IEC 61158-5-23

Edition 3.0 2023-03

INTERNATIONAL STANDARD

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

IEC 61158-5-23:2023-03(en)

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IEC 61158-5-23

Edition 3.0 2023-03

INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-6579-6

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

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Attention is drawn to the fact that the use of the associated protocol type is restricted by its intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by its intellectual-property-right holders.

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.

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, RWr, and RWw

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, salve to master, 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 salve, 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, slave to master, 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

a) The "FAL ASE:" entry is the name of the FAL ASE that provides the services for the class being specified.

b) 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.

c) 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.

d) 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:	**Data type ASE**
CLASS:	**Data type**
CLASS ID:	**5**
PARENT CLASS:	Top
ATTRIBUTES:	

1	Data type numeric identifier	=	22
2	Data type name	=	Bitstring8
3	Format	=	Fixed length
4.1	Octet length	=	1

5.2.1.2 BitString16

FAL ASE:	**Data type ASE**
CLASS:	**Data type**
CLASS ID:	**5**
PARENT CLASS:	Top
ATTRIBUTES:	

1	Data type numeric identifier	=	23
2	Data type name	=	Bitstring16
3	Format	=	Fixed length
4.1	Octet length	=	2

5.2.1.3 BitString32

FAL ASE:	**Data type ASE**
CLASS:	**Data type**
CLASS ID:	**5**
PARENT CLASS:	Top
ATTRIBUTES:	

1	Data type numeric identifier	=	24
2	Data type name	=	Bitstring32
3	Format	=	Fixed length
4.1	Octet 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.

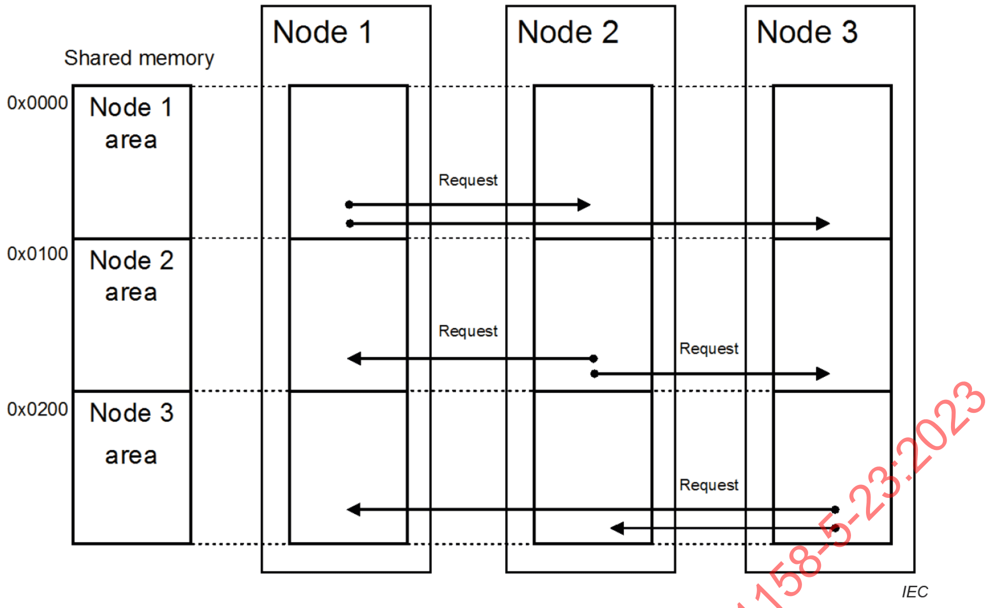

Figure 1 – Cyclic model (n:n type distributed shared memory, unconfirmed push model)

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.

