

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 5-23: Application layer service definition – Type 23 elements**

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Type 23 elements****FOREWORD**

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NOTE Combinations of protocol types are specified in the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61158-5-23 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This third edition cancels and replaces the second edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) addition of Type T ASE (6.2.10 to 6.2.15).
- b) addition of Type T AR (6.5).

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/1203/FDIS	65C/1244/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This document is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the "three-layer" fieldbus reference model described in IEC 61158-1.

The application service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This document defines the application service characteristics that fieldbus applications and/or system management can exploit.

Throughout the set of fieldbus standards, the term "service" refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the application layer service defined in this document is a conceptual architectural service, independent of administrative and implementation divisions.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-23: Application layer service definition – Type 23 elements

1 Scope

1.1 General

The Fieldbus Application Layer (FAL) provides user programs with a means to access the fieldbus communication environment. In this respect, the FAL can be viewed as a "window between corresponding application programs".

This part of IEC 61158 provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 23 fieldbus. The term "time-critical" is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This document defines in an abstract way the externally visible service provided by the different Types of the fieldbus Application Layer in terms of

- a) an abstract model for defining application resources (objects) capable of being manipulated by users via the use of the FAL service,
- b) the primitive actions and events of the service;
- c) the parameters associated with each primitive action and event, and the form that they take; and
- d) the interrelationship between these actions and events, and their valid sequences.

The purpose of this document is to define the services provided to

- a) the FAL user at the boundary between the user and the Application Layer of the Fieldbus Reference Model, and
- b) Systems Management at the boundary between the Application Layer and Systems Management of the Fieldbus Reference Model.

This document specifies the structure and services of the IEC Fieldbus Application Layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) and the OSI Application Layer Structure (ISO/IEC 9545).

FAL services and protocols are provided by FAL application-entities (AE) contained within the application processes. The FAL AE is composed of a set of object-oriented Application Service Elements (ASEs) and a Layer Management Entity (LME) that manages the AE. The ASEs provide communication services that operate on a set of related application process object (APO) classes. One of the FAL ASEs is a management ASE that provides a common set of services for the management of the instances of FAL classes.

Although these services specify, from the perspective of applications, how request and responses are issued and delivered, they do not include a specification of what the requesting and responding applications are to do with them. That is, the behavioral aspects of the applications are not specified; only a definition of what requests and responses they can send/receive is specified. This permits greater flexibility to the FAL users in standardizing such object behavior. In addition to these services, some supporting services are also defined in this document to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this document is to specify the characteristics of conceptual application layer services suitable for time-critical communications, and thus supplement the OSI Basic Reference Model in guiding the development of application layer protocols for time-critical communications.

A secondary objective is to provide migration paths from previously existing industrial communications protocols. It is this latter objective which gives rise to the diversity of services standardized as the various Types of IEC 61158, and the corresponding protocols standardized in subparts of IEC 61158-6.

This document can be used as the basis for formal Application Programming-Interfaces. Nevertheless, it is not a formal programming interface, and any such interface will need to address implementation issues not covered by this specification, including

- a) the sizes and octet ordering of various multi-octet service parameters, and
- b) the correlation of paired request and confirm, or indication and response, primitives.

1.3 Conformance

This document does not specify individual implementations or products, nor does it constrain the implementations of application layer entities within industrial automation systems.

There is no conformance of equipment to this application layer service definition standard. Instead, conformance is achieved through implementation of conforming application layer protocols that fulfill any given Type of application layer services as defined in this document.

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.

NOTE All parts of the IEC 61158 series, as well as the IEC 61784-1 series and the IEC 61784-2 series are maintained simultaneously. Cross -references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61158-1:2023, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-6 (all parts), *Industrial communication networks – Fieldbus specifications – Part 6-X: Application layer protocol specification*

ISO/IEC 646, *Information technology – ISO 7-bit coded character set for information interchange*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 8822, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8824-1, *Information technology – Abstract Syntax Notation One (ASN.1) – Part 1: Specification of basic notation*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

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

IEEE Std 802.1AS, *Standard for Local and Metropolitan Area Networks – Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks*

IEEE Std 1588, *Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems*

3 Terms, definitions, symbols, abbreviated terms and conventions

For the purposes of this document, the following terms, definitions, symbols, abbreviated terms and conventions apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Referenced terms and definitions

3.1.1 ISO/IEC 7498-1 terms

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

- a) application entity
- b) application process
- c) application protocol data unit
- d) application service element

3.1.2 ISO/IEC 8822 terms

For the purposes of this document, the following terms given in ISO/IEC 8822 apply:

- a) abstract syntax

3.1.3 IEC 61158-1 terms

For the purposes of this document, the following terms given in IEC 61158-1 apply:

- a) DLL mapping protocol machine
- b) fieldbus application layer
- c) FAL service protocol machine
- d) protocol data unit.

3.2 Additional Type 23 terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.2.1

cyclic transmission

transmission that is performed periodically used for the link device update

3.2.2

intelligent device station

node capable of performing 1:n bit data and word data cyclic transmission and transient transmission with the master station, and transient transmission with slave stations, excluding remote I/O stations and having client functions and server functions during transient transmission

3.2.3

link bit

link relay bit data that are shared by all the nodes through the cyclic transmission and is used as one bit unit shared memory of the n:n type

3.2.4

link device

link bit, link word, link x and link y or RX, RY, RW_r, and RW_w

3.2.5

link word

link register two octet unit data that are shared by all the nodes through the cyclic transmission and is used as two octet unit shared memory of the n:n type

3.2.6

link x

link input received bit data that are transmitted from each node through the cyclic transmission and is used as an input shared memory of the 1:n type

3.2.7

link y

link output bit data that are sent to each node through the cyclic transmission and is used as an output shared memory of the 1:n type

3.2.8

local station

node capable of performing n:n bit data and word data cyclic transmission and transient transmission with the master station and other local stations, and transient transmission with slave stations, excluding remote I/O stations and having server functions and client functions during transient transmission

3.2.9

management node

node in which parameters are set

3.2.10

master ID

ID that represents the node number of the master station

3.2.11

master station

node that has control information (parameters) and manages cyclic transmission

3.2.12**node**

element that forms a network and performs data transmission, reception, and transfer

3.2.13**node-to-node test**

physical layer test between two nodes

3.2.14**normal node**

node other than a management node

3.2.15**remote device station**

node capable of performing 1:n bit data and word data cyclic transmission and transient transmission with the master station, and transient transmission with slave stations, excluding remote I/O stations and having server functions during transient transmission

3.2.16**remote I/O station**

node capable of performing 1:n bit data cyclic transmission with the master station

3.2.17**reserve node**

node that is not yet connected, but counted in the total node number of the network not performing cyclic transmission, but always regarded as normal from applications

3.2.18**RX**

remote input as viewed from the master station with bit data that are periodically updated by cyclic transmission, master to slave, or in local station as viewed from the master station is RY of the local station

3.2.19**RY**

remote output as viewed from the master station with bit data that are periodically updated by cyclic transmission, master to slave, or in local station as viewed from the master station is RX of the local station

3.2.20**RWr**

remote register (input) as viewed from the master station with word data that are periodically updated by cyclic transmission, master to slave, or in local station as viewed from the master station is RWw of the local station

3.2.21**RWw**

remote register (output) as viewed from the master station with word data that are periodically updated by cyclic transmission, master to slave, or in local station as viewed from the master station is RWr of the local station

3.2.22**slave station**

node other than the master station

3.2.23**station**

node of a network

3.2.24

synchronization manager

single node in a master station role per network that manages synchronization, distributing synchronization timing to other nodes

3.2.25

transient transmission

transmission that is performed upon each request

3.2.26

transient transmission client function

function that issues a transient request

3.2.27

transient transmission server function

function that receives a transient request and issues a response

3.2.28

transmission control manager

single node in a master station role per network that performs token passing management

3.2.29

word

unit representing data, 16 bits in length

3.3 Symbols and abbreviated terms

AE	Application Entity
AL	Application Layer
AP	Application Process
APDU	Application Protocol Data Unit
APO	Application Process Object
AR	Application Relationship
AREP	Application Relationship Endpoint
ASE	Application Service Element
ASN.1	Abstract Syntax Notation 1
CRC	Cyclic Redundancy Check
DLL	Data-link Layer
DMPM	DLL Mapping Protocol Machine
FAL	Fieldbus Application Layer
FSPM	FAL Service Protocol Machine
LB	Link Bit
LSB	Least Significant Bit
LW	Link Word
LX	Link X
LY	Link Y
MSB	Most Significant Bit
OSI	Open Systems Interconnection
PDU	Protocol Data Unit

3.4 Conventions

3.4.1 General conventions

This document uses the descriptive conventions given in ISO/IEC 10731.

The service model, service primitives, and time-sequence diagrams used are entirely abstract descriptions; they do not represent a specification for implementation.

Service primitives, used to represent service user/service provider interactions (see ISO/IEC 10731), convey parameters that indicate information available in the user/provider interaction.

This document uses a tabular format to describe the component parameters of the service primitives. The parameters that apply to each group of service primitives are set out in tables throughout the remainder of this document. Each table consists of up to five columns, containing the name of the service parameter, and a column each for those primitives and parameter-transfer directions used by the service:

- the request primitive's input parameters;
- the indication primitive's output parameters;
- the response primitive's input parameters; and
- the confirm primitive's output parameters.

NOTE The request, indication, response and confirm primitives are also known as requestor.submit, acceptor.deliver, acceptor.submit, and requestor.deliver primitives, respectively (see ISO/IEC 10731).

One parameter (or part of it) is listed in each row of each table. Under the appropriate service primitive columns, a code is used to specify the type of usage of the parameter on the primitive and parameter direction specified in the column:

- | | |
|---------|---|
| M | parameter is mandatory for the primitive. |
| U | parameter is a User option, and can be provided or not depending on the dynamic usage of the service-user. When not provided, a default value for the parameter is assumed. |
| C | parameter is conditional upon other parameters or upon the environment of the service-user. |
| (blank) | parameter is never present. |

Some entries are further qualified by items in brackets. These may be a parameter-specific constraint:

- | | |
|-----|---|
| (=) | indicates that the parameter is semantically equivalent to the parameter in the service primitive to its immediate left in the table. |
|-----|---|

In any particular interface, not all parameters need to be explicitly stated. Some may be implicitly associated with the primitive.

In the diagrams which illustrate these interfaces, dashed lines indicate cause-and-effect or time-sequence relationships, and wavy lines indicate that events are roughly contemporaneous.

3.4.2 Conventions for class definitions

Class definitions are defined using templates. Each template consists of a list of attributes and services for the class. The general form of the template is shown below:

FAL ASE:			ASE Name
CLASS:			Class Name
CLASS ID:			#
PARENT CLASS:			Parent Class Name
ATTRIBUTES:			
1	(o)	Key Attribute:	numeric identifier
2	(o)	Key Attribute:	name
3	(m)	Attribute:	attribute name (values)
4	(m)	Attribute:	attribute name (values)
4.1	(s)	Attribute:	attribute name (values)
4.2	(s)	Attribute:	attribute name (values)
4.3	(s)	Attribute:	attribute name (values)
5	(c)	Constraint:	constraint expression
5.1	(m)	Attribute:	attribute name (values)
5.2	(o)	Attribute:	attribute name (values)
6	(m)	Attribute:	attribute name (values)
6.1	(s)	Attribute:	attribute name (values)
6.2	(s)	Attribute:	attribute name (values)
SERVICES:			
1	(o)	OpsService:	service name
2	(c)	Constraint:	constraint expression
2.1	(o)	OpsService:	service name
3	(m)	MgtService:	service name

- The "FAL ASE:" entry is the name of the FAL ASE that provides the services for the class being specified.
- The "CLASS:" entry is the name of the class being specified. All objects defined using this template will be an instance of this class. The class may be specified by this document, or by a user of this document.
- The "CLASS ID:" entry is a number that identifies the class being specified. This number is unique within the FAL ASE that will provide the services for this class. When qualified by the identity of its FAL ASE, it unambiguously identifies the class within the scope of the FAL. The value "NULL" indicates that the class cannot be instantiated. Class IDs between 1 and 255 are reserved by this document to identify standardized classes. They have been assigned to maintain compatibility with existing national standards. CLASS IDs between 256 and 2048 are allocated for identifying user defined classes.
- The "PARENT CLASS:" entry is the name of the parent class for the class being specified. All attributes defined for the parent class and inherited by it are inherited for the class being defined, and therefore do not have to be redefined in the template for this class.

NOTE The parent-class "TOP" indicates that the class being defined is an initial class definition. The parent class TOP is used as a starting point from which all other classes are defined. The use of TOP is reserved for classes defined by this document.

- e) The "ATTRIBUTES" label indicate that the following entries are attributes defined for the class.
- 1) Each of the attribute entries contains a line number in column 1, a mandatory (m) / optional (o) / conditional (c) / selector (s) indicator in column 2, an attribute type label in column 3, a name or a conditional expression in column 4, and optionally a list of enumerated values in column 5. In the column following the list of values, the default value for the attribute may be specified.
 - 2) Objects are normally identified by a numeric identifier or by an object name, or by both. In the class templates, these key attributes are defined under the key attribute.
 - 3) The line number defines the sequence and the level of nesting of the line. Each nesting level is identified by period. Nesting is used to specify the following:
 - i) fields of a structured attribute (4.1, 4.2, 4.3),
 - ii) attributes conditional on a constraint statement (5). Attributes may be mandatory (5.1) or optional (5.2) if the constraint is true. Not all optional attributes require constraint statements as does the attribute defined in (5.2),
 - iii) the selection fields of a choice type attribute.
- f) The "SERVICES" label indicates that the following entries are services defined for the class.
- 1) An (m) in column 2 indicates that the service is mandatory for the class, while an (o) indicates that it is optional. A (c) in this column indicates that the service is conditional. When all services defined for a class are defined as optional, at least one shall be selected when an instance of the class is defined.
 - 2) The label "OpsService" designates an operational service (1).
 - 3) The label "MgtService" designates a management service (2).
 - 4) The line number defines the sequence and the level of nesting of the line. Each nesting level is identified by a period. Nesting within the list of services is used to specify services conditional on a constraint statement.

