JASO

Automobiles - Clock Extension Peripheral Interface (CXPI) - Part1: General Information and Use Cases Definition

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FOREWORD

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There are following part in the **JASO D015**.

JASO D015-1 Part1：General Information and Use Cases Definition
JASO D015-2 Part2：Transport Protocol and Network Layer Services
JASO D015-3 Part3：Protocol Specification
JASO D015-4 Part4：Unified diagnostic services on Clock extension peripheral interface (UDSonCXPI)
JASO D015-5 Part5：Protocol Conformance Test Specification

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Automobiles - Clock Extension Peripheral Interface (CXPI) -Part1 : General Information and Use Cases Definition

INTRODUCTION

The objective of this standard "Clock Extension Peripheral Interface" (abbreviation: CXPI) communication protocol is to define a specification which enables the arbitration without destructing even if the protocol sends the PWM (Pulse Width Modulation) waveform which is superimposed the data and clock on communication bus and also the multiple peripherals send the UART (Universal Asynchronous Receiver Transmitter) at the same time.

1 SCOPE

This standard defines the CXPI general information and use cases for mainly HMI (Human Machine Interface) of road vehicles electric system.

2 REFERENCES

The following standards contain sections which, through reference in this text, constitute sections of this standard. For dated references, it shall apply the version but not the revised version (including the supplemental version). For the undated references, the latest edition of the normative document referred to applies (including the supplemental version).

JIS X 0001: 1994 Glossary of terms used in information processing - Fundamental terms
JIS X 0005: 2002 Glossary of terms used in information processing (Representation of data)
JIS X 0009: 1997 Glossary of terms used in information processing (Data communication)
JIS X 0025: 1994 Glossary of terms used in information processing (Local area networks)
JIS X 0026: 1995 Glossary of terms used in information processing (Open Systems Interconnection)

3 TERMS AND DEFINITIONS

For the purposes of this standard, the following terms and definitions, other than those given in **JIS X 0001**, **JIS X 0005**, **JIS X 0009**, **JIS X 0025** and **JIS X 0026** apply.

3.1

IFS

Becoming less crowded of the communication bus among frames.

3.2

master node

Only one node in a system having function of schedule management and a primary clock master.

3.3

slave node

Each node other than master node connected with system

3.4

schedule

Information specifying which frame is transmitted to which timing that becomes the origin of periodic

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transmission

3.5

sequence

Procedure of transmission and reception of the data among two or more nodes

3.6

PTYPE field

Abbreviation of Protected TYPE field. It includes the parity bit of “1 bit” and the frame TYPE of “7 bit”.

3.7

PID field

Abbreviation of Protected ID field. It includes the parity bit of “1 bit” and the frame ID of “7 bit”.

3.8

operational state

Supported wakeup/ sleep; in the state of normal mode, Non-supported wakeup/ sleep; in the state of power-on

3.9

event transmission

(Method 1) On Event Trigger Method, to send out the PID field after any one of nodes has detected IFS on the communication bus. (Method 2) On Polling Method, to send out the PID field immediately after the master node sends out the PTYPE field.

4 SYMBOLS AND ABBREVIATED TERMS

4.1 Abbreviated Terms

BAT	BAT pin of the transceiver
BUS	BUS pin of the transceiver
CLK	CLK pin of the transceiver
CRC	Cyclic Redundancy Check
GND	GND pin of the transceiver
HI	HIgh
IBS	Inter Byte Space
IFS	Inter Frame Space
LO	LOw
NRZ	Non Return to Zero
NSLP	NSLP pin of the transceiver
OSC	OSCillator
OSI	Open Systems Interconnection
PID	Protected ID
PTYPE	Protected TYPE
PWM	Pulse Width Modulation
RXD	RXD pin of the transceiver
TXD	TXD pin of the transceiver

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UART Universal Asynchronous Receiver Transmitter

5 USE CASE SPECIFICATION

5.1 JASO D015 Overview

5.1.2 Outline

The **JASO D015** specification defines the fundamental requirements for a vehicle network system using the CXPI communication protocol.

5.1.2 Configuration and outline of the specification

The configuration and outline of the **JASO D015** series documents are shown below;

a) Automobiles - Clock Extension Peripheral Interface (CXPI) - Part 1 : General information and the use cases definition

Describes the configuration and general information of the CXPI specification, and the definition of the use cases corresponding to each specification of **JASO D015**.

b) Automobiles - Clock Extension Peripheral Interface (CXPI) - Part 2 : Transport protocol and Network layer service specification (to be issued)

c) Automobiles - Clock Extension Peripheral Interface (CXPI) - Part 3 : Protocol specification

Defines the fundamental requirements for the Data Link layer and the Physical layer of the CXPI communication protocol.

d) Automobiles - Clock Extension Peripheral Interface (CXPI) - Part 4 : Application Program Interface (API) specification (to be issued)

e) Automobiles - Clock Extension Peripheral Interface (CXPI) - Part 5 : Protocol conformance test specification

Defines the fundamental requirements for testing the conformance of an implementation based on the **JASO D015** Part 3 : Protocol Specification.

5.1.3 OSI model

The **JASO D015** refers to the Open System Interconnection (OSI) model and illustrates parts of this standard which correspond to the OSI Layer 1 through Layer 7.

5.1.4 Reference relationship between JASO D015 and OSI model

Figure 1 shows the reference relationship between the each standard of **JASO D015** and the each layer of the OSI model.