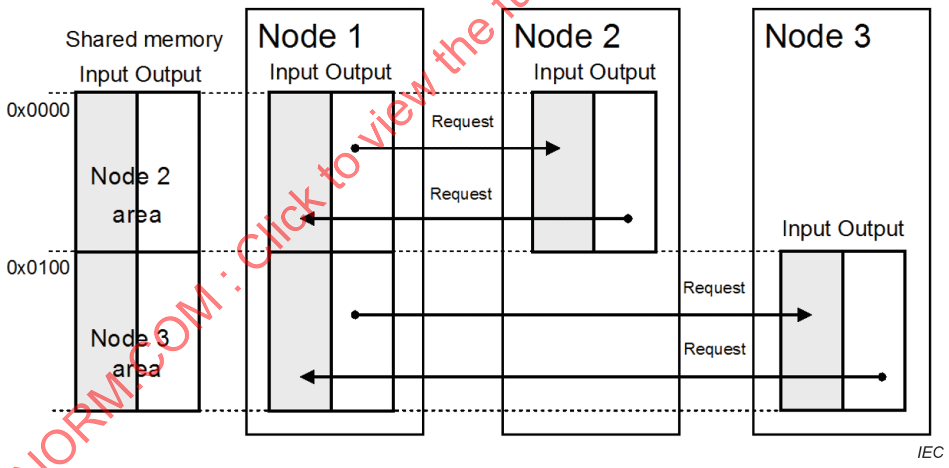

Figure 2 – Cyclic model (1:n type distributed shared memory, unconfirmed push model)

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.

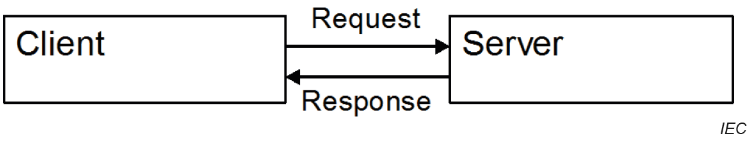

Figure 3 – Transient model (Client server model)

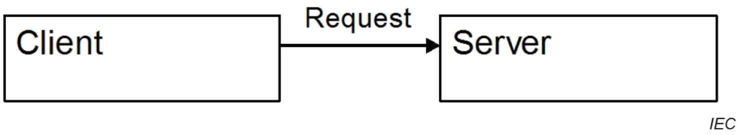

Figure 4 – Transient model (Push model)

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.

