

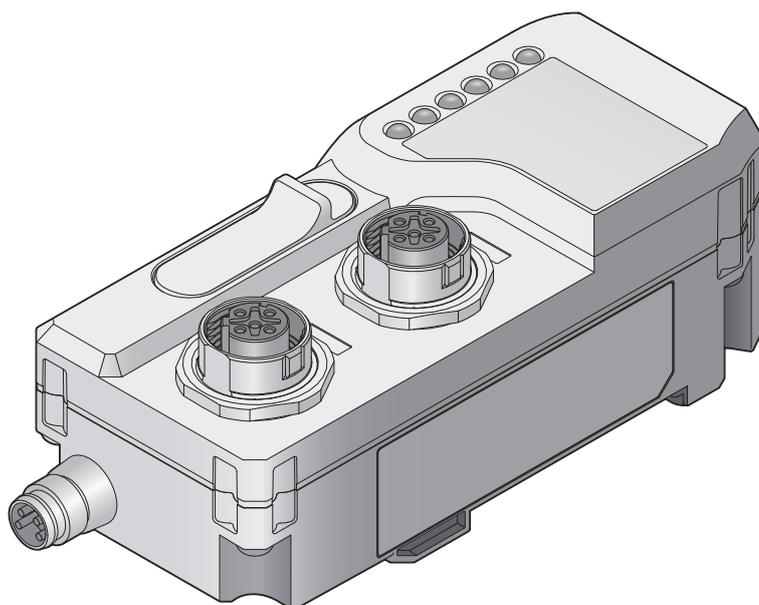


Good Thinking, Good Future

*FASTUS is a product brand of OPTEX FA.

EtherNet/IP Communication Unit UC1-EP

User's Manual



OPTEX FA CO., LTD.

Introduction



Thank you for purchasing the UC1-EP EtherNet/IP Communication Unit.

This manual contains the information necessary for using the UC1-EP EtherNet/IP Communication Unit.

Read this manual thoroughly before using the product to ensure correct product use with full understanding of the functions and performance of the product. Also, after you have finished reading this manual, store it safely for future reference.

- Trademarks and registered trademarks appearing in this manual are the property of their respective owners.
- The copyright of this user's manual is owned by OPTEX FA Co., Ltd. All the contents contained herein are protected by copyright law. Unauthorized copying of this manual is strictly prohibited.



Safety Precautions

This manual uses the following symbols to display safety precautions for ensuring safe operation of the UC1-EP EtherNet/IP Communication Unit.

Precautions listed here describe important information about safety. Make sure to follow them accordingly.

■ Safety Symbols

The indications and their meanings are as follows.

 Warning	Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage. Improper handling can also result in damage to property.
 Caution	Indicates that any improper operation or handling may sometimes result in moderate or minor injury or property damage.

■ Notes

 Warning	
	Do not disassemble, repair, modify, deform under pressure, or attempt to incinerate this product. Doing so may cause injury or fire.
	Do not use this product in water or in a location where it may be exposed to water. Do not use this product if wet. Doing so may cause a fire or damage the product.
	This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in an explosion or fire.
	Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in an explosion or fire.
	Do not use this product in environments other than industrial environments. If used in other environments, it may cause induction and radiation interference.
	Do not install this product or its cables in any of the following locations. Doing so may cause a fire, damage, or a malfunction. <ol style="list-style-type: none"> 1. Locations where dust, salt, iron powders, or vapor (steam) is present. 2. Locations subjected to corrosive gases or flammable gases. 3. Locations where water, oil, or chemical splashes may occur. 4. Locations where heavy vibrations or impacts may occur. 5. Locations where the ambient temperature exceeds the rated range. 6. Locations subject to rapid temperature changes (or where condensation occurs). 7. Locations with strong electric or magnetic fields. 8. Outdoor locations or locations subject to direct light.
	Do not use the product at voltages or with AC power supplies that exceed the rated voltage. Doing so may cause a fire or damage the product.

! Warning

	<p>What to do in the event of a malfunction such as smoke being emitted from the product</p> <p>If you detect any malfunction including emission of smoke, abnormal smells or sounds, or the body becoming very hot, immediately stop operating the product and turn off the power. Failure to do so can cause fire.</p> <p>Repairing the product is dangerous and should in no way be performed by the customer. Contact an OPTEX FA sales representative for repairs.</p>
	<p>What to do if water enters the product</p> <p>If water or any other liquid enters the product or the cable, immediately stop operating the product and turn off the power. Using the product in this condition may cause a fire.</p>

! Caution

	Do not touch this product or the cable with wet hands. Doing so may damage the product.
	When wiring this product, do so properly according to this manual and specified instruction manuals. Incorrect wiring can cause product failure or malfunction.
	Connect only specified cables to this product. Use of cables other than those specified can cause malfunction.
	Keep wiring separate from high voltage and motor circuits. Using the same wiring can cause malfunction or failure. If this is unavoidable, shield with a conductor such as an earthed conduit.
	Install this product as far away as possible from high-voltage equipment, equipment that generates large switching surges and equipment that generates noise, such as welding machines or inverter motors.
	Use this product with the included end plate mounted to the DIN rail. Make sure locking mechanisms are locked before use.
	Tighten mounting screws with the torque values specified in this manual.
	Do not apply torsional stress to cables. Doing so can cause cables and connectors to malfunction. Secure the communications cable drawn out of this product within lengths of 30 cm to ensure no load is applied to the product.
	Do not drop this product or subject it to strong impact or vibrations. Doing so may damage the product.
	This product generates heat during operation, so do not maintain physical contact for long periods of time. Doing so can cause low-temperature burns, etc.
	Use this product within the rated range.

Caution

	Do not cut power during communication.
	Changing the slot number for the addition of the sensor-amplifier requires changing the variables and programs on the master side. If there is a change in the slot number after you add a sensor-amplifier, make sure to change the variables or programs on the master side.
	There are restrictions on the order of interconnection for the applicable sensor-amplifiers used to interconnect to this unit. If the order of interconnection is incorrect, the unit will not operate properly, so interconnect in the correct order.
	To add an applicable sensor-amplifier to this unit after the system is operational, turn OFF the power of this unit.
	Make sure to turn OFF the power before connecting or disconnecting cables and connectors. Connection or disconnection while running can cause malfunction.
	Always hold the connector when connecting or disconnecting cables and do not apply excessive force to cables.
	When removing a connector, do not touch the terminals inside the connector or allow foreign objects to get inside.
	Use conductive type DIN rail because the frame ground (FG) is grounded via the DIN rail.
	When using power cables or commercially available switching regulators, make sure the frame ground (FG) is grounded.
	Wait until after transient state (approx. 2 sec.) when power is turned ON before use.
	Make sure to attach the protective cap when the connector of this unit is not attached to a cable.
	Make sure to use an isolation transformer for DC power supply.
	If a surge occurs in the power supply used, use a surge absorber for the source of generation.

■ Maintenance

Do not use thinner, benzene, acetone or kerosene to clean devices.

■ Handling Precautions

- (1) After carefully considering the intended use, required specifications, and usage conditions, install and use the product within the specified ranges.
- (2) Due to advances in technology, published content, including the hardware, software, and system information published in this user's manual, is subject to change without notice.
- (3) When using this product, it is the responsibility of the customer to ensure necessary safety designs in hardware, software, and systems in order to prevent any threat to life, physical health, and property due to product malfunction or failure.
- (4) This product is not intended for use with nuclear power, railways, aviation, vehicles, medical equipment, food-handling equipment, or any application where particular safety measures are required. Absolutely do not use this product for any of these fields.
- (5) This product cannot be used in applications that directly or indirectly detect human bodies for the purpose of ensuring safety. Do not use this product as a detection device for ensuring human safety.
- (6) Do not use this product for the development of weapons of mass destruction, for military use, or for any other military application. Moreover, if this product is to be exported, comply with all applicable export laws and regulations, including the "Foreign Exchange and Foreign Trade Act" and the "Export Administration Regulations," and carry out the necessary procedures pursuant to the provisions therein.
- (7) For more details on conformity to the Restriction of Hazardous Substances Directive for this product, please contact an OPTEX FA sales representative.
Before using this product, fully examine the applicable environmental laws and regulations, and operate the product in conformity to such laws and regulations.
OPTEX FA does not assume any responsibility for damages or losses occurring as a result of noncompliance with applicable laws and regulations.

■ Trademarks

- EtherNet/IP is a registered trademark of ODVA.
- Other company, system and product names in this manual are the trademarks or registered trademarks of their respective companies.

■ Notes on overseas regulations and standards

● CE Marking

This product complies with the following EN standards of the EMC directive.

Emission

EN 55011:2009+A1:2010 (Group 1, Class A, ≤ 20 kVA)

EN 61131-2:2007

EN 61000-6-4:2007+A1:2011

Immunity

EN 61131-2:2007

EN 61000-6-2:2005

To use this product as an EN standard compliant product, make sure to observe the following installation specifications.

- Install in a conductive enclosure (control panel, etc.).
- Use a power supply cable of 30 m or less.

Related Manuals

Manuals related to this manual are as follows. Reference them as needed.

Manual name	Details
Digital Fiber Sensor D3RF Series Instruction Manual	Instruction manual included with digital fiber sensor, D3RF series (interconnection type). Reference when interconnecting this unit with the D3RF series.
Digital Fiber Sensor D3WF Series Instruction Manual	Instruction manual included with digital fiber sensor, D3WF series (interconnection type). Reference when interconnecting this unit with the D3WF series.
Displacement sensor Amplifier Unit CDA Series Instruction Manual	Instruction manual included with the displacement sensor amplifier unit, CDA series. Reference when interconnecting this unit with the CDA series.
Displacement sensor Amplifier Unit CDA Series User's Manual	User's manual for the displacement sensor amplifier unit, CDA series. Reference this instruction manual when interconnecting this unit with the displacement sensor amplifier unit, CDA series.
Compact laser displacement sensor CD22 Series Instruction Manual	Instruction manual included with compact laser displacement sensor, CD22 series (RS-485 communication type). Reference when connecting the CD22 series with the CDA series.
Through-beam Edge Sensor TD1 Series Instruction Manual	Instruction manual included with the through-beam edge sensor, TD1 series. Reference when connecting the TD1 series with the CDA series.
Through-beam Edge Sensor TD1 Series User's Manual	User's manual for the through-beam edge sensor, TD1 series. Reference this instruction manual when interconnecting this unit with the through-beam edge sensor, TD1 series.
Digital Fiber Amplifier D4RF Series Instruction Manual	Instruction manual included with the fiber amplifier D4RF series (interconnection type). Reference when interconnecting this unit with the D4RF series.
Digital Fiber Amplifier D4RF Series User's Manual	User's manual for the digital fiber amplifier D4RF series (interconnection type). Reference when interconnecting this unit with the D4RF series, as well as the instruction manual.

Manual Structure

This manual's content is structured as follows.

1. Overview	An overview for this unit.
2. Installation and Wiring	This chapter describes interconnection between this unit and applicable sensor-amplifiers, connection for EtherNet/IP communication, and wiring to the power supply.
3. Communication	This chapter describes the data configurations that this unit handles for EtherNet/IP communication, and provides examples of communication.
4. Specifications	This chapter describes the specifications of this unit.
5. Troubleshooting	This chapter describes how to carry out troubleshooting and provides other useful information on using this unit.
6. Appendix	This chapter describes how to install additional applicable sensor-amplifiers and also describes the reset function.

- 1
- 2
- 3
- 4
- 5
- 6

Contents

.....

Introduction	i
Safety Precautions	ii
Related Manuals	vi
Manual Structure	vii
Contents	viii
Notations Used in this Manual	xi
1-1 Checking the Included Items	xii

1 Overview

1-1 Product Overview	1-2
1-2 Part Names and Functions	1-6
1-3 Basic Procedures	1-9

2 Installation and Wiring

2-1 Configuration of This Unit and Applicable Sensor-amplifiers and Sensors	2-2
2-1-1 Assigning Slot Numbers for Applicable Sensor-amplifier units	2-2
2-1-2 Configuration Limitations of Applicable Sensor-amplifiers and Sensors	2-4
2-2 Installing on a DIN Rail	2-11
2-3 Wiring	2-13
2-3-1 Connecting the Communication Cable	2-13
2-3-2 Wiring with the Power Supply Cable	2-15

3 Communication

3-1 EtherNet/IP Communication Using This Unit	3-2
3-1-1 Configuring the Cyclic Communication Mechanism in This Unit	3-2
3-1-2 Acyclic Communication Mechanism in This Unit	3-5
3-2 Operations Required for This Unit to Communicate with the EtherNet/IP Master	3-6

3-2-1	Downloading and Installing the EDS File for This Unit	3-6
3-2-2	Configuring the IP Address for This Unit	3-6
3-2-3	Configuring EtherNet/IP Communication on the Master and This Unit ...	3-6
3-2-4	Downloading Connection Settings to the Master	3-7
3-3	Cyclic Communication	3-8
3-3-1	Cyclic Communication Data in This Unit	3-8
3-4	Acyclic Communication	3-12
3-4-1	Instance IDs for This Unit and Sensor Objects	3-12
3-4-2	List of Class IDs (Model Codes) and Product Codes	3-14
3-4-3	Confirming Class IDs (Model Codes), Product Codes, and Instance IDs for Each Slot	3-15
3-5	Specific Examples of Communication	3-16
3-5-1	Cyclic Reading of ON/OFF Output from Sensors	3-16
3-5-2	Teaching the Sensors	3-16
3-5-3	Cyclic Reading of Received Light Levels from Sensors	3-17
3-5-4	Reading ON/OFF Output for All Sensors Connected to This Unit as Needed	3-17
3-5-5	Changing Setting Values of Sensors	3-18
3-5-6	Reading the Sensor Configuration for All Slots Connected to This Unit	3-18
3-5-7	Changing the Method to Configure the IP Address of This Unit to BOOTP or DHCP	3-18
3-6	List of Information Monitored/Configured Using Acyclic Communication	3-19
3-6-1	Services Supported by Objects in This Unit	3-19
3-6-2	Identity Object (Class ID: 01 h)	3-21
3-6-3	Message Router Object (Class ID: 02 h)	3-23
3-6-4	Assembly Object (Class ID: 04 h)	3-23
3-6-5	Connection Manager Object (Class ID: 06 h)	3-25
3-6-6	DLR Object (Class ID: 47 h)	3-25
3-6-7	QoS Object (Class ID: 48 h)	3-26
3-6-8	TCP/IP Interface Object (Class ID: F5 h)	3-27
3-6-9	Ethernet Link Object (Class ID: F6 h)	3-30

3-6-10	This Unit's Object (Class ID: 64 h)	3-34
3-6-11	D3RF Object (Class ID: 65 h)	3-36
3-6-12	D3WF Object (Class ID: 66 h)	3-39
3-6-13	CD22 Object (Class ID: 67 h)	3-41
3-6-14	TD1 Object (Class ID: 68 h)	3-48
3-6-15	D4RF Object (Class ID: 69 h)	3-52
3-6-16	Module Configuration Object (Class ID: 80 h)	3-59

4 Specifications

4-1	Specifications	4-2
4-2	Data Processing Time	4-4
4-3	Dimensions	4-8

5 Troubleshooting

5-1	List of Error Codes for This Unit and Each Sensor	5-2
5-1-1	Error Codes for This Unit	5-2
5-1-2	Error Codes for Connected Sensor-amplifiers	5-3
5-1-3	Error Codes for Connected Sensors	5-4
5-2	Troubleshooting List	5-5
5-2-1	Troubleshooting Based on LED Status	5-5
5-2-2	Troubleshooting Other Issues	5-6
5-2-3	Notes on Communication Method and Communication Speed	5-7

6 Appendix

6-1	Installing Additional Applicable Sensor-amplifier Units	6-2
6-2	Reset Function	6-7
6-3	INDEX	6-8

Notations Used in this Manual

These are the notations used in this manual.

CAUTION

This indicates particularly important points to observe during operation.

MEMO

This information is useful for operation.

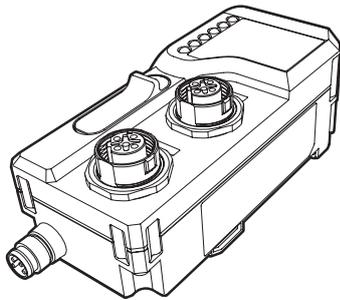
■ Generic Term for the Fiber Amplifiers

The D4RF, D3WF, and D3RF series, which can be used by interconnecting to this unit, are indicated as “fiber amplifiers”.

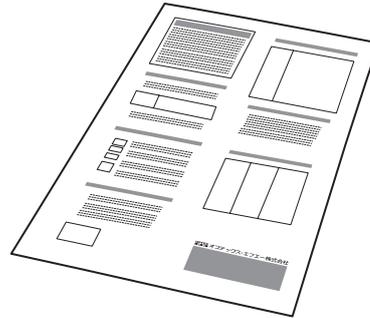
Checking the Included Items

Before you use this unit, check the items included with it. If there are any defective or damaged items, please contact our customer support center.

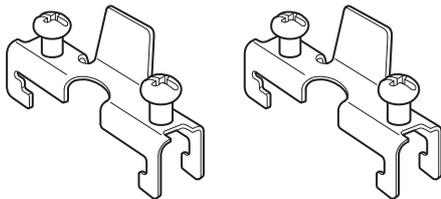
■ Items Included with This Unit



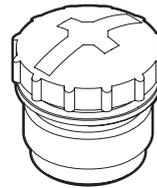
• UC1-EP



• Instruction manual



• End plate x 2



• Protective cap

■ Other Required Items

● Cables

The following cables are used with this unit.

Type	Specifications
EtherNet/IP cable Commercially available	CAT5e or higher Ethernet cables that fulfill the following specifications <ul style="list-style-type: none"> • Connector: M12 connector (plug: male) • Cable: STP cable (shielded twisted pair cable) • Quantity: According to the connection type: <ul style="list-style-type: none"> - Star configuration: 1 - Linear bus configuration: 1 for terminal, 2 for others - Device level ring configuration: 2
Power supply cable Optional	M8 connector cable for power supply M84CN-2S: 2 m, M84CN-5S: 5 m, M84CN-10S: 10 m



1

Overview

This chapter describes an overview of the EtherNet/IP Communication Unit (hereafter referred to as “this unit”).

1-1 Product Overview

This unit is an EtherNet/IP communication unit used for communication between our sensor-amplifiers (hereafter referred to as the “applicable sensor-amplifiers”) and an EtherNet/IP master (e.g. PLC) manufactured by another company for ON/OFF output, monitoring of the detection amount, writing parameters, and performing operations of the sensors connected to the sensor-amplifiers.

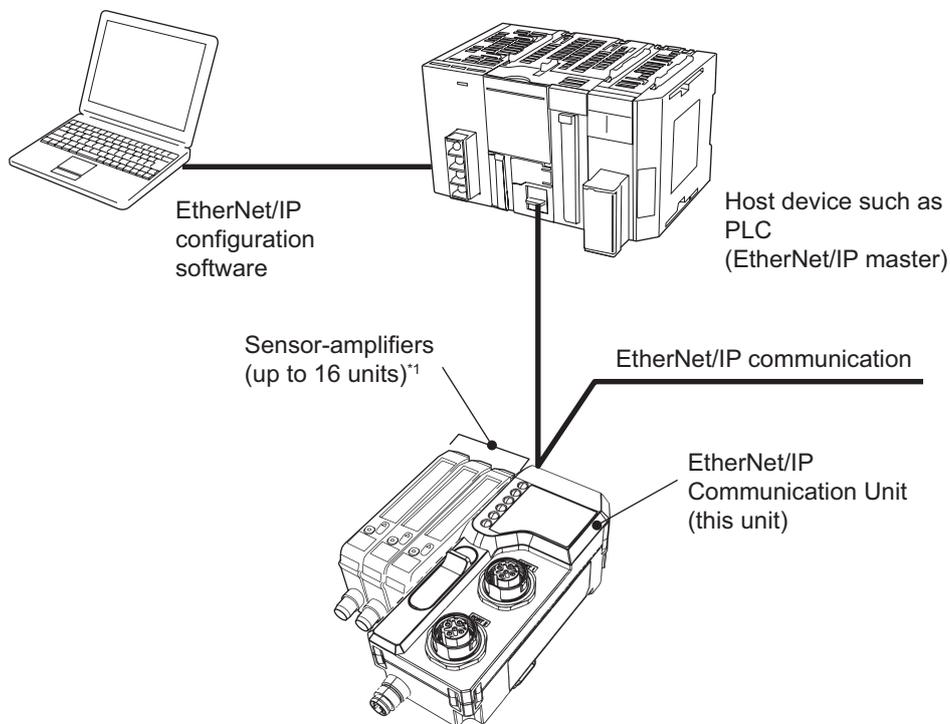
It supports both cyclic communication and acyclic communication.

This unit can be interconnected with up to 16^{*1} of the following applicable sensor-amplifiers.

- Fiber amplifier (interconnection type)
- Displacement sensor amplifier unit

*1 A single unit occupies two because a displacement sensor amplifier unit can be connected to two sensors.

■ EtherNet/IP System Configuration Example



*1 A single unit occupies two because a displacement sensor amplifier unit can be connected to two sensors.

■ Type/Number of Applicable Sensor-Amplifier Units

See the following section for applicable sensor-amplifiers that can be interconnected to the EtherNet/IP system by interconnecting to this unit.

MEMO

For precautions on the configuration of this unit and applicable sensor-amplifiers and sensors, refer to “2-1 Configuration of This Unit and Applicable Sensor-amplifiers and Sensors” (Page 2-2).

● Interconnectable Fiber Amplifiers

Fiber amplifiers that can interconnect to this unit are D4RF, D3WF and D3RF series interconnection types.

For details on the interconnection order, refer to “Configuration and Limitations of Applicable Sensor-amplifiers and Sensors” (2-4page).

Light source	Type	Connection	Control output	Model	No. of occupied IDs per unit	max. no. of interconnectable units
4-element red LED	Standard interconnection, main unit	Connector	1 output	D4RF-TMC4 ⁺²	1	16 units ⁺⁴ (1 x main unit, 15 x expansion units)
		Cable ^{*1}	1 output	D4RF-TM ⁺²		
	2 outputs		D4RF-TDM ⁺²			
	Standard interconnection, expansion unit	Connector	1 output	D4RF-TSC4 ⁺²		
		Cable ^{*1}	1 output	D4RF-TS ⁺²		
	2 outputs		D4RF-TDS ⁺²			
	Short range and high accuracy interconnection, main unit	Cable ^{*1}	2 outputs	D4RF-TDM-Y ⁺²		
	Short range and high accuracy interconnection, expansion unit			D4RF-TDS-Y ⁺²		
	Interconnection for communication unit, main unit	Cable-less	-	D4RF-TM-0 ⁺²		
	Interconnection for communication unit, expansion unit			D4RF-TS-0 ⁺²		
	Interconnection for communication unit, main unit Without display and keys	Connector	-	D4RF-MC4 ⁺²		
	Interconnection for communication unit, expansion unit Without display and keys	Cable-less	-	D4RF-S ⁺²		
	Interconnection, main unit (Discontinued in March 2024)	Connector	1 x NPN	D3RF-TMCN4 ⁺³		
				1 x PNP		
		Cable ^{*1}	1 x NPN	D3RF-TMN ⁺³		
			2 x NPN	D3RF-TDMN ⁺³		
			1 x PNP	D3RF-TMP ⁺³		
			2 x PNP	D3RF-TDMP ⁺³		
	Interconnection, expansion unit (Discontinued in March 2024)	Connector	1 x NPN	D3RF-TSCN4 ⁺³		
			1 x PNP	D3RF-TSCP4 ⁺³		
Cable ^{*1}		1 x NPN	D3RF-TSN ⁺³			
		2 x NPN	D3RF-TDSN ⁺³			
		1 x PNP	D3RF-TSP ⁺³			
		2 x PNP	D3RF-TDSP ⁺³			
White LED	Interconnection, main unit	Connector	1 x NPN	D3WF-TMCN4 ⁺³		
			1 x PNP	D3WF-TMCP4 ⁺³		
	Interconnection, expansion unit		1 x NPN	D3WF-TSCN4 ⁺³		
			1 x PNP	D3WF-TSCP4 ⁺³		

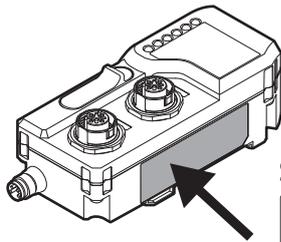
*1 Since the wire function of the cable type can be provided by communication, OPTEX FA recommends the use of a connector type fiber amplifier for connection to this unit.
When using a cable type fiber amplifier, the power line should be insulated to prevent short circuit. A short circuit may damage the equipment.

