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Industrial automation systems and integration — Open systems application integration framework —

Part 5: Reference description for HDLC-based control systems

Systèmes d'automatisation industrielle et intégration — Cadres d'intégration d'application pour les systèmes ouverts —

Partie 5: Description de référence pour les systèmes de contrôle fondés sur HDLC

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Foreword

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ISO 15745-5 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 5, *Architecture, communications and integration frameworks*.

ISO 15745 consists of the following parts under the title *Industrial automation systems and integration — Open systems application integration framework*:

— *Part 1: Generic reference description*

— *Part 2: Reference description for ISO 11898-based control systems*

— *Part 3: Reference description for IEC 61158-based control systems*

— *Part 4: Reference description for Ethernet-based control systems*

— *Part 5: Reference description for HDLC-based control systems*

Introduction

The application integration framework (AIF) described in ISO 15745 defines elements and rules that facilitate:

— the systematic organization and representation of the application integration requirements using integration models;

— the development of interface specifications in the form of application interoperability profiles (AIPs) that enable both the selection of suitable resources and the documentation of the "as built" application.

ISO 15745-1 defines the generic elements and rules for describing integration models and AIPs, together with their component profiles - process profiles, information exchange profiles, and resource profiles. The context of ISO 15745 and a structural overview of the constituents of an AIP are given in Figure 1 of ISO 15745-1:2003.

This part of ISO 15745 extends the generic AIF described in ISO 15745-1 by defining the technology specific elements and rules for describing both communication network profiles and the communication related aspects of device profiles specific to HDLC[1] -based control systems (CC-Link[2]). CC-Link is based on HDLC technology.

In particular, this part of ISO 15745 describes technology specific profile templates for the device profile and the communication network profile. Within an AIP, a device profile instance or a communication network profile instance is part of the resource profile defined in ISO 15745-1. The device profile and the communication network profile XML instance files are included in a resource profile XML instance using the ProfileHandle_DataType as specified in ISO 15745-1:2003, 7.2.5.

AIFs specified using the elements and rules of ISO 15745-1 can be easily integrated with the component profiles defined using the elements and rules specified in this part of ISO 15745.

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1) HDLC is used in this document as a synonym for ISO/IEC 13239.

2) CC-Link is the trade name of the CC-Link Partner Association (CLPA). This information is given for the convenience of users of ISO 15745 and does not constitute an endorsement by ISO of the trade name holder or any of its products. Compliance to this part of ISO 15745 does not require use of the trade name CC-Link. Use of the trade name CC-Link requires permission of the CLPA.

Industrial automation systems and integration — Open systems application integration framework — Part 5: Reference description for HDLC-based control systems

1 Scope

This part of ISO 15745 defines the technology specific elements and rules for describing both communication network profiles and the communication related aspects of device profiles specific to HDLC-based control systems.

NOTE Generic elements and rules for describing integration models and application interoperability profiles, together with their component profiles (process profiles, information exchange profiles, and resource profiles) are specified in ISO 15745-1.

This part of ISO 15745 is to be used in conjunction with ISO 15745-1 to describe an application integration framework.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15745-1:2003, *Industrial automation systems and integration – Open systems application integration framework – Part 1: Generic reference description*

ISO/IEC 13239, *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures*

REC-xml-20040204, *Extensible Markup Language (XML) 1.0 Third Edition – W3C Recommendation 04 February 2004*

REC-xmlschema-1-20010502, *XML Schema Part 1: Structures – W3C Recommendation 02 May 2001*

REC-xmlschema-2-20010502, *XML Schema Part 2: Datatypes – W3C Recommendation 02 May 2001*

UML V1.4, *OMG - Unified Modeling Language Specification (Version 1.4, September 2001)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15745-1 apply.

NOTE The UML terminology and notation used in this part of ISO 15745 is described in Annex A of ISO 15745-1:2003 and Annex B of this part of ISO 15745.