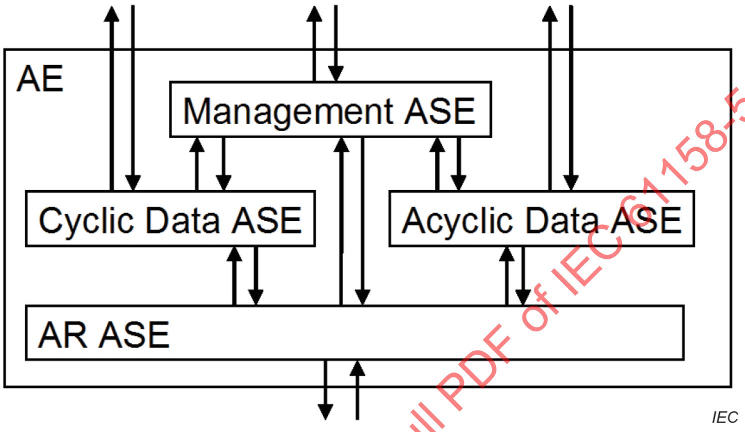

Figure 5 – Structure of ASE type C of FAL Type 23

6.2.2 Overview type F

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

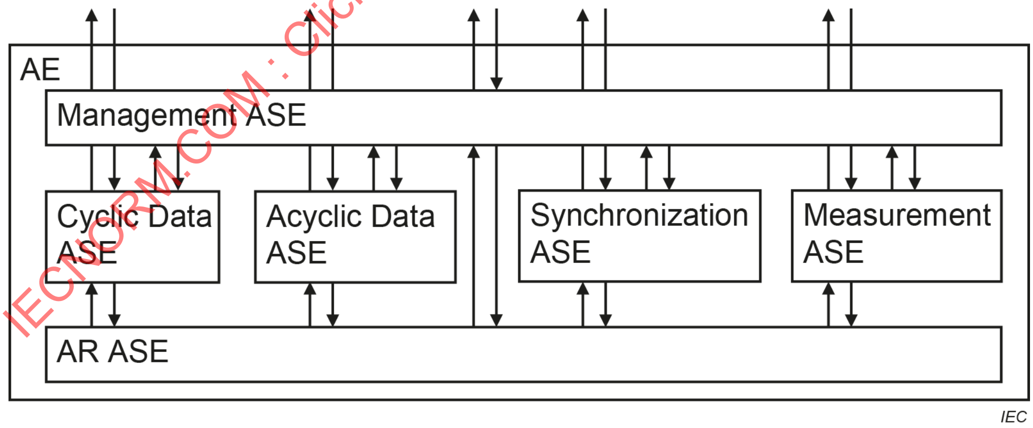

Figure 6 – Structure of ASE type F of FAL Type 23

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

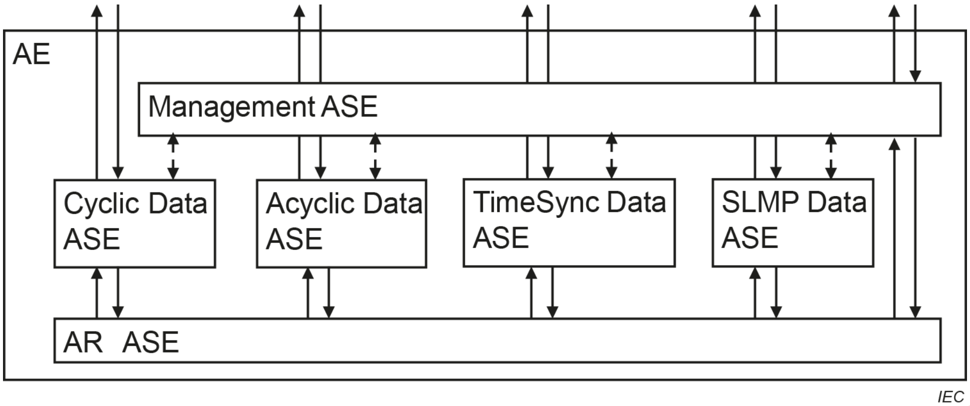

Figure 7 – Structure of ASE type T of FAL Type 23

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:	SlmpData

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.

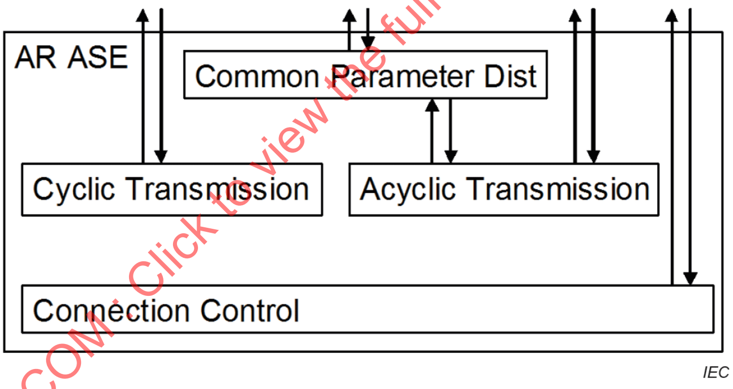

Figure 8 – Structure of AR type C

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

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.

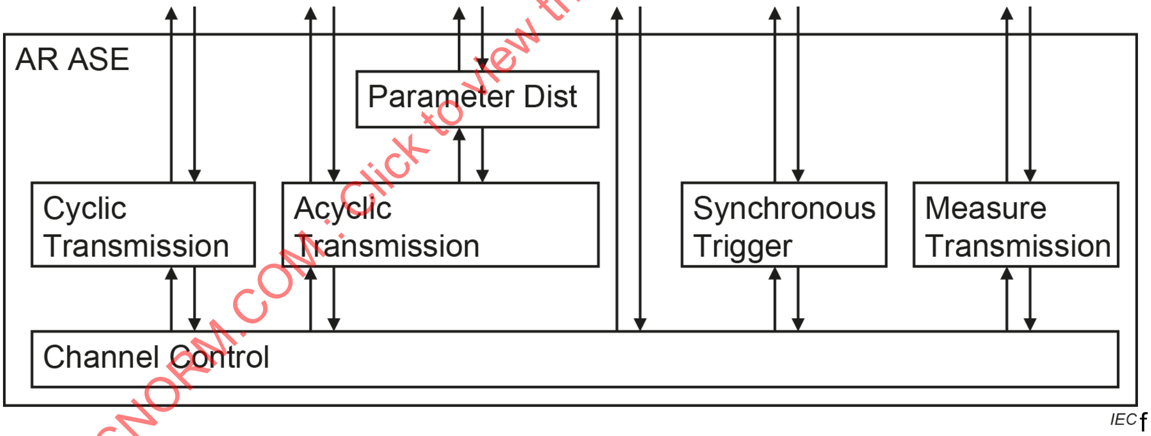

Figure 9 – Structure of AR type F

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 µs, 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