Also, for the connector type, when the connector cable is not connected, attach the supplied black cap to the M8 connector to prevent the pins from short-circuiting.

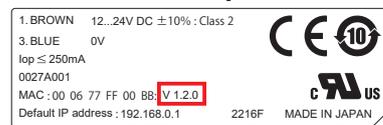
*2 To use D4RF with this unit, the software version of this unit must be V1.2.0 or later. Products with software versions earlier than V1.1.9 cannot be used.

The software version is indicated on the product label as follows.

Product label position



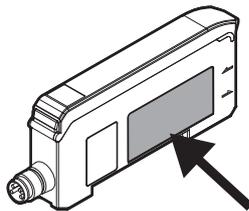
Software version position on label



*3 The D3RF fiber amplifier applicable with this unit is lot number “1443 ■ (■ = the alphabet at the end is irrelevant)” or later. Products with lot numbers earlier than “1442 ■” support only some functions.

The D3RF lot number is indicated on the product label as follows.

Product label position



Lot number position on label



*4 The maximum number of units that can be interconnected depends on the maximum ambient temperature and the load current flowing to the control output, as follows.

D3RF/D3WF series

Number of interconnected units	1 to 3	4 to 8	9 to 16
Upper and lower limits of ambient temperature	-25 to +55 °C	-25 to +50 °C	-25 to +45 °C
Max. load current at control output	100 mA	50 mA	0 mA (Control output disabled)

D4RF series

Number of connected units	1	2	3 to 5	6 to 16*
Upper and lower limits of ambient temperature	-25 to +55 °C	-25 to +55 °C	-25 to +50 °C	-25 to +45 °C
Max. load current per output	1-output setting	100 mA	20 mA	20 mA
	2-output setting	100 mA	10 mA	10 mA

*For use as a UL certified product when 6 or more units are interconnected, refer to the instruction manual included with the D4RF.-

● Interconnectable Displacement Sensor Amplifier Units

When connecting a displacement sensor, interconnect a displacement sensor amplifier unit to this unit.

Product	Interface	Model	No. of occupied IDs per unit	Max. no. of interconnectable units
Displacement sensor amplifier unit	2 x analog outputs 2 x control outputs 1 x external input	<Main unit> CDA-DM2	2	8^2 (1 x main unit + 7 x expansion units)
	1 x analog output 3 x control outputs 2 x external inputs	<Main unit> CDA-M		
	1 x analog output 3 x control outputs 2 x external inputs	<Expansion unit> CDA-S		

Up to two displacement sensors or two through-beam edge laser sensors can be connected to one displacement sensor amplifier unit. Even if only one sensor is connected, it will be recognized as two.

The following sensors can be connected to the CDA a displacement sensor amplifier unit (current as of January, 2020) .

Product	Interface	Connection	Model
Compact laser displacement sensor CD22 series	RS-485 communication type	Pigtail connector ^{*1}	CD22-15-485M12 CD22-35-485M12 CD22-100-485M122
Through-beam edge sensor TD1 series	-	Connector	TD1-010M8 TD1-010M8J

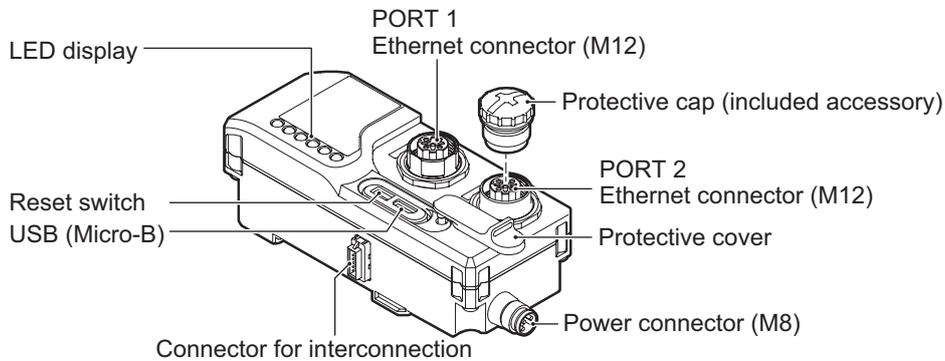
*1: For sensors with pigtail connector, order the optional sensor-to-amplifier extension cable DSL-1204-G02M.

Note: Ultra high-accuracy laser displacement sensor CDX series is not compatible with UC1 and cannot be used.

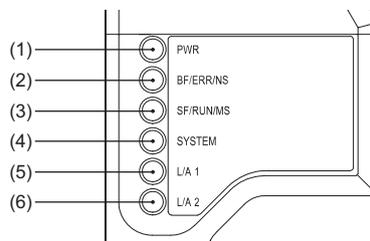
1-2 Part Names and Functions

The following is a description of the names of the parts of this unit and their functions.

■ UC1-EP Unit



● LED Display



Above figure number	LED	Details	Display		Meaning
(1)	PWR	Indicates whether or not power is being supplied to this unit.	Green	Lit	Power ON
				Off	Power OFF
(2)	NS ^{*1}	Indicates the network status.	Green	Lit	Connected (some connection established)
				Flashing	Not connected (no connection established)
			Red	Lit	IP address conflict (if Address Conflict Detection [ACD] is enabled)
				Flashing	Connection timeout
			Red/green	Flashing back and forth	Power-on self-test
Off	Power is OFF, an IP address is not configured, or there is an IP address conflict (if Address Conflict Detection [ACD] is enabled)				
(3)	MS ^{*1}	Indicates the module status.	Green	Lit	Device operating
				Flashing	The device is in standby and no IP address has been assigned
			Red	Lit	Error (device not operating)
				Flashing	Warning (device operating)
			Red/green	Flashing back and forth	Power-on self-test
Off	Power OFF				
(4)	SYSTEM (communication ready)	Indicates communication status of this unit.	Green	Off	Not ready for communication (cannot connect)
				Lit	Ready for communication (able to connect)

Above figure number	LED	Details	Display		Meaning
(5)	L/A1 (Link/Activity 1)	Indicates PORT1 (IN) communication status.	Green	Off	PORT1 is not connected to the network
				Lit	PORT1 is connected to the network
(6)	L/A2 (Link/Activity 2)	Indicates PORT1 (OUT) communication status.	Green	Off	PORT2 is not connected to the network
				Lit	PORT2 is connected to the network

*1: NS/MS LED combinations

Network status (NS)	Module status (MS)	Operation status
Lit green	Lit green	Normal communication status (connection established) Note: Also includes assembly instance conflicts. Refer to “5-2-2 Troubleshooting Other Issues” for further information.
Flashing green	Lit green	No connection established
Lit red	Flashing red	IP address conflict (if Address Conflict Detection [ACD] is enabled)
Flashing red	Lit green	Exclusive Owner connection timeout
Off	Flashing green	IP address conflict (if Address Conflict Detection [ACD] is disabled) or Unable to receive IP address from BOOTP/DHCP server
Off	Off	No power supply

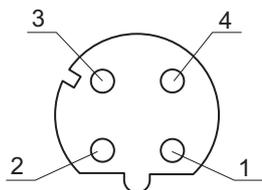
Refer to “5-2 Troubleshooting List” (Page 5-5) in “Chap 5 Troubleshooting” for troubleshooting based on blinking state of LED.

● Ethernet Connectors (PORT1, PORT2)

Connect the M12 connector / LAN cable to the M12 connection 4 pin.

Connect a network cable from the master side to PORT1 of this unit.

When connecting other EtherNet/IP units, connect a network cable to PORT2 of this unit. When other EtherNet/IP units are not connected, put on the M12 protective cap.



Pin	Terminal name	Function
1	Tx+	Transmitted data: +
2	Rx+	Received data: +
3	Tx-	Transmitted data: -
4	Rx-	Received data: -

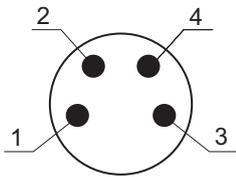
This unit supports the following connection types. Refer to “2-3-1 Connecting the Communication Cable” for further information.

- Star configuration
Connect a LAN cable to the M12 connector for either PORT 1 or PORT2, and then connect the cable to an industrial switching hub.
- Linear bus configuration
Connect the M12 connector for either PORT1 or PORT2 to the upstream device (the device nearer the master). Connect the other M12 connector to the downstream device (the device further from the master).
- Device level ring configuration
Connect LAN cables to the M12 connectors on PORT1 and PORT2.

Use a category 5/5e or higher STP cable (shielded twisted pair cable) as the communication cable for both.

● Power Connector

Pin arrangement of the power connector is as follows. Connect this unit when no voltage (0 V) is being supplied.



Pin	Terminal name	Function
1	24 V	Terminal for external power input from 12 to 24 VDC. Allowable current is 2 A or under.
2	Not used	-
3	0 V	Terminal for external power input of 0 V.
4	Not used	-

● Reset Switch

Press and hold for three seconds or more to restore the factory settings.

●●● MEMO ●●●

Refer to "6-2 Reset Function" for information on the settings initialized with the reset switch.

● USB (Micro-B)

Not used. Do not connect anything to this port.

1-3 Basic Procedures



The procedures to install and configure this unit and start the EtherNet/IP communication are shown below.

Procedure	Details	References
Prior confirmation	<ul style="list-style-type: none"> Check the model number and number of units for applicable sensor-amplifier to be interconnected to this unit (including ambient temperature range, which limits the number of units). 	Chap 1 Overview Chap 4 Specifications
	<ul style="list-style-type: none"> Check the position of interconnection with applicable sensor-amplifier units. (Changing the interconnection position affects the variables and programs on the master side, so consideration should be given to the possibility of future expansion.) Note 1: The user will need to know the slot numbers of applicable sensors for cyclic communication. Note 2: The user will need to know the connection order within the same model code for applicable sensors for acyclic communication.	2-1 Configuration of This Unit and Applicable Sensor-amplifiers and Sensors 6-1 Installing Additional Applicable Sensor-amplifier Units
	<ul style="list-style-type: none"> Calculate power consumption. 	2-3-2 Wiring with the Power Supply Cable
	<ul style="list-style-type: none"> Which EtherNet/IP connection type to use. 	2-3-1 Connecting the Communication Cable
	<ul style="list-style-type: none"> Prepare a power cable and EtherNet/IP cable(s). 	Checking the Included Items
	<ul style="list-style-type: none"> How to set the IP address for this unit and what value to use. 	3-2 Operations Required for This Unit to Communicate with the EtherNet/IP Master
	<ul style="list-style-type: none"> What to read and write with cyclic communication. What to read and write with acyclic communication. 	Chap 3 Communication
↓	↓	
Hardware installation and wiring	Install the EtherNet/IP master.	Manual of the EtherNet/IP master being used
	↓	
	Install this unit and applicable sensor-amplifiers to the DIN rail.	2-2 Installing on a DIN Rail
	↓	
	Wire the EtherNet/IP communication cable.	2-3-1 Connecting the Communication Cable
	↓	
	Wire the external power supply.	2-3-2 Wiring with the Power Supply Cable
	↓	
Wire sensors to sensor-amplifiers.	Manuals of the applicable sensor-amplifiers	
↓	↓	

Procedure	Details	References
Operation to communicate with the EtherNet/IP master	Install the EDS file for this unit.	3-2 Operations Required for This Unit to Communicate with the EtherNet/IP Master Manual of the EtherNet/IP master being used Manual for the EtherNet/IP configuration software being used
	↓	
	Configure the IP address for this unit.	
	↓	
	<ul style="list-style-type: none"> • Cyclic communication: Add this unit to the EtherNet/IP system in the EtherNet/IP configuration software, configure the connection, and configure the cyclic communication area. • Acyclic communication: Create a communication program. 	
	↓	
	Download connection settings to the master.	
↓	↓	
Starting communication	Start EtherNet/IP communication.	Same as above
↓	↓	
Checking operation	Check the displays of the master, this unit, and the sensor-amplifiers.	Manual of the EtherNet/IP master being used 1-2 Part Names and Functions, and 5-2 Troubleshooting List Manuals of the applicable sensor-amplifiers / sensors
	↓	
	Verify that the EtherNet/IP master reads and writes data.	Manual of the EtherNet/IP master being used
	↓	
	Set the parameters of this unit with acyclic communication (if needed).	3-6 List of Information Monitored/Configured Using Acyclic Communication
↓	↓	
Troubleshooting	Check the displays of the master, this unit, and the sensor-amplifiers. Check the error codes on the sensor-amplifier and sensor configuration and the sensor specific error codes with acyclic communication.	Chap 5 Troubleshooting



2

Installation and Wiring

This chapter describes interconnection between this unit and applicable sensor-amplifiers, connection for EtherNet/IP communication, and wiring to the power supply.

2-1 Configuration of This Unit and Applicable Sensor-amplifiers and Sensors

This section describes the configuration of this unit and applicable sensor-amplifiers and sensors.

2-1-1 Assigning Slot Numbers for Applicable Sensor-amplifier units

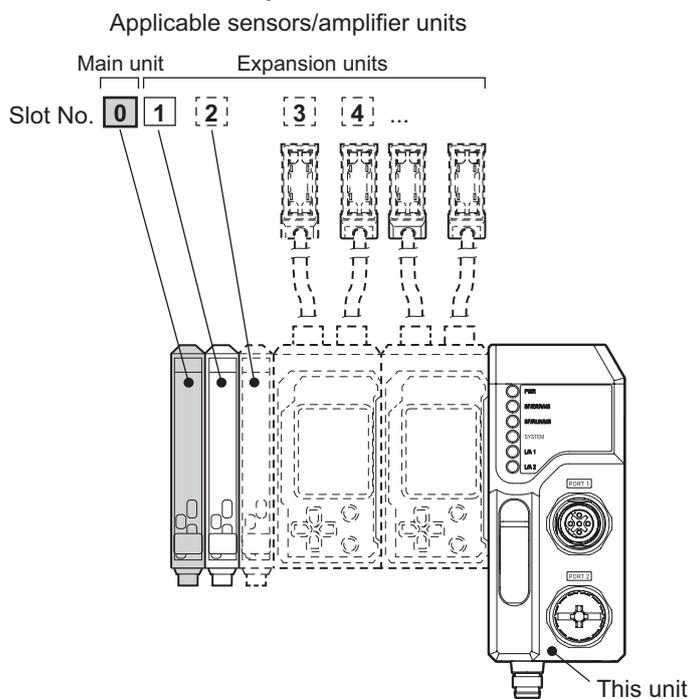
The slot numbers are 0 to 15 (0 to F in hexadecimal values).

Slot number = 0 is set for the leftmost unit (the one furthest from this unit), with subsequent slot numbers assigned in ascending order toward this unit.

The number of occupied slot numbers differs depending on the type of sensor-amplifier. Details are provided below.

Type of sensor-amplifier	Occupied slot number	Notes
D4RF fiber amplifier	1	
D3RF fiber amplifier	1	
D3WF fiber amplifier	1	
CDA displacement sensor amplifier unit	2	A single unit occupies two slot numbers because the unit can be connected to two sensors.

Connection of Sensor-amplifiers



The slot numbers are used to identify connected sensors in cyclic communication.

MEMO

- During acyclic communication, the connected sensor is identified using the “instance ID (the connection order within the model code)” rather than this “slot number.” Refer to “3-4-1 Instance IDs for This Unit and Sensor Objects” for further information on “instance IDs.”
 - As indicated above, up to two applicable sensors can be connected to the CDA displacement sensor amplifier unit. CDAs occupy two slot numbers for two applicable sensors even when only one applicable sensor is connected. In this case, the slot number that is not connected to an applicable sensor will be configured with a class ID (model code) of 00 h, an instance ID (connection order within model code) of 00 h, and a product code of 0000 h.
 - As indicated above, slot numbers are assigned in ascending order from the left. When an applicable sensor-amplifier is added to the left of existing applicable sensor-amplifiers, the slot numbers of the existing applicable sensor-amplifiers change. Therefore, consider the configuration of applicable sensor-amplifiers by interconnection position, which is the slot number, if future expansion is planned. Refer to “6-1 Installing Additional Applicable Sensor-amplifier Units” (Page 6-2) later in this manual for more information on limitations when adding applicable sensor-amplifier units.
-

2-1-2 Configuration Limitations of Applicable Sensor-amplifiers and Sensors

Limitations in the configuration of applicable sensor-amplifiers and sensors are as follows.

The following three types of interconnection configurations are used.

- Configuration to interconnect only fiber amplifiers.
- Configuration to interconnect only displacement sensor amplifier units.
- Mixed configurations in which both the fiber amplifiers and the displacement sensor amplifier units are interconnected.

MEMO

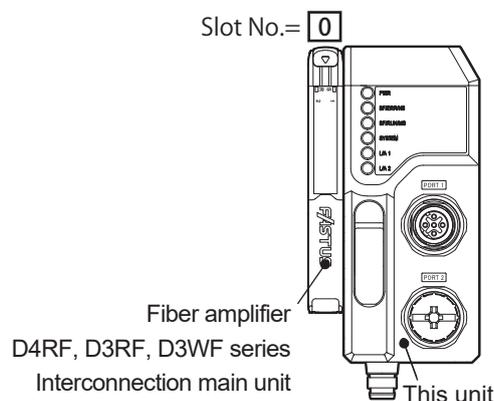
If more than the maximum number of applicable sensor-amplifiers or sensors (16) are connected, the following will occur.

- If 17 applicable sensors are connected, it will no longer be possible to transmit or receive using cyclic communication. The 18th will be recognized as slot 0, the 19th as slot 1, and so on. In this case, cyclic communication cannot be performed with applicable sensors beginning with the 17th.
- If 17 or more are connected and acyclic communication is attempted with a sensor object (class ID: 65 h, 66 h, 67 h, or 68 h), it will cause a "Path destination unknown (09 h)" general error code.

■ Configuration to Interconnect Only Fiber Amplifiers

● Interconnect Only One Fiber Amplifier

- When interconnecting any series of fiber amplifiers, the fiber amplifier should be a interconnection main unit.
- Do not connect an external power supply to the fiber amplifier. For details, see "2-3-2 Wiring with the Power Supply Cable" (Page 2-15)



● Multiple Interconnection

- It is possible to interconnect a single series of fiber amplifiers (e.g., interconnection with D4RF only) or possible to interconnect multiple series of fiber amplifiers. When interconnecting multiple series of fiber amplifiers, interconnect in the following order from the left (Slot No.= 0):

① D3RF → D3WF → D4RF → This unit

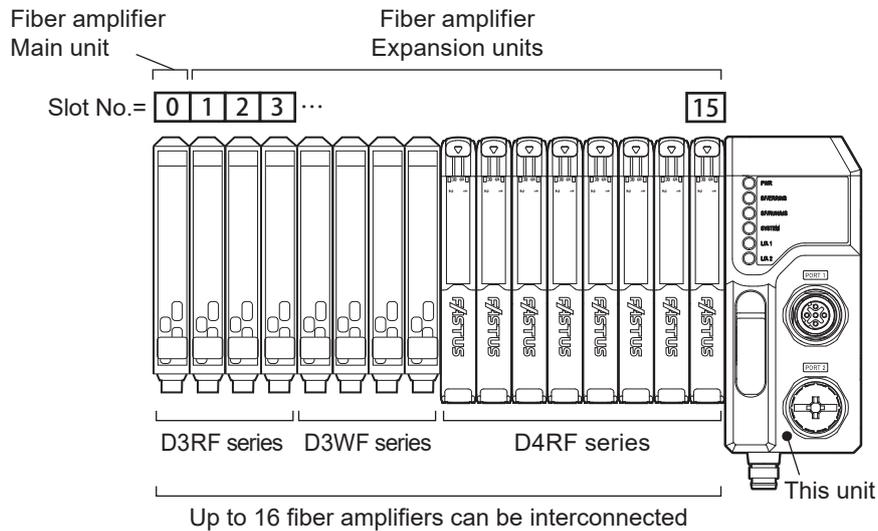
② D3WF → D3RF → D4RF → This unit.

Note that the unit will not operate correctly if interconnected in any order other than the above.

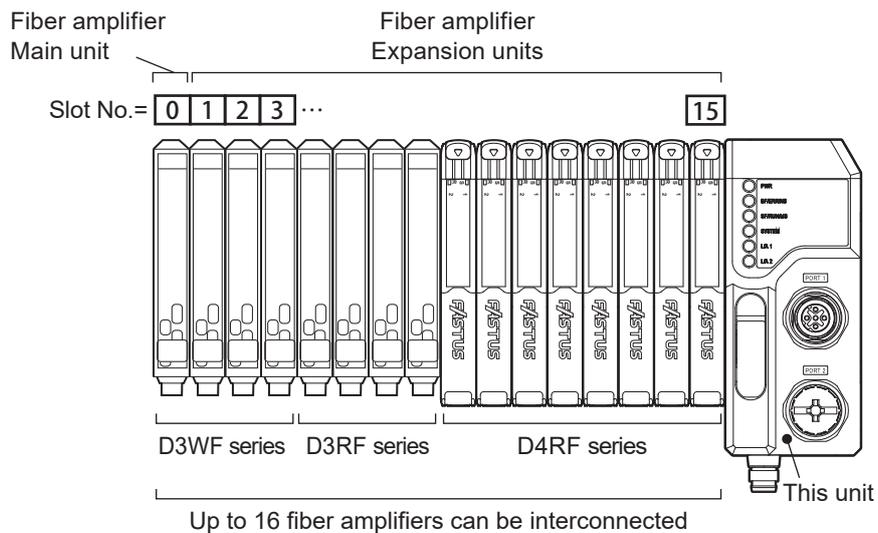
- Interconnect the fiber amplifier of the interconnection main unit to the left end (Slot No.= 0). For fiber amplifiers other than the left end, use the interconnection expansion unit.

- Up to 16 fiber amplifiers can be interconnected.
- Do not connect an external power supply to the fiber amplifier. For details, see “2-3-2 Wiring with the Power Supply Cable” (Page 2-15).

Interconnection example: ① D3RF → D3WF → D4RF → This unit



Interconnection example: ② D3WF → D3RF → D4RF → This unit



MEMO

The interconnection order is

- ① D3RF → D3WF → D4RF → This unit
- ② D3WF → D3RF → D4RF → This unit.

The reason why only two patterns can be used is that the current value and setting value in D3RF and D3WF are limited to 14 bits, while the current value and setting value in D4RF are processed as 16 bits. This means that if D4RF is interconnected to the left of D3RF or D3WF, EtherNet/IP communication can be executed for both cyclic and acyclic communication, however, the current values sent from the D4RF to the left of the D3RF or D3WF to the master will be incorrect, as will the setting value set by the master.

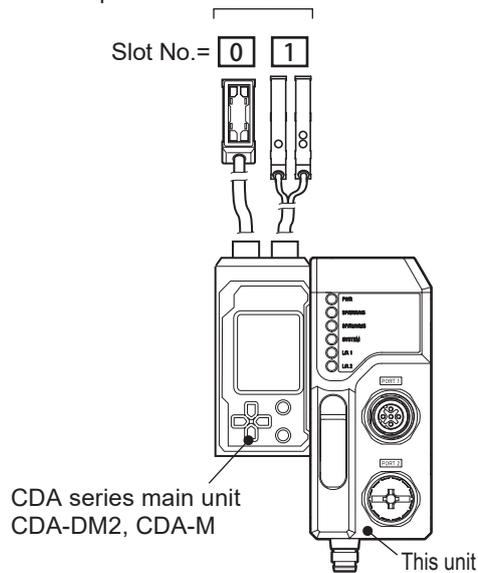
Invalid connection order errors can be checked by reading 6A h (Error Code) from this unit's object (class ID: 64 h) using acyclic communication from the master (error code: 0008 h). Refer to “5-1 List of Error Codes for This Unit and Each Sensor” for further information.