3.4.3 Conventions for service definitions

3.4.3.1 General

The service model, service primitives, and time-sequence diagrams used are entirely abstract descriptions; they do not represent a specification for implementation.

3.4.3.2 Service parameters

Service primitives are used to represent service user/service provider interactions (ISO/IEC 10731). They convey parameters which indicate information available in the user/provider interaction. In any particular interface, not all parameters need to be explicitly stated.

The service specifications of this document use a tabular format to describe the component parameters of the ASE service primitives. The parameters which apply to each group of service primitives are set out in tables. Each table consists of up to five columns for the

- a) parameter name,
- b) request primitive (transmitted from the sender),
- c) indication primitive (transmitted to the receiver),
- d) response primitive (transmitted from the receiver), and
- e) confirm primitive (transmitted to the sender).

One parameter (or component of it) is listed in each row of each table. Under the appropriate service primitive columns, a code is used to specify the type of usage of the parameter on the primitive specified in the column:

- M parameter is mandatory for the primitive.
- U parameter is a User option, and can be provided or not depending on dynamic usage of the service user. When not provided, a default value for the parameter is assumed.
- C parameter is conditional upon other parameters or upon the environment of the service user.
- (blank) parameter is never present.
- S parameter is a selected item.

Some entries are further qualified by items in brackets. These may be

- 1) a parameter-specific constraint:
 - "(=)" indicates that the parameter is semantically equivalent to the parameter in the service primitive to its immediate left in the table.
- 2) an indication that some note applies to the entry:
 - "(n)" indicates that the following note "n" contains additional information pertaining to the parameter and its use.

3.4.3.3 Service procedures

The procedures are defined in terms of:

- the interactions between application entities through the exchange of fieldbus Application Protocol Data Units, and
- the interactions between an application layer service provider and an application layer service user in the same system through the invocation of application layer service primitives.

These procedures are applicable to instances of communication between systems which support time-constrained communications services within the fieldbus application layer.

4 Concept

The basic concept of application layer services follows IEC 61158-1, Clause 9.

The FAL defined herein has two primary deployment models. A peer-level connection based controller network is identified throughout this FAL as type C. A master/slave oriented field network is identified throughout this FAL as type F. Both support a distributed memory model as well as client/server models.

5 Data type ASE

5.1 Overview

The overview of the data type ASE follows of IEC 61158-1, Clause 10. The template is used to define the data type for the FAL.

5.2 Fixed length types

5.2.1 Bitstring types

5.2.1.1 BitString8

FAL ASE:

CLASS:

CLASS ID:

PARENT CLASS:

ATTRIBUTES:

1	Data type numeric identifier
2	Data type name
3	Format
4.1	Octet length

Data type ASE

Data type

5

Top

=	22
=	Bitstring8
=	Fixed length
=	1

5.2.1.2 BitString16

FAL ASE:

CLASS:

CLASS ID:

PARENT CLASS:

ATTRIBUTES:

1	Data type numeric identifier
2	Data type name
3	Format
4.1	Octet length

Data type ASE

Data type

5

Top

=	23
=	Bitstring16
=	Fixed length
=	2

5.2.1.3 BitString32

FAL ASE:

CLASS:

CLASS ID:

PARENT CLASS:

ATTRIBUTES:

1	Data type numeric identifier
2	Data type name
3	Format
4.1	Octet length

Data type ASE

Data type

5

Top

=	24
=	Bitstring32
=	Fixed length
=	4

5.2.2 Numeric types

5.2.2.1 Integer types

5.2.2.1.1 Integer8

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 2
2 Data type name	= Integer8
3 Format	= Fixed length
4.1 Octet length	= 1

This integer type is a two's complement binary number with a length of one octet.

5.2.2.1.2 Integer16

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 3
2 Data type name	= Integer16
3 Format	= Fixed length
4.1 Octet length	= 2

This integer type is a two's complement binary number with a length of two octets.

5.2.2.1.3 Integer32

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 4
2 Data type name	= Integer32
3 Format	= Fixed length
4.1 Octet length	= 4

This integer type is a two's complement binary number with a length of four octets.

5.2.2.2 Unsigned types

5.2.2.2.1 Unsigned8

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 5
2 Data type name	= Unsigned8
3 Format	= Fixed length
4.1 Octet length	= 1

This type is a binary number with a length of one octet. No sign bit is included. The most significant bit of the most significant octet is always used as the most significant bit of the binary number.

5.2.2.2.2 Unsigned16

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 6
2 Data type name	= Unsigned16
3 Format	= Fixed length
4.1 Octet length	= 2

This type is a binary number with a length of two octets. No sign bit is included. The most significant bit of the most significant octet is always used as the most significant bit of the binary number.

5.2.2.2.3 Unsigned32

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 7
2 Data type name	= Unsigned32
3 Format	= Fixed length
4.1 Octet length	= 4

This type is a binary number with a length of four octets. No sign bit is included. The most significant bit of the most significant octet is always used as the most significant bit of the binary number.

5.2.2.3 OctetString character types

5.2.2.3.1 OctetString1

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 30
2 Data type name	= OctetString1
3 Format	= Fixed length
4.1 Octet length	= 1

This type is an OctetString with a length of one octet.

5.2.2.3.2 OctetString2

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 31
2 Data type name	= OctetString2
3 Format	= Fixed length
4.1 Octet length	= 2

This type is an OctetString with a length of two octets.

5.2.2.3.3 OctetString4

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 32
2 Data type name	= OctetString4
3 Format	= Fixed length
4.1 Octet length	= 4

This type is an OctetString with a length of four octets.

5.2.2.3.4 OctetString8

FAL ASE:		Data type ASE
CLASS:		Data type
CLASS ID:		5
PARENT CLASS:		Top
ATTRIBUTES:		
1	Data type numeric identifier	= 33
2	Data type name	= OctetString8
3	Format	= Fixed length
4.1	Octet length	= 8

This type is an OctetString with a length of eight octets.

5.2.2.3.5 OctetString16

FAL ASE:		Data type ASE
CLASS:		Data type
CLASS ID:		5
PARENT CLASS:		Top
ATTRIBUTES:		
1	Data type numeric identifier	= 34
2	Data type name	= OctetString16
3	Format	= Fixed length
4.1	Octet length	= 16

This type is an OctetString with a length of 16 octets.

5.2.2.3.6 MACAddress

FAL ASE:		Data type ASE
CLASS:		Data type
CLASS ID:		5
PARENT CLASS:		Top
ATTRIBUTES:		
1	Data type numeric identifier	= -
2	Data type name	= MACAddress
3	Format	= Fixed length
4.1	Octet length	= 6

This type is an OctetString with a length of 6 octets and represents a MAC address.

5.2.2.4 Character String Type

5.2.2.4.1 OctetString

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 10
2 Data type name	= OctetString
3 Format	= string
4.1 Octet length	= 1 to n

This type is with a length of one to n octets. Octet 1 is referred to as the first octet.

5.2.2.4.2 VisibleString

FAL ASE:	Data type ASE
CLASS:	Data type
CLASS ID:	5
PARENT CLASS:	Top
ATTRIBUTES:	
1 Data type numeric identifier	= 9
2 Data type name	= VisibleString
3 Format	= string
4.1 Octet length	= 1 to n

This type is defined as the ISO/IEC 646 string type.

6 Communication model specification

6.1 Communication model

6.1.1 General

Two types of communication models are used in FAL Type 23: The cyclic model and the transient model.

6.1.2 Cyclic model n:n

The n:n type distributed shared memory cyclic model is shown in Figure 1 and uses an unconfirmed push model performed periodically.

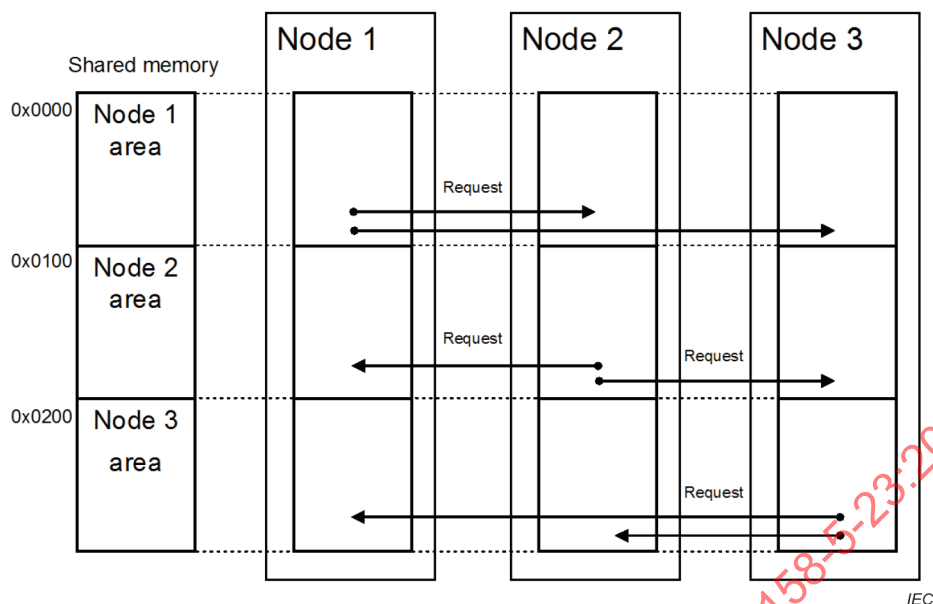


Figure 1 – Cyclic model (n:n type distributed shared memory, unconfirmed push model)

6.1.3 Cyclic model 1:n

The 1:n type distributed shared memory cyclic model is shown in Figure 2 and uses an unconfirmed push model performed periodically.

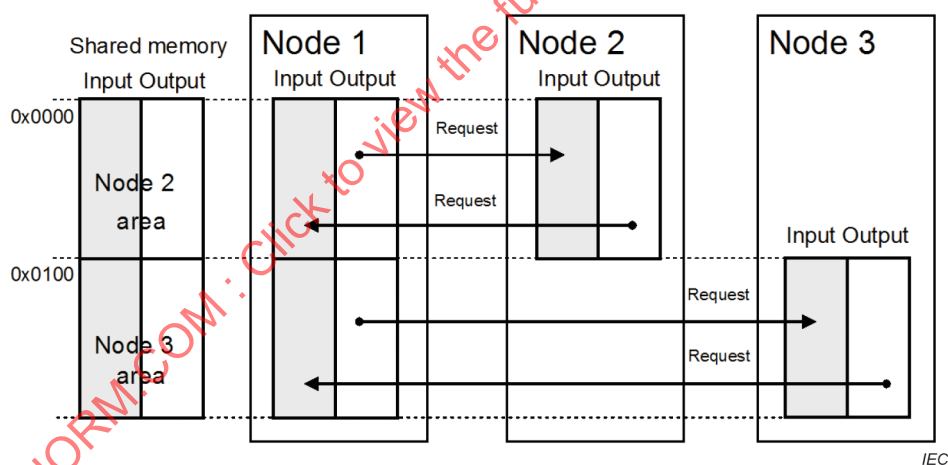


Figure 2 – Cyclic model (1:n type distributed shared memory, unconfirmed push model)

6.1.4 Transient model

The transient model is the client server model shown in Figure 3 and the push model shown in Figure 4.

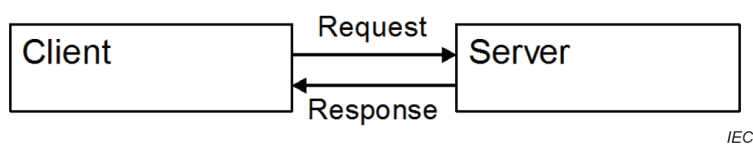


Figure 3 – Transient model (Client server model)

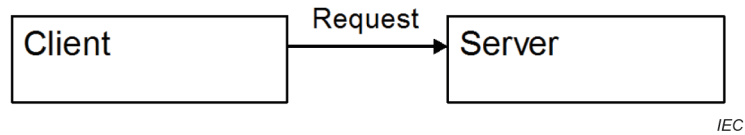


Figure 4 – Transient model (Push model)

6.2 ASE

6.2.1 Overview type C

The structure of the ASE type C for FAL Type 23 is shown in Figure 5.

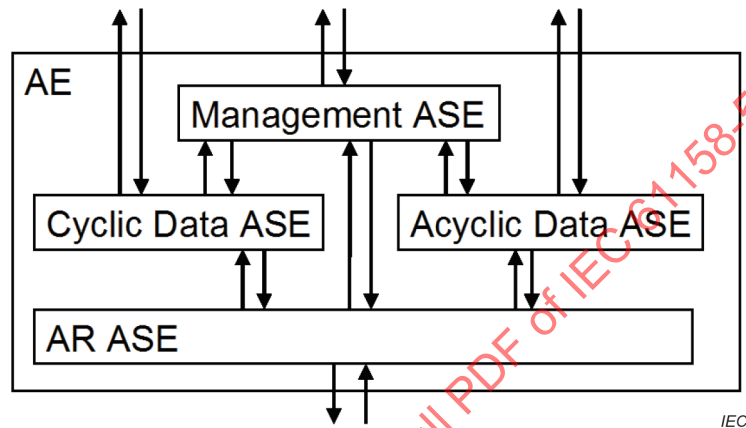


Figure 5 – Structure of ASE type C of FAL Type 23

6.2.2 Overview type F

The structure of the ASE type F for FAL Type 23 is shown in Figure 6.