4 Abbreviated terms

AIF	Application Integration Framework
AIP	Application Interoperability Profile
ASCII	American Standard Code for Information Interchange
CSP	CC-Link System Profile (see BAP-05028)
HDLC	High-level Data Link Control (see ISO/IEC 13239)
IAS	Industrial Automation Systems
I/O	Input and Output
LT	CC-Link/LT
OSI	Open System Interconnection
RWr	Remote register for read
RWw	Remote register for write
RX	Remote input
RY	Remote output
SEMI	Semiconductor Equipment and Materials International (in this context refer to SEMI standard, SEMI E54.12-0701)
UML	Unified Modeling Language (see UML V1.4)
XML	eXtensible Markup Language (see REC-xml-20040204)

5 Technology specific elements and rules

5.1 Integration models and IAS interfaces

The AIP developer shall develop the integration model using the rules described in ISO 15745-1, and shall ensure that the HDLC-based device and communication network profiles (whether representing the interface requirements or those derived from existing devices/communication networks) include the necessary IAS interfaces. The IAS interfaces included in the profile shall be identified in the header section (see ISO 15745-1:2003, 7.2.2).

NOTE IAS interfaces are described in ISO 15745-1:2003, Annex B.

5.2 Profile templates

5.2.1 General

The HDLC-based technology specific profile templates are derived from the generic profile templates specified in ISO 15745-1:2003, clause 7.

5.2.2 Contents and syntax

ISO 15745 specifies profile templates that are XML schemas (REC-xmlschema-1-20010502 and REC-xmlschema-2-20010502) and use a common general structure. The device and communication network profiles based on these templates typically contain:

— information needed to identify the connected device,

— a description of device data that can be accessed via the network,

— a description of the communication capabilities supported by the device,

— additional vendor-specific information.

However, CC-Link technology uses specific legacy ASCII syntax. Hence, for backward compatibility, template definitions (see Annex A) include the following:

— communication network and device profile templates, as defined in ISO 15745-1,

— ISO 15745 template to encapsulate files with legacy ASCII syntax ("wrapper").

5.2.3 Header

The profile template header defined in ISO 15745-1:2003, 7.2.2, is used for HDLC-based technology specific profile templates. Each technology uses one or more names to identify the technology or its particular component(s) (see Table 1). The selected name shall be stored in the ProfileTechnology attribute in the header section.

Table 1 — ProfileTechnology names

ProfileTechnology name	Technology
CC-Link	CC-Link
CSP	CC-Link

5.3 Technology specific profiles

The technology specific communication network profile structure and communication related aspects of device profile structure based on HDLC technology are described in clause 6. The technology included is CC-Link (see 6.2).

The related profile template definitions are specified in Annex A.

6 Device and communication network profiles for HDLC-based control systems

6.1 General

The CC-Link technology specific device and communication network profiles are described in 6.2.

6.2 CC-Link

6.2.1 Device profile

6.2.1.1 General

Figure 1 shows the class structure of the CC-Link device profile.

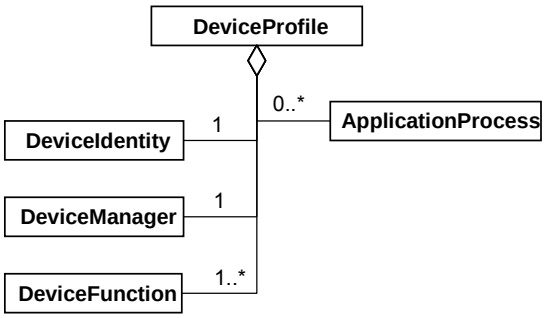

Figure 1 — CC-Link device profile class diagram

The DeviceProfile class of any version of CC-Link except version LT may include the ApplicationProcess class. The DeviceProfile class of CC-Link version LT shall not include the ApplicationProcess class.

The available formats for CC-Link device profiles are described in A.2.

The XML schema representing the CC-Link device profiles template is defined in A.2.1.3. The file name of this XML schema shall be “CC-Link_DeviceProfile.xsd”.

The XML schema representing the encapsulation of a CC-Link CSP into the ISO 15745 device profile template is defined in A.2.2.2. The file name of this XML schema shall be “CSP_DeviceProfile_wrapper.xsd”. The legacy CSP ASCII syntax itself is described in A.4.

6.2.1.2 Device identity

Figure 2 shows the class structure of the DeviceIdentity class.