■ Configuration to Interconnect Only Displacement Sensor Amplifier Units

● Interconnect Only One Displacement Sensor Amplifier Unit

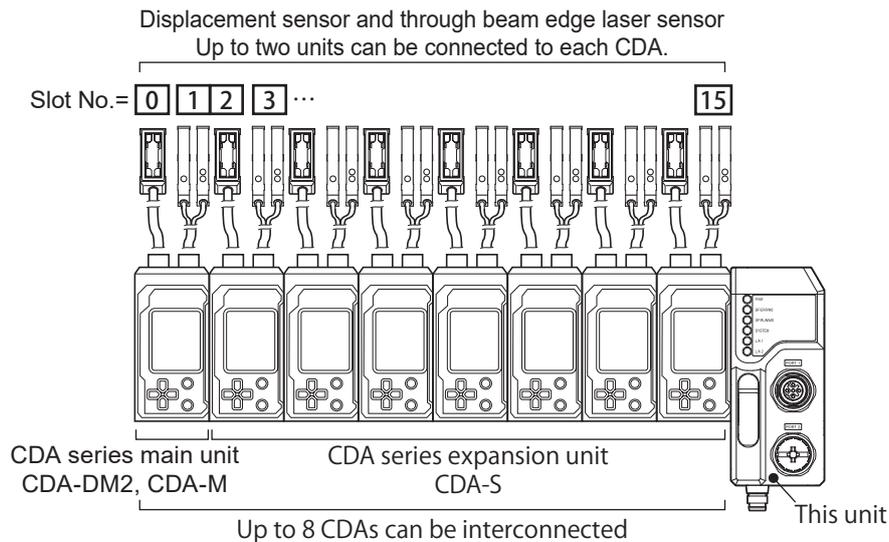
- Interconnect CDA-DM2 or CDA-M of the main unit of the displacement sensor amplifier unit CDA series.
- Up to two units of displacement sensor CD22 series or through-beam edge laser sensor TD1 series can be connected to CDA.
- When connecting the displacement sensor CD22 to the CDA, select the RS-485 pigtail type and use the optional sensor/amplifier connection cable (DSL-1204-G02M) to connect to each channel of the CDA.
- When connecting the through beam edge laser sensor TD1 to the CDA, use the Y-branch cable (TDCN-Y2-M8) delivered with the TD1 to connect to each channel of the CDA.

Displacement sensor and through beam edge laser sensor
Up to two units can be connected.



● Multiple Interconnection

- Interconnect the CDA series main unit CDA-DM2 or CDA-M to the left end (Slot No.=0, 1). For CDAs other than the left end, use the interconnection expansion units.
- Up to 8 CDAs can be interconnected.
- Up to two units of displacement sensor CD22 series or through-beam edge laser sensor TD1 series can be connected to each CDA.
- When connecting the displacement sensor CD22 to the CDA, select the RS-485 pigtail type and use the optional sensor/amplifier connection cable (DSL-1204-G02M) to connect to each channel of the CDA.
- When connecting the through beam edge laser sensor TD1 to the CDA, use the Y-branch cable (TDCN-Y2-M8) delivered with the TD1 to connect to each channel of the CDA.



■ Mixed Configurations in Which Both the Fiber Amplifiers and CDA Displacement Sensor Amplifier Units Are Interconnected

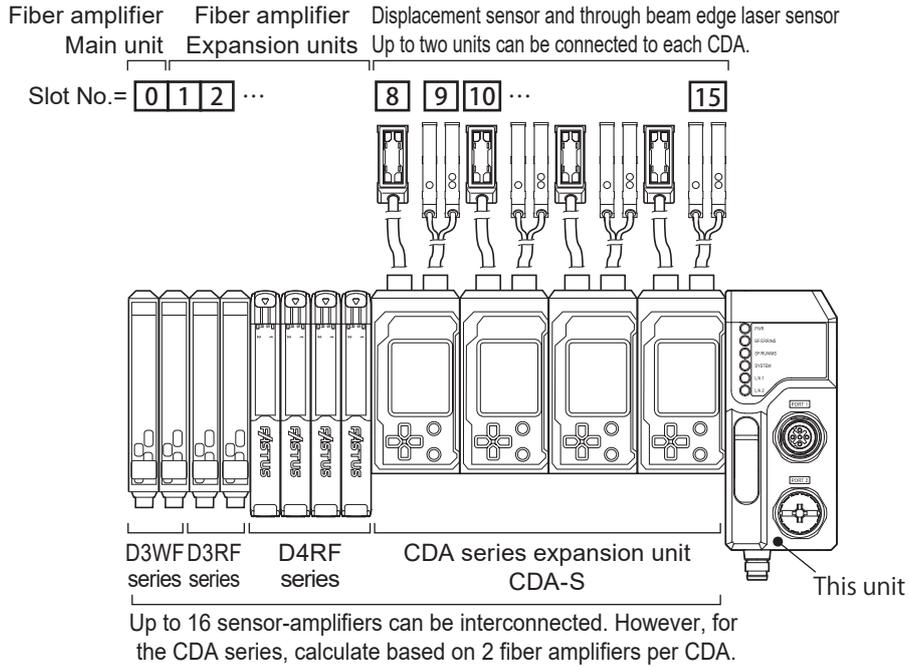
● Mixed Interconnection

- Interconnect the fiber amplifier main unit the left end (Slot No.=0). For all fiber amplifiers and displacement sensor amplifier units other than the left end, use the expansion units.
- The interconnection order is from left to right:
 - ① D3WF → D3RF → D4RF → CDA → This unit
 - ② D3RF → D3WF → D4RF → CDA → This unit
 - ③ D3WF → D3RF → CDA → D4RF → This unit
 - ④ D3RF → D3WF → CDA → D4RF → This unit
 The above four patterns are available.

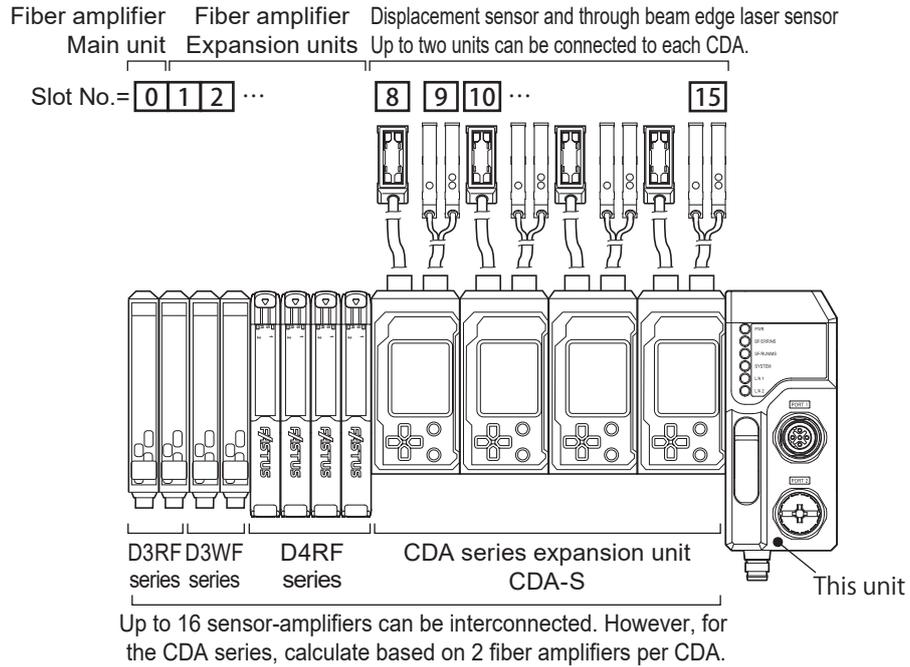
Note that the unit will not operate correctly if interconnected in any order other than the above.

- Up to 16 units can be interconnected. Since up to two sensors can be connected to the CDA series, please calculate two sensors in one CDA and interconnect them so that the total number of sensor-amplifiers does not exceed 16.
- Do not connect an external power supply to the fiber amplifier. For details, see “2-3-2 Wiring with the Power Supply Cable” (page 2-14).

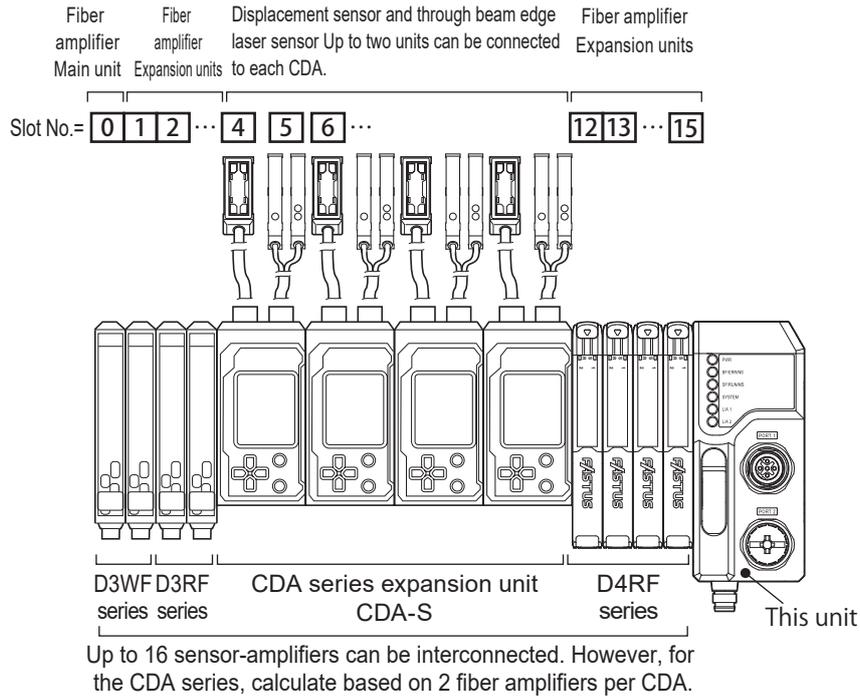
Interconnection example: ① D3WF → D3RF → D4RF → CDA → This unit



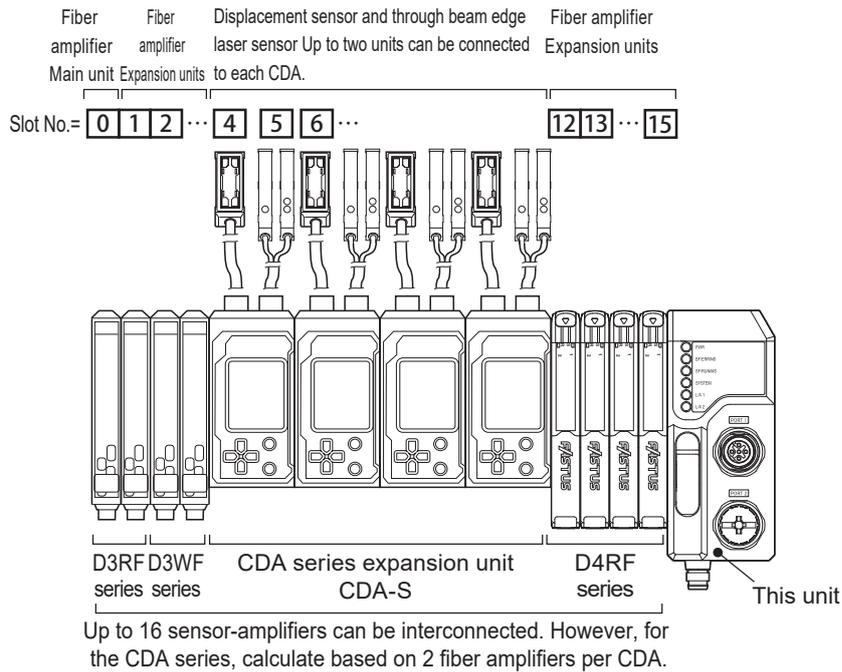
Interconnection example: ② D3RF → D3WF → D4RF → CDA → This unit



Interconnection example: ③ D3WF → D3RF → CDA → D4RF → This unit



Interconnection example: ④ D3RF → D3WF → CDA → D4RF → This unit



MEMO

The interconnection order is

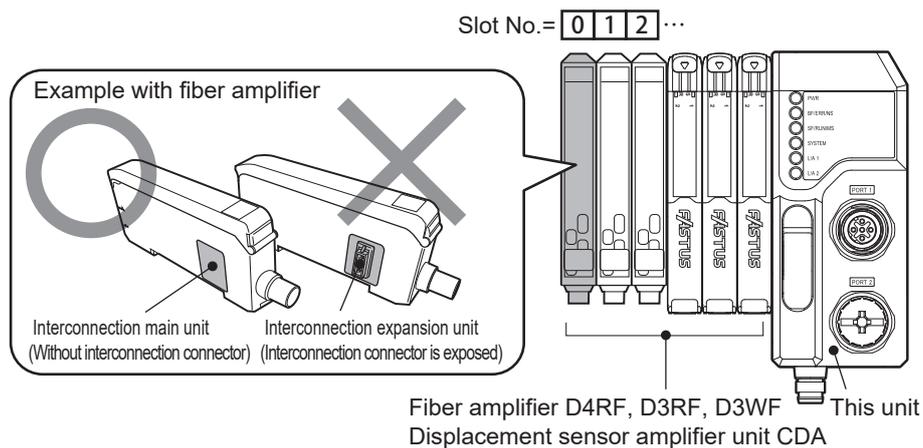
- ① D3WF→D3RF→D4RF→CDA→This unit
- ② D3RF→D3WF→D4RF→CDA→This unit
- ③ D3WF→D3RF→CDA→D4RF→This unit
- ④ D3RF→D3WF→CDA→D4RF→This unit.

The reason why only 4 patterns can be used is that the current value and setting value in D3RF and D3WF are limited to 14 bits, while the current value and setting value in D4RF or CDA are processed as 16 bits. This means that if D4RF or CDA is interconnected to the left of D3RF or D3WF, EtherNet/IP communication can be executed for both cyclic communication and acyclic communication, however, the current values sent from the D4RF or CDA to the left of the D3RF or D3WF to the master will be incorrect, as will the setting value set by the master.

Invalid connection order errors can be checked by reading 6A h (Error Code) from this unit's object (class ID: 64 h) using acyclic communication from the master (error code: 0008 h). Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for further information.

CAUTION

When interconnecting the D3RF, D3WF, and D4RF series fiber amplifiers and the CDA series displacement sensor amplifier units, be sure to interconnect the main unit at the left end (Slot No.= 0). If the expansion unit is on the left end, the interconnection connector will be exposed and interfere with the End plate. In addition, the fiber amplifier may malfunction due to dirt or damage to the interconnection connector.



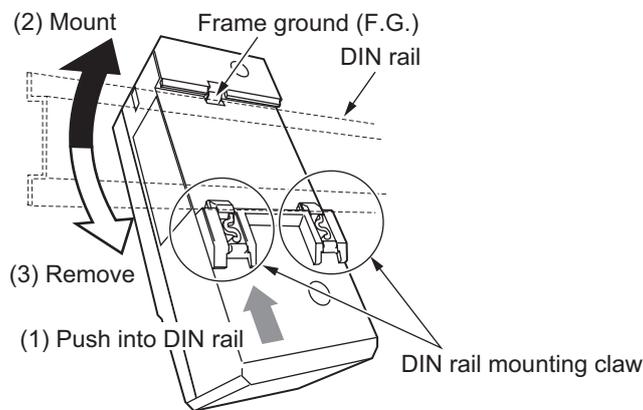
2-2 Installing on a DIN Rail

Install this unit on a DIN rail. Install the applicable sensor-amplifier units in the same way when interconnecting.

MEMO

- Remove the power supply cable during installation. In particular, make sure this unit and the applicable sensor-amplifier units are not powered when interconnecting or removing them.
- In this example, only fiber amplifiers (interconnection type) are interconnected with this unit, but CDA can be interconnected in the same way.

- 1** Align the DIN rail mounting claw at the bottom of this unit with the bottom of the DIN rail, push this unit onto the DIN rail in the direction indicated by (1) and then collapse it in the direction indicated by (2).

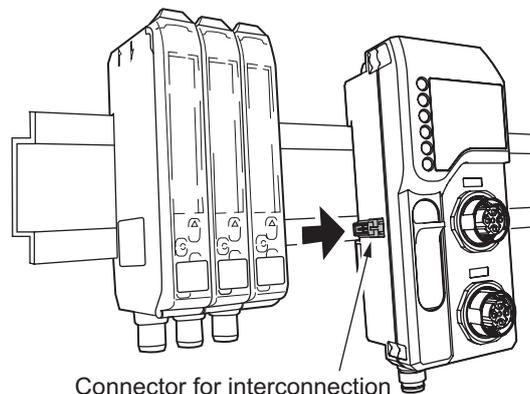


*If this unit is not properly attached to the DIN rail, faults may occur when interconnecting with the applicable sensor-amplifier units or connecting FGs. Make sure the DIN rail mounting claw is fully locked and this unit is securely mounted.

MEMO

To remove this unit from the DIN rail, push this unit onto the DIN rail in the direction indicated by (1) and collapse it in the direction of (3).

- 2** Mount the applicable sensor-amplifier units on the DIN rail in the same way and interconnect them with this unit.



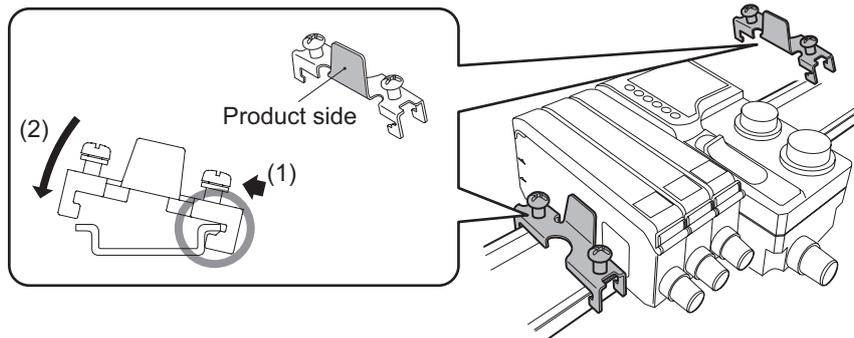
CAUTION

Interconnect this unit securely with the applicable sensor-amplifier units using the connectors for interconnection. If the connectors for interconnection are slanted or are not inserted all the way in, this unit or the applicable sensor-amplifier unit may be damaged when powered.

3 Mount the end plates on both sides of the interconnected units and secure them with screws.

The tightening torque must be 0.9 N·m or less.

Mount the end plates to both sides of this unit and the applicable sensor-amplifier units with the product side (see the diagram below) facing this unit or the applicable amplifier unit. Mount the end plates by catching the notch on the DIN rail as shown in the diagram below.



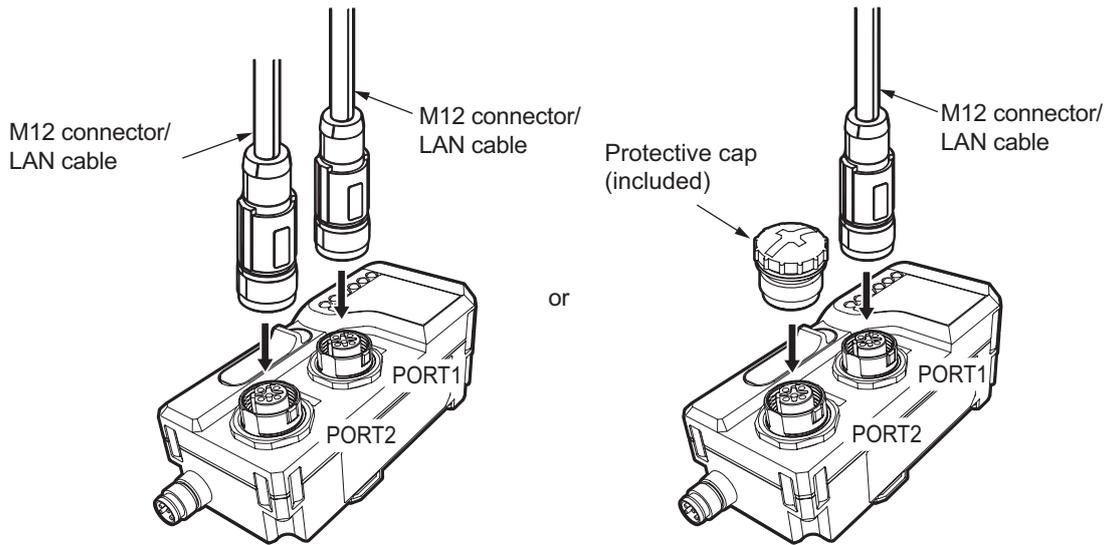
2-3 Wiring

This section describes wiring with the EtherNet/IP cable and power supply cable.

2-3-1 Connecting the Communication Cable

Connect the M12 connector/LAN cable to either PORT1 or PORT2 on this unit.

Attach the included protective cap to either PORT1 or PORT2, whichever is not being used.



■ EtherNet/IP Connection Cable

Prepare a CAT5e or higher Ethernet cable that fulfills the following specifications.

- Connector: M12 connector (plug: male)
- Cable: STP cable (shielded twisted pair cable)

■ Ethernet Connection Types

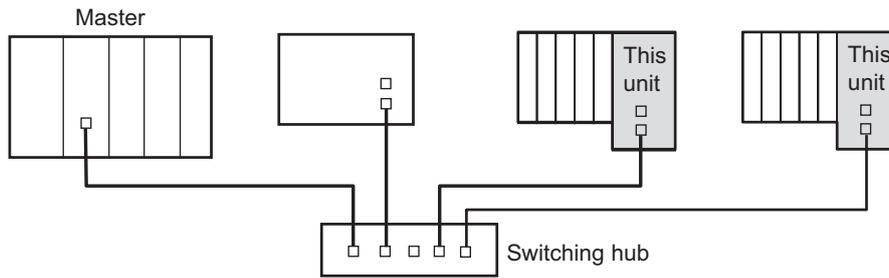
Connect connectors/cables depending on the Ethernet connection type.

This unit supports the following connection types.

- Star configuration
- Linear bus configuration
- Device level ring configuration

● Star Configuration

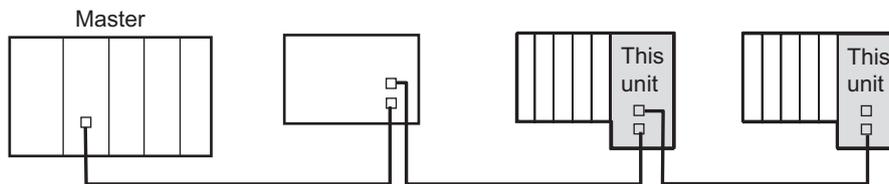
A star configuration network is a connection type in which various devices are connected through a switching hub. The network can be connected to either PORT1 or PORT2 on this unit.



● Linear Bus Configuration

A linear bus configuration network is a connection type in which devices are daisy chained together. This requires no switching hub and can result in a shorter total LAN cable length.

The upstream device (toward the master) and downstream device can be connected to either PORT1 or PORT2 on this unit.