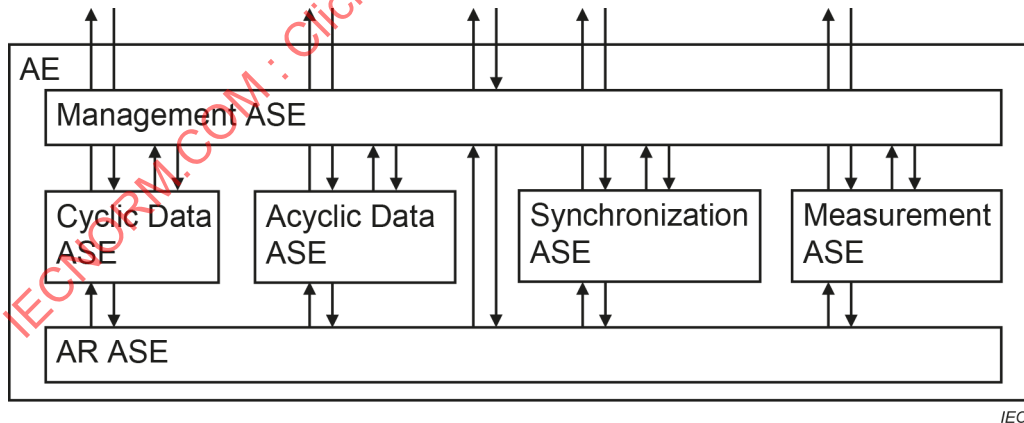


Figure 6 – Structure of ASE type F of FAL Type 23

6.2.3 Cyclic data ASE type C

6.2.3.1 Overview

The cyclic data ASE represents a distributed shared memory model which is realized using the cyclic data transmissions. The cyclic transmission is performed to read and write data periodically.

6.2.3.2 Common memory class specification

6.2.3.2.1 Overview

Common memory class is the parent class which realizes distributed shared memories.

6.2.3.2.2 Format model

FAL ASE: Cyclic data ASE type C

CLASS: Common memory C

CLASS ID: not used

PARENT CLASS: TOP

ATTRIBUTES:

1	(m)	Key Attribute:	Node number
2	(m)	Key Attribute:	Common memory ID

6.2.3.2.3 Attributes

Node number

Represents the node number of the node.

Common memory ID

Represents the identification of the shared memory.

6.2.3.3 LB Common memory class specification

6.2.3.3.1 Overview

LB Common memory class realizes the LB.

6.2.3.3.2 Format model

FAL ASE: Cyclic data ASE type C

CLASS: LB Common memory

CLASS ID: not used

PARENT CLASS: Common memory C

ATTRIBUTES:

1	(m)	Attribute:	LB Common Memory Head Address
2	(m)	Attribute:	LB Common Memory Size

SERVICES:

1	(m)	OpsService:	Ld
2	(m)	OpsService:	Set
3	(m)	OpsService:	Reset
4	(m)	OpsService:	Read
5	(m)	OpsService:	Write

6.2.3.3.3 Attributes

LB Common memory head address

Represents the starting address of the LB.

LB Common memory size

Represents all the memory sizes (per bit) of the LB.

6.2.3.3.4 Service specification

6.2.3.3.4.1 Ld

This service is used to read a specified bit. Table 1 shows the parameters for this service.

Table 1 – Ld service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.3.3.4.2 Set

This service is used to set a specified bit to the value 1 (on). Table 2 shows the parameters for this service.

Table 2 – Set service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

6.2.3.3.4.3 Reset

This service is used to set a specified bit to the value 0 (off). Table 3 shows the parameters for this service.

Table 3 – Reset service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

6.2.3.3.4.4 Read

This service is used to read specified multiple bits. Table 4 shows the parameters for this service.

Table 4 – Read service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the starting address of the target memory.

Size

Specifies the size (per bit) of the target memory.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.3.3.4.5 Write

This service is used to write data into specified multiple bits. Table 5 shows the parameters for this service.

Table 5 – Write service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Data	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the starting address of the target memory.

Size

Specifies the size (per bit) of the target memory.

Data

Specifies the data to be written into the specified target memory.

6.2.3.4 LW Common memory class specification**6.2.3.4.1 Overview**

Link work (LW) Common memory class realizes the LW.

6.2.3.4.2 Format model

FAL ASE: Cyclic data ASE type C

CLASS: LW Common memory

CLASS ID: not used

PARENT CLASS: Common memory C

ATTRIBUTES:

1 (m) Attribute: LW Common Memory Head Address

2 (m) Attribute: LW Common Memory Size

SERVICES:

1 (m) OpsService: Ld

2 (m) OpsService: Set

3 (m) OpsService: Reset

4 (m) OpsService: Read

5 (m) OpsService: Write

6.2.3.4.3 Attributes**LW Common memory head address**

Represents the starting address of the LW.

LW Common memory Size

Represents all the memory sizes (per two octets) of the LW.

6.2.3.4.4 Service specification**6.2.3.4.4.1 Ld**

This service is used to read a specified bit. Table 6 shows the parameters for this service.

Table 6 – Ld service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Bit Location	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Bit location

Specifies the target memory bit at a location in Address. A value of 0 specifies the LSB, a value of F specifies the MSB.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.3.4.4.2 Set

This service is used to set a specified bit to the value 1 (on). Table 7 shows the parameters for this service.

Table 7 – Set service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Bit Location	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Bit location

Specifies the target memory bit at a location in Address. A value of 0 specifies the LSB, a value of F specifies the MSB.

6.2.3.4.4.3 Reset

This service is used to set a specified bit to the value 0 (off). Table 8 shows the parameters for this service.

Table 8 – Reset service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Bit Location	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Bit location

Specifies the target memory bit at a location in Address. A value of 0 specifies the LSB, a value of F specifies the MSB.

6.2.3.4.4.4 Read

This service is used to read data from a specified address. Table 9 shows the parameters for this service.

Table 9 – Read service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Size

Specifies the size (per two octets) of the target memory.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.3.4.4.5 Write

This service is used to write data into a specified address. Table 10 shows the parameters for this service.

Table 10 – Write service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Data	M			

Argument

The argument conveys the service specific parameters of the service request.

Address

Specifies the address of the target memory.

Size

Specifies the size (per two octets) of the target memory.

Data

Specifies the value to be written into the target memory.

6.2.3.5 LX/LY Common memory class specification

6.2.3.5.1 Overview

Link X (LX) and link Y (LY) Common memory class realizes the LX/LY.

6.2.3.5.2 Format model

FAL ASE:		Cyclic data ASE type C
CLASS:		LX/LY Common memory
CLASS ID:		not used
PARENT CLASS:		Common memory C
ATTRIBUTES:		
1	(m) Attribute:	LX Common Memory Head Address
2	(m) Attribute:	LX Common Memory Size
3	(m) Attribute:	LY Common Memory Head Address
4	(m) Attribute:	LY Common Memory Size
SERVICES:		
1	(m) OpService:	Ld
2	(m) OpService:	Set
3	(m) OpService:	Reset
4	(m) OpService:	Read
5	(m) OpService:	Write

6.2.3.5.3 Attributes

LX Common memory head address

Represents the starting address of the LX.

LX Common memory size

Represents the size (per two octets) of the LX.

LY Common memory head address

Represents the starting address of the LY.

LY Common memory size

Represents the size (per two octets) of the LY.

6.2.3.5.4 Service specification

Refer to 6.2.3.3.4.

6.2.4 Cyclic data ASE type F

6.2.4.1 Overview

The cyclic data ASE represents a distributed shared memory model which is realized using the cyclic data transmissions. The cyclic transmission is performed to read and write data periodically.

6.2.4.2 Common memory class specification

6.2.4.2.1 Overview

Common memory class is the parent class which realizes distributed shared memories.

6.2.4.2.2 Format model

FAL ASE:		Cyclic data ASE type F
CLASS:		Common memory F
CLASS ID:		not used
PARENT CLASS:		TOP
ATTRIBUTES:		
1	(m)	Key Attribute: Node number
2	(m)	Key Attribute: Common memory ID
3	(m)	Attribute: Type
SERVICES:		
1	(m)	OpsService: Ld
2	(m)	OpsService: Set
3	(m)	OpsService: Reset
4	(m)	OpsService: Read
5	(m)	OpsService: Write

6.2.4.2.3 Attributes

Node Number

Represents the node number of the node.

Common Memory ID

Represents the identification of the shared memory.

Type

Indicates the shared memory type.

6.2.4.2.4 Service specification

6.2.4.2.4.1 Ld

This service is used to read a specified bit. Table 11 shows the parameters for this service.

Table 11 – Ld service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Type	M			
Address	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Type

Specifies the target memory type.

Address

Specifies the address of the target memory.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.4.2.4.2 Set

This service is used to set a specified bit to the value 1 (on). Table 12 shows the parameters for this service.

Table 12 – Set service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Type	M			
Address	M			

Argument

The argument conveys the service specific parameters of the service request.

Type

Specifies the target memory type.

Address

Specifies the address of the target memory.

6.2.4.2.4.3 Reset

This service is used to set a specified bit to the value 0 (off). Table 13 shows the parameters for this service.

Table 13 – Reset service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Type	M			
Address	M			

Argument

The argument conveys the service specific parameters of the service request.

Type

Specifies the target memory type.

Address

Specifies the address of the target memory.

6.2.4.2.4.4 Read

This service is used to read specified multiple bits. Table 14 shows the parameters for this service.

Table 14 – Read service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Type	M			
Address	M			
Size	M			
Result				M
Data				M

Argument

The argument conveys the service specific parameters of the service request.

Type

Specifies the target memory type.

Address

Specifies the starting address of the target memory.

Size

Specifies the size (per bit) of the target memory.

Result

This conveys the service specific parameters of the service response.

Data

Contains the value of the specified target memory.

6.2.4.2.4.5 Write

This service is used to write data into specified multiple bits. Table 15 shows the parameters for this service.

Table 15 – Write service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Type	M			
Address	M			
Size	M			
Data	M			

Argument

The argument conveys the service specific parameters of the service request.

Type

Specifies the target memory type.

Address

Specifies the starting address of the target memory.

Size

Specifies the size (per bit) of the target memory.

Data

Specifies the data to be written into the specified target memory.

6.2.4.3 RX Common memory class specification

6.2.4.3.1 Overview

The RX Common memory class realizes the RX.

6.2.4.3.2 Format model

FAL ASE:		Cyclic data ASE type F
CLASS:		RX Common memory
CLASS ID:		not used
PARENT CLASS:		Common memory F
ATTRIBUTES:		
1	(m)	Attribute: RX Common Memory Base Address
2	(m)	Attribute: RX Common Memory Size

6.2.4.3.3 Attributes

RX Common memory bead address

Indicates the head address of RX of the ASE.

RX Common memory size

Indicates the size of RX of the ASE.

6.2.4.4 RY Common memory class specification

6.2.4.4.1 Overview

The RY Common memory class realizes the RY.

6.2.4.4.2 Format model

FAL ASE:		Cyclic data ASE type F
CLASS:		RY Common memory
CLASS ID:		not used
PARENT CLASS:		Common memory F
ATTRIBUTES:		
1	(m)	Attribute: RY Common Memory Head Address
2	(m)	Attribute: RY Common Memory Size

6.2.4.4.3 Attributes

RY Common memory head address

Indicates the head address of RY of the ASE.

RY Common memory size

Indicates the size of RY of the ASE.

6.2.4.5 RWr Common memory class specification

6.2.4.5.1 Overview

The RWr Common memory class realizes the RWr.

6.2.4.5.2 Format model

FAL ASE:	Cyclic data ASE type F
CLASS:	RWr Common memory
CLASS ID:	not used
PARENT CLASS:	Common memory F
ATTRIBUTES:	
1	(m) Attribute: RWr Common Memory Head Address
2	(m) Attribute: RWr Common Memory Size

6.2.4.5.3 Attributes

RWr Common memory head address

Indicates the head address of RWr of the ASE.

RWr Common memory size

Indicates the size of RWr of the ASE.

6.2.4.6 RWw Common memory class specification

6.2.4.6.1 Overview

The RWw Common memory class realizes the RWw.

6.2.4.6.2 Format model

FAL ASE:	Cyclic data ASE type F
CLASS:	RWw Common memory
CLASS ID:	not used
PARENT CLASS:	Common memory F
ATTRIBUTES:	
1	(m) Attribute: RWw Common Memory Head Address
2	(m) Attribute: RWw Common Memory Size

6.2.4.6.3 Attributes

RWw Common memory head address

Indicates the head address of RWw of the ASE.

RWw Common memory size

Indicates the size of RWw of the ASE.

6.2.5 Acyclic data ASE type C

6.2.5.1 Overview

Acyclic data ASE type C provides communication between nodes realized by the transient transmission.