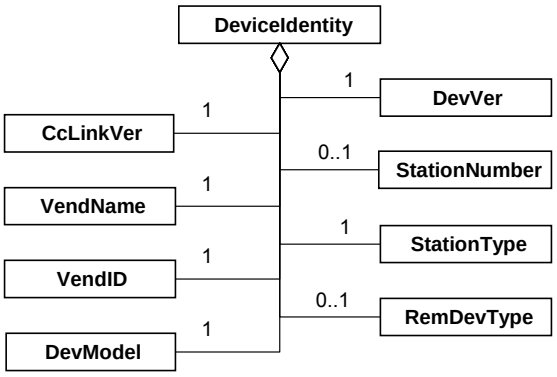

Figure 2 — CC-Link DeviceIdentity class diagram

The DeviceIdentity class shall consist of the child classes shown in Figure 2 and specified in Table 2. Child classes of DeviceIdentity class apply to profile, type, and instance.

Table 2 — Child classes of DeviceIdentity class

Class	Description
CcLinkVer	CC-Link version used by the device
VendName	vendor name
VendID	vendor code
DevModel	model name
DevVer	version number
StationNumber	Identifier of the device
StationType	type code for slave station
RemDevType	type code for remote device station

6.2.1.3 Device manager

6.2.1.3.1 General

Figure 3 shows the structure of the DeviceManager class.

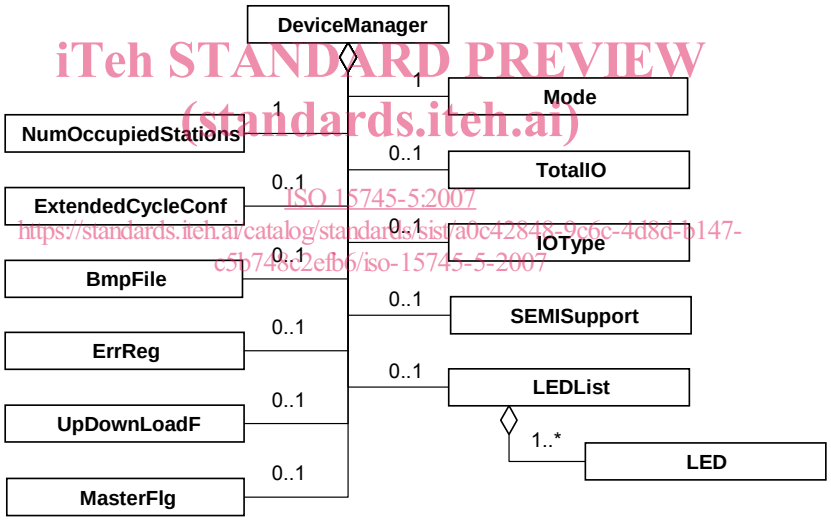

Figure 3 — CC-Link DeviceManager class diagram

The DeviceManager class consists of the child classes shown in Figure 3 and Table 3.

Table 3 — Child classes of DeviceManager class

Class	Version 1.00 / 1.10	Version 1.11	Version 2.00	Version LT
NumOccupiedStations	Mandatory	Mandatory	Mandatory	Mandatory
ExtendedCycleConf	Not applicable	Not applicable	Optional	Not applicable
BmpFile	Mandatory	Mandatory	Mandatory	Not applicable
ErrReg	Optional	Optional	Optional	Not applicable
UpDownLoadF	Mandatory	Mandatory	Mandatory	Not applicable
MasterFlg	Optional	Optional	Optional	Not applicable
Mode	Mandatory	Mandatory	Mandatory	Mandatory
TotalIO	Optional	Optional	Optional	Optional
IOType	Optional	Optional	Optional	Optional
SEMISupport	Not applicable	Optional	Optional	Not applicable
LEDList	Optional	Optional	Optional	Optional
NOTE The four right hand columns indicate whether a certain child class is mandatory, optional, or not applicable for a device profile of a specified CC-Link version.				

6.2.1.3.2 NumOccupiedStations

NumOccupiedStations is the number of occupied stations.

6.2.1.3.3 ExtendedCycleConf

ExtendedCycleConf is the extension level of an amount of I/O points used in the extended cyclic communication.

6.2.1.3.4 BmpFile

BmpFile is the name of the associated bitmap file.

6.2.1.3.5 ErrReg

ErrReg is a register used to store an error code.