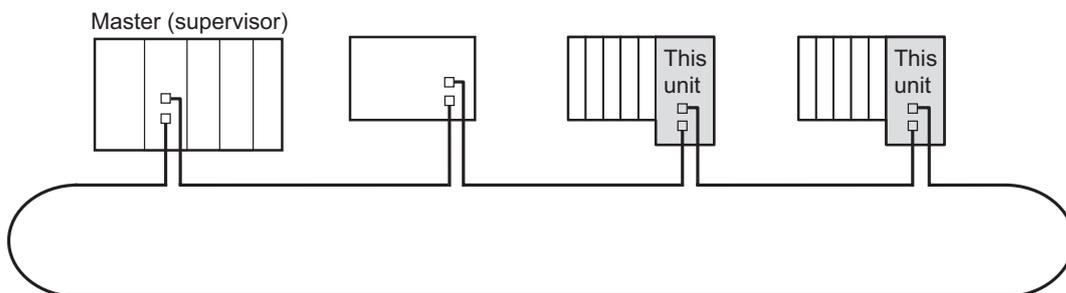
● Device Level Ring Configuration

A device level ring (DLR) configuration network is a connection type that provides strong resilience to outages. The network can be connected to either PORT1 or PORT2 on this unit.

Devices are installed in a ring shape. If a single device fails or is disconnected, the network switches to a linear bus configuration to maintain connectivity.

A managing device called a supervisor is required on the network.

All devices connected to a DLR configuration network must support DLR.



To check status information on the DLR protocol for this unit, use acyclic communication to read the DLR object (class ID: 47 h).

●●● MEMO ●●●

This unit supports a function called Device Level Ring Protocol (DLR), which allows the network to be switched quickly if a communication outage occurs. This can only be used when using a device level ring configuration.

This function allows the network to be switched quickly (for example, if there are 50 nodes, switching will take from 1 to 7 ms from detecting the error to recovering connectivity). Refer to the manual of the DLR compatible master for more information.

2-3-2 Wiring with the Power Supply Cable

This unit runs on an external power input (12 to 24 VDC / 2 A or less). Make sure the input voltage and current are correct. Incorrect wiring to the power source can cause fire or malfunction.

This unit uses the following dedicated M8 power supply connector cables (sold separately) for external power input.

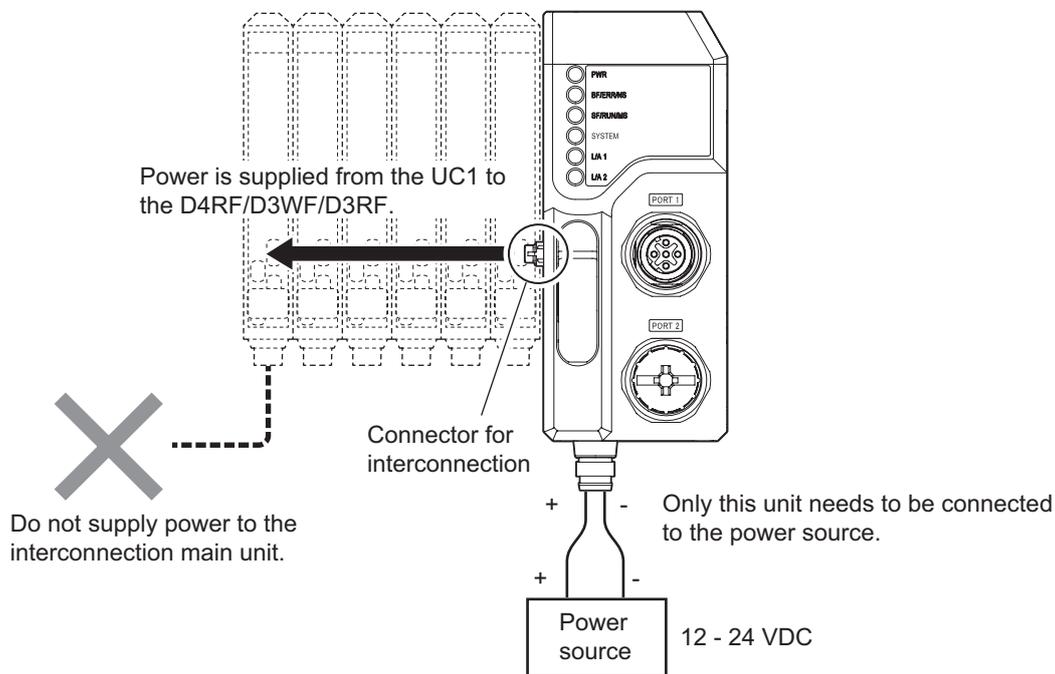
M84CN-2S: 2 m, M84CN-5S: 5 m, M84CN-10S: 10 m

This section describes wiring with the power supply cable when setting up each interconnection.

■ Supplying Power

● When Only Fiber Amplifiers Are Interconnected

Connect only this unit to the external power supply as shown in the diagram below. Fiber amplifier is powered by this unit (and thus does not need to be connected to a power supply).



MEMO

For the interconnection order and number of interconnection units, see "2-1-2 Configuration Limitations of Applicable Sensor-amplifiers and Sensors" (2-4 page).

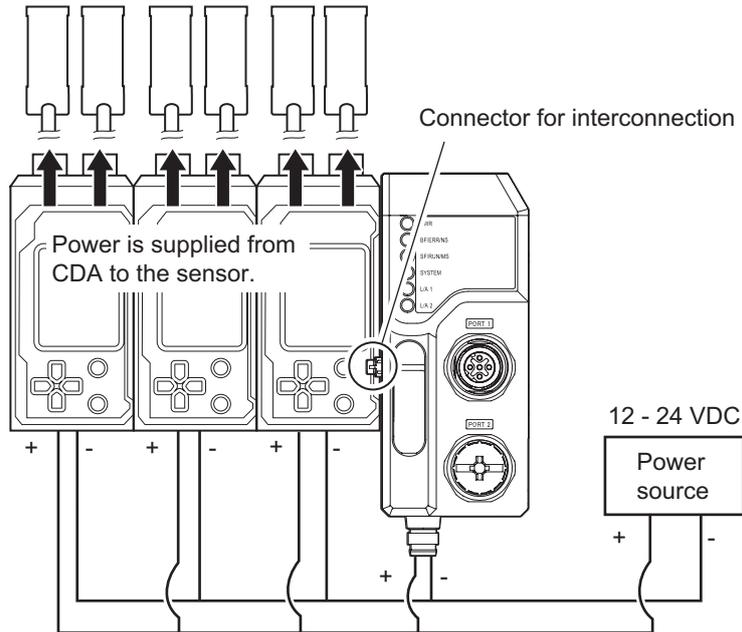
CAUTION

- D3RF, D3WF and D4RF are supplied with power from this unit, so do not connect an external power supply to D3RF, D3WF or D4RF. If GND is not common, communication may not work properly. In addition, overvoltage may occur depending on the conditions.
- When using cable-type fiber amplifiers, perform insulation processing to prevent the power wires (brown/blue) from short-circuiting. Short-circuits may lead to device damage. Furthermore, in the case of connector types, connect the included black cap to the M8 connector when the connector cable is not connected to prevent the pins from short-circuiting.
- The length of the power cable to this unit should be 30 m or less; if it exceeds 30 m, noise from the power cable may affect this unit and peripheral devices.

● When Only CDA is Interconnected

Connect this unit and CDA to the external power supply as shown in the diagram below. Devices such as displacement sensors are powered by CDA.

In this case, this unit's connector for interconnection is only used for communication.



This unit and all CDA units interconnected with it need to be connected to the same power source.

●●● MEMO ●●●

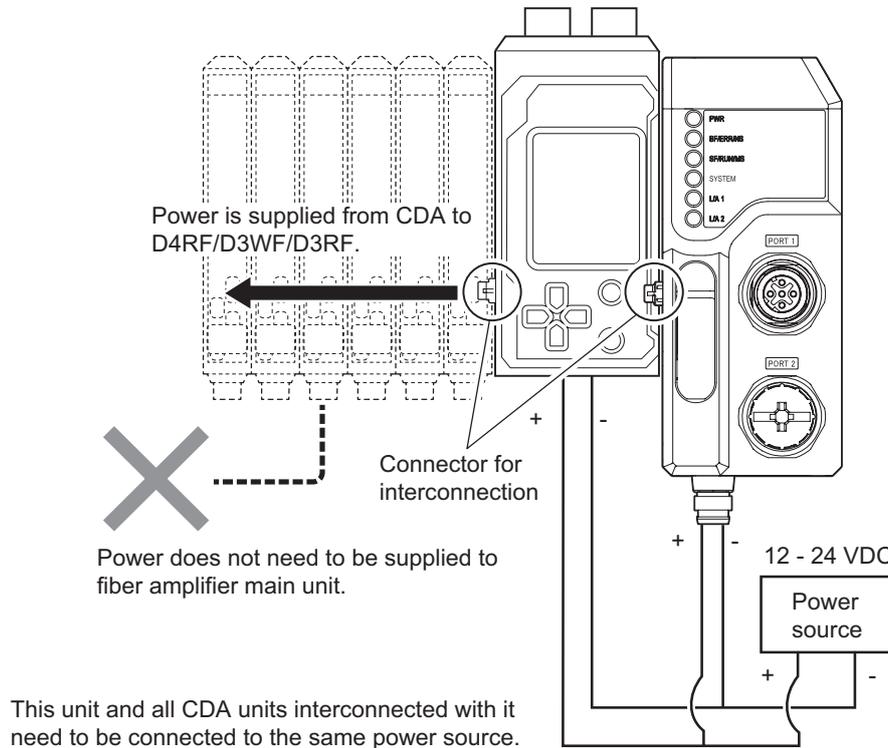
For the interconnection order and number of interconnection units, see "2-1-2 Configuration Limitations of Applicable Sensor-amplifiers and Sensors"(2-4 page).

CAUTION

- All interconnected CDA units must be powered by the same external power source as this unit. Normal communication may not be possible if a different power source is used.
- To prevent short circuits, wire CDA to the external power supply first, then this unit.
CDA will short circuit if UC1 is wired to an external power supply while CDA is in its factory default state (with the wires bundled) and not wired to an external power supply (when interconnected with this unit).
- The system can be operated without wiring this unit to an external power supply.
- The cable length of the power supply cable connected to this unit and the CDA Series must be 30 m or less. If it is longer than 30 m, noise from the power supply cable can affect this unit and its peripheral devices.

● When Fiber Amplifier and Displacement Sensor Amplifier Unit Are Interconnected

Connect both this unit and CDA to an external power supply as shown in the figure below. The fiber amplifiers do not require a power supply.



MEMO

For the interconnection order and number of interconnection units, see "2-1-2 Configuration Limitations of Applicable Sensor-amplifiers and Sensors"(2-4 page).

CAUTION

- When fiber amplifiers and CDAs are both interconnected, power to the fiber amplifiers is supplied from this unit through the CDAs. so do not connect an external power supply to D3RF, D3WF or D4RF. If GND is not common, communication may not work properly. In addition, overvoltage may occur depending on the conditions.
- CDAs must be powered by the same external power source as this unit. If a different power source is used, communication may not work properly.
- The cable length of the power supply cable connected to this unit and the CDA Series must be 30 m or less. If it is longer than 30 m, noise from the power supply cable can affect this unit and its peripheral devices.

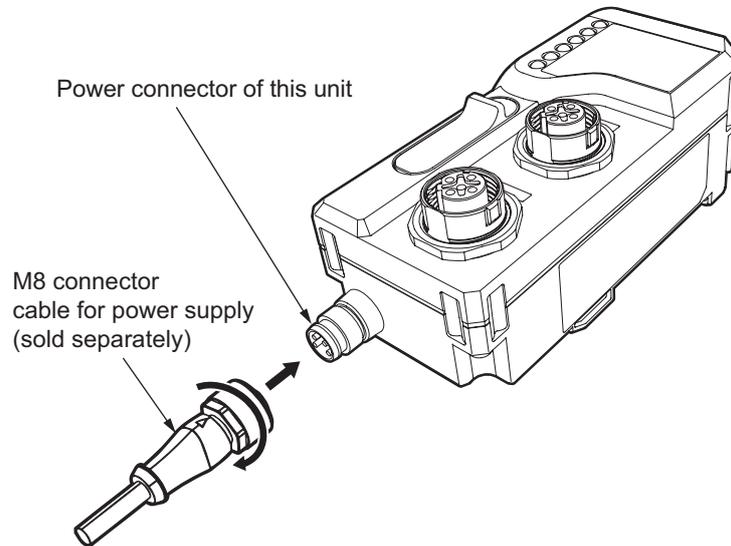
■ Calculating Power Consumption

Calculate the power consumed by this unit and the connected sensor-amplifiers and sensors as follows.

Type		Max. power consumption per unit	Number of units	
This unit		3 W	1	
Sensor-amplifiers	D4RF -TM -TMC4 -TDM -TDM-Y -TS -TSC4 -TDS -TDS-Y	0.792 W	× number of units connected	
	-TM-0 -TS-0	0.720 W	× number of units connected	
	-MC4 -S	0.624 W	× number of units connected	
	D3RF -TMN -TMCN4 -TMP -TMCP4 -TSN -TSCN4 -TSP -TSCP4	0.864 W	× number of units connected	
	-TDMN -TDMP -TDSN -TDSP	0.936 W	× number of units connected	
	D3WF	0.864 W	× number of units connected	
	CDA	1.2 W	× number of units connected	
	Sensors	CD22 RS-485 communication type	1.68 W	× number of units connected
		TD1	1.68 W	× number of units connected

■ Connecting Cables

- 1** Insert the connector of an M8 power supply connector cable (sold separately) to the power connector of this unit.
- 2** Tighten the fixture sufficiently by hand.





3

Communication

This chapter describes the data configurations that this unit handles for EtherNet/IP communication, and provides examples of communication.

3-1 EtherNet/IP Communication Using This Unit

This section describes the communication that this unit can perform with the EtherNet/IP master. This unit is capable of the following cyclic and acyclic communication with the EtherNet/IP master.

● Cyclic Communication

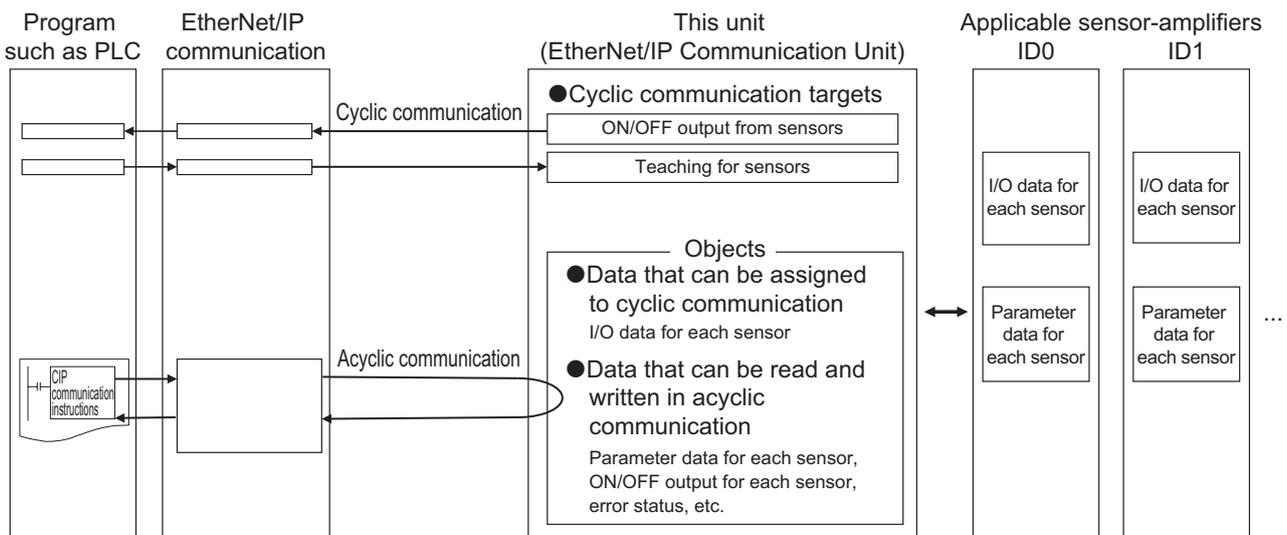
At regular intervals, the pre-determined data in this unit is exchanged with the EtherNet/IP master. The following data is exchanged.

- Connected sensor output 1
- Connected sensor output 1, output 2, external input or output 3, and teaching error status
- Teaching execution and error-clearing
- Received light levels or measurement values of connected sensor

● Acyclic Communication

Specific data for this unit is read and written by the EtherNet/IP master when necessary at the desired timing. All data objects in this unit can be read and written.

This method is mainly used to set parameter data for each sensor, read error statuses, perform reset operations, and read connected sensor configurations.



3-1-1 Configuring the Cyclic Communication Mechanism in This Unit

During cyclic communication, a device opens a logical communication line called a “connection” with another device. Data communication begins once this is successfully opened.

The device that opens the connection is called the “originator” and other device is called the “target.”

Generally, a device that has the originator function is called a “scanner” while a device with only the target function is called an “adapter.”

This unit is an “adapter.”

Note that a “scanner” can function as either an originator or target.

■ Connections Supported by This Unit

The three following connections are provided in the EDS file of this unit.

Connection	Connection I/O type
Connection 1	Exclusive Owner
Connection 2	Exclusive Owner
Connection 3	Input Only

Exclusive Owner is a connection I/O type that allows both the input instance^{*1} and output instance^{*1} to be configured. Input Only is a connection I/O type that allows only the input instance^{*1} to be configured.

*1: These are instances for the Assembly object.

The assembly instances assigned to each connection are as follows.

Connection	Connection I/O type	Assigned assembly instances	
		Input	Output
Connection 1	Exclusive Owner	Either of the following can be assigned. <ul style="list-style-type: none"> • 101: Connected sensor output 1 (size: 2 bytes) • 102: Connected sensor output 1, output 2, external input or output 3, and teaching error status (size: 8 bytes) • 104: Received light levels or measurement values of connected sensor (size: 32 bytes) 	103: Teaching execution and error-clearing (size: 4 bytes)
Connection 2	Exclusive Owner		103: Teaching execution and error-clearing (size: 4 bytes)
Connection 3	Input Only		None

The user determines which type of connection to use ahead of time. The user then assigns the assembly instance to input or output to that connection.

However, the same assembly instance cannot be assigned among multiple connections. Doing so will prevent cyclic communication.

Assembly instance 103 is assigned to connection 1 and 2 and cannot be changed, so connection 1 and connection 2 cannot be used at the same time.

The following connection patterns allow for simultaneous use.

- Either connection 1 or 2, and connection 3
- Connection 1 only
- Connection 2 only
- Connection 3 only

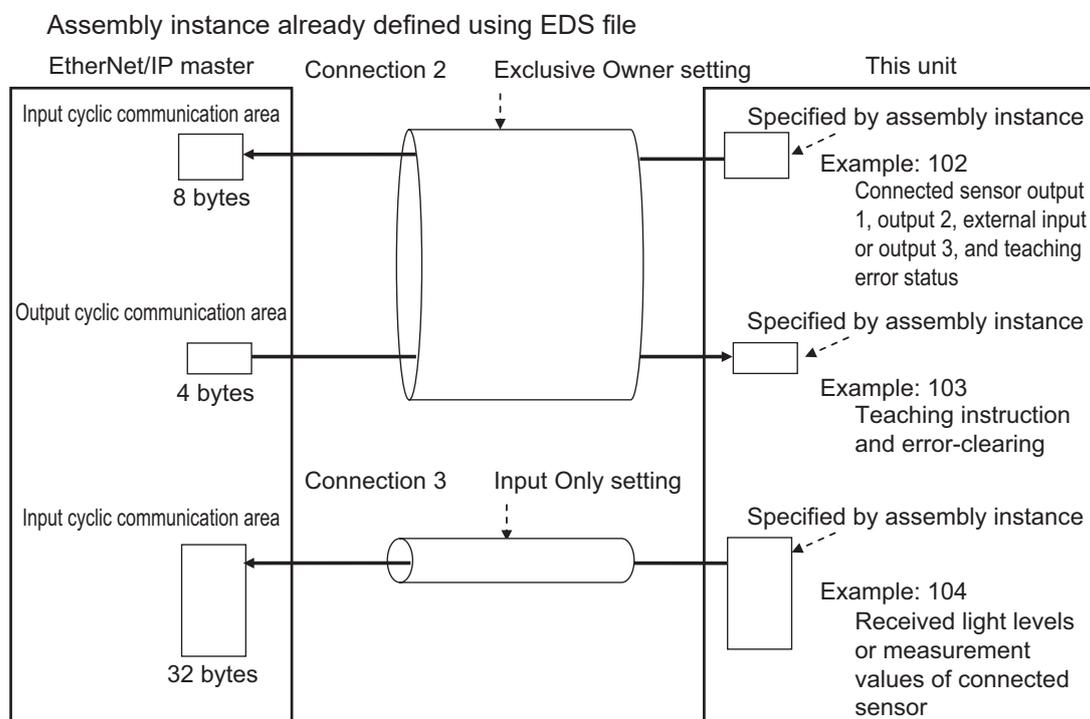
CAUTION

If the same assembly instance is configured for multiple connections during cyclic communication, it will no longer be possible to establish cyclic communication. For example, if connection 1 and connection 2 are used at the same time, assembly instance 103 will be assigned to the outputs of both. This will cause a conflict error and prevent cyclic communication.

Note that it may not be possible to assign an assembly instance to a connection, depending on the master. In this case, cyclic communication will be performed for the following assembly instances already defined in the EDS file.

Connection	Connection I/O type	Assembly instance already defined using EDS file	
		Input	Output
Connection 1	Exclusive Owner	101: Connected sensor output 1 (size: 2 bytes)	103: Teaching execution and error-clearing (size: 4 bytes)
Connection 2	Exclusive Owner	102: Connected sensor output 1, output 2, external input or output 3, and teaching error status (size: 8 bytes)	103: Teaching execution and error-clearing (size: 4 bytes)
Connection 3	Input Only	104: Received light levels or measurement values of connected sensor (size: 32 bytes)	None

Example: When using connection 2 and 3



MEMO

- To configure this unit to enable error code diagnosis when a connection is established, Enable the Global Diagnosis configuration assembly instance (100) in the connection settings (on the target device) of the EtherNet/IP configuration software. Refer to “5-1-1 Error Codes for This Unit” for more information about the error codes of this unit.

Examples of Using Connections

Periodically Read Output 1 and the Received Light Level from the Connected Sensor

Use connection 1 (Exclusive Owner) and connection 3 (Input Only).

Assign assembly instance 101 to the input of connection 1, and assembly instance 104 to the input of connection 3.

● Periodically Read Connected Sensor Output 1, Output 2, External Input or Output 3, Teacher Error Status, and Received Light Level

Use connection 2 (Exclusive Owner) and connection 3 (Input Only).

Assign assembly instance 102 to the input of connection 2, and assembly instance 104 to the input of connection 3.

●●● MEMO ●●●

- It may not be possible to use multiple connections at the same time, depending on the master.
- To specify a memory area in the cyclic communication area of the master, specify an area that will retain memory even if the operation mode of the master changes. Otherwise, the information in the memory area performing cyclic communication will be cleared when the operation mode of the master is changed.

■ Available Connection Types

The following connection types can be selected for each assembly instance of this unit.

Assembly instance	Connection type	
	Multicast (Multi-castconnection)	Unicast (Point to Point connection)
101: Connected sensor output 1	Can be selected	
102: Connected sensor output 1, output 2, external input or output 3, and teaching error status	Can be selected	
103: Teaching execution and error-clearing	Cannot be used	Fixed and cannot be changed
104: Received light levels or measurement values of connected sensor	Can be selected	

3-1-2 Acyclic Communication Mechanism in This Unit

During acyclic communication, the following information is specified using communication instructions from the master.

- Service code
- Class ID
- Instance ID
- Attribute ID

For this unit, specify the instance ID of the sensor object to specify the sensor to access. The instance ID is the connection order within the same model. Refer to “3-4-1 Instance IDs for This Unit and Sensor Objects” for further information on sensor object instance IDs.

3-2 Operations Required for This Unit to Communicate with the EtherNet/IP Master

This section describes the operations required on the EtherNet/IP master for this unit to perform EtherNet/IP communication.

For more information, refer to the manual of the EtherNet/IP master or that of the EtherNet/IP configuration software being used.