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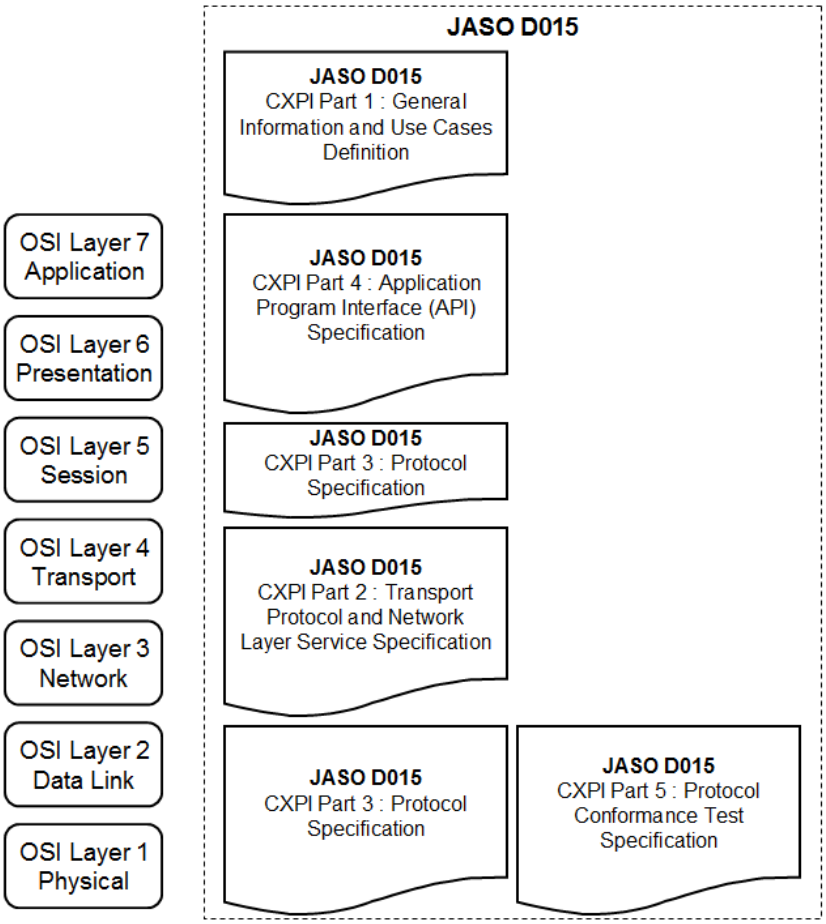

Figure 1 - Relationship between 7 layers of OSI model and CXPI specification

5.2 Use Case Over view

5.2.1 Guide lines for Use Case definition

The purpose of the use case definition is described below;

a) To illustrate usage examples of the CXPI communication protocol, as a reference for product and system design

b) To illustrate operational examples in cases where the CXPI communication network falls into an abnormal state, as a reference for product and system design

5.2.2 Configuration of use case definition

Table 1 shows the configuration of CXPI use case definition. More than one use case may be included in each configuration component.

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Table 1 - Configuration of CXPI use cases definition

No.	Classification of CXPI use case definition	Description
1	CXPI Frame Transmission	Describes operation examples of the processing sequence when sending and receiving frames.
2	CXPI Communication Protocol	Describes the operation examples of the specific features of the CXPI communication protocol.
3	CXPI Error Confinement	Describes the operation examples in case of error occurrence e.g. electrical abnormal status is detected on the communication bus.
4	CXPI Implementation	Describes implementation examples of the network which is based on the CXPI communication protocol or the products which implement the CXPI communication protocol.

5.3 Definition of use cases

5.3.1 CXPI Frame Transmission

5.3.1.1 Control methods of Frame transmittion

The CXPI communication protocol provides two access methods shown in **Table 2**, **Table 3** and **Table 4**. Either method can be chosen and implemented according to the system requirements.

Table 2 - (Method 1) Event Trigger Method

Use case name	(Method 1) Event Trigger Method
Goal	Configuration of a network system in which any node can transmit a PID field.
Actor	All nodes of method 1
Use case input	1) Internal requirement for transmitting PID field occurs 1) Detection of an IFS 2) Reception of a PID field
Use case output	1) Transmission of a PID field 2) Transmission of a response
Brief description	1) All nodes, - which are in operational state and - the data transmission on the communication bus is available and - which have registered an internal event and - the node has already detected the IFS then - the node can transmit the PID field on the communication bus 2) All nodes, - which are in operational state and - the data transmission on the communication bus is available and - the node receives the PID field which is associated to its own data then - the node shall transmit a response
Classification	Optional

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Table 3 - (Method 2) Polling Method - Master node

Use case name	(Method 2) Polling Method
Goal	To build a network system where any node can transmit the PID field following the master node's PTYPE field transmission, and any node can transmit a response corresponding to the PID field.
Actor	Master node of Method 2
Use case input	1) Internal requirement for transmitting PTYPE field occurs 1) Internal requirement for transmitting PID field occurs 1) Detect IFS 2) Receive PID field
Use case output	1) Transmit PTYPE field 1) Transmit PID field 2) Transmit response
Brief description	1) Master node, - which is in operational state and - the data transmission on the communication bus is available and - the requirement for transmission of a PTYPE field or a PID field has occured and - the IFS has been detected or the last frame does not overlap the field being sent out currently, then - the master node can transmit the PTYPE field or the PID field. 2) Master node, - which is in operational state and - the data transmission on the communication bus is available and - the master node receives the PID field which is associated with its own data then - the master node shall transmit a response.
Classification	Optional

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