6.2.5.2 Acyclic Data class specification

6.2.5.2.1 Format model

FAL ASE: Acyclic data ASE Type C

CLASS: Acyclic data C

CLASS ID: not used

PARENT CLASS: Top

ATTRIBUTES:

1 (m) Key Attribute: Network number

2 (m) Key Attribute: Node number

SERVICES:

1 (m) OpsService: Get memory access info

2 (m) OpsService: Run

3 (m) OpsService: Stop

4 (m) OpsService: Read memory

5 (m) OpsService: Write memory

6.2.5.2.2 Attributes

Network Number

Represents the network number of the node.

Node Number

Represents the node number of the node.

6.2.5.2.3 Service specification

6.2.5.2.3.1 Get memory access info

This service is used to get memory access information. Table 16 shows the parameters for this service.

Table 16 – Get memory access info service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)
Access code enabled			C	C (=)
Device name			C	C (=)
Number of access points			C	C (=)

Argument

The argument conveys the service specific parameters of the service request.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

Access code enabled

Contains a list of available access codes in case of the service request succeeded.

Device name

Contains the name of the device in case of the service request succeeded.

Number of access points

Contains the number of access points in case of the service request succeeded.

6.2.5.2.3.2 Run

This service is used to set a target node to the RUN state from other nodes. Table 17 shows the parameters for this service.

Table 17 – Run service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Mode	M	M (=)		
Clear mode	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Mode

Specifies the mode. There are two modes: normal RUN and forced RUN.

Clear mode

Specifies the clear mode. There are three clear modes: no device clear, clear all except latch area, and all clear.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.5.2.3.3 Stop

This service is used to set a target node to the STOP state from other nodes. Table 18 shows the parameters for this service.

Table 18 – Stop service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Mode	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Mode

Specifies the mode. There are two modes: normal mode and forced mode.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.5.2.3.4 Read memory

This service is used to read memory. Table 19 shows the parameters for this service.

Table 19 – Read memory service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Quantity	M	M (=)		
Memory attribute	M	M (=)		
Access code	M	M (=)		
Memory address	M	M (=)		
Number of points	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)
Data			C	C (=)

Argument

The argument conveys the service specific parameters of the service request.

Quantity

Specifies the quantity, where a batch read is specified by 1, and a random read is specified within the quantity range 2 to 160.

Memory attribute

Specifies the attribute of the memory. The contents of the attributes include the location of memory (within the network module or controller) and the unit to access (bit access, byte access, word access, and double word access).

Access code

Specifies the access codes. The contents of the access codes include types (retain, status, link, counter, and timer) and functions (word data, bit data (output and input)).

Memory address

Specifies the address of the target memory.

Number of points

Specifies the number of retrieval points. For the batch read, specify the bit within the range of 16 to 7 680 points and the word within the range of 1 to 480 points. For the random read, specify the bit within the range of 0 to 7 680 points, the word within the range of 0 to 480 points, and the byte within the range of 0 to 960 points.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

Data

Contains the value of the specified target memory in case of the service request succeeded.

6.2.5.2.3.5 Write memory

This service is used to write memory. Table 20 shows the parameters for this service.

Table 20 – Write memory service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Quantity	M	M (=)		
Memory attribute	M	M (=)		
Access code	M	M (=)		
Memory address	M	M (=)		
Number of points	M	M (=)		
Data	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Quantity

Specifies the quantity, where a batch read is specified by 1, and a random read is specified within the quantity range 2 to 100.

Memory attribute

Specifies the attribute of the memory. The contents of the attributes include the location of memory (within the network module or controller) and the unit to access (bit access, byte access, word access, and double word access).

Access code

Specifies the access codes. The contents of the access codes include types (retain, status, link, counter, and timer) and functions (word data, bit data (output and input)).

Memory address

Specifies the address of the target memory.

Number of points

Specifies the number of writing points. For the batch read, specify the bit within the range of 16 to 7 680 points and the word within the range of 1 to 480 points. For the random write, specify the bit within the range of 0 to 7 680 points, the word within the range of 0 to 480 points, and the byte within the range of 0 to 960 points.

Data

Specifies the value to be written to the specified target memory.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.6 Acyclic data ASE type F

6.2.6.1 Overview

Acyclic data ASE type F provides communication between nodes realized by the transient transmission.

6.2.6.2 Acyclic data class specification

6.2.6.2.1 Format model

FAL ASE:		Acyclic data ASE type F
CLASS:		Acyclic data F
CLASS ID:		not used
PARENT CLASS:		Top
ATTRIBUTES:		
1	(m) Key Attribute:	Network number
2	(m) Key Attribute:	Node number
SERVICES:		
1	(o) OpsService:	Get memory access info
2	(o) OpsService:	Run
3	(o) OpsService:	Stop
4	(o) OpsService:	Read memory
5	(o) OpsService:	Write memory
6	(o) OpsService:	Vendor command
7	(o) OpsService:	Distribute node info
8	(o) OpsService:	Get statistics
9	(o) OpsService:	Get node info detail
10	(o) OpsService:	AC Data
11	(o) OpsService:	AC Data ND

6.2.6.2.2 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

6.2.6.2.3 Service specification

6.2.6.2.3.1 Get memory access info

This service is used to get memory access information. Table 21 shows the parameters for this service.

Table 21 – Get memory access info service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)
Access code enabled			C	C (=)
Device name			C	C (=)
Number of access points			C	C (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

Access code enabled

Contains a list of available access codes in case of the service request succeeded.

Device name

Contains the name of the device in case of the service request succeeded.

Number of access points

Contains the number of access points in case of the service request succeeded.

6.2.6.2.3.2 Run

This service is used to set a target node to the RUN state from other nodes. Table 22 shows the parameters for this service.

Table 22 – Run service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Mode	M	M (=)		
Clear mode	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Mode

Specifies the mode. There are two modes: normal RUN and forced RUN.

Clear mode

Specifies the clear mode. There are three clear modes: no device clear, clear all except latch area, and all clear.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.6.2.3.3 Stop

This service is used to set a target node to the STOP state from other nodes. Table 23 shows the parameters for this service.

Table 23 – Stop service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Mode	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Mode

Specifies the mode. There are two modes: normal mode and forced mode.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.6.2.3.4 Read memory

This service is used to read memory. Table 24 shows the parameters for this service.

Table 24 – Read memory service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Quantity	M	M (=)		
Memory attribute	M	M (=)		
Access code	M	M (=)		
Memory address	M	M (=)		
Number of points	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)
Data			C	C (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Quantity

Specifies the quantity, where a batch read is specified by 1, and a random read is specified within the quantity range 2 to 160.

Memory attribute

Specifies the attribute of the memory. The contents of the attributes include the location of memory (within the network module or controller) and the unit to access (bit access, byte access, word access, and double word access).

Access code

Specifies the access codes. The contents of the access codes include types (retain, status, link, counter, and timer) and functions (word data, bit data (output and input)).

Memory address

Specifies the address of the target memory.

Number of points

Specifies the number of retrieval points. For the batch read, specify the bit within the range of 16 to 7 680 points and the word within the range of 1 to 480 points. For the random read, specify the bit within the range of 0 to 7 680 points, the word within the range of 0 to 480 points, and the byte within the range of 0 to 960 points.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

Data

Contains the value of the specified target memory in case of the service request succeeded.

6.2.6.2.3.5 Write memory

This service is used to write memory. Table 25 shows the parameters for this service.

Table 25 – Write memory service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Quantity	M	M (=)		
Memory attribute	M	M (=)		
Access code	M	M (=)		
Memory address	M	M (=)		
Number of points	M	M (=)		
Data	M	M (=)		
Result			M	M (=)
Error code			M	M (=)
Error severity			M	M (=)
Error location			M	M (=)
Vendor specific error code			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Quantity

Specifies the quantity, where a batch read is specified by 1, and a random read is specified within the quantity range 2 to 100.

Memory attribute

Specifies the attribute of the memory. The contents of the attributes include the location of memory (within the network module or controller) and the unit to access (bit access, byte access, word access, and double word access).

Access code

Specifies the access codes. The contents of the access codes include types (retain, status, link, counter, and timer) and functions (word data, bit data (output and input)).

Memory address

Specifies the address of the target memory.

Number of points

Specifies the number of writing points. For the batch read, specify the bit within the range of 16 to 7 680 points and the word within the range of 1 to 480 points. For the random write, specify the bit within the range of 0 to 7 680 points, the word within the range of 0 to 480 points, and the byte within the range of 0 to 960 points.

Data

Specifies the value to be written to the specified target memory.

Result

This conveys the service specific parameters of the service response.

Error code

Contains an error code.

Error severity

Contains a code showing the severity of the error.

Error location

Contains the location of the error.

Vendor specific error code

Contains an error code defined by the vendor.

6.2.6.2.3.6 Vendor command

This service is used to execute a vendor specific command. Table 26 shows the parameters for this service.

Table 26 – Vendor command service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Vendor specific arguments	M	M (=)		
Result			U	U (=)
Vendor specific results			U	U (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Vendor specific arguments

Specifies the vendor specific argument list.

Result

This conveys the service specific parameters of the service response.

Vendor specific results

Contains the vendor specific response parameter list.

6.2.6.2.3.7 Distribute node info

This service is used to distribute node address information. Table 27 shows the parameters for this service.

Table 27 – Distribute node info service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Dist seq number	M	M (=)		
Master net number	M	M (=)		
Master device type	M	M (=)		
Master model code	M	M (=)		
Master vendor code	M	M (=)		
Master node type	M	M (=)		
List of node info	M	M (=)		
Node number	M	M (=)		
Transient receive capability	M	M (=)		
Node number assigned capability	M	M (=)		
Network number	M	M (=)		
Device type	M	M (=)		
Model code	M	M (=)		
Vendor code	M	M (=)		
Node type	M	M (=)		
MAC address	M	M (=)		

Argument

The argument conveys the service specific parameters of the service request.

Dist seq number

Indicates the distribution sequential number.

Master net number

Indicates the master station network number.

Master device type

Indicates the master station device type.

Master model code

Indicates the master station model code.

Master vendor code

Indicates the master station vendor code.

Master node type

Indicates the master station node type.

List of node info

Contains the node information to be distributed.

Node number

Indicates the node number.

Transient receive capability

Indicates the existence or non-existence of a node transient reception function.

Node number assigned capability

Indicates the existence or non-existence of a node number setting function.

Network number

Indicates the node network number.

Device type

Indicates the node device type.

Model code

Indicates the node model code.

Vendor code

Indicates the node vendor code.

Node type

Indicates the node type

MAC address

Indicates the node MAC address.

6.2.6.2.3.8 Get statistics

This service is used to retrieve statistical information. Table 28 shows the parameters for this service.

Table 28 – Get statistics service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Result			M	M (=)
Port1 statistics			M	M (=)
HEC errors			M	M (=)
DCS/FCS errors			M	M (=)
Undersize frame errors			M	M (=)
Forward frames			M	M (=)
Upward frames			M	M (=)
Forward overflow errors			M	M (=)
Upward overflow errors			M	M (=)
Port2 statistics			M	M (=)
HEC errors			M	M (=)
DCS/FCS errors			M	M (=)
Undersize frame errors			M	M (=)
Forward frames			M	M (=)
Upward frames			M	M (=)
Forward overflow errors			M	M (=)
Upward overflow errors			M	M (=)
List of health status			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Result

Specifies the vendor specific argument list.

Port1 statistics

Indicates the statistical information of port 1.

HEC errors

Indicates the number of HEC error frames for this port. This value is the accumulated value since previously acquired.

DCS/FCS errors

Indicates the number of DCS/FCS error frames for this port. This value is the accumulated value since previously acquired.

Undersize frame errors

Indicates the number of undersize (less than 28 octets) error frames for this port. This value is the accumulated value since previously acquired.

Forward frames

Indicates the number of forward frames for this port. This value is the accumulated value since previously acquired.

Upward frames

Indicates the number of frames delivered to the upper layer for this port. This value is the accumulated value since previously acquired.

Forward overflow errors

Indicates the number of frames discarded as a result of a full forward buffer for this port. This value is the accumulated value since previously acquired.

Upward overflow errors

Indicates the number of frames received in the upper layer and discarded as a result of a full buffer for this port. This value is the accumulated value since previously acquired.

Port2 statistics

Indicates the statistical information of port 2.

List of health status

Indicates a list of health status data.

6.2.6.2.3.9 Get node info detail

This service is used to retrieve node information detail. Table 29 shows the parameters for this service.

Table 29 – Get node info detail service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Result			M	M (=)
Local RY size			M	M (=)
Local RWw size			M	M (=)
Local RX size			M	M (=)
Local RWr size			M	M (=)
Number of ports			M	M (=)
Token keep time			M	M (=)
Network info			M	M (=)
Network behavior			M	M (=)
Multiple transmit			M	M (=)
Frame interval			M	M (=)
Multiple tokens			M	M (=)
Node info			M	M (=)
I/O type			M	M (=)
Network F/W version			M	M (=)
Network device type			M	M (=)
Network model code			M	M (=)
Network vendor code			M	M (=)
Network model name			M	M (=)
Network vendor name			M	M (=)
Controller info			C	C (=)
Controller F/W version			C	C (=)
Controller device type			C	C (=)
Controller model code			C	C (=)
Controller vendor code			C	C (=)
Controller model name			C	C (=)
Controller vendor name			C	C (=)
Controller vendor specific info			C	C (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Result

Specifies the vendor specific argument list.

Local RY size

Indicates the RY size.

Local RWw size

Indicates the RWw size.

Local RX size

Indicates the RX size.

Local RWr size

Indicates the RWr size.

Number of ports

Indicates the number of points.

Token keep time

Indicates the keep time for a node that is to transmit testDataAck-PDU after the start of token inspection.