3-2-1 Downloading and Installing the EDS File for This Unit

- 1 Download the EDS file for this unit from the OPTEX FA website below:**
<https://www.optex-fa.com/>
- 2 Install the EDS file for this unit in the EtherNet/IP configuration software.**
Copy the EDS file for this unit (Electronic Data Sheets file) to the folder specified by the EtherNet/IP configuration software.

3-2-2 Configuring the IP Address for This Unit

Use a commercial configuration tool or the TCP/IP Interface object (class ID: F5 h) for acyclic communication to configure the IP address of this unit.

By default, the IP address is configured using a “static IP address.” The default IP address is “192.168.0.1.” The method used to configure the IP address can be changed to BOOTP or DHCP. To change this, send a CIP message to the TCP/IP Interface object (class ID: F5 h).

Refer to “3-6-8 TCP/IP Interface Object (Class ID: F5 h)” for further information on the TCP/IP Interface object.

3-2-3 Configuring EtherNet/IP Communication on the Master and This Unit

The settings required differ depending on whether cyclic communication or acyclic communication is being used.

■ Cyclic Communication

If using the cyclic communication function, design and configure by following the procedure below.

● Design

- 1 Determine which data in this unit to use with cyclic communication**
There are multiple types of internal data (assembly instances) for cyclic communication in this unit.
Determine which data to transmit periodically.
- 2 Determine the connection I/O type to use**
Determine which connection I/O type to use from types 1 through 3.

3 Confirm the assembly instance and size of each type of data

Each type of data uses a predetermined assembly instance and size, as shown below. Confirm this information ahead of time.

Cyclic communication internal data	Assembly instance	Size	Data direction
Connected sensor output 1	101 (65 h)	2 byte	From target (this unit) to originator (master)
Connected sensor output 1, output 2, external input or output 3, and teaching error status	102 (66 h)	8 byte	
Received light levels or measurement values of connected sensor	104 (68 h)	32 byte	From target (this unit) to originator (master)
Teaching execution and error-clearing	103 (67 h)	4 byte	From originator (master) to target (this unit)

● Configuration

Use the EtherNet/IP configuration software to configure the following.

- 1 Register this unit on the EtherNet/IP network in the configuration software, and then enter the IP address of this unit (configured in “3-2-2 Configuring the IP Address for This Unit”).
- 2 Create a cyclic communication area on the master for which to assign data from this unit.
- 3 Select the connection I/O type (from types 1 through 3) of this unit (target).
- 4 Assign the assembly instance of this unit to the input/output of the selected connection.
- 5 Select the cyclic communication area on the master to assign.
- 6 Configure the RPI, timeout value, and connection type for the connection parameters.
- 7 To enable error code diagnosis for this unit when a connection is established, enable the Global Diagnosis configuration assembly instance (100) in the connection settings (on the target device) of the EtherNet/IP configuration software. Note that error codes can be read with acyclic communication. Refer to “5-1 List of Error Codes for This Unit and Each Sensor” for more information about error codes.
- 8 To use two or more connections, repeat steps 3 through 7 above.

■ Acyclic Communication

If you are using acyclic communication, create a communication program on the master.

3-2-4 Downloading Connection Settings to the Master

Use the EtherNet/IP configuration software to download the configured connection to the master.

Cyclic communication will automatically start.

3-3 Cyclic Communication

This unit can input and output the following data from/to our sensors compatible with communication connected to this unit with the EtherNet/IP master cyclically.

- Output to the Master:
 - Bit data: sensor ON/OFF output signals, external input signals, and error statuses
 - Word data: received light levels and measured values of sensors
- Input from the Master:
 - Bit data: Teaching execution and error-clearing

MEMO

- When using cyclic communication, the user must know which model is connected with which slot.

3-3-1 Cyclic Communication Data in This Unit

The assembly instance and size of internal data (Assembly object) for cyclic communication for this unit are as follows.

● From Target (This Unit) to Originator (Master)

Assembly instance	Cyclic communication internal data	Size
101 (65 h)	Connected sensor output 1	2 byte
102 (66 h)	Connected sensor output 1, output 2, external input or output 3, and teaching error status	8 byte
104 (68 h)	Received light levels or measurement values of connected sensor	32 byte

● From Originator (Master) to Target (This Unit)

Assembly instance	Cyclic communication internal data	Size
103 (67 h)	Teaching execution and error-clearing	4 byte

■ Memory Assignment

The memory assignment for cyclic communication data in this unit is shown below.

Note: In the following explanation, the corresponding relationship between the slot and bit when “bit 0 to 15: slot 0 to 15” is indicated is as follows.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word	Slot 15	Slot 14	Slot 13	Slot 12	Slot 11	Slot 10	Slot 9	Slot 8	Slot 7	Slot 6	Slot 5	Slot 4	Slot 3	Slot 2	Slot 1	Slot 0

● From Target (This Unit) to Originator (Master)

• Instance ID 101: Connected sensor output 1 (total: 2 bytes)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word																
+0	Bit 0 to 15: Output 1 ON/OFF for connected sensor in slot 0 to 15.															

“Connected sensor output 1” indicates the following.

- D4RF: Sensor output 1
- D3RF: Sensor output 1
- D3WF: Sensor output 1
- CDA + CD22: Hi output
- CDA + TD1: None

For example, if either output 1 of the connected sensor is ON for slot 0 and 9 only, bit 0 and bit 9 from the start of the word data will be ON and the value will be as follows.

0201 h

• Instance ID 102: Connected sensor output 1, output 2, external input or output 3, and teaching error status (total: 8 bytes)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word																
+0	Bit 0 to 15: Output 1 ON/OFF for connected sensor in slot 0 to 15.															
+1	Bit 0 to 15: Output 2 ON/OFF for connected sensor in slot 0 to 15.															
+2	Bit 0 to 15: External input or output 3 ON/OFF for connected sensor in slot 0 to 15.															
+3	Bit 0 to 15: Teaching error status ON/OFF for connected sensor in slot 0 to 15.															

“Connected sensor output 1” for +0 word (0 to 1 bytes) indicates the following.

- D4RF: Sensor output 1
- D3RF: Sensor output 1
- D3WF: Sensor output 1
- CDA + CD22: Hi output
- CDA + TD1: None

“Connected sensor output 2” for +1 word (2 to 3 bytes) indicates the following.

- D4RF: Sensor output 2
- D3RF: Sensor output 2
- D3WF: Sensor output 2
- CDA + CD22: Lo output
- CDA + TD1: None

“Connected sensor external input or output 3” for +2 word (4 to 5 bytes) indicates the following.

- D4RF: External input
- D3RF: External input
- D3WF: External input
- CDA + CD22: Go output
- CDA + TD1: None

“Connected sensor teaching error status” for +3 word (6 to 7 bytes) indicates the following.

- D4RF: Error status
- D3RF: Error status
- D3WF: Error status
- CDA + CD22: Error status
- CDA + TD1: Error status

For example, if either output 1, 2, or 3 is ON for slot 0 and 9 only and there is an error for only slot 0 and slot 9, the values will be as follows.

0201 0201 0201 0201 h

• **Instance ID 104: Received light levels or measurement values of connected sensor (total: 32 bytes)**

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word																
+0	Received light levels or measurement values of connected sensor for slot 0															
+1	Received light levels or measurement values of connected sensor for slot 1															
+2	Received light levels or measurement values of connected sensor for slot 2															
+3	Received light levels or measurement values of connected sensor for slot 3															
+4	Received light levels or measurement values of connected sensor for slot 4															
+5	Received light levels or measurement values of connected sensor for slot 5															
+6	Received light levels or measurement values of connected sensor for slot 6															
+7	Received light levels or measurement values of connected sensor for slot 7															
+8	Received light levels or measurement values of connected sensor for slot 8															
+9	Received light levels or measurement values of connected sensor for slot 9															
+10	Received light levels or measurement values of connected sensor for slot 10															
+11	Received light levels or measurement values of connected sensor for slot 11															
+12	Received light levels or measurement values of connected sensor for slot 12															
+13	Received light levels or measurement values of connected sensor for slot 13															
+14	Received light levels or measurement values of connected sensor for slot 14															
+15	Received light levels or measurement values of connected sensor for slot 15															

“Received light levels or measurement values of connected sensor” indicates the following.

- D4RF: Received light level
- D3RF: Received light level
- D3WF: Received light level
- CDA + CD22: Measurement values or calculation values
- CDA + TD1: Measurement values or calculation values

For example, if the received light level for slot 0 is 0123 h, the received light level for slot 9 is 0345 h, and the received light level for other sensors is 0000 h, the values will be as follows.

0000 0000 0000 0000 0000 0000 0345 0000 0000 0000 0000 0000 0000 0000 0000 0123 h

● **From Originator (Master) to Target (This Unit)**

- **Instance ID 103: Teaching execution and error-clearing (total: 4 bytes)**

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word																
+0	Bit 0 to 15: Teaching execution ON/OFF for connected sensor in slot 0 to 15.															
+1	Bit 0 to 15: Error-clearing ON/OFF for connected sensor in slot 0 to 15.															

[0 to 1 bytes]: "Connected sensor teaching execution" indicates the following.

All models: Execution of teaching

[2 to 3 bytes]: "Connected sensor error-clearing" indicates the following.

All models: Error-clearing

For example, to execute teaching for slot 0 and 9 only, turn only bit 0 and bit 9 from the start of the word data ON and set the following values.

0000 0201h

3-4 Acyclic Communication

The EtherNet/IP master can read or write the following data using acyclic communication when necessary.

- Reading and writing setting values from each sensor
 - Reading ON/OFF output, external input, and teaching error information from all sensors connected to this unit
 - Teaching execution and error-clearing for all sensors connected to this unit
 - Reading sensor ON/OFF output, received light levels, measurement values, etc. for each sensor
 - Teaching execution and other instructions for each sensor
 - Reading the latest error codes specific to each device for each sensor
 - Reading configurations of sensors connected to this unit
 - Reading the number of sensors connected to this unit
- Etc.

EtherNet/IP communication instructions from the EtherNet/IP master can be used to specify the class ID, instance ID, and attribute ID of a given object, to read and write data.

Refer to “3-6-1 Services Supported by Objects in This Unit” for information on supported objects.

3-4-1 Instance IDs for This Unit and Sensor Objects

The instance IDs for this unit’s object and sensor objects are used as identification codes that indicate the connection order within the same class ID (model code).

If using acyclic communication to access each sensor object, specify the sensor to access by specifying this instance ID.

MEMO

If accessing a sensor object with acyclic communication, the user will need to know the “instance ID of the sensor object” for the connection order within this same class ID (model code).

Instance ID of This Unit

The instance ID of this unit is set to 01 h and cannot be changed.

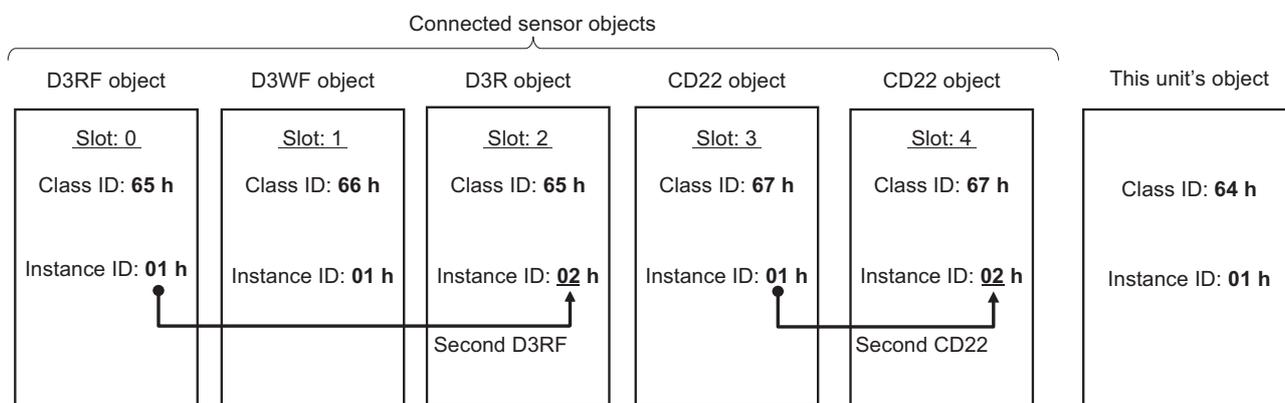
Object	Class ID (model code)	Instance ID
This unit’s object	64 h	Fixed to 01 h and cannot be changed

■ Assigning Instance IDs to Sensor Objects

The instance IDs assigned to each of the following sensor objects connected to this unit are determined by the connection order in the same class ID (model code). The numbers are assigned to each class ID (model code) in order starting from 01 h.

Sensor object	Class ID (model code)	Instance ID
D3RF object	65 h	Numbers are assigned in connection order starting from 01 h within the same class ID (model code) to the left.
D3WF object	66 h	
CD22 object	67 h	
TD1 object	68 h	
D4RF object	69 h	

In the following example, D3RF in slot 2 (the third from the left) is the second D3RF, so the instance ID is 02 h. Therefore, to access the D3RF object in slot 2 using acyclic communication, specify an instance ID of 02 h. Similarly, CD22 in slot 4 (the fifth from the left) is the second CD22, so the instance ID is 02 h. Therefore, to access the CD22 object in slot 4 using acyclic communication, specify an instance ID of 02 h.



MEMO

- Note that instance IDs for sensor objects differ from slot numbers.
- Instance IDs for sensor objects in each slot can be read with acyclic communication to the Module Configuration object (class ID: 80 h).

3-4-2 List of Class IDs (Model Codes) and Product Codes

The class IDs (model codes) and product codes for this unit and applicable sensors connected to this unit are listed below.

The following class IDs (model codes) and product codes can both be used to identify the model of a device.

This unit, or applicable sensor connected to this unit	Class ID (model code)	Product code	Model
This unit	64 h	2509 h	UC1-EP
D3RF	65 h	2101 h: Fiber amplifier, 1-output	<Interconnection main unit> D3RF-TMN <Interconnection main unit> D3RF-TMCN4 <Interconnection main unit> D3RF-TMP <Interconnection main unit> D3RF-TMCP4 <Interconnection expansion unit> D3RF-TSN <Interconnection expansion unit> D3RF-TSCN4 <Interconnection expansion unit> D3RF-TSP <Interconnection expansion unit> D3RF-TSCP4
		2102 h: Fiber amplifier, 2-output	<Interconnection main unit> D3RF-TDMN <Interconnection main unit> D3RF-TDMCN4 <Interconnection main unit> D3RF-TDMP <Interconnection main unit> D3RF-TDMCP4 <Interconnection expansion unit> D3RF-TDSN <Interconnection expansion unit> D3RF-TDSCN4 <Interconnection expansion unit> D3RF-TDSP <Interconnection expansion unit> D3RF-TDSCP4
D3WF	66 h	2111 h: Fiber amplifier, 1-output	<Interconnection main unit> D3WF-TMCN4 <Interconnection main unit> D3WF-TMCP4 <Interconnection expansion unit> D3WF-TSCN4 <Interconnection expansion unit> D3WF-TSCP4
CD22	67 h	1301 h: CD22-15-485	CD22-15-485M12
		1302 h: CD22-35-485	CD22-35-485M12
		1303 h: CD22-100-485	CD22-100-485M122
TD1	68 h	2321 h	TD1-010M8 TD1-010M8J
D4RF	69 h	2122 h: Fiber amplifier, 1-output	<Interconnection main unit> D4RF-TM <Interconnection main unit> D4RF-TMC4 <Interconnection expansion unit> D4RF-TS <Interconnection expansion unit> D4RF-TSC4
		2120 h: Fiber amplifier, 2-output	<Interconnection main unit> D4RF-TDM <Interconnection main unit> D4RF-TDM-Y <Interconnection expansion unit> D4RF-TDS <Interconnection expansion unit> D4RF-TDS-Y
		2121 h: Fiber amplifier, cable-less	<Interconnection main unit> D4RF-TM-0 <Interconnection expansion unit> D4RF-TS-0
		2123 h: Fiber amplifier, without display and keys	<Interconnection main unit> D4RF-MC4
		2123 h: Fiber amplifier, without display and keys, cable-less	<Interconnection expansion unit> D4RF-S

3-4-3 Confirming Class IDs (Model Codes), Product Codes, and Instance IDs for Each Slot

The class ID (model code) and product code of the sensors connected to each slot, as well as the instance ID assigned to each sensor, can be read with acyclic communication to the Module Configuration object (class ID: 80 h).

Refer to “3-6-16 Module Configuration Object (Class ID: 80 h)” for further information on the Module Configuration object.

3-5 Specific Examples of Communication

This section describes specific examples of communication between this unit and the master. Communication can be performed with cyclic communication or acyclic communication.

3-5-1 Cyclic Reading of ON/OFF Output from Sensors

Cyclic reading of ON/OFF output from sensors is performed with cyclic communication. Select the assembly instance for either of the internal data items (Assembly object) below.

Application	Internal data (Assembly object)	Assembly instance	Size
Read output 1 only	Connected sensor output 1	101 (65 h)	2 byte
Read output 2, external input or output 3, or teaching error status, other than output 1	Connected sensor output 1, output 2, external input or output 3, and teaching error status	102 (66 h)	8 byte

For example, to read output 1 and 2 of sensor D3RF in slot 0, select connection 2 (connection I/O type: Exclusive Owner) and assign 102 (66 h) to its input.

Leave the variable in the master as the cyclic communication area.

The variable in the master has a data size of 8 bytes. Only four bytes are used in this case, so use a 64-element BOOL type array variable.

Output data from the sensor is cyclically sent to the variable in the master.

The following is an example of a variable in the master.

Variable name: ABC (*)

Data type: ARRAY[0..63] OF BOOL (64-element BOOL type array)

*: The variable name is an example of a name defined by the user.

Then, read bit 0 in the above array variable for output 1. Read bit 16 in the above array variable for output 2.

3-5-2 Teaching the Sensors

Teaching of the sensors is performed with cyclic communication.

Collected instructions to the sensor-amplifiers are cyclically sent from variables in the master.

Select the assembly instance for the internal data (Assembly object) below.

Application	Internal data (Assembly object)	Assembly instance	Size
Execute teaching cyclically	Teaching execution and error-clearing	103 (67 h)	4 byte

For example, to cyclically execute teaching for sensor D3RF in slot 0, select connection 1 (connection I/O type: Exclusive Owner) and assign 103 (67 h) to its output.

Leave the variable in the master as the cyclic communication area.

The variable in the master has a data size of 4 bytes. Only 2 bytes are used in this case, so use a 32-element BOOL type array variable.

Master variable data is cyclically sent as input data to the sensor.

The following is an example of a variable in the master.

Variable name: DEF (*)

Data type: ARRAY[0..31] OF BOOL (16-element BOOL type array)

*: The variable name is an example of a name defined by the user.

Then, turn bit 0 of the above array variable ON.

3-5-3 Cyclic Reading of Received Light Levels from Sensors

Cyclic reading of received light levels from sensors is performed with cyclic communication.

Use the EtherNet/IP configuration software to assign the assembly instance for the internal data (Assembly object) below to the connection.

Application	Internal data (Assembly object)	Assembly instance	Size
Cyclically read the received light levels or measurement values of a sensor	Received light levels or measurement values of connected sensor	104 (68 h)	32 byte

For example, to read the received light level of sensor D3RF in slot 0, select connection 3 (connection I/O type: Input Only) and assign 104 (68 h) to its input.

Leave the variable in the master as the cyclic communication area.

The variable in the master has a data size of 16 words. Only one word is used in this case, so use a 16-element UINT type array variable.

Output data from the sensor-amplifier is cyclically sent to the variable in the master.

The following is an example of a variable in the master.

Variable name: GHI (*)

Data type: ARRAY[0..15] OF UINT (16-element UINT type array)

*: The variable name is an example of a name defined by the user.

Then, read the first word in the above variable.

3-5-4 Reading ON/OFF Output for All Sensors Connected to This Unit as Needed

Use acyclic communication when reading the ON/OFF output for all sensors connected to this unit as needed.

For example, to read ON/OFF output 1 for all sensors, send a CIP message from the master to the following class ID object in this unit.

- Service code: 0E h (Get_Attribute_Single)
- Class ID: 64 h (this unit's object)
- Instance ID: 01 h
- Instance attribute ID: 01 h (ON/OFF output 1 for all sensors)

3-5-5 Changing Setting Values of Sensors

The setting values of the sensors can be changed with acyclic communication.

For example, to change the lower threshold setting for output 1 for D3RF in slot 2 (third sensor from the left), send a CIP message from the master to the following class ID object in this unit.

- Service code: 10 h (Set_Attribute_Single)
- Class ID: 65 h (D3RF object)
- Instance ID: In this case, slot 0 and 1 are the same with model D3RF, so this is the third D3RF and therefore the ID is 03 h
- Instance attribute ID: 76 h (lower threshold setting for output 1)
- Write parameter: 100 (when using a lower threshold setting for output 1 of 100)

3-5-6 Reading the Sensor Configuration for All Slots Connected to This Unit

To read the configuration of the sensors connected to this unit, use acyclic communication.

For example, read the product code, class ID (model code), and instance ID (connection order within the model code) for all slots. Send a CIP message from the master to the following class ID object in this unit. Use service code "01 h" (Get_Attributes_All) when reading the sensor configuration in all slots.

- Service code: 01 h (Get_Attributes_All)
- Class ID: 80 h (Module Configuration object)
- Instance ID: 01 h

3-5-7 Changing the Method to Configure the IP Address of This Unit to BOOTP or DHCP

To change how the IP address of this unit is configured from a static IP address to using BOOTP or DHCP, use acyclic communication.

For example, to change to obtaining an IP address using BOOTP, send a CIP message from the master to the following class ID object in this unit.

- Service code: 10 h (Set_Attribute_Single)
- Class ID: F5 h (TCP/IP Interface object)
- Instance ID: 01 h
- Change instance attribute ID "03 h" (IP address configuration method) to "1" (obtain IP address using BOOTP function)

3-6 List of Information Monitored/ Configured Using Acyclic Communication

This section describes information monitored and configured using acyclic communication.

This unit contains sets of parameters called “objects.” The EtherNet/IP master reads from and writes to this location to monitor and set parameters.

3-6-1 Services Supported by Objects in This Unit

The following table lists services supported by objects in this unit.

Object name	Class ID	Details	Application
Identity object	01 h	This object provides identification information and general information on this unit.	Confirm the vendor ID of this unit, perform a reset operation, etc.
Message Router object	02 h	This object is located within the node and is used to distribute explicit message requests to the appropriate application objects. It has no class attributes or instance attributes.	-
Assembly object	04 h	This object binds the attributes of multiple objects. This allows data between each object to be sent and received using a single connection.	<ul style="list-style-type: none"> • Acyclically execute functions similar to cyclic communication • Read whether error diagnosis is enabled or disabled
Connection Manager object	06 h	This object assigns and manages internal resources associated with both cyclic communication and acyclic communication.	-
LLDP Management	109 h	Protocol for collecting adjacent device information	Sends information about the self-device and the relevant port to each port connected to the adjacent device.
DLR object	47 h	This object provides a status information interface for the Device Level Ring Protocol (DLR) when using a ring configuration network environment. Note: The DLR protocol is used to switch the network quickly when a communication outage occurs.	Read the network topology, network status, Supervisor IP address, etc. when using the DLR function
QoS object	48 h	This object manages all data and activity related to the Quality of Service (QoS) function of a device. It includes the DSCP setting in the IP header.	Configure QoS-related settings Note: This is used for time-critical applications such as DLR.

