisite	The test system set-up shall be in accordance with Figure 2 .
Set-up	<ul style="list-style-type: none"> — The IUT shall be configured as a slave node or a master node. — The IUT shall be configured to support User Specific configurations (see 6.6.3), TST_MSG_01_REQ_PID, TST_MSG_00_REQ_PTYPE and TST_MSG_10_RESP_0-12. — The bit rate shall be set to the default value (see 6.6). — The SUT shall be initialised to the prohibit transmission (see 6.7.5).
Step	<ol style="list-style-type: none"> 1. The LT shall wait for 500 ms or more after the transmission prohibition state is established in the SUT. 2. The LT shall transmit the TST_MSG_01_REQ_PID or the TST_MSG_00_REQ_PTYPE according to Table 43.
Iterations	TC_Number = 0; REPEAT step 1, 2 times; The LT shall set (TC_Number = TC_Number + 1); REPEAT END.
Expected response	See Table 43 .
Remark	--

Table 43 specifies the expected response of 8.CTC_6.9.

Table 43 — Recovery from transmission prohibition by normal reception

TC_Number	Test message to be transmitted by the LT	Expected response
#1	TST_MSG_01_REQ_PID	After step 2: The IUT shall transmit the TST_MSG_10_RESP_0-12. The LT shall receive the TST_MSG_10_RESP_0-12 and shall report to the UT.
#2	TST_MSG_01_REQ_PID with an inverted parity bit	After step 2: The IUT shall not transmit any messages. The LT shall report no messages to the UT.