Network info

Indicates the network related information.

Network behavior

Indicates the network operation setting information.

Multiple transmit

Indicates the number of times a token holding node is to repeatedly transmit an FALPDU other than a token-PDU.

Frame interval

Indicates the interval from token-PDU reception to myStatus-PDU transmission.

Multiple tokens

Indicates the number of times the token-PDU is to be transmitted during single token hold.

Node info

Indicates the information for the node.

I/O type

Indicates the I/O type as one of:

- In/Out with the same index (front/back mixed)
- Input
- Output
- In/Out with different index (mixed)

Network F/W version

Indicates the network firmware version.

Network device type

Indicates the network device type.

Network model code

Indicates the network model code.

Network vendor code

Indicates the network vendor code.

Network model name

Indicates the network model name.

Network vendor name

Indicates the network vendor name.

Controller info

Indicates the information for the controller.

Controller F/W version

Indicates the controller firmware version.

Controller device type

Indicates the controller device type.

Controller model code

Indicates the controller model code.

Controller vendor code

Indicates the controller vendor code.

Controller model name

Indicates the controller model name.

Controller vendor name

Indicates the controller vendor name.

Controller vendor specific info

Contains vendor specific information.

6.2.6.2.3.10 AC data

This service is based on the link scan unit restriction method used to transmit general purpose data. Table 30 shows the parameters for this service.

Table 30 – AC data service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Data	M	M (=)		
Result			U	U (=)
Response			U	U (=)
Additional data			U	U (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Data

Contains the transmission data.

Result

This conveys the service specific parameters of the service response.

Response

Contains the response.

Additional data

Contains the additional response data.

6.2.6.2.3.11 AC data ND

This service is based on the node unit restriction method used to transmit general purpose data. Table 31 shows the parameters for this service.

Table 31 – AC data ND service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Target network number	M	M (=)		
Target node	M	M (=)		
Data	M	M (=)		
Result			U	U (=)
Response			U	U (=)
Additional data			U	U (=)

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Indicates the network number of the target node.

Target node

Indicates the node number of the target node.

Data

Contains the transmission data.

Result

This conveys the service specific parameters of the service response.

Response

Contains the response.

Additional data

Contains the additional response data.

6.2.7 Management ASE

6.2.7.1 Overview

Management ASE provides the network management function.

6.2.7.2 Network manager class specification

6.2.7.2.1 Overview

Network Manager class provides network management functions other than the parameter management function.

6.2.7.2.2 Format model

FAL ASE:	Management ASE
CLASS:	Network manager
CLASS ID:	not used
PARENT CLASS:	Top
ATTRIBUTES:	
1 (m)	Key Attribute: Network number
2 (m)	Key Attribute: Node number
SERVICES:	
1 (m)	MgtService: Get attribute
2 (m)	MgtService: Set attribute

6.2.7.2.3 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

6.2.7.2.4 Service specification

6.2.7.2.4.1 Get attribute

This service is used to read the attribute value of a class other than Common parameter dist. Table 32 shows the parameters for this service.

Table 32 – Get attribute service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
List of requested attributes	M	M (=)		
Result			M	M (=)
Response state			M	M (=)
List of attribute values			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

List of requested attributes

Specifies the attributes of the target whose values are requested.

Result

This conveys the service specific parameters of the service response.

Response state

Contains the result of the retrieval.

List of attribute values

Contains the value of the target attributes.

6.2.7.2.4.2 Set attribute

This service is used to set the attribute value of a class other than Common parameter dist. Table 33 shows the parameters for this service.

Table 33 – Set attribute service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
List of attributes and values	M	M (=)		
Attribute	M	M (=)		
Attribute value	M	M (=)		
Result			M	M (=)
Response state			M	M (=)

Argument

The argument conveys the service specific parameters of the service request.

List of attribute and values

A list of specified attributes and values to be set.

Requested attribute

Specifies the attribute to be a set.

Attribute value

Specifies the value to be set to the attribute.

Result

This conveys the service specific parameters of the service response.

Response state

Contains the result of the retrieval.

6.2.7.3 Parameter manager class specification**6.2.7.3.1 Overview**

Parameter manager class provides parameter management functions.

6.2.7.3.2 Format model

FAL ASE:	Management ASE
CLASS:	Parameter manager
CLASS ID:	not used
PARENT CLASS:	Top
ATTRIBUTES:	
1 (m) Key Attribute:	Network number
2 (m) Key Attribute:	Node number
SERVICES:	
1 (m) MgtService:	Get attribute
2 (m) MgtService:	Set attribute

6.2.7.3.3 Attributes**Network number**

Represents the network number of the node.

Node number

Represents the node number of the node.

6.2.7.3.4 Service specification

Refer to 6.2.7.2.4.

6.2.8 Synchronization ASE

6.2.8.1 Overview

Synchronization ASE provides synchronization functions.

6.2.8.2 Synchronization class specification

6.2.8.2.1 Overview

The synchronization class provides the synchronization timing function for network synchronization.

6.2.8.2.2 Format model

FAL ASE:	Synchronization ASE
CLASS:	Synchronization
CLASS ID:	not used
PARENT CLASS:	Top
ATTRIBUTES:	
1 (m) Key Attribute:	Network number
2 (m) Key Attribute:	Node number
SERVICES:	
1 (m) OpsService:	Synchronization trigger

6.2.8.2.3 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

6.2.8.2.4 Service specification

6.2.8.2.4.1 Synchronization trigger

This service is used to generate synchronization timing notifications. Table 34 shows the parameters for this service.

Table 34 – Synchronization trigger service parameters

Parameter name	Req	Ind	Rsp	Cnf
Result		M		
Status		M		

Result

This conveys the service specific parameters of the service response.

Status

Contains the receiving result of the synchronous timing frame.

6.2.9 Measurement ASE

6.2.9.1 Overview

Measurement ASE provides transmission path delay functions.

6.2.9.2 Measurement class specification

6.2.9.2.1 Overview

The measurement class provides for the measurement of transmission delay time.

6.2.9.2.2 Format model

FAL ASE:	Measurement ASE
CLASS:	Measurement
CLASS ID:	not used
PARENT CLASS:	Top
ATTRIBUTES:	
1 (m) Key Attribute:	Network number
2 (m) Key Attribute:	Node number
SERVICES:	
1 (m) OpsService:	Start measurement
2 (m) OpsService:	Get offset

6.2.9.2.3 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

6.2.9.2.4 Service specification

6.2.9.2.4.1 Start measurement

This service is used to start a transmission delay time measurement. Table 35 shows the parameters for this service.

Table 35 – Start measurement service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Target network number	M			
Target node number	M			
Offset	M			
Result				U
Measurement value				U

Argument

The argument conveys the service specific parameters of the service request.

Target network number

Specifies the network number of the target node.

Target node number

Specifies the node number of the target node.

Offset

Specifies the transmission path delay measurement offset.

Result

This conveys the service specific parameters of the service response.

Measurement value

Contains the result of the transmission path delay time measurement at the master station.

6.2.9.2.4.2 Get offset

This service is used to retrieve the result of a transmission delay time measurement. Table 36 shows the parameters for this service.

Table 36 – Get offset service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	U			
List of Requested parameter	U			
Result				M
Offset value				M
Measurement Value				M

Argument

The argument conveys the service specific parameters of the service request.

List of requested parameters

Specifies the list of parameters to return.

Result

This conveys the service specific parameters of the service response.

Offset value

Contains the offset value form the master station.

Measurement value

Contains the result of the transmission path delay time measurement.

6.2.10 Overview type T

The structure of the ASE type T for FAL Type 23 is shown in Figure 7.

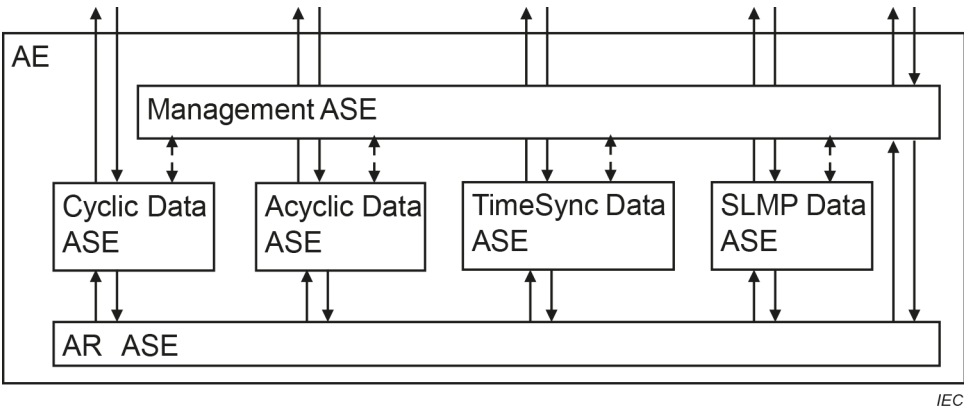


Figure 7 – Structure of ASE type T of FAL Type 23

6.2.11 Cyclic data ASE type T

6.2.11.1 Overview

Cyclic data ASE implements the distributed shared memory model utilizing the cyclic transmission that reads/writes data periodically.

6.2.11.2 Distributed shared memory class specification

6.2.11.2.1 Overview

Distributed shared memory cyclic class realizes the distributed shared memory model.

6.2.11.2.2 Format model

FAL ASE:		Cyclic data ASE type T	
CLASS:		Distributed shared memory cyclic	
CLASS ID:		not used	
PARENT CLASS:		TOP	
ATTRIBUTES:			
1	(m)	Key Attribute:	Implicit
2	(m)	Attribute:	Address
3	(m)	Attribute:	Size
SERVICES:			
1	(m)	OpsService:	Read
2	(m)	OpsService:	Write

6.2.11.2.3 Attributes

Implicit

Indicates that the cyclic memory address is implicitly specified.

Address

Indicates the start address of the cyclic memory.

Size

Indicates the accessible size from the start address.

6.2.11.2.4 Service specification

6.2.11.2.4.1 Read

This service is used to read the specified cyclic data. Table 37 shows the parameters for this service.

Table 37 – Read service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Result(+)				S
Data				M
Result(-)				S

Argument

Indicates requested service parameters.

Address

Indicates the start address of the target cyclic memory.

Size

Indicates the size of the target cyclic memory.

Result(+)

Indicates completion of the requested service.

Data

Indicates the contents of the read cyclic memory.

Result(-)

Indicates failure of the requested service.

6.2.11.2.4.2 Write

This service is used to write the specified cyclic data. Table 38 shows the parameters for this service.

Table 38 – Write service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Address	M			
Size	M			
Data	M			
Result(+)				S
Result(-)				S

Argument

Indicates requested service parameters.

Address

Indicates the start address of the target cyclic memory.

Size

Indicates the size of the target cyclic memory.

Data

Indicates the data to be written to the target memory.

Result(+)

Indicates completion of the requested service.

Result(-)

Indicates failure of the requested service.

6.2.12 Acyclic data ASE type T**6.2.12.1 Overview**

Acyclic data ASE implements the distributed shared memory model utilizing the acyclic transmission that reads/writes data using transient transmissions.

6.2.12.2 Distributed shared memory class specification**6.2.12.2.1 Overview**

Distributed shared memory acyclic class realizes the distributed shared memory model.

6.2.12.2.2 Format model

FAL ASE:		Cyclic data ASE type T
CLASS:		Distributed shared memory acyclic
CLASS ID:		not used
PARENT CLASS:		TOP
ATTRIBUTES:		
1	(m)	Key Attribute: implicit
2	(m)	Attribute: fType
3	(o)	Attribute: request type
SERVICES:		
1	(m)	OpsService: Priority
2	(m)	OpsService: Detection
3	(m)	OpsService: Detection Ack
4	(o)	OpsService: Test Data
5	(o)	OpsService: Test Data Ack
6	(o)	OpsService: Acyclic Data RSV
7	(o)	OpsService: Acyclic Data NRSV

6.2.12.2.3 Attributes**Implicit**

Indicates that the acyclic memory address is implicitly specified.

fType

Indicates the frame type.

request type

Indicates the request type.

6.2.12.2.4 Service specification

6.2.12.2.4.1 Priority

This service is used to acquire the priority information for the management master station. Table 39 shows the parameters for this service.

Table 39 – Priority service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
fType	M	M(=)		
Src Address	M	M(=)		
Mng Priority	M	M(=)		
Mng Address	M	M(=)		
Hop Count	M	M(=)		
Kind Flag	M	M(=)		

Argument

Indicates requested service parameters.

fType

Indicates the frame type.

Src Address

Indicates the address of the source.

Mng Priority

Indicates the priority of stations that are recognized by the management master station.

Mng Address

Indicates the address information of stations that are recognized by the management master station.

Hop Count

Indicates the hop count from stations that are recognized by the management master station.

Kind Flag

Indicates the request/send, phase, and master type.

6.2.12.2.4.2 Detection

This service is used by the management master station to detect the network connection status. Table 40 shows the parameters for this service.

Table 40 – Detection service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
fType	M	M(=)		
Protocol Version	M	M(=)		
Mng Address	M	M(=)		
Prev Node Address	M	M(=)		
Prev Node Port	M	M(=)		
Option Flag	O	O(=)		
Hop Count	M	M(=)		
IP Address	M	M(=)		
Send Info	M	M(=)		

Argument

Indicates requested service parameters.

fType

Indicates the frame type.

Protocol Version

Indicates the protocol version.

Mng Address

Indicates the address information of stations that are recognized by the management master station.