Object name	Class ID	Details	Application
TCP/IP Interface object	F5 h	This object writes and reads settings such as the IP address, subnet mask, and default gateway.	Configure/monitor TCP/IP-related settings; specifically: <ul style="list-style-type: none"> • Change how the IP address of this unit is configured, from a static IP address to using BOOTP or DHCP • Configure the IP address of this unit using a CIP message • Enable/disable the Address Conflict Detection (ACD) function
Ethernet Link object	F6 h	This object provides setting parameters, error counters, and status information for the Ethernet IEEE 802.3 communication interface.	Confirm the current communication speed
This unit's object	64 h	This object reads and writes data from this unit.	<ul style="list-style-type: none"> • Read ON/OFF output, external input, and teaching error information from all sensors connected to this unit • Perform teaching execution and error-clearing for all sensors connected to this unit • Read the number of sensors connected to this unit
D3RF object	65 h	This object reads and writes data from the D3RF sensor object.	<ul style="list-style-type: none"> • Read and write setting values from the sensor • Read ON/OFF output, received light levels, measurement values, etc. from each sensor • Provide instructions to the sensor, such as teaching execution
D3WF object	66 h	This object reads and writes data from the D3WF sensor object.	
CD22 object	67 h	This object reads and writes data from the CD22 sensor object.	
TD1 object	68 h	This object reads and writes data from the TD1 sensor object.	
D4RF object	69 h	This object reads and writes data from the D4RF sensor object.	
Module Configuration object	80 h	This object reads the configuration of the sensor connected to this unit.	Read configurations of sensors connected to this unit

3-6-2 Identity Object (Class ID: 01 h)

This object provides identification information and general information on this unit.

Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h - 09 h

Service Codes

Service Code	Service name	Details
01 h	Get_Attributes_All	Read the values of all attributes.
05 h	Reset	Soft reset this unit, or return it to factory settings and then soft reset it. Set the following reset types for the parameter. Reset type 0: Restart Reset type 1: Return to factory settings and then restart
0E h	Get_Attribute_Single	Read the value of the specified attribute.

Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Vendor ID	Vendor ID	R	UINT	05F6 h
02 h	Device Type	Device type	R	UINT	000C h (communication adapter)
03 h	Product Code	Product code	R	UINT	2509 h
04 h	Revision	Identity object revision	R	Struct	-
	Major Revision	Major revision	R	USINT	01 h
	Minor Revision	Minor revision	R	USINT	01 h
05 h	Status	Device status	R	WORD	Value varies depending on device status. Refer to “*1. Device status” for further information.
06 h	Serial Number	Serial number	R	UDINT	Device serial number
07 h	Product Name	Product name	R	SHORT_STRING	“UC1-EP”
08 h	State	Device operation state	R	USINT	Value varies depending on device operation state. Refer to “*2. Device operation state” for further information.
09 h	Configuration Consistency Value	Configuration value applied	R	UINT	0000 h

*1. Device status

Bit	Name	Description
0	Owned by master	ON when connection with master complete
1	Reserved	Always 0
2	Configured	ON when configuration complete
3	Reserved	Always 0
4 to 7	Extended device status	Indicates extended information on the device status. 0: Not used 1: Not used 2: Status when at least one I/O connection failure has occurred 3: Status when I/O connection is not established 4: Not used 5: Status when critical fault has occurred (MS error) 6: Status when at least one I/O connection is established, and at least one is in the RUN status 7: Status when at least one I/O connection is established, and all are in the idle status 8 to 15: Not used
8	Minor Recoverable Fault	Recoverable minor error
9	Minor Unrecoverable Fault	Unrecoverable minor error
10	Major Recoverable Fault	Recoverable major error
11	Major Unrecoverable Fault	Unrecoverable major error
12 to 15	Reserved	Always 0

*2. Device operation state

Value	Description
00 h	Nonexistent
01 h	Self-test
02 h	Standby
03 h	Operating
04 h	Recoverable major error
05 h	Unrecoverable major error
FF h	Default value

■ Reset Service Parameters

Specify the reset type when the service code is 05 h (Reset).

Data	Parameter name	Details	Attribute
0	Reset type 0	Restart.	W
1	Reset type 1	Return to factory settings and then restart. Refer to "6-2 Reset Function" for information on the settings initialized by "reset type 1."	W

3-6-3 Message Router Object (Class ID: 02 h)

This object is located within the node and is used to distribute explicit message requests to the appropriate application objects. It has no class attributes or instance attributes.

3-6-4 Assembly Object (Class ID: 04 h)

This object binds the attributes of multiple objects. This allows data between each object to be sent and received using a single connection.

■ Instance/Attribute Range

Instance ID		Attribute ID
Default value for Global Diagnosis when connection is established	64 h (100)	03 h, 04 h
Connected sensor output 1	65 h (101)	
Connected sensor output 1, output 2, external input or output 3, and teaching error status	66 h (102)	
Teaching execution and error-clearing	67 h (103)	
Received light levels or measurement values of connected sensor	68 h (104)	

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute

■ Attribute ID List

- For instance ID 64 h (100)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	<p>Default value for Global Diagnosis when connection is established</p> <p>00 h: Global Diagnosis disabled</p> <p>01 h: Global Diagnosis enabled</p> <p>Use only one byte in the front.</p> <p>The other 15 bytes are reserved.</p> <p>This indicates the default value of Global Diagnosis (attribute ID: D3 h [error diagnosis enabled/disabled]) for this unit's object (class ID: 64 h) when a connection is established.</p> <p>It is configured using the connection settings (for the target device) in the EtherNet/IP configuration software.</p>	R	ARRAY of BYTE	0000 h 0000 h 0000 h 0000 h 0000 h 0000 h 0000 h 0000 h
04 h	Size	Size (bytes)	R	UINT	0010 h

• For instance ID 65 h (101)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Connected sensor output 1 • D4RF: Sensor output 1 • D3RF: Sensor output 1 • D3WF: Sensor output 1 • CDA + CD22: Hi output • CDA + TD1: None	R	ARRAY of BYTE	0000 h Each bit 0: OFF 1: ON
04 h	Size	Size (bytes)	R	UINT	0002 h

• For instance ID 66 h (102)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Connected sensor output 1, output 2, external input or output 3, and teaching error status 0 to 1 bytes: • D4RF: Sensor output 1 • D3RF: Sensor output 1 • D3WF: Sensor output 1 • CDA + CD22: Hi output • CDA + TD1: None 2 to 3 bytes: • D4RF: Sensor output 2 • D3RF: Sensor output 2 • D3WF: Sensor output 2 • CDA + CD22: Lo output • CDA + TD1: None 4 to 5 bytes: • D4RF: External input • D3RF: External input • D3WF: External input • CDA + CD22: Go output • CDA + TD1: None 6 to 7 bytes: All models: Error status	R	ARRAY of BYTE	0000 h 0000 h 0000 h 0000 h Each bit 0: OFF 1: ON
04 h	Size	Size (bytes)	R	UINT	0008 h

• For instance ID 67 h (103)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Teaching execution and error-clearing 0 to 1 bytes: All models: Execution of teaching 2 to 3 bytes: All models: Error-clearing	R	ARRAY of BYTE	0000 h 0000 h Each bit 0 to 1 bytes: 0: No execution of teaching 1: Execution of teaching 2 to 3 bytes: 0: No error-clearing 1: Error-clearing
04 h	Size	Size (bytes)	R	UINT	0004 h

• For instance ID 68 h (104)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Received light levels or measurement values of connected sensor	R	ARRAY of BYTE	0000 0000 h 0000 0000 h
04 h	Size	Size (bytes)	R	UINT	0020 h

3-6-5 Connection Manager Object (Class ID: 06 h)

This object assigns and manages internal resources associated with both cyclic communication and acyclic communication. There are no instances.

3-6-6 DLR Object (Class ID: 47 h)

This object provides a status information interface for the Device Level Ring Protocol (DLR) when using a ring configuration network environment. The DLR protocol is used to switch the network quickly when a communication outage occurs.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h, 02 h, 0A h, 0C h

■ Service Codes

Service Code	Service name	Details
01 h	Get_Attributes_All	Read the values of all attributes.
0E h	Get_Attribute_Single	Read the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Network Topology	Network topology 0: Linear bus topology 1: Ring topology	R	USINT	00 h
02 h	Network Status	Network status Bit 0: Indicates normal status Bit 1: Indicates that a ring fault was detected Bit 2: Indicates that an invalid loop was detected Bit 3: Indicates that an error occurred in some part of the network Bit 4: Not used (Supervisor Only)	R	USINT	00 h
0A h	Active Supervisor Address	Supervisor IP and MAC address	R	Struct	
	IP Address	Supervisor IP address	R	UDINT	00000000 h
	Mac Address	Supervisor MAC address	R	ARRAY of 6 USINTs	000000000000 h
0C h	Capability Flags	List of functions supported by the DLR object Bit 0: Not used Bit 1: Indicates that Beacon-based rings are supported Bit 5: Not used Bit 6: Not used Bit 7: Indicates that the Flush_table is supported.	R	DWORD	00000082 h

3-6-7 QoS Object (Class ID: 48 h)

This object manages all data and activity related to the Quality of Service (QoS) function of a device. It includes the DSCP setting in the IP header. It is required for time-critical applications, such as using DLR.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h, 04 h - 08 h

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute
10 h	Set_Attribute_Single	Write the value to the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	802.1Q Tag Enable DSCP Urgent	802.1Q frame enabled/disabled setting 0: Disabled (default value) 1: Enabled	R/W	USINT	0 (00 h)
04 h	DSCP Urgent	Differentiated Services Code Point (DSCP) value of Urgent Priority message in cyclic communication (Valid range: 0 to 63)	R/W	USINT	55 (37 h)
05 h	DSCP Scheduled	DSCP value of Scheduled Priority message in cyclic communication (Valid range: 0 to 63)	R/W	USINT	47 (2F h)
06 h	DSCP High	DSCP value of High Priority message in cyclic communication (Valid range: 0 to 63)	R/W	USINT	43 (2B h)
07 h	DSCP Low	DSCP value of Low Priority message in cyclic communication (Valid range: 0 to 63)	R/W	USINT	31 (1F h)
08 h	DSCP Explicit	DSCP value of message (Class3 or UCMM) in acyclic communication (Valid range: 0 to 63)	R/W	USINT	27 (1B h)

3-6-8 TCP/IP Interface Object (Class ID: F5 h)

This object writes and reads settings such as the IP address, subnet mask, and default gateway.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h - 0D h

■ Service Codes

Service Code	Service name	Details
01 h	Get_Attributes_All	Read the values of all attributes.
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value to the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Interface status	<p>Interface status</p> <p>Bit 0 to 3:</p> <p>0=IP address not set</p> <p>1=Address applied (either by DHCP/BOOTP or a static address)</p> <p>2=Setting applied by hardware (not supported by UC1-EP)</p> <p>Bit 4: Indicates that a new TTL or Mcast Config value was set. The value will be applied upon reset.</p> <p>Bit 5: Indicates that a new value is pending for Interface Configuration. This bit is not switched on, as it is reset when the value is set via UC1-EP.</p> <p>Bit 6: Indicates that an address conflict was detected in the network by the ACD function.</p> <p>Bit 7: Indicates that an address conflict was detected in the network by the ACD function, and that the port cannot currently be used.</p>	R	DWORD	Depends on device operation state
02 h	Configuration Capability	<p>List of functions supported by the TCPIP object</p> <p>Bit 0: BOOTP client</p> <p>Bit 1: DNS client (unsupported)</p> <p>Bit 2: DHCP client</p> <p>Bit 3: DHCP/DNS client (unsupported)</p> <p>Bit 4: Configurable via configuration</p> <p>Bit 5: Configurable via hardware (unsupported)</p> <p>Bit 6: Reset required to change Interface Configuration</p> <p>Bit 7: ACD function support</p>	R	DWORD	000095 h
03 h	Configuration Control	<p>IP address configuration method</p> <p>Bit 0 to 3:</p> <p>0=Set static IP address</p> <p>1=Obtain address using BOOTP function</p> <p>2=Obtain address using DHCP function</p> <p>Bit 4: DNS function support (unsupported)</p>	R/W	DWORD	00000000 h
04 h	Physical Link Object	The path to the link object in the physical layer	R	Struct	None
	Path size	Path size (set to 0 and cannot be changed for models with Multi Port)		UINT	0000 h
	Path	The path to the link object in the physical layer		Padded EPATH	None

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
05 h	Interface Cofiguration	EtherNet/IP unit settings	R/W	Struct	-
	IP Address	IP address		UDINT	192.168.0.1
	Network Mask	Subnet mask		UDINT	255.255.255.0
	Gateway Address	Default gateway		UDINT	0.0.0.0
	Nama Server	Primary name server		UDINT	0.0.0.0
	Nama Server2	Secondary name server		UDINT	0.0.0.0
	Domain Name	Domain name		STRING	""
06 h	Host Name	Host name	R/W	STRING	""
07 h	Safety Network Number	Safety network	R	6 octets	No support
08 h	TTL Value	TTL value for multicast packets (valid range: 1 to 255)	R/W	USINT	1
09 h	Mcast Config	Multicast address settings	R/W	Struct	
	Alloc Control	Multicast determination method 0=The multicast address and number of addresses are determined automatically (default value) 1=The multicast address and number of addresses are determined by the user		USINT	00 h
	Reserved	Reserved	-	USINT	-
	Num Mcast	Number of multicast addresses		UINT	Assigned automatically
	Mcast Start Addr	Starting multicast address		UDINT	Assigned automatically
0A h	SelectAcid	Address Conflict Detection (ACD) function enabled/disabled 0=Disabled 1=Enabled (default value) Specify whether to enable or disable the function that searches for IP address conflicts with other devices on the network.	R/W	BOOL	01 h
0B h	LastConflictDetected	Information on the address conflict that was last detected	R/W	Struct	
	AcdActivity	ACD status when a conflict is detected 0=No conflict detected (default value) 1=Conflict while generating an IPV4 address 2=Conflict during operation 3=Conflict during semi-active probe		USINT	00 h
	Remote MAC	MAC address of the device with a conflicting IP address detected by ARP		Array of 6 USINT	0
	ArpPdu	Copy of the IP address conflict information from ARP		ARRAY of 28 USINTs	0

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
0C h	EtherNet/IP Quick Connect	Quick Connect enabled/disabled 0 = Disabled 1 = Enabled	R/W	BOOL	00 h
0D h	Encapsulation Inactivity Timeout	Timeout during packet generation. The TCP socket will be closed if the specified time is exceeded. 0=Function disabled Default value: 120 seconds (valid range: 1 to 3600 seconds, 0001 - 0E10 h)	R/W	UINT	0078 h (120 seconds)

3-6-9 Ethernet Link Object (Class ID: F6 h)

This object provides setting parameters, error counters, and status information for the Ethernet IEEE 802.3 communication interface.

■ Instance/Attribute Range

Instance ID		Attribute ID
Port1	01 h	01 h - 0B h
Port2	02 h	

■ Service Codes

Service Code	Service name	Details
01 h	Get_Attributes_All	Read the values of all attributes.
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value to the specified attribute.
4C h	Get And Clear	Reset and read the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Interface Speed	Interface communication speed 0 = 0 M Speed 10 = 10 M Speed 100 = 100 M Speed	R	UDINT	The set communication speed
02 h	Interface Flags	Interface status flag Bit 0: Link status Bit 1: Half-duplex (0) or full-duplex (1) Bits 2 to 4: 0: Performing auto negotiation 1: Failed to perform auto negotiation and detect speed 2: Failed to perform auto negotiation but detected speed successfully 3: Successfully performed auto negotiation 4: Auto negotiation not attempted Bit 5: Reset required to apply settings Bit 6: Hardware fault (always 0)	R	DWORD	Value varies depending on settings
03 h	Physical Address	Device MAC address	R	ARRAY of 6 USINTs	Device MAC address
04 h	Interface Counters	Counter value related to packets received on interface	R/R and clear	Struct	0
	In Octets	Octets received on interface		UDINT	0
	In Ucast Packets	Unicast packets received on interface		UDINT	0
	In NUcast Packets	Packets other than unicast packet received on interface		UDINT	0
	In Discards	Inbound packets discarded after receipt		UDINT	0
	In Errors	Inbound packets including errors (not including those discarded)		UDINT	0
	In Unknown Protos	Inbound packets received via unknown protocol		UDINT	0
	Out Octets	Octets sent on interface		UDINT	0
	Out Ucast Packets	Unicast packets sent on interface		UDINT	0
	Out Nucast Packets	Packets other than unicast packet sent on interface		UDINT	0
	Out Discards	Discarded outbound packets		UDINT	0
	Out Errors	Outbound packets including errors		UDINT	0

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
05 h	Media Counters	Counter values related to Ethernet media	R/R and clear	Struct	0
	Alignment Errors	Received frames not composed of octets where the data length is an integer value		UDINT	0
	FCS Errors	Received frames that did not pass through FCS check		UDINT	0
	Single Collisions	Frames successfully sent for which a collision was predicted		UDINT	0
	Multiple Collisions	Frames successfully sent for which at least one collision was predicted		UDINT	0
	SQE Test Errors	Number of SQE test error messages generated		UDINT	0
	Deferred Transmissions	Frames where the initial transmission was delayed due to busy status		UDINT	0
	Late Collisions	Number of times where a collision was detected after the 512-bit time when sending a packet		UDINT	0
	Excessive Collisions	Frames for which sending failed due to excessive collisions		UDINT	0
	MAC Transmit Errors	Frames for which sending failed due to an internal MAC sublayer transmission error		UDINT	0
	Carrier Sense Errors	Time where assertion was not performed due to loss of carrier detection function for frame transmission		UDINT	0
	Frame Too Long	Frames received exceeding the maximum size allowed		UDINT	0
	MAC Receive Errors	Frames for which receipt failed due to an internal MAC sublayer receive error		UDINT	0
06 h	Interface Control	Physical layer interface settings	R/W	Struct	0
	Control Bits	Interface management bit Bit 0: Auto negotiation status (1: Yes, 0: No [fixed setting]) Bit 1: Type of fixed setting (0: Half-duplex, 1: Full-duplex)		WORD	0001 h (auto negotiation)
	Forced Interface Speed	Interface speed 10 Mbps: 000A h 100 Mbps: 0064 h Set to 0 (0000 h) for auto negotiation.		UINT	0000 h
07 h	Interface Type	Interface type Bit 0: Unknown interface type Bit 1: Device dedicated interface Bit 2: Twisted pair Bit 3: Optical fiber	R	USINT	02 h

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
08 h	Interface State	Interface status Bit 0: Unknown status Bit 1: Normal Bit 2: Interface disabled Bit 3: Interface test status	R	USINT	Value varies depending on interface status
09 h	Admin State	Administrator permissions enabled/ disabled 1=Enabled (default value) 2=Disabled	R/W	USINT	01 h
0A h	Interface Label	Label name for each interface	R	SHORT_STRING	Instance 1: "port1" Instance 2: "port2"
0B h	Interface Capability	Functions supported by interface	R	Struct	
	Capability Bits	Functions supported by interface Bit 0: Reset required to apply manual settings Bit 1: Auto negotiation support Bit 2: Auto MDIX support Bit 3: Manual speed/communication method can be configured		DWORD	0000000F h
	Speed/Duplex Options	List of communication speeds/ communication methods supported by interface	R	Struct	
		Number of component elements		USINT	04 h
		Communication speed/communication method		ARRAY of Struct	
		Communication speed 1 000A h =10M Speed 0064 h =100M Speed		UINT	000A h
		Communication method 1 00 h = Half-duplex 01 h = Full-duplex		USINT	00 h
		Communication speed 2		UINT	000A h
		Communication method 2		USINT	01 h
		Communication speed 3		UINT	0064 h
Communication method 3			USINT	00 h	
Communication speed 4		UINT	0064 h		
Communication method 4		USINT	01 h		

3-6-10 This Unit's Object (Class ID: 64 h)

This object reads and writes data from this unit.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h - DC h *Includes reserved attributes

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Q1 of all connected modules	ON/OFF output 1 for all sensors	R	UINT	0000 h
02 h	Q2 of all connected modules	ON/OFF output 2 for all sensors	R	UINT	0000 h
03 h	Q3 of all connected modules	External input for all sensors	R	UINT	0000 h
04 h	Error Information of all connected modules	Teaching error information for all sensors	R	UINT	0000 h
05 h	Reserved	Reserved	-	-	-
06 h	Teach of all connected modules	Teaching execution for all sensors	R/W	UINT	0000 h
07 h	Error clear of all connected modules	Error-clearing for all sensors	R/W	UINT	0000 h
08 h	Product Code	Product code	R	UINT	2509 h
09 h	Product Type	Product type	R	UINT	0001 h
0A h	Firmware Version	Firmware version	R	UINT	0001 h
0B h	Protocol Version	Protocol version	R	UINT	0001 h
0C h	Product Revision	Version number of product hardware	R	UINT	0001 h
0D h	Vendor Name	Vendor name	R	STRING: 7 bytes	"OPTEX FA"
0E h	Product Name	Product name	R	STRING: 9 bytes	"UC1-EP"
0F h	Product ID	Product ID	R	STRING: 7 bytes	"0020282"

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
10 h	User Tag Name	User ID (maximum 32 characters)	R/W	STRING: 32 bytes	""
11 h	Operation Status	Operation status of this unit	R	UINT	0 (Idle) 2 (Run)
12 h	Vendor ID	Vendor ID	R	UINT	05F6 h
13 h	Network Profile	Network profile	R	STRING: 19 bytes	"EtherNet/IP Coupler"
67 h	Product Serial Number	Serial number	R	DWORD	Serial number
69 h	Number of connected Modules	Number of connected sensors	R	UINT	0 - 10 h
6A h	Error Code	Read error codes Refer to "5-1-1 Error Codes for This Unit" for information on the error codes of this unit. Note: If attribute D3 h (Global Diagnosis) is set to "Enabled" for this object, the latest error code for this unit will be stored automatically. Note that the error code can be cleared by writing 0 h as the value.	R/W	UINT	0 h
D0 h	Host CPU firmware version	Host CPU version	R	STRING: 4 bytes	"1001"
D1 h	LFW firmware version	Loadable firmware version	R	STRING: 12 bytes	"EI21400.NXF"
D2 h	Find me	Self search	R/W	UINT	1: Self search ON 0: Self search OFF (default value)
D3 h	Global Diagnosis	Error code diagnosis enabled/disabled for this unit If set to "Enabled," the latest error code for this unit will be stored automatically in attribute 6A h (Error Code) in this object. Note: This setting is saved in non-volatile memory, and the setting will be preserved the next time the power is turned ON.	R/W	UINT	0: Disabled (default value ^{*1}) 1: Enabled
DC h	Factory Reset	Initialize to factory settings	W	UINT	3: Execute

*1: To set Global Diagnosis (error diagnosis enabled/disabled) to the default value when a connection is established, configure Disable/Enable for Global Diagnosis in the configuration assembly instance (100), in the connection settings (on the target device) of the EtherNet/IP configuration software.

When the connection is established, a CIP message is sent to the above attribute ID: D3 h (Global Diagnosis), allowing the enabled/disabled setting to be changed for error code diagnosis in this unit.

3-6-11 D3RF Object (Class ID: 65 h)

This object reads and writes data from the D3RF sensor object.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h - 10 h *Depends on the number of connected units. Refer to "3-4-1 Instance IDs for This Unit and Sensor Objects" for further information.	01 h - DC h *Includes reserved attributes.