6.2.1.3.6 UpDownLoadF

UpDownLoadF indicates whether an upload and download is applicable or not.

6.2.1.3.7 MasterFlg

MasterFlg indicates whether the device can be a standby master or not.

6.2.1.3.8 Mode

Mode indicates supporting operation modes (see Table A.3).

6.2.1.3.9 TotalIO

TotalIO is the total number of I/O points (see Table A.4).

6.2.1.3.10 IOType

IOType is the type of I/O (see Table A.5).

6.2.1.3.11 SEMISupport

SEMISupport indicates whether the SEMI standard function is supported or not.

6.2.1.3.12 LEDList, LED

The LEDList is a listing of available LEDs. The LED describes the name and the possible state of the LED on the device (see Table A.6).

6.2.1.4 Device function

Figure 4 shows the structure of the DeviceFunction class.

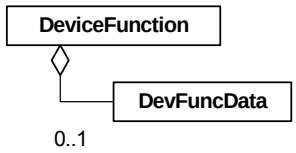

Figure 4 — CC-Link DeviceFunction class diagram

NOTE The definition of the DevFuncData of the DeviceFunction is outside the scope of this part of ISO 15745.

6.2.1.5 Application process

6.2.1.5.1 General

Figure 5 shows the class structure of the ApplicationProcess class.

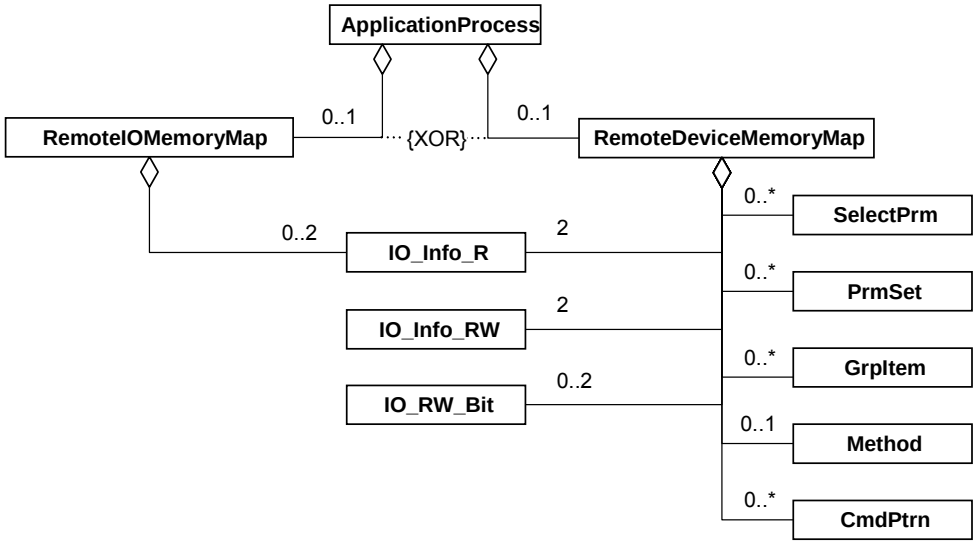

Figure 5 — CC-Link ApplicationProcess class diagram

6.2.1.5.2 RemoteIOMemoryMap

6.2.1.5.2.1 General

RemoteIOMemoryMap is a CSP profile equivalent for a remote I/O device. The CSP profile is described in A.4.

6.2.1.5.2.2 IO_Info_R

Figure 6 shows the class structure of the IO_Info_R class.

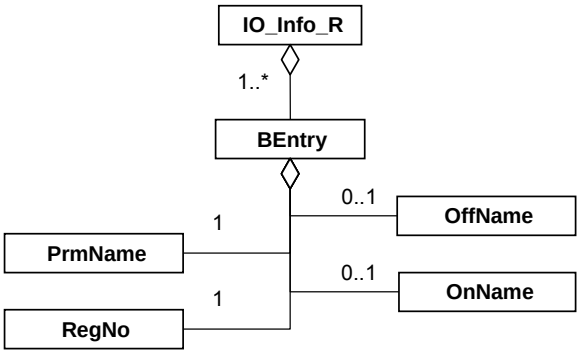

Figure 6 — CC-Link IO_Info_R class diagram

The IO_Info_R represents IO_Info_RX section and IO_Info_RY section of the CSP profile. A BEntry shall contain the child classes shown in Figure 6 and A.2.1.2.4.1.