Prev Node Address

Indicates the address information of the last station that sends or relays data.

Prev Node Port

Indicates the port number of the last station that sends or relays data.

Option Flag

Indicates that a function such as the DetectionAck forced transmission is specified.

Hop Count

Indicates the hop count from stations that are recognized by the management master station.

IP Address

Indicates the IP address of the management master station and subnet mask of the server.

Send Info

Indicates the source type and phase.

6.2.12.2.4.3 Detection Ack

This service is used to give a response about the connection status of the host station when the management master station sends a connection detection request. Table 41 shows the parameters for this service.

Table 41 – Detection Ack service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
fType	M	M(=)		
Node Type	M	M(=)		
Protocol Version	M	M(=)		
Node Switch	M	M(=)		
Src Address	M	M(=)		
Prev Node Address	M	M(=)		
Prev Node Port	M	M(=)		
Detect Rcv Port	M	M(=)		
My Port	M	M(=)		
My Port Link Status	M	M(=)		
My Port Filter Status	M	M(=)		
Current Manager	M	M(=)		
IP Address	M	M(=)		
Performance	M	M(=)		
GM Priority	M	M(=)		
Sync Type	M	M(=)		
Pdelay Res Time	M	M(=)		
Delay Set Time	M	M(=)		
Announce Relay Time	M	M(=)		
List of Device Info	M	M(=)		
Device Version	O	O(=)		
Vendor Code	M	M(=)		
Model Code	O	O(=)		
Expansion Model Code	O	O(=)		
Device Type	M	M(=)		
Memory address	M	M(=)		
Cyclic Size	M	M(=)		
Function	M	M(=)		
Option Info	M	M(=)		
Station Mode	M	M(=)		

Argument

Indicates requested service parameters.

fType

Indicates the frame type.

Node Type

Indicates the host station type and host station function installation.

Protocol Version

Indicates the protocol version.

Node Switch

Indicates the value of the setting switch that the station has.

Src Address

Indicates the MAC address information of the host station.

Prev Node Address

Indicates the MAC address of the last station that relays Detection.

Prev Node Port

Indicates the sending port number of the last station that relays Detection.

Detect Rcv Port

Indicates the receiving port number of the station that receives Detection.

My Port

Indicates the number of ports that the host station has.

My Port Link Status

Indicates the link status of all the ports that the host station has.

My Port Filter Status

Indicates the filtering status of all the ports that the host station has.

Current Manager

Indicates the MAC address information of the current management master station.

IP Address

Indicates the IP address information.

Performance

Indicates performance of the host station such as the effective throughput and time synchronization error detection.

GM Priority

Indicates the priority information of the host station.

Sync Type

Indicates the time synchronization type of the host station.

Pdelay Res Time

Indicates the time from when Pdelay_Req is received to when PDelay_Resp_Follow_Up response is sent.

Delay Set Time

Indicates the time from when propagation delay time is calculated to when PortRole is set to MasterPort.

Announce Relay Time

Indicates the time from when Announce is received and PortRole is set to when MasterPort is immediately relayed to Announce.

List of Device Info

Indicates the station information of the host station.

Device Version

Indicates the device version.

Vendor Code

Indicates the vendor code. The values managed by CLPA are used.

Model Code

Indicates the model code.

Expansion Model Code

Indicates the extension model code.

Device Type

Indicates the device type. The values managed by CLPA are used.

Memory address

Indicates the memory address of the sub payload receiving station.

Cyclic Size

Indicates the number of cyclic points.

Function

Indicates the function type, for example, whether the watchdog counter is installed, whether the setting is able to be overwritten, or whether the station is a local station.

Option Info

Indicates existence of the controller information part or option information.

Station Mode

Indicates the information to identify the COMM_IF section created with CSP+.

6.2.12.2.4.4 Test data

This service is used for the management master station to detect the network connection status when the CC-Link IE Field coexists. Table 42 shows the parameters for this service.

Table 42 – Test data service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
fType	M	M(=)		
dType	M	M(=)		
Master Priority	M	M(=)		
Station Type	M	M(=)		
Station Num	M	M(=)		
Protocol Version	M	M(=)		
Mng Address	M	M(=)		
Prev Node Port	M	M(=)		
Send Info	M	M(=)		
Hop Count	M	M(=)		
IP Address	M	M(=)		

Argument

Indicates parameters of the request service.

fType

Indicates the frame type.

dType

Indicates the data type.

Master Priority

Indicates the priority of the master station.

Station Type

Indicates the station type.

Station Num

Indicates the host station number.

Protocol Version

Indicates the protocol version.

Mng Address

Indicates the address information of the station that is recognized as a management master station.

Prev Node Port

Indicates the port number of the last station that is sent or relayed.

Send Info

Indicates the source type and phase.

Option Flag

Indicates that a function such as the forced DetectionAck transmission is specified.

Hop Count

Indicates the hop count from the station that is recognized as a management master station.

IP Address

Indicates the IP address (IPv4 or IPv6), subnet mask, and subnet prefix length of the management master station.

6.2.12.2.4.5 Test data ack

This service is used to give a response about the connection status of the host station when the CC-Link IE Field coexists and the management master station sends a connection detection request. Table 43 shows the parameters for this service.

Table 43 – Test data ack service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
fType	M	M(=)		
dType	M	M(=)		
Master Priority	M	M(=)		
Station Type	M	M(=)		
Station Num	M	M(=)		
Protocol Version	M	M(=)		
Mng Address	M	M(=)		
Prev Node Port	M	M(=)		
Rcv Port	M	M(=)		
My Port	M	M(=)		
Token Keep Time	M	M(=)		
My Connect Status	M	M(=)		

Argument

Indicates parameters of the request service.

fType

Indicates the frame type.

dType

Indicates the data type.

Master Priority

Indicates the priority of the master station.

Station Type

Indicates the station type.

Station Num

Indicates the host station number.

Protocol Version

Indicates the protocol version.

Mng Address

Indicates the address information of the station that is recognized as a management master station.

Prev Node Port

Indicates the port number of the last station that is sent or relayed.

Rcv Port

Indicates the receive port number of the station that received TestData.

My Port

Indicates the number of ports in the host station.

Token Keep Time

Indicates the time in which the host station keeps the token.

My Connect Status

Indicates the connection status of the host station port.

6.2.12.2.4.6 Acyclic data rsv

This service is used to perform transient transmission of the bandwidth reservation method using the CC-Link IE TSN frame type. Table 44 shows the parameters for this service.

Table 44 – Acyclic data rsv service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
Target Node Address	M	M(=)		
Data Arg	M	M(=)		
Result(+)			S	S(=)
Data Result			M	M(=)
Result(-)			S	S(=)
Error Code			M	M(=)

Argument

Indicates requested service parameters.

Target Node Address

Indicates the address information of the target station.

Data Arg

Indicates the data to be sent.

Result(+)

Indicates completion of the requested service.

Data Result

Indicates the response data.

Result(-)

Indicates failure of the requested service.

Error Code

Indicates error codes.

6.2.12.2.4.7 Acyclic data nrsv

This service is used to perform transient transmission with TS0 using the CC-Link IE TSN frame type. Table 45 shows the parameters for this service.

Table 45 – Acyclic data nrsv service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
Target Node Address	M	M(=)		
Data Arg	M	M(=)		
Result(+)			S	S(=)
Data Result			M	M(=)
Result(-)			S	S(=)
Error Code			M	M(=)

Argument

Indicates requested service parameters.

Target Node Address

Indicates the address information of the target station.

Data Arg

Indicates the data to be sent.

Result(+)

Indicates completion of the requested service.

Data Result

Indicates the response data.

Result(-)

Indicates failure of the requested service.

Error Code

Indicates error codes.

6.2.13 Management ASE type T**6.2.13.1 Overview**

Management ASE type T provides the network management function.

6.2.13.2 Management type T class specification**6.2.13.2.1 Overview**

Network management class realizes the supervisory management of the network.

6.2.13.2.2 Format model

FAL ASE:		Management ASE type T
CLASS:		Network manager
CLASS ID:		not used
PARENT CLASS:		TOP
ATTRIBUTES:		
1	(m)	KeyAttribute: List Name
2	(m)	Attribute: My Address
3	(m)	Attribute: Memory Assignment
SERVICES:		
1	(m)	MgtService: Get Attribute
2	(m)	MgtService: Set Attribute

6.2.13.2.3 Attributes

List Name

Indicates the attribution list name.

My Address

Indicates the address information of the host station.

Memory Assignment

Indicates the assignment information of the cyclic memory.

6.2.13.2.4 Service specification

6.2.13.2.4.1 Get attribute

This service is used to read the attribute value of the specified service class. Table 46 shows the parameters for this service.

Table 46 – Get attribute service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
List Name	M			
Attribute Name	M			
Result(+)				S
Attribute Value				M
Result(-)				S

Argument

Indicates requested service parameters.

List Name

Indicates the name of the target attribution list.

Attribute Name

Indicates the name of the target attribution.

Result(+)

Indicates completion of the requested service.

Attribute Value

Indicates the read attribute value.

Result(-)

Indicates failure of the requested service.

6.2.13.2.4.2 Set attribute

This service is used to set the specified attribute value. Table 47 shows the parameters for this service.

Table 47 – Set attribute service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
List Name	M			
Attribute Name	M			
Attribute Value	M			
Result(+)				S
Result(-)				S

Argument

Indicates requested service parameters.

List Name

Indicates the name of the target attribution list.

Attribute Name

Indicates the name of the target attribution.

Attribute Value

Indicates the value to be written to the target attribution.

Result(+)

Indicates completion of the requested service.

Result(-)

Indicates failure of the requested service.

6.2.14 Time sync data ASE type T**6.2.14.1 Overview**

Time sync data ASE provides the management function for the time synchronization compliant with IEEE Std 802.1AS or IEEE Std 1588. For details, refer to these standards.

6.2.14.2 Time sync data type T class specification**6.2.14.2.1 Overview**

Time sync data class realizes the time synchronization model.

6.2.14.2.2 Format model

FAL ASE:	Time sync data ASE type T
CLASS:	Time sync data
CLASS ID:	not used
PARENT CLASS:	TOP
ATTRIBUTES:	
1 (m) Key Attribute:	Implicit
SERVICES:	
1 (m) OpsService:	TimeSyncMng

6.2.14.2.3 Attributes

Implicit

Indicates that the cyclic memory address is implicitly specified.

6.2.14.2.4 Service specification

6.2.14.2.4.1 TimeSyncMng

This service is used for the execution request, completion notification of the time synchronization, or execution of the management service. Table 48 shows the parameters for this service.

Table 48 – TimeSyncMng service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
TimeSync Data	M	M(=)		
Result(+)				S
TimeSyncData				M
Status				M
Result(-)				S
Status				M

Argument

Indicates requested service parameters.

TimeSync Data

Indicates the data used for the management service.

Result(+)

Indicates completion of the requested service.

TimeSync Data

Indicates the response data which is the execution result of the management service.

Status

Indicates the execution status of the management service.

Result(-)

Indicates failure of the requested service.

Status

Indicates the execution status of the management service.

6.2.15 SLMP data ASE type T

6.2.15.1 Overview

SLMP data ASE provides the communication function using SLMP-PDU that is required for the CC-Link IE TSN network.

6.2.15.2 SLMP data type T class specification

6.2.15.2.1 Overview

SLMP data type T class realizes the SLMP-PDU transmission model.

6.2.15.2.2 Format model

FAL ASE:		SLMP data ASE type T
CLASS:		SLMP data type T
CLASS ID:		not used
PARENT CLASS:		TOP
ATTRIBUTES:		
1	(m)	Key Attribute: Implicit
2	(m)	Attribute: Request Type
SERVICES:		
1	(m)	OpsService: SImpData

6.2.15.2.3 Attributes

Implicit

Indicates that the cyclic memory address is implicitly specified.

Request Type

Indicates the request type information. Either of the followings is indicated as the request type:

- Client Request
- Server Response

6.2.15.2.4 Service specification

6.2.15.2.4.1 SLMP data

This service is used to send or receive SLMP-PDU. Table 49 shows the parameters for this service.

Table 49 – SLMP data service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M(=)		
Target Address	M	M(=)		
Data Arg	M	M(=)		
Result(+)			S	S(=)
Data Result			M	M(=)
Result(-)			S	S(=)
Error Code			M	M(=)

Argument

Indicates requested service parameters.

Target Address

Indicates the target address information.

Data Arg

Indicates SLMP-PDU.

Result(+)

Indicates completion of the requested service.

Data Result

Indicates the SLMP response data.

Result(-)

Indicates failure of the requested service.

Error Code

Indicates error codes.

6.3 AR type C**6.3.1 Overview**

AR consists of four classes: Cyclic transmission class, Acyclic transmission class, Connection control class, and Common parameter dist class. Figure 8 shows the structure.

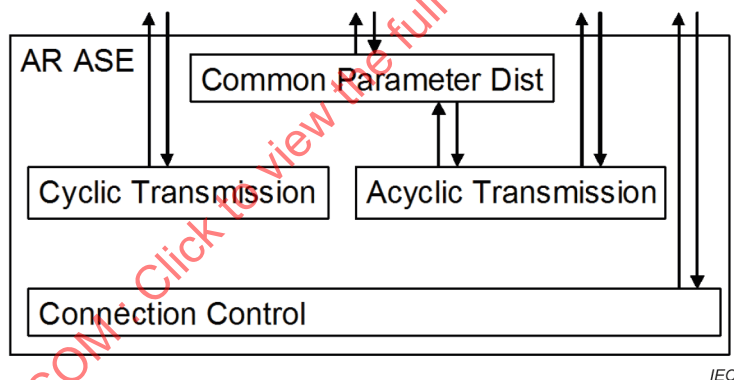


Figure 8 – Structure of AR type C

There are two AR end points in each node for the cyclic transmission and the transient transmission. These end points correspond to the Cyclic transmission class and the Acyclic transmission class respectively. The Connection control class is a class relating to the network configuration. The Common parameter dist class is a class relating to the distribution of common parameters for the cyclic transmission.