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
01 h	Q1 Status	Output 1	R	BOOL	0
02 h	Q2 Status	Output 2	R	BOOL	0
03 h	External Input Status	External input	R	BOOL	0
04 h	Error Information	Error information	R	BOOL	0
05 h	Light Level	Received light level	R	UINT	0000 h
06 h	Teach-in request	Execution of teaching	R/W	BOOL	0
07 h	Error Clear	Error-clearing	R/W	BOOL	0
08 h	Product Code	Product code	R	UINT	2101 h: Fiber amplifier 1-output 2102 h: Fiber amplifier 2-output
09 h	Product Type	Product type	R	UINT	0012 h
0A h	Firmware Version	Firmware version	R	UINT	0200 h or above
0B h	Protocol Version	Protocol version	R	UINT	0001 h
0C h	Product Revision	Version number of product hardware	R	UINT	0001 h
0D h	Vendor Name	Vendor name	R	STRING: 2 - 16 bytes	"OPTEX FA"
0E h	Product Name	Product name	R	STRING: 2 - 32 bytes	Product name

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
0F h	Product ID	Product ID	R	STRING: 2 to 16 bytes	Product ID
10 h	User Tag Name	User ID (maximum 32 characters)	R/W	STRING: 2 to 32 bytes	""
11 h	Operation Status	Operation status of D3RF	R	UINT	0: Initialize 1: Idle 2: Execute 3: Use by user
6A h	Error Code	Latest error code for D3RF Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for information on the error codes for D3RF.	R/W	UINT	<ul style="list-style-type: none"> • Read: Last error code • Write arbitrary value: Delete last error code
6C h	Display	Display settings	R/W	UINT	0: Number display 1: Bar display 2: Percentage display
6E h	Teach-in mode CH1	Output 1 teaching mode	R/W	UINT	0: Two-point teaching 1: One-point teaching
6F h	Teach-in mode CH2	Output 2 teaching mode	R/W	UINT	2: Through teaching 3: Zone teaching 4: Auto-teaching 5: Percentage teaching 6: Zero percentage teaching
70 h	Response Speed	Response speed setting	R/W	UINT	0: 1-HS (22 μ s) 1: 2-FS (85 μ s) 2: 3-ST (250 μ s) 3: 4-LG (1 ms) 4: 5-PL (2 ms) 5: 6-UL (4 ms) 6: 7-EL (8 ms)
71 h	Gain	Emitting power setting	R/W	UINT	0: Low power 1: Medium power 2: High power
72 h	MF-Input	External input setting	R/W	UINT	0: External teaching input 1: Test input 2: Synchronization input 3: Counter reset input 4: External all teaching input 5: No function

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
73 h	Key Lock	Lock level setting	R/W	UINT	0: Unlocked 1: Lock level 1 (fully locked) 2: Lock level 2 (half locked)
74 h	Operation mode CH1	Output 1 operation mode	R/W	UINT	0: L-on (light on) 1: D-on (dark on)
75 h	Operation mode CH2	Output 2 operation mode	R/W	UINT	
76 h	Threshold level CH1 Lower Limit	Lower threshold (Far) setting for output 1	R/W	UINT	-999 to 9999 The range that can be written differs depending on the operation mode.
77 h	Threshold level CH1 Upper Limit	Upper threshold (Near) setting for output 1	R/W	UINT	-999 to 9999 Can only be accessed in zone teaching mode.
78 h	Threshold level CH2 Lower Limit	Lower threshold (Far) setting for output 2	R/W	UINT	-999 to 9999 The range that can be written differs depending on the operation mode.
79 h	Threshold level CH2 Upper Limit	Upper threshold (Near) setting for output 2	R/W	UINT	-999 to 9999 Can only be accessed in zone teaching mode.
7A h	Timer setting CH1	One-shot timer specification for output 1	R/W	UINT	0: Off delay time 1: One-shot timer
7B h	Timer setting CH2	One-shot timer specification for output 2	R/W	UINT	
7C h	CH1 Off delay time	Off delay timer time for output 1	R/W	UINT	0 to 9999: 0 to 9999 ms -1 to -9: 0.1 to 0.9 ms
7D h	CH1 On delay time	On delay timer time for output 1	R/W	UINT	
7E h	CH2 Off delay time	Off delay timer time for output 2	R/W	UINT	
7F h	CH2 On delay time	On delay timer time for output 2	R/W	UINT	
83 h	Hysteresis	Hysteresis setting	R/W	UINT	1 to 40
85 h	ASC (Automatic Switching threshold tracking)	ASC setting (automatic sensitivity correction)	R/W	UINT	0: None 1: Normal correction 2: High-speed correction 3: Maximum-speed correction
86 h	Energy Saving	Eco mode setting	R/W	UINT	0: Standard 1: Automatically turn OFF indicators 2: 2x emitting cycle 3: Display and emitting cycle

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
87 h	Reverse display	Reverse display setting	R/W	UINT	0: Standard 1: Reverse display
D0 h	Store zero-reset	Execute zero reset	W	Byte	0 to 65535: Execute
D1 h	Cancel zero-reset	Clear zero reset	W	Byte	0 to 65535: Execute
D2 h	Teach-in 1-point	First teaching	W	UINT	1: Teaching for output 1 2: Teaching for output 2
D3 h	Teach-in 2-point	Second teaching	W	UINT	
DA h	Warm start Reset	Restart instruction	W	UINT	3: Execute restart
DB h	Return to top menu	Back to top menu	W	Byte	Execute by writing values
DC h	Factory Reset	Initialize setting values	W	UINT	3: Execute initialization (only allowed when unlocked)

3-6-12 D3WF Object (Class ID: 66 h)

This object reads and writes data from the D3WF sensor object.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h - 10 h *Depends on the number of connected units. Refer to "3-4-1 Instance IDs for This Unit and Sensor Objects" for further information.	01 h - DC h *Includes reserved attributes.

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
01 h	Q1 Status	Output 1	Read	BOOL	0
03 h	External Input Status	External input	Read	BOOL	0
04 h	Error Information	Error information	Read	BOOL	0
05 h	Light Level	Received light level	R	UINT	0000 h
06 h	Teach-in request	Execution of teaching	R/W	BOOL	0
07 h	Error Clear	Error-clearing	R/W	BOOL	0

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
08 h	Product Code	Product code	R	UINT	2111 h: Fiber amplifier 1-output
09 h	Product Type	Product type	R	UINT	0012 h
0A h	Firmware Version	Firmware version	R	UINT	0100 h
0B h	Protocol Version	Protocol version	R	UINT	0001 h
0C h	Product Revision	Version number of product hardware	R	UINT	0001 h
0D h	Vendor Name	Vendor name	R	STRING: 2 to 16 bytes	"OPTEX FA"
0E h	Product Name	Product name	R	STRING: 2 to 32 bytes	Product name
0F h	Product ID	Product ID	R	STRING: 2 to 16 bytes	Product ID
10 h	User Tag Name	User ID (maximum 32 characters)	R/W	STRING: 2 to 32 bytes	User ID (maximum 32 characters)
11 h	Operation Status	Operation status of D3WF	R	UINT	0: Initialize 1: Idle 2: Execute 3: Use by user
6A h	Error Code	Latest error code for D3WF Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for information on the error codes for D3WF.	R/W	UINT	<ul style="list-style-type: none"> • Read: Last error code • Write arbitrary value: Delete last error code
6C h	Display	Display settings	R/W	UINT	0: Number display 1: Bar display 2: Percentage display
6E h	Teach-in mode CH1	Output 1 teaching mode	R/W	UINT	0: One-point teaching 1: Two-point teaching 2: Dynamic teaching
70 h	Response speed	Response speed setting	R/W	UINT	0: 16 μ s 1: 200 μ s
71 h	Gain	Emitting power setting	R/W	UINT	0: Low power 1: Standard power 2: High power 3: Automatic power
72 h	MF Input	External input setting	R/W	UINT	0: Extended input 1: All teaching (master only) 2: Toggle between light on/dark on 3: Test input 4: Off
73 h	Key Lock	Lock level setting	R/W	UINT	0: Cancel 1: Lock 2: Lock except extended input

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
74 h	Operation mode CH1	Output 1 operation mode	R/W	UINT	0: Automatic 1: L-on (light on) 2: D-on (dark on)
76 h	Threshold level CH1 Lower Limit	Lower threshold (Far) setting for output 1	R/W	UINT	-999 to 9999 The range that can be written differs depending on the operation mode.
7A h	Timer setting CH1	One-shot timer specification for output 1	R/W	UINT	0: Delay out 1: Individual
7C h	CH1 Off delay time	Off delay timer time for output 1	R/W	UINT	0 - 9999: 0 - 9999 ms
7D h	CH1 On delay time	On delay timer time for output 1	R/W	UINT	-1 to -9: 0.1 to 0.9 ms
81 h	Synchronisation	Synchronization	R/W	UINT	0: Asynchronous 1: Synchronous
83 h	Sensitivity	Sensitivity	R/W	UINT	0: 10% 1: 20% 2: 50%
85 h	Automatic sensitivity control	ASC setting (automatic sensitivity correction)	R/W	UINT	0: Off 1: On
86 h	Eco mode	Eco mode setting	R/W	UINT	0: Off 1: On
87 h	Reverse display	Reverse display setting	R/W	UINT	0: Normal display 1: Reverse display
D0 h	Store zero-reset	Execute zero reset	W	Byte	Execute with writing operation
D1 h	Cancel zero-reset	Clear zero reset	W	Byte	Execute with writing operation
D2 h	Teach-in 1-Point	First teaching	W	UINT	1: Teaching for output 1
D3 h	Teach-in 2-Point	Second teaching	W	UINT	2: Teaching for output 2
DA h	Warm start Reset	Restart instruction	W	UINT	3: Execute restart
DB h	Return to top menu	Back to top menu	W	Byte	Execute with writing operation
DC h	Factory Reset	Initialize setting values	W	UINT	3: Execute initialization (only allowed when unlocked)

3-6-13 CD22 Object (Class ID: 67 h)

This object reads and writes data from the CD22 sensor object.

■ Instance/Attribute Range

Instance ID	Attribute ID
-------------	--------------

01 h - 10 h *Depends on the number of connected units. Refer to “3-4-1 Instance IDs for This Unit and Sensor Objects” for further information.	01 h - DC h *Includes reserved attributes.
---	---

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
01 h	Q1 Status	Hi output	R	BOOL	0
02 h	Q2 Status	Lo output	R	BOOL	0
03 h	External Input Status	Go output	R	BOOL	0
04 h	Error Information	Error information	R	BOOL	0
05 h	Measurement value	Received light level	R	UINT	0000 h
06 h	Teach-in request	Execution of teaching	R/W	BOOL	0
07 h	Error Clear	Error-clearing	R/W	BOOL	0
08 h	Product Code	Product code	R	UINT	1301 h: CD22-15-485 1302 h: CD22-35-485 1303 h: CD22-100-485
09 h	Product Type	Product type	R	UINT	0011 h
0A h	Firmware Version	Firmware version	R	UINT	0011 h
0B h	Protocol Version	Protocol version	R	UINT	0000 h
0C h	Product Revision	Version number of product hardware	R	UINT	0000 h
0D h	Vendor Name	Vendor name	R	STRING: 2 to 16 bytes	"OPTEX FA"
0E h	Product Name	Product name	R	STRING: 2 to 32 bytes	Product name
0F h	Product ID	Product ID	R	STRING: 2 to 32 bytes	Product ID
10 h	User Tag Name	User ID (maximum 32 characters)	R/W	STRING: 2 to 32 bytes	""
11 h	Operation Status	Operation status of connected CD22	R	UINT	0: Initialize 1: Idle 2: Execute 3: Use by user

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
6A h	Error Status	Latest error code for connection CD22 Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for information on the error codes for CD22.	R/W	UINT	<ul style="list-style-type: none"> • Read: Last error code • Write arbitrary value: Delete last error code
6C h	Threshold Near	External output threshold (Near)	R/W	UINT	-32768 to 32767
6D h	Threshold Far	External output threshold (Far)	R/W	UINT	
6E h	Output hysteresis	External output hysteresis setting	R/W	UINT	0 to 32767
6F h	Calculation flags	Calculation flag (setting value for each connected sensor)	R/W	UINT	0: No calculation 1: Calculation
70 h	Calculation coefficient Add	Sensor measurement addition coefficient (A) (setting value for each connected sensor)	R/W	UINT	-10000 to 10000
71 h	Calculation coefficient Multiply	Sensor measurement multiplication coefficient (M) (setting value for each connected sensor)	R/W	UINT	
72 h	Calculation coefficient Divide	Sensor measurement division coefficient (D) (setting value for each connected sensor)	R/W	UINT	1 to 32767
73 h	Monitor Calculation Values	Calculation result monitor	R/W	UINT	0: Measurement value for sensor 2 1: Calculation result
74 h	Calculation Values Head1	Calculation of measurement values for sensor 1	R/W	UINT	0: None 1: Addition 2: Subtraction 3: Absolute difference
75 h	Calculation Values Head2	Calculation of measurement values for sensor 2	R/W	UINT	
76 h	Calculation Values Unit left Head1	Calculation of measurement values for left sensor 1	R/W	UINT	
77 h	Calculation Values Unit left Head2	Calculation of measurement values for left sensor 2	R/W	UINT	
78 h	I/O polarity	I/O polarity	R/W	UINT	0: PNP (N.O.) 1: NPN (N.O.) 2: PNP (N.C.) 3: NPN (N.C.)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
79 h	Output Selection CH1	Select function for external output 1	R/W	UINT	0: No output 1: Within threshold range for calculation results (GO) 2: Outside near range for calculation results (LO) 3: Outside far range for calculation results (HI) 4: Within threshold range for sensor 1 (GO) 5: Outside near range for sensor 1 (LO) 6: Outside far range for sensor 1 (HI) 7: Within threshold range for sensor 2 (GO) 8: Outside near range for sensor 2 (LO) 9: Outside far range for sensor 2 (HI)
7A h	Output Selection CH2	Select function for external output 2	R/W	UINT	
7B h	Output Selection CH3	Select function for external output 3	R/W	UINT	
7C h	External input selection	Select external input	R/W	UINT	0: No function 1: Teaching (rising on far side, falling on near side) 2: BGS/FGS teaching 3: Zero reset 4: Laser emitting off
7D h	Analog output selection	Select analog output	R/W	UINT	0: None 1: Calculation result 2: Sensor 1 3: Sensor 2
7E h	Analog scaling	Analog scaling	R/W	UINT	0: No scaling 1: Scaling
7F h	Analog Scaling (max.) 10 V / 20 mA	Max analog scaling	R/W	UINT	-32768 to 32767
80 h	Analog Scaling (min.) 0 V / 4 mA	Min analog scaling	R/W	UINT	

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
81 h	Baud rate	Sensor head communication speed (setting value for each connected sensor)	R/W	UINT	0: No connection (unit for values below: bps) 1: 9.6 k 2: 19.2 k 3: 38.4 k 4: 57.6 k 5: 115.2 k 6: 230.4 k 7: 312.5 k 8: 468.75 k 9: 500 k 10: 625 k 11: 833.3 k 12: 937.5 k 13: 1250 k
89 h	Amplifier product code	Product code for connected sensor-amplifier	R	UINT	2503 h
8A h	Switching point Near Leap Point Close	Output judgment Near threshold	R/W	UINT	CD22-15-485: -7499 to 7499 (1 μ m increments) CD22-35-485: -2249 to 2249 (10 μ m increments) CD22-100-485: -7499 to 7499 (1 μ m increments)
8B h	Switching point Far Leap Point Away	Output judgment Far threshold	R/W	UINT	
8C h	Background ObSB	Output judgment Distance set for FGS2	R/W	UINT	
8D h	Tolerance ObSB	Output judgment Operation range for FGS2	R/W	UINT	CD22-15-485: 0 to 7499 (1 μ m increments) CD22-35-485: 0 to 2249 (10 μ m increments) CD22-100-485: 0 to 7499 (1 μ m increments)
8E h	Average Numbe	Number of averaging operations	R/W	UINT	0: 1 1: 8 2: 64 3: 512
8F h	Teaching mode	Teach mode	R/W	UINT	0: Two-point teaching 1: One-point teaching 2: FGS2
90 h	Sampling rate	Sampling period	R/W	UINT	0: 500 μ s 1: 1 ms 2: 2 ms 3: 4 ms 4: Automatic
91 h	Keylock	Key lock function	R/W	UINT	0: No lock 1: Lock

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
92 h	Switching behaviour	Select output polarity	R/W	UINT	0: Light on (on within range) 1: Dark on (on outside range)
93 h	Calibration Distance close	Actual measurement values on near side	R/W	UINT	CD22-15-485: -7499 to 7499 (1 µm increments)
94 h	Calibration distance Away	Actual measurement values on far side	R/W	UINT	CD22-35-485: -2249 to 2249 (10 µm increments) CD22-100-485: -7499 to 7499 (1 µm increments)
95 h	Error Behaviour	Select alarm operation	R/W	UINT	0: Output clamp error value (H7FFF) 1: Retain last valid measurement value before hold
96 h	Clamp holding time	Alarm hold count	R/W	UINT	0 to 9999
98 h	Zeroing Value	Zero reset value	R	UINT	CD22-15-485: -7499 to 7499 (1 µm increments) CD22-35-485: -2249 to 2249 (10 µm increments) CD22-100-485: -7499 to 7499 (1 µm increments)
9C h	Barycenter	Select receiving light waveform	R/W	UINT	0: Waveform with strongest received light level 1: Closest point to sensor 2: Second closest point to sensor 3: Third closest point to sensor 4: Fourth closest point to sensor 5: Fifth closest point to sensor
9F h	Hysteresis value	Hysteresis	R/W	UINT	CD22-15-485: 0 to 7499 (1 µm increments) CD22-35-485: 0 to 2249 (10 µm increments) CD22-100-485: 0 to 7499 (1 µm increments)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
A0 h	Sensitivity	Sensitivity	R/W	UINT	0: Automatic adjustment 1: Minimum 2 Low 3: Medium 4: Medium high 5: High 6: Maximum
A1 h	Light threshold	Waveform threshold	R/W	UINT	0: Lowest surface 1: Low position 2: Center position 3: High position
A3 h	Keylock active	Display indicators	R/W	UINT	0: Continue displaying when locked 1: Turn off when locked
D0 h	Save Zero Reposition	Execute zero reset	W	Byte	Execute by writing values
D1 h	Cancel zero-reset	Clear zero reset	W	Byte	Execute by writing values
D2 h	Teach in 1 Point	One-point teaching	W	UINT	Execute by writing values
D3 h	Teach in 2 Point	Two-point teaching	W	UINT	Execute by writing values
D4 h	Teach-in ObSB	FGS2 teaching	W	UINT	Execute by writing values
DA h	Warm start Reset	Restart instruction	W	UINT	3: Execute restart
DB h	Return to top menu	Back to top menu	W	Byte	0, 1, 2: Execute
DC h	Factory Reset	Initialize setting values	W	UINT	3: Execute initialization

3-6-14 TD1 Object (Class ID: 68 h)

This object reads and writes data from the TD1 sensor object.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h - 10 h *Depends on the number of connected units. Refer to "3-4-1 Instance IDs for This Unit and Sensor Objects" for further information.	01 h - DC h *Includes reserved attributes.

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
01 h	Reserved	Reserved	-	-	-
02 h	Reserved	Reserved	-	-	-
03 h	Reserved	Reserved	-	-	-
04 h	Error Information	Error information	R	BOOL	0
05 h	Measurement value	Received light level	R	UINT	0000
06 h	Reserved	Reserved	-	-	-
07 h	Error Clear	Error information clear	R/W	BOOL	0
08 h	Product Code	Product code	R	UINT	2321 h: TD1
09 h	Product Type	Product type	R	UINT	0011 h
0A h	Firmware Version	Firmware version	R	UINT	1011 h
0B h	Protocol Version	Protocol version	R	UINT	0
0C h	Product Revision	Version number of product hardware	R	UINT	Firmware version of this product
0D h	Vendor Name	Vendor name	R	STRING: 2 to 16 bytes	"OPTEX FA"
0E h	Product Name	Product name	R	STRING: 2 to 32 bytes	Product name
0F h	Product ID	Product ID	R	STRING: 2 to 32 bytes	Product ID

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
10 h	User Tag Name	User ID (maximum 32 characters)	R/W	STRING: 2 to 32 bytes	User ID (maximum 32 characters)
11 h	Operation Status	Operation status of connected TD1	R	UINT	0: Initialize 1: Idle 2: Execute 3: Use by user
16 h	Serial Number	Serial number	R	STRING: 2 to 32 bytes	Set in ASCII code
6A h	Error Status	Latest error code for connection TD1: None Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for information on the error codes for TD1.	R/W	UINT	<ul style="list-style-type: none"> • Read: Last error code • Write arbitrary value: Delete last error code
6C h	Threshold Near	External output threshold (Near)	R/W	UINT	-32768 to 32767
6D h	Threshold Far	External output threshold (Far)	R/W	UINT	
6E h	Output hysteresis	External output hysteresis setting	R/W	UINT	0 to 32767
6F h	Calculation flags	Calculation flag (setting value for each connected sensor)	R/W	UINT	0: No calculation 1: Calculation
70 h	Calculation coefficient Add	Sensor measurement addition coefficient (A) (setting value for each connected sensor)	R/W	UINT	-10000 to 10000
71 h	Calculation coefficient Multiply	Sensor measurement multiplication coefficient (M) (setting value for each connected sensor)	R/W	UINT	
72 h	Calculation coefficient Divide	Sensor measurement division coefficient (D) (setting value for each connected sensor)	R/W	UINT	1 to 32767
73 h	Monitor accumulations	Calculation result monitor	R/W	UINT	0: Measurement value for sensor 2 1: Calculation result
74 h	Calculation Values Head1	Calculation of measurement values for sensor 1	R/W	UINT	0: None 1: Addition 2: Subtraction 3: Absolute difference
75 h	Calculation Values Head2	Calculation of measurement values for sensor 2	R/W	UINT	
76 h	Calculation Values Unit left Head1	Calculation of measurement values for left sensor 1	R/W	UINT	
77 h	Calculation Values Unit left Head2	Calculation of measurement values for left sensor 2	R/W	UINT	

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
78 h	I/O polarity	I/O polarity	R/W	UINT	0: PNP (N.O.) 1: NPN (N.O.) 2: PNP (N.C.) 3: NPN (N.C.)
79 h	Output Selection CH1	Select function for external output 1	R/W	UINT	0: No output 1: Within threshold range for calculation results (GO) 2: Outside near range for calculation results (LO) 3: Outside far range for calculation results (HI) 4: Within threshold range for sensor 1 (GO) 5: Outside near range for sensor 1 (LO) 6: Outside far range for sensor 1 (HI) 7: Within threshold range for sensor 2 (GO) 8: Outside near range for sensor 2 (LO) 9: Outside far range for sensor 2 (HI)
7A h	Output Selection CH2	Select function for external output 2	R/W	UINT	
7B h	Output Selection CH3	Select function for external output 3	R/W	UINT	
7C h	External input selection	Select external input	R/W	UINT	0: No function 1: Teaching (rising on far side, falling on near side) 2: BGS/FGS teaching 3: Zero reset 4: Laser emitting off
7D h	Analog output selection	Select analog output	R/W	UINT	0: None 1: Calculation result 2: Sensor 1 3: Sensor 2
7E h	Analog scaling	Analog scaling	R/W	UINT	0: No scaling 1: Scaling
7F h	Analog Scaling (max.) 10 V / 20 mA	Max analog scaling	R/W	UINT	-32768 to 32767
80 h	Analog Scaling (min.) 0 V / 4 mA	Min analog scaling	R/W	UINT	

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
81 h	Baud rate	Sensor head communication speed (setting value for each connected sensor)	R/W	UINT	0: No connection (unit for values below: bps) 1: 9.6 k 2: 19.2 k 3: 38.4 k 4: 57.6 k 5: 115.2 k 6: 230.4 k 7: 312.5 k 8: 468.75 k 9: 500 k 10: 625 k 11: 833.3 k 12: 937.5 k 13: 1250 k
89 h	Amplifier product code	Product code for connected sensor-amplifier	R	UINT	2503 h
8E h	Average Number	Number of averaging operations	R/W	UINT	1 to 128
8F h	Measurement Type	Measurement type	R/W	UINT	0: Edge positive 1: Edge negative 2: Gap/external diameter
90 h	Sampling rate	Sampling period	R/W	UINT	0: 500 μ s (fixed value)
97 h	Measuring direction	Measurement direction	R/W	UINT	0: Top to bottom 1: Bottom to top
98 h	Zeroing value	Offset value	R	UINT	-9999 to 5000
A0 h	Sensitivity	Sensitivity	R/W	UINT	0: Minimum value 1: Second 2: Third 3: Fourth 4: Maximum value 5: Adjusted value
D0 h	Save zero-reset	Execute zero reset	W	Byte	Execute with writing operation
D1 h	Cancel zero-reset	Clear zero reset	W	Byte	Execute with writing operation
DC h	Factory Reset	Initialize to factory settings	W	UINT	3: Execute initialization

3-6-15 D4RF Object (Class ID: 69 h)

This object reads and writes data from the D4RF sensor object.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h - 10 h *Depends on the number of connected units. Refer to “3-4-1 Instance IDs for This Unit and Sensor Objects” for further information.	01 h - DC h *Includes reserved attributes.