6.2.1.5.3 RemoteDeviceMemoryMap

6.2.1.5.3.1 General

RemoteDeviceMemoryMap is a CSP profile equivalent for a remote device.

6.2.1.5.3.2 IO_Info_R

The class structure of the IO_Info_R class is described in 6.2.1.5.2.2.

6.2.1.5.3.3 IO_Info_RW

Figure 7 shows the class structure of IO_Info_RW class.

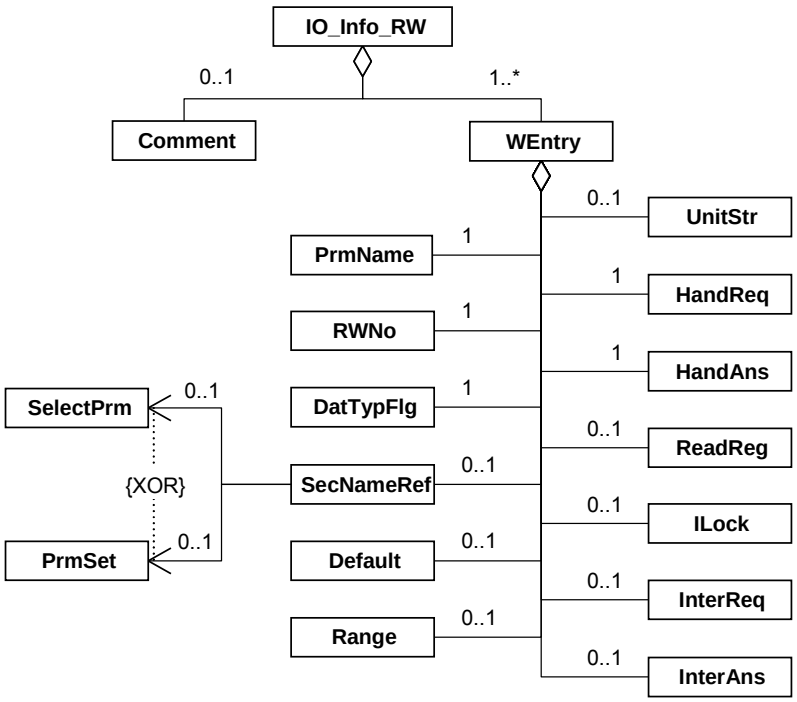

Figure 7 — CC-Link IO_Info_RW class diagram

Comment class is used to annotate. A WEntry contains the child classes shown in Figure 7 and A.2.1.2.4.2. A WEntry represents parameters of a word register.

6.2.1.5.3.4 IO_RW_Bit

Figure 8 shows the class structure of IO_RW_Bit class.

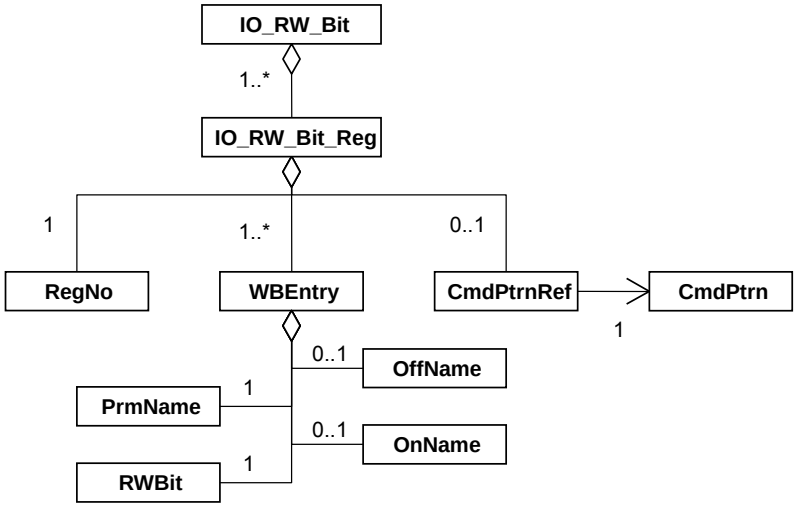

Figure 8 — CC-Link IO_RW_Bit class diagram