6.3.2 Connection Control

6.3.2.1 Common Control class specification

6.3.2.1.1 Format model

FAL ASE:			AR ASE type C
CLASS:			Connection control
CLASS ID:			not used
PARENT CLASS:			Top
ATTRIBUTES:			
1	(m)	Key Attribute:	Network number
2	(m)	Key Attribute:	Node number
3	(m)	Attribute:	MAC Address
4	(m)	Attribute:	Node Type
5	(m)	Attribute:	Node Loop State
6	(m)	Attribute:	Node Cyclic State
7	(m)	Attribute:	Node Group Address
8	(m)	Attribute:	Vendor Code
9	(m)	Attribute:	Device Type
10	(m)	Attribute:	Unit Type Name
11	(m)	Attribute:	Unit Type Code
12	(m)	Attribute:	Vendor Specific Node Info
13	(m)	Attribute:	In Far Node MAC Address
14	(m)	Attribute:	In Far Node Number
15	(m)	Attribute:	Out Far Node MAC Address
16	(m)	Attribute:	Out Far Node Number
17	(s)	Attribute:	Common Parameter Id
18	(s)	Attribute:	DCS and FCS Errors
19	(m)	Attribute:	NTN Test Info
19.1	(m)	Attribute:	NTN Test State
19.2	(m)	Attribute:	NTN Test Tries
19.3	(m)	Attribute:	NTN Test Sent Frames
19.4	(m)	Attribute:	NTN Test Received Frames
19.5	(m)	Attribute:	NTN Test FCS Check Errors
19.6	(m)	Attribute:	NTN Test DCS Check Errors
19.7	(m)	Attribute:	NTN Test HEC Check Errors
SERVICES:			
1	(m)	OpsService:	Control cyclic

6.3.2.1.2 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

MAC address

Represents the MAC address of the node.

Node type

Represents the node type as one of the following:

Management node

Management node

Normal node with common parameter

Normal node (common parameter setting node)

Normal node without common parameter

Normal node (common parameter non-setting node)

Node loop state

Represents the loop status of the node. The node loop status is one of the following:

Through

Through

In loopback and out disconnect

Loop back to "In" side, "Out" side disconnected

In loopback and out improper connecting

Loop back to "In" side, In/Out check error in "Out" side

In loopback and out checking

Loop back to "In" side, In/Out check being performed in "Out" side

In disconnect and out loopback

"In" side disconnected, loop back to "Out" side

In improper connecting and out loopback

In/Out check error in "In" side, loop back to "Out" side

In checking and out loopback

In/Out check being performed in "In" side, loop back to "Out" side

Node cyclic status

Represents the cyclic status of the node.

Cyclic not started

Cyclic transmission is not performed

Cyclic started

Cyclic transmission is performed

Common parameter not received

Common parameters not received

Common parameter distributing

Receiving common parameters

Common parameter incorrect

Common parameters error

Node number incorrect

The node number is illegal

Node reserved

Reserve node setting

Cyclic suspended

Cyclic stop instruction

Offline test in execution

Performing off-line test

Supervisory timer timeout

Monitor timer time out

Node number not configured

Node number not set

Node operational failure

The node CPU error

Node number duplicated

The node number duplication

Management node duplicated

The node management node duplication

Node number duplicated and management node duplicated

The node number and management node duplication

Network number incorrect

Network number error

Node group address

Shows the group address.

Vendor code

Represents the vendor code.

Device type

Represents the model type.

Unit type name

Represents the unit model name.

Unit type code

Represents the unit model code.

Vendor specific node info

Represents the user-defined node information.

In far node MAC address

Represents the MAC address of a node connected to "In" side.

In far node number

Represents the node number of a node connected to "In" side.

Out far node MAC address

Represents the MAC address of a node connected to "Out" side.

Out far node number

Represents the node number of a node connected to "In" side.

Common parameter ID

Represents the ID of common parameters.

DCS and FCS errors

Represents the number of error occurrences both in DCS and FCS.

NTN test info

Represents the information of the node-to-node test.

NTN Test result

Represents the result of the node-to-node test. The result of the node-to-node test is the following value.

NTN Test OK

Node-to-node test: Normal

NTN Test NG

Node-to-node test: Error

NTN Test tries

Represents the number of trials of the node-to-node test.

NTN Test sent frames

Represents the number of frame sending times of the node-to-node test.

NTN Test received frames

Represents the number of frame receptions of the node-to-node test.

NTN Test FCS check errors

Represents the number of FCS check errors in the node-to-node test.

NTN Test sent frames

Represents the number of DCS check errors in the node-to-node test.

NTN Test received frames

Represents the number of HEC check errors in the node-to-node test.

6.3.2.1.3 Service specification**6.3.2.1.3.1 Control cyclic**

This service is used to restart/stop the cyclic transmission. Table 50 shows the parameters for this service.

Table 50 – Control cyclic service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M			
Control type	M			
Result				M
State				M

Argument

The argument conveys the service specific parameters of the service request.

Control type

Specifies control type. The control type is one of the followings.

Restart

Cyclic restarted

Stop

Cyclic stopped

Result

This conveys the service specific parameters of the service response.

State

Contains the control result. The control result is one of the followings.

Running

Cyclic in progress

Stop

Cyclic suspended

6.3.3 Cyclic transmission type C**6.3.3.1 Cyclic transmission C class specification****6.3.3.1.1 Format model**

FAL ASE:		AR ASE type C	
CLASS:		Cyclic transmission C	
CLASS ID:		not used	
PARENT CLASS:		Top	
ATTRIBUTES:			
1	(m)	Key Attribute:	Network number
2	(m)	Key Attribute:	Node number
3	(o)	Attribute:	Local LB
4	(o)	Attribute:	Local LW
5	(o)	Attribute:	Local LY1
6	(o)	Attribute:	Local LY2
7	(o)	Attribute:	Local LX1
8	(o)	Attribute:	Local LX2
SERVICES:			
1	(m)	OpsService:	CT update

6.3.3.1.2 Attributes**Network number**

Represents the network number of the node.

Node number

Represents the node number of the node.

Local LB

Represents the local LB of the node.

Local LW

Represents the local LW of the node.

Local LY1

Represents the local LY1 of the node.

Local LY2

Represents the local LY2 of the node.

Local LX1

Represents the local LX1 of the node.

Local LX2

Represents the local LX2 of the node.

6.3.3.1.3 Service specification**6.3.3.1.3.1 CT Update**

This service is used to update data. Table 51 shows the parameters for this service.

Table 51 – CT Update service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Data type	M	M (=)		
Offset address	M	M (=)		
Size	M	M (=)		
Data	M	M (=)		

Argument

The argument conveys the service specific parameters of the service request.

Data type

Specifies the data type. The data type is any of LB, LW, LY1, LY2, LX1, and LX2.

Offset address

Specifies the offset address that corresponds to the data.

Size

Specifies the size of the data. Expressed in octet.

Data

Specifies the value to be updated.

6.3.4 Acyclic transmission type C**6.3.4.1 Acyclic transmission C class specification****6.3.4.1.1 Format model**

FAL ASE:	AR ASE type C
CLASS:	Acyclic transmission C
CLASS ID:	not used
PARENT CLASS:	Top
ATTRIBUTES:	
1 (m) Key Attribute:	Network number
2 (m) Key Attribute:	Node number
3 (m) Attribute:	Max transmission
SERVICES:	
1 (m) OpsService:	AC send
2 (m) OpsService:	AC param send

6.3.4.1.2 Attributes**Network number**

Represents the network number of the node.

Node number

Represents the node number of the node.

Max transmission

Represents the maximum number of transient transmissions at a time.

6.3.4.1.3 Service specification**6.3.4.1.3.1 AC Send**

This service is used to send data. Table 52 shows the parameters for this service.

Table 52 – AC Send service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Source Network Number	M	M (=)		
Source Node Number	M	M (=)		
Source Module	M	M (=)		
Dest Network Number	M	M (=)		
Dest Node Number	M	M (=)		
Dest Module	M	M (=)		
Request Type	M	M (=)		
Command	M	M (=)		
Size	M	M (=)		
Data	M	M (=)		

Argument

The argument conveys the service specific parameters of the service request.

Source network number

Specifies the network number of source node.

Source node number

Specifies the node number of source node.

Source module

Specifies the source module. Shows whether in the unit or in the controller.

Dest network number

Specifies the network number of destination node.

Dest node number

Specifies the node number of destination node.

Dest module

Specifies the target module. Shows whether in the unit or in the controller.

Command

Specifies the command as one of the following:

Send parameter 1

Sends Parameter 1.

Send parameter 2

Sends Parameter 2.

Get system info

Retrieves the system information.

Get memory access info

Retrieves the memory access information.

Run

Requests RUN.

Stop

Requests STOP.

Line test

Requests a line test.

Read memory

Reads memory.

Write memory

Writes memory.

Request Type

Specifies the request type as one of the following:

Client request

Requests a client.

Server response

Response from the server

Push request

Requests a push.

Size

Specifies the size of the data.

Data

Contains the data associated with the command.

6.3.4.1.3.2 AC Param send

This service is used to distribute parameters. Table 53 shows the parameters for this service.

Table 53 – AC Param send service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
Dest group	M	M (=)		
Data ID	M	M (=)		
Data type	M	M (=)		
Size	M	M (=)		
Data	M	M (=)		

Argument

The argument conveys the service specific parameters of the service request.

Dest group

Specifies the destination group. It uses BitString32, and Bit0 represents the group address 1. Following that, each bit represents a destination group address up to Bit31 that shows the group address 32.

Data ID

Specifies the identification number of the data.

Data type

Specifies the data type. The data type is delivered by parameter.

Size

Specifies the size of data. Expressed in octet.

Data

Specifies the values to be sent.

6.3.5 Common parameter dist**6.3.5.1 Common parameter dist class specification****6.3.5.1.1 Format model****FAL ASE:****AR ASE type C****CLASS:****Common Parameter Dist****CLASS ID:****not used****PARENT CLASS:****Top****ATTRIBUTES:**

1	(m)	Key Attribute:	Network Number
2	(m)	Key Attribute:	Node Number
3	(m)	Attribute:	Parameter ID
4	(m)	Attribute:	Total Nodes
5	(m)	Attribute:	Network Type
6	(m)	Attribute:	Acyclic Times
7	(m)	Attribute:	Supervisory Period
8	(o)	Attribute:	LB/LW Common Memory Area
8.1	(m)	Attribute:	LW CM Head Address
8.2	(m)	Attribute:	LW CM Total Size
8.3	(m)	Attribute:	LB CM Head Address
8.4	(m)	Attribute:	LB CM Total Size
8.5	(m)	Attribute:	LB/LW CM Table List

8.5.1	(m)	Attribute:	LW CM Head Address of Node
8.5.2	(m)	Attribute:	LW CM Size
8.5.3	(m)	Attribute:	LB CM Head Address of Node
8.5.4	(m)	Attribute:	LB CM Size
9	(o)	Attribute:	LB/LW Common Memory Additional Area
9.1	(m)	Attribute:	LW CM Head Address
9.2	(m)	Attribute:	LW CM Total Size
9.3	(m)	Attribute:	LB CM Head Address
9.4	(m)	Attribute:	LB CM Total Size
9.5	(m)	Attribute:	LB/LW CM Table List
9.5.1	(m)	Attribute:	LW CM Head Address of Node
9.5.2	(m)	Attribute:	LW CM Size
9.5.3	(m)	Attribute:	LB CM Head Address of Node
9.5.4	(m)	Attribute:	LB CM Size
10	(o)	Attribute:	LX/LY Common Memory 1 Area
10.1	(m)	Attribute:	Master Node Number
10.2	(m)	Attribute:	LY CM Head Address
10.3	(m)	Attribute:	LY CM Total Size
10.4	(m)	Attribute:	LX CM Head Address
10.5	(m)	Attribute:	LX CM Total Size
10.6	(m)	Attribute:	LX/LY CM Table List
10.6.1	(m)	Attribute:	LY CM Head Address Sent
10.6.2	(m)	Attribute:	LY CM Size
10.6.3	(m)	Attribute:	LX CM Head Address Master Received
10.6.4	(m)	Attribute:	LX CM Head Address Received
10.6.5	(m)	Attribute:	LX CM Size
10.6.6	(m)	Attribute:	LY CM Head Address Master Sent
11	(o)	Attribute:	LX/LY Common Memory 2 Area
11.1	(m)	Attribute:	Master Node Number
11.2	(m)	Attribute:	LY CM Head Address
11.3	(m)	Attribute:	LY CM Total Size
11.4	(m)	Attribute:	LX CM Head Address
11.5	(m)	Attribute:	LX CM Total Size
11.6	(m)	Attribute:	LX/LY CM Table List
11.6.1	(m)	Attribute:	LY CM Head Address Sent
11.6.2	(m)	Attribute:	LY CM Size
11.6.3	(m)	Attribute:	LX CM Head Address Master Received
11.6.4	(m)	Attribute:	LX CM Head Address Received
11.6.5	(m)	Attribute:	LX CM Size
11.6.6	(m)	Attribute:	LY CM Head Address Master Sent

SERVICES:

1	(m)	OpsService:	CPD set
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6.3.5.1.2 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

Parameter ID

Represents the parameter ID.

Total nodes

Represents the total number of nodes.

Network type

Represents the network type. The network type is the following value.

Controller network

Controller network

Acyclic times

Represents the number of the transient transmission.

Supervisory period

Represents the monitoring time (per 1 ms).

LB/LW Common memory area

Represents the basic settings of the LB and LW.

LW CM Head address

Represents the starting relative address of the LW.

LW CM Total size

Represents the total number of words in the LW setting range.

LB CM Head address

Represents the starting address of the LB.

LB CM Total size

Represents the total number of words in the LB setting range.

LB/LW CM Table list

Represents the parameter table list of LB and LW. The number of tables is 120.

LW CM Head address of nodes

Represents the starting relative address of the LW of each node.

LW CM Size

Represents the number of words of the LW of each node.

LB CM Head address of nodes

Represents the starting relative address of the LB of each node.

LB CM Size

Represents the number of words of the LB of each node.

LB/LW Common memory additional area

Represents the additional parameter of the LB and LW.

LW CM Head address

Represents the starting relative address of the LW.

LW CM Total size

Represents the total number of words in the LW setting range.

LB CM Head address

Represents the starting address of the LB.

LB CM Total size

Represents the total number of words in the LB setting range.

LB/LW CM Table list

Represents the parameter table list of the LB and LW. The number of tables is 120.

LW CM Head address of nodes

Represents the starting relative address of the LW of each node.

LW CM Size

Represents the number of words of the LW of each node.

LB CM Head address of nodes

Represents the starting relative address of the LB of each node.

LB CM Size

Represents the number of words of the LB of each node.

LX/LY Common memory 1 area

Represents the basic settings of the LX/LY1.

Master node number

Represents the node number of the master node.

LY CM Head address

Represents the starting address of the LY.

LY CM Total size

Represents the total size (per two octets) of the LY.

LX CM Head address

Represents the starting address of the LX.

LX CM Total size

Represents the total size (per two octets) of the LX.

LX/LY Common memory table list

Represents the parameter table list of the LX/LY1. The number of tables is 120.

LY CM Head address sent

Represents the LY starting address sent by each node

LY CM Size

Represents the LY size sent by each node (per two octets).

LX CM Head address master received

Represents the LX starting address received by the master node.

LX CM Head address received

Represents the LX starting address received by each node.

LX CM Size

Represents the LX size received by each node (per two octets).

LY CM Head address master sent

Represents the LY starting address sent by the master node.

LX/LY Common memory 2 area

Represents the basic settings of the LX/LY.

Master node number

Represents the node number of the master node.

LY CM Head address

Represents the starting address of the LY.

LY CM Total size

Represents the total size (per two octets) of the LY.

LX CM Head address

Represents the starting address of the LX.

LX CM Total size

Represents the total size (per two octets) of the LX.

LX/LY Common memory table list

Represents parameter table list of the LX/LY2. The number of tables is 120.

LY CM Head address sent

Represents the LY starting address sent by each node

LY CM Size

Represents the LY size sent by each node (per two octets).

LX CM Head address master received

Represents the LX starting address received by the master node.

LX CM Head Address received

Represents the LX starting address received by each node.

LX CM Size

Represents the LX size received by each node (per two octets).

LY CM Head address master sent

Represents the LY starting address sent by the master node.

6.3.5.1.3 Service specification**6.3.5.1.3.1 CPD Set**

This service is used to update common parameters. Table 54 shows the parameters for this service.

Table 54 – CPD Set service parameters

Parameter name	Req	Ind	Rsp	Cnf
Argument	M	M (=)		
List of parameters	M	M (=)		
Requested parameter	M	M (=)		
Attribute value	M	M (=)		

Argument

The argument conveys the service specific parameters of the service request.

List of parameters

Specifies the common parameter subject to the update, and its value.

Requested attribute

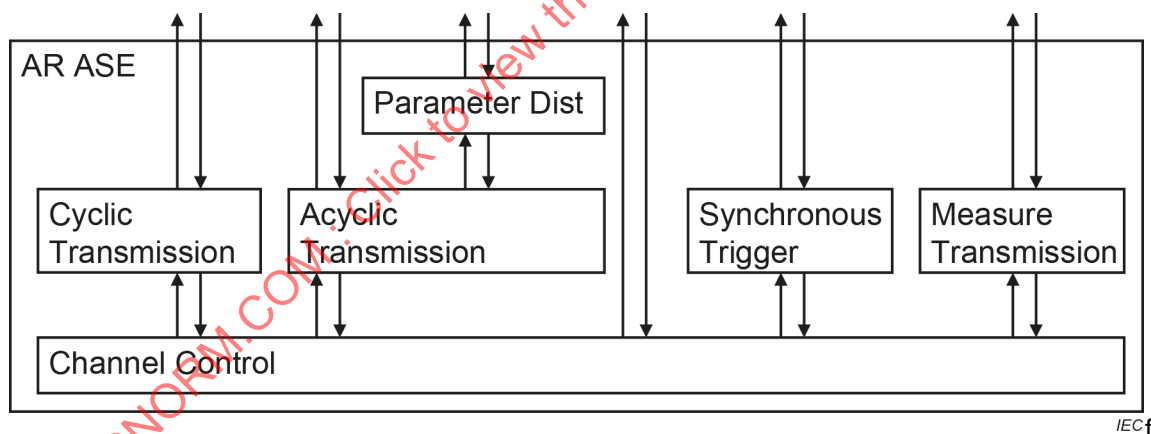
Specifies the common parameter subject to the update.

Attribute value

Specifies the value to be set.

6.4 AR type F**6.4.1 Overview**

AR consists of six classes: Cyclic transmission class, Acyclic transmission class, Channel control class, Parameter dist class, Measure transmission class and Synchronous trigger class. Figure 9 shows the structure.

**Figure 9 – Structure of AR type F**

There are two AR end points in each node for the cyclic transmission and the transient transmission. These end points correspond to the Cyclic transmission class and the Acyclic transmission class respectively. The Channel control class is a class related to the transmission path configuration. The Parameter dist class is a class related to the distribution of common parameters for the cyclic transmission. The Measurement transmission class is class associated with the measurement of the transmission path time delay. The Synchronous trigger class is associated with synchronization.

6.4.2 Channel control

6.4.2.1 Channel control class specification

6.4.2.1.1 Format model

FAL ASE:			AR ASE type F
CLASS:			Channel control
CLASS ID:			not used
PARENT CLASS:			Top
ATTRIBUTES:			
1	(m)	Key Attribute:	Network Number
2	(m)	Key Attribute:	Node Number
3	(m)	Attribute:	MAC Address
4	(m)	Attribute:	Node Type
5	(m)	Attribute:	Device Type
6	(m)	Attribute:	Model Code
7	(m)	Attribute:	IO Type
8	(m)	Attribute:	Vendor Name
9	(m)	Attribute:	Vendor Code
10	(m)	Attribute:	F/W Version
11	(m)	Attribute:	Timer
12	(m)	Attribute:	Ports
13	(m)	Attribute:	Port Status List
13.1	(m)	Attribute:	Port Number
13.2	(m)	Attribute:	Port Status
13.3	(m)	Attribute:	Port Usage
13.4	(m)	Attribute:	Port Statistics
13.4.1	(m)	Attribute:	Port Receive Error
13.4.2	(m)	Attribute:	Port Duplicate Transmission Permission Error
13.4.3	(m)	Attribute:	Port Receive Timing Error
13.4.4	(m)	Attribute:	Port HEC Error
13.4.5	(m)	Attribute:	Port DCS/FCS Error
13.4.6	(m)	Attribute:	Port Under Size Error
13.4.7	(m)	Attribute:	Port Forward Frames
13.4.8	(m)	Attribute:	Port Upward Frames
13.4.9	(m)	Attribute:	Port Forward Buffer Full Discards
13.4.10	(m)	Attribute:	Port Upward Buffer Full Discards
14	(m)	Attribute:	Application State Detail
15	(m)	Attribute:	Application Error Severity
16	(m)	Attribute:	Error Code
17	(m)	Attribute:	Vendor Specific Node Info
18	(m)	Attribute:	Channel Group
19	(m)	Attribute:	Token Destination Node MAC Address
20	(m)	Attribute:	Token Keep Time
21	(m)	Attribute:	Multiple Tokens
22	(m)	Attribute:	Multiple Transmit
23	(m)	Attribute:	Frame Interval
24	(m)	Attribute:	Master Role

25	(m)	Attribute:	Parameter Received
26	(m)	Attribute:	Parameter Confirmation
27	(m)	Attribute:	Communication Ready State
28	(m)	Attribute:	Transient Receive Capability
29	(m)	Attribute:	Transient Receive State
30	(c)	Constraint:	Node Type == Master
30.1	(m)	Attribute:	Max Transients per one round
30.2	(m)	Attribute:	Application State
30.3	(m)	Attribute:	Application Error State
31	(c)	Constraint:	Node Type != Master
31.1	(m)	Attribute:	Node Type Invalid State
31.2	(m)	Attribute:	Temporal Error State
31.3	(m)	Attribute:	Reserved Node State
31.4	(m)	Attribute:	Leave Timer
31.5	(m)	Attribute:	Node Number Set up Capability
31.6	(m)	Attribute:	Node Number Setting State
31.7	(m)	Attribute:	Node Number Duplication
31.8	(m)	Attribute:	Cyclic Data Size Set up Capability
31.9	(m)	Attribute:	RX Size
31.10	(m)	Attribute:	RY Size
31.11	(m)	Attribute:	RWr Size
31.12	(m)	Attribute:	RWw Size
31.13	(m)	Attribute:	Size error
31.14	(m)	Attribute:	Cyclic Stop Comprehensive Order State
31.15	(m)	Attribute:	Cyclic Stop Specific Order State

SERVICES:

1	(c)	Constraint:	Node type == Master
1.1	(m)	OpsService:	Control Cyclic

6.4.2.1.2 Attributes

Network number

Represents the network number of the node.

Node number

Represents the node number of the node.

MAC address

Represents the MAC address of the node.

Node type

Represents the node type as one of the following:

- Master
- Local
- Intelligent device
- Remote device
- Remote IO

Device type

This attribute indicates the device type.

Model code

This attribute indicates the model code.

IO Type

This attribute indicates the I/O type as one of the following:

- In/Out with the same index (front/back mixed)
- Input
- Output
- In/Out with different index (mixed)

Vendor name

This attribute indicates the vendor name.

Vendor code

This attribute indicates the vendor code.

F/W Version

This attribute indicates the F/W version.

Timer

This attribute indicates the timer value in units of 15, 258 789 062 5 μ s, with January 1, 2000, 00:00:00 as the origin.

Ports

This attribute indicates the physical number of communication points held by the node.

Port status list

This attribute indicates the port status list.

Port number

Indicates the port number.

Port status

Indicates the port status as:

- Link down
- Link up – 1 Gbps

Port usage

Indicates the port usage as:

- Disabled
- Enabled

Port statistics

Indicates the port statistics

Port receive error

This attribute indicates the reception error status as:

- None
- Error

Port duplicate transmission error

This attribute indicates the status of duplicate transmission permissions detection as:

- None
- Error

Port receive timing error

This attribute indicates the status of invalid token-PDU reception timing as:

- None
- Error

Port HEC errors

Indicates the number of HEC error frames for the port.

Port DCS/FCS errors

Indicates the number of DCS/FCS error frames for the port.

Port under size errors

Indicates the number of undersize (28 octets) error frames for the port.

Port forward frames

Indicates the number of forward frames for the port.

Port upward frames

Indicates the number of frames delivered to the upper layer from the port.

Port forward buffer full discards

Indicates the number of frames discarded due to a full forward buffer for the port.

Port upward buffer full discards

Indicates the number of frames received in the upper layer and discarded due to a full buffer for the port.

Application state detail

Indicates the detailed application state as:

- Not supported
- Application stopped
- Application running
- Application not exist

Application error severity

Indicates the application error detection status as:

- None
- Minor
- Major
- Critical

Error code

Indicates the error code.

Vendor specific node info

Indicates the vendor specific node information.

Channel group

Indicates the multi-cast address generated from the MAC address of the transmission control manager. The address sets 1 as the I/G bit of the MAC address of the transmission control manager.

Token destination node MAC address

Indicates the set value of the MAC address of the token destination node during token inspection.

Token keep time

Indicates the token keep time for a node that is to transmit testDataAck-PDU after the start of token inspection.

Multiple tokens

Indicates the number of times the token-PDU to be transmitted during a single token hold is to be repeatedly transmitted.

Multiple transmit

Indicates the number of times a node holding a token is to repeatedly transmit an FALDPU other than a token-PDU.

Frame interval

Indicates the interval from token-PDU reception to myStatus-PDU transmission.

Master role

Indicates whether or not the station is operating as the master station as:

- True
- False

Parameter received

Indicates the cyclic communication parameter reception status as:

- Valid parameter received
- Not received (not received or ID mismatch)
- Validating
- Invalid parameter received

Parameter confirmation

Indicates the cyclic communication parameter confirmation status as:

- Validated
- Validating

Communication ready state

Indicates the communication ready state as:

- Ready
- Cyclic not running with self-judgment

Transient receive capability

Indicates the existence or non-existence of a transient reception function as:

- Not supported
- Supported

Transient receive state

Indicates the transient reception status as:

- Disable
- Enable