■ Service Codes

Service Code	Service name	Details
0E h	Get_Attribute_Single	Read the value of the specified attribute.
10 h	Set_Attribute_Single	Write the value of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
01h	Q1 Status	Output 1	R	BOOL	0
02h	Q2 Status	Output 2	R	BOOL	0
03h	External Input Status	External input	R	BOOL	0
04h	Error Information	Error Information	R	BOOL	0
05h	Light Level	Received light level	R	UINT	0000 h
06h	Teach-in request	Excution of teaching	R/W	BOOL	0
07h	Error Clear	Error-clearing	R/W	BOOL	0
08h	Product code	Product code	R	UINT	0
09h	Product type	Product type	R	UINT	0x0001
0Ah	Firmware version	Firmware version	R	UINT	0xabcd
0Bh	Protocol version	Protocol version	R	UINT	0x0001
0Ch	Product Revision	Version number of product hardware	R	UINT	0xXXXX
0Dh	Vender name	Vender name	R	STRING	OPTEX FA
0Eh	Product name	Product name	R	STRING	Actual product type name
0Fh	Product ID	Product ID	R	STRING	Actual product type code
010h	User Tag name	User ID (maximum 32 characters)	R/W	STRING	***** (default)
011h	Operation Status	Operation status of D4RF	R	UINT	2: Run
012h	Gangmount protocol version		R	UINT	0x0101
06Ah	Error code	Latest error code for D4RF Refer to "5-1 List of Error Codes for This Unit and Each Sensor" for information on the error codes for D4RF.	R/W	UINT	Error code Delete the error by writing any value
06Ch	Display mode	Display settings (CH1)	R/W	UINT	0 to 3 bit: Value 1: Bar graph 2: Percentage 3: Counter 4: Edge 4 to 7 bit: 0: Hold off 1: Hold peak/bottom 2: Hold peak 4: Hold bottom

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
06Dh	Display mode	Display settings (CH1)	R/W	UINT	0 to 3 bit: Value 1: Bar graph 2: Percentage 3: Counter 4: Edge 4 to 7 bit: 0: Hold off 1: Hold peak/bottom 2: Hold peak 4: Hold bottom
06Eh	Brightness	Brightness	R/W	UINT	10 to 100% (unit: 10%) Rounding down to the nearest 10
06Fh	Rotate display	Rotate display	R/W	UINT	0: Off, 1: On
070h	Invert display	Invert display	R/W	UINT	0: Execute, 1: Not used
071h	Alarm display	Alarm display	R/W	UINT	0: Off, 1: On
072h	Zeroing	Zeroing	R/W	UINT	0: CH1, 1: CH2
073h	Eco mode	Eco mode	R/W	UINT	-9999 to 9999
074h	Current channel	Current channel	R/W	UINT	-9999 to 9999
076h	SP1	SP1	R/W	UINT	-9999 to 9999
077h	SP1	SP1	R/W	UINT	-9999 to 9999
078h	SP2	SP2	R/W	UINT	-9999 to 9999
079h	SP2	SP2	R/W	UINT	-9999 to 9999
07Ah	Received light amount	Received light amount	R/W	UINT	-9999 to 9999
07Bh	Rock mode	Rock mode	R/W	UINT	Bit2: Lock all Bit3: Lock keys
07Dh	Response time	Response time	R/W	UINT	6: 16us/22us 5: 70us 4: 250us 3: 500us 2: 1ms 1: 2ms 0: 8ms
07Eh	Language	Language	R/W	UINT	1 : English 6 : Español 7 : Chinese 8 : Japanese 10 : Korean
080h	Timer mode	Timer mode (CH1)	R	UINT	0: Deactivated 1: On delay 2: Off delay 3: On/off delay 4: Pulse output, 5: On delay pulse

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
081h	Timer mode	Timer mode (CH2)	R/W	UINT	0: Deactivated 1: On delay 2: Off delay 3: On/off delay 4: Pulse output, 5: On delay pulse
082h	Timer setup1	Timer time (CH1)	R/W	UINT	1 to 30000 (ms)
083h	Timer setup1	Timer time (CH2)	R/W	UINT	1 to 30000 (ms)
084h	Timer setup2	Additional timer time (CH1)	R/W	UINT	1 to 30000 (ms)
085h	Timer setup2	Additional timer time (CH1)	R/W	UINT	1 to 30000 (ms)
08Ah	Hysteresis	Hysteresis setting (CH1)	R/W	UINT	1 to 90%
08Bh	Hysteresis	Hysteresis setting (CH2)	R/W	UINT	1 to 90%
08Ch	Threshold mode	Threshold mode (CH1)	R/W	UINT	0 : Deactivated 1 : Single 2 : Window 128 : Edge
08Dh	Threshold mode	Threshold mode (CH2)	R/W	UINT	0 : Deactivated 1 : Single 2 : Window 128 : Edge
08Eh	Edge direction	Edge direction (CH1)	R/W	UINT	0: Positive 1: Negative 2: Both
08Fh	Edge direction	Edge direction (CH2)	R/W	UINT	0: Positive 1: Negative 2: Both
090h	Cycle offset	Edge setting: time (CH1)	R/W	UINT	1 to 255 (* Response time)
091h	Cycle offset	Edge setting: time (CH2)	R/W	UINT	1 to 255 (* Response time)
092h	Edge hys.	Edge setting: hysteresis (CH1)	R/W	UINT	1 to 9999
093h	Edge hys.	Edge setting: hysteresis (CH2)	R/W	UINT	1 to 9999
094h	Teach offset	Teach offset	R/W	UINT	0% to 99%
095h	Teach mode	Teach mode (CH1)	R/W	UINT	0: 1 point 1: 2 points 2: Auto 3: 1-point Zone 4: 2-point Zone 5: Through
096h	Teach mode	Teach mode (CH2)	R/W	UINT	0: 1 point 1: 2 points 2: Auto 3: 1-point Zone 4: 2-point Zone 5: Through
097h	APC	APC (Automatic Power Control) setting	R/W	UINT	0: Off, 1: On

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
098h	ASC	ASC (Automatic Sensitivity Control) setting	R/W	UINT	0: Off 1: On-normal 2: On-fast 3: On-high
099h	Emitter status	Emitter status	R/W	UINT	0: Sender active 1: Sender not active
09Ah	Emitter power	Emitter power	R/W	UINT	0 : Maximum 1 : Middle 2 : Minimum 10: Auto
09Bh	Counter	Counter mode	R/W	UINT	0: Off, 1: On
09Ch	Set count	Set counter threshold	R/W	UINT	0 to 16383
09Dh	Counter value	Counter value	R/W	UINT	0 reset by writing any value.
09Eh	Minimum height jump	Edge setting: Min. threshold value (CH1)	R/W	UINT	0 to 9999
09Fh	Minimum height jump	Edge setting: Min. threshold value (CH2)	R/W	UINT	0 to 9999
0A0h	Maximum height jump	Edge setting: Max. threshold value (CH1)	R/W	UINT	0 to 9999
0A1h	Maximum height jump	Edge setting: Max. threshold value (CH2)	R/W	UINT	0 to 9999
0A8h	I/O polarity	Input/ output polarity	R/W	UINT	0: PNP 1: NPN 2: Push-pull
0A9h	Output mode	L/D on, N.O./ N.C. (CH1)	R/W	UINT	0: Light on/ (N.O.) 1: Dark on/ (N.C.)
0AAh	Output mode	L/D on, N.O./ N.C. (CH2)	R/W	UINT	0: Light on/ (N.O.) 1: Dark on/ (N.C.)
0ABh	Pin 2 setting	Pin 2 setting	R/W	UINT	1 output and 1 switchable output/input 0: Deactivated 1: Switch signal 2: Alert 3: Teach-in, 4: Sender off 5: Counter reset 2 outputs and 1 input type 0: Deactivated 3: Teach-in 4: Sender off 5: Counter reset, 6: Job load
0ACh	Pin 5 setting	Pin 5 setting	R/W	UINT	0: Deactivated 1: Switch signal 2: Alert output 7: Input acknowledge
0B2h	Serial number	Serial number	R	STRING	

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
0B3h	Temperature	Internal temperature	R	UINT	XX degC
0B4h	Operation time	Operation time	R	UINT	XX hours
0B5h	Total time	Total operation time	R	UINT	XX hours
0B6h	Received light	Light-receiving diagnostics	R	UINT	0 to 254: % 255: Not available
0B7h	No. of devices	Number of connected units	R	UINT	1 to 16
0B8h	Device number	Device number	R	UINT	1 to 16
0B9h	Edge peak	Edge peak value (Max.)	R/W	UINT	0 to 9999 Write any value to execute reset the value on Max. and Min.
0BAh	Edge peak	Edge peak value (Min.)	R/W	UINT	-9999 to 0 Write any value to execute reset the value on Max. and Min.
0BBh	Input signal status	External input status	R	UINT	0: LOW, 1: HIGH
0BCh	Teach status	Teach status	R	UINT	Bit 0 to 3: Teach status 0: IDLE 1: 1-PT SUCCESS 2: 2-PT SUCCESS 3: 1/2-PT SUCCESS 4: WAITING FOR COMMAND 5: BUSY, 7: ERROR Bit 4: Teach status SP1 TP1 0: Not taught 1: Successfully taught Bit 5: Teach flag SP1 TP2 0: Not taught 1: Successfully taught Bit 6: Teach flag SP2 TP1 0: Not taught 1: Successfully taught
0D0h	1 point	1 point teach	W	UINT	1: CH1, 2: CH2
0D1h	2 point	2 point teach (1st)	W	UINT	1: CH1, 2: CH2
0D2h	2 point	2 point teach (2nd)	W	UINT	1: CH1, 2: CH2
0D3h	Auto	Auto teach (Start)	W	UINT	1: CH1, 2: CH2
0D4h	Auto	Auto teach (End)	W	UINT	1: CH1, 2: CH2
0D5h	1-point zone	1-point teach	W	UINT	1: CH1, 2: CH2
0D6h	2-point zone	2-point zone teach (1st)	W	UINT	1: CH1, 2: CH2
0D7h	2-point zone	2-point zone teach (2nd)	W	UINT	1: CH1, 2: CH2
0D8h	Through	Through teach	W	UINT	1: CH1, 2: CH2
0E4h	Setting reset	Setting reset	W	UINT	1: Execute
0E5h	Factory reset	Factory reset	W	UINT	1: Execute
0E6h	Find me	Find me	R/W	UINT	0: Off, 1: On
0E7h	Restart	Restart	W	UINT	1: Execute

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Value
0E8h	Go to RUN	To detection mode	W	UINT	1: Execute
0EEh	Preset	Bank (write)	W	UINT	1: Preset 1 save 2: Preset 2 save 3: Preset 3 save 4: Preset 4 save 5: Preset 5 save
0EFh	Preset	Bank (read)	W	UINT	1: Preset 1 load 2: Preset 2 load 3: Preset 3 load 4: Preset 4 load 5: Preset 5 load
0F0h	Device display Block1	Device display display area 1	R	STRING	
0F1h	Device display Block2	Device display display area 2	R	STRING	
0F2h	Device display Block3	Device display display area 3	R	STRING	
0F3h	Device display Block4	Device display display area 4	R	STRING	
0F4h	Device display Block5	Device display display area 5	R	STRING	
0F5h	Device buttons	Device buttons	W	UINT	Bit0: Plus button Bit1: Minus button Bit2: Menu/OK button, Bit3: Teach/ESC button
0F6h	Device LEDs	Device LEDs	R	UINT	0byte: Power LED 1byte: Q1 LED 2byte: Q2 LED 0: off 1: on 2: blink1 (1Hz 50:50) 3: blink2 (6Hz 50:50) 4: blink3 (4Hz 25:75) 5: blink4 (1Hz 50:50) 6: blink5 (1Hz 90:10)

3-6-16 Module Configuration Object (Class ID: 80 h)

This object reads the configuration of the sensor connected to this unit.

It reads the product code, class ID (model code), and instance ID for the sensor in each slot (attribute ID=1 to 16: slot 0 to 15).

To read information from sensors in all slots, use “Get_Attributes_All” as the service code.

Note that the instance ID indicates the connection order within the same model. Refer to “3-4-1 Instance IDs for This Unit and Sensor Objects” for further information.

■ Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h - 10 h

■ Service Codes

Service Code	Service name	Details
01 h	Get_Attributes_All	Read the values (information from sensors in all slots) of all attributes.
0E h	Get_Attribute_Single	Read the values (information from the sensor in the specified slot) of the specified attribute.

■ Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Module Information Slot0	Information from the sensor object in slot 0	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
02 h	Module Information Slot1	Information from the sensor object in slot 1	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
03 h	Module Information Slot2	Information from the sensor object in slot 2	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
04 h	Module Information Slot3	Information from the sensor object in slot 3	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
05 h	Module Information Slot4	Information from the sensor object in slot 4	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
06 h	Module Information Slot5	Information from the sensor object in slot 5	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
07 h	Module Information Slot6	Information from the sensor object in slot 6	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
08 h	Module Information Slot7	Information from the sensor object in slot 7	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
09 h	Module Information Slot8	Information from the sensor object in slot 8	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
0A h	Module Information Slot9	Information from the sensor object in slot 9	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
0B h	Module Information Slot10	Information from the sensor object in slot 10	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
0C h	Module Information Slot11	Information from the sensor object in slot 11	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
0D h	Module Information Slot12	Information from the sensor object in slot 12	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
0E h	Module Information Slot13	Information from the sensor object in slot 13	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
0F h	Module Information Slot14	Information from the sensor object in slot 14	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h
10 h	Module Information Slot15	Information from the sensor object in slot 15	R	Struct	
	Product Code	Product code	R	UINT	0000 h
	Class ID	Class ID (model code)	R	BYTE	00 h
	Instance ID	Instance ID (connection order within model code)	R	BYTE	00 h

Note: If 17 or more sensors are connected, the attribute IDs from 01 h to 0F h will all be 0.

- **List of class IDs (model codes) and product codes**

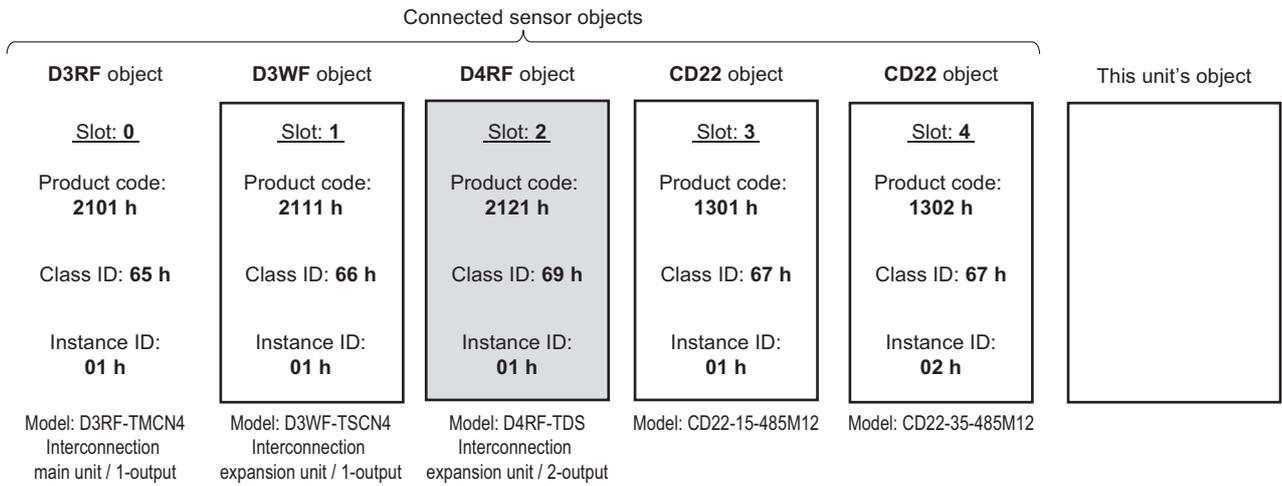
The class IDs (model codes) and product codes for this unit and applicable sensors connected to this unit are listed below.

This unit, or applicable sensor connected to this unit	Class ID (model code)	Product code	Model
This unit	64 h	2509 h	UC1-EP
D3RF	65 h	2101 h: Fiber amplifier, 1-output	<Main unit> D3RF-TMN <Main unit> D3RF-TMCN4 <Main unit> D3RF-TMP <Main unit> D3RF-TMCP4 <Expansion unit> D3RF-TSN <Expansion unit> D3RF-TSCN4 <Expansion unit> D3RF-TSP <Expansion unit> D3RF-TSCP4
		2102 h: Fiber amplifier, 2-output	<Main unit> D3RF-TDMN <Main unit> D3RF-TDMCN4 <Main unit> D3RF-TDMP <Main unit> D3RF-TDMCP4 <Expansion unit> D3RF-TDSN <Expansion unit> D3RF-TDSCN4 <Expansion unit> D3RF-TDSP <Expansion unit> D3RF-TDSCP4

This unit, or applicable sensor connected to this unit	Class ID (model code)	Product code	Model
D3WF	66 h	2101 h: Fiber amplifier, 1-output	<Main unit> D3WF-TMCN4 <Main unit> D3WF-TMCP4 <Expansion unit> D3WF-TSCN4 <Expansion unit> D3WF-TSCP4
CD22	67 h	1301 h: CD22-15-485	CD22-15-485M12
		1302 h: CD22-35-485	CD22-35-485M12
		1303 h: CD22-100-485	CD22-100-485M122
TD1	68 h	2321 h	TD1-010M8 TD1-010M8J
D4RF	69 h	2120 h: Fiber amplifier 1-output	<Main unit> D4RF-TM <Main unit> D4RF-TMC4 <Expansion unit> D4RF-TS <Expansion unit> D4RF-TSC4
		2121 h: Fiber amplifier 2-output	<Main unit> D4RF-TDM <Main unit> D4RF-TDM-Y <Expansion unit> D4RF-TDS <Expansion unit> D4RF-TDS-Y
		2122 h: Fiber amplifier, cableless	<Main unit> D4RF-TM-0 <Expansion unit> D4RF-TS-0
		2123 h: Fiber amplifier, without display and keys	<Main unit> D4RF-MC4
		2124 h: Fiber amplifier, without display and keys, cableless	<Expansion unit> D4RF-S

Example: In the following case, obtaining attribute ID 03 h (i.e. slot 2) (sensor object information in the shaded area below) will allow you to obtain the following four-byte data in order from byte 0.

- 2121 h (product code)
- 69 h (class ID)
- 01 h (instance ID)





4

Specifications

This chapter describes the specifications of this unit.

4-1 Specifications

Model		UC1-EP
EtherNet/IP Specifications ^{*1}	Applicable version	EtherNet/IP adapter
	Authentication version	CT16
	Conforming standard	IEEE802.3u
	Distance between nodes	Within 100 m
	Transfer speed	10 M (10BASE-T), 100 Mbps (100BASE-TX)
	Cable	Twisted pair cable (STP) Category 5/5e or higher
	Communication ports	M12 connector (plug: male) x2
	IP address configuration	Static IP address, DHCP, or BOOTP
	Cyclic communication (Implicit Message)	<ul style="list-style-type: none"> • Class1 service
	Acyclic communication (Explicit Message)	<ul style="list-style-type: none"> • Class3 message • UCMM
	Support objects	<ul style="list-style-type: none"> • Identity object • Message Router object • Assembly object • Connection Manager object • DLR object • QoS object • TCP/IP Interface object • Ethernet Link object • This unit's object • D3RF object • D3WF object • D4RF object • CD22 object • TD1 object • Module Configuration object
	Reset service	<ul style="list-style-type: none"> • Type0 • Type1
	Maximum no. of connections	8 (including cyclic connections and acyclic connections)
	Packet interval (RPI)	1 to 3200 ms
Other functions	<ul style="list-style-type: none"> • ACD (Address Conflict Detection) • DLR (Device Level Ring) • Auto Negotiation • Auto MDIX • Quick Connect 	
Connected devices	Connectable models	Interconnection main and expansion unit of D4RF/D3RF/D3WF series Main and expansion unit of CDA series
	Number of units connected	Maximum 16 units ^{*2} (one CDA unit accounts for two units)
	Connection type	5-pin connector for interconnection (functions as end unit for interconnection)
Indicators		Power indicator - green (PWR)
		Module status - red/green (MS)
		Network status - red/green (NS)
		Operation indicator - green (SYSTEM)
		PORT1 indicator - green (L/A1)
		PORT2 indicator - green (L/A2)

Model		UC1-EP
Data		Cyclic communication (transmission: max 40 bytes, receipt: max 4 bytes)
		Acyclic communication
Rating	Power supply voltage	12 to 24 VDC including ripple (p-p) +/-10%
	Power consumption	Maximum 3 W
Protection circuit		Reverse connection protection
Route stabilization time		1.5 s or less
Environmental resistance	Ambient temperature range/humidity	-25 to +55°C/35 to 85% RH (no freezing or condensation)
	Storage temperature/humidity	-40 to +70°C/35 to 85% RH (no freezing or condensation)
	Vibration resistance	10 to 55 Hz, double amplitude 1.5 mm, 2 hours in X, Y and Z directions
	Shock resistance	500 m/s ² (approx. 50 G), 3 times in X, Y, and Z directions
	Degree of protection	IP50
Conforming laws and regulations	EMC	EMC (2014/30/EU)
	Environment	RoHS directive (2011/65/EU), China RoHS (Regulation 32)
Conforming standards		EN61000-6-2, EN55011
Company standards		Noise resistance: Passes Feilen Level 3
Mounting		35 mm DIN rail (conductive surface)
Material		Polycarbonate
Included accessories		Instruction manual, M12 protective cap, end plate x 2
Weight		Body around 90 g (including connectors), around 155 g when packaged

*1: EtherNet/IP is a registered trademark of ODVA (Open DeviceNet Vendor Association Inc.).

*2: The ambient temperature and maximum number of interconnections for D3RF, D3WF or D4RF are shown below. However, for use as a UL certified product when 6 to 16 units are interconnected, refer to the instruction manual included with the D4RF.

D3RF/D3WF series

Number of interconnected units	1 to 3	4 to 8	9 to 16
Upper and lower limits of ambient temperature	-25 to +55 °C	-25 to +50 °C	-25 to +45 °C
Max. load current at control output	100 mA	50 mA	0 mA (Control output disabled)

D4RF series

Number of connected units		1	2	3 to 5	6 to 16 ^{*3}
Upper and lower limits of ambient temperature		-25 to +55 °C	-25 to +55 °C	-25 to +50 °C	-25 to +45 °C
Max. load current per output	1-output setting	100 mA	20 mA	20 mA	20 mA
	2-output setting	100 mA	10 mA	10 mA	10 mA

*3: For use as a UL certified product when 6 or more units are interconnected, refer to the instruction manual included with the D4RF.

4-2 Data Processing Time

A processing time (total of the following processing times) is required between detection of the applicable sensor and processing of the data by the EtherNet/IP master.

- Data processing time of applicable sensors or amplifier units
- Data processing time of this unit
- EtherNet/IP communication period between the EtherNet/IP master and this unit
- Internal processing time of EtherNet/IP master

The data processing time of the applicable sensor or amplifier unit and the data processing time of this unit are as follows.

MEMO

Refer to the manual of the EtherNet/IP master for information on the EtherNet/IP communication cycle and the internal processing time of the EtherNet/IP master.

Data Processing Time of Applicable Sensors or Amplifier Units

Data Processing Time of D4RF

Fiber amplifier D4RF can be written without any latency.

Data Processing Time of D3RF/D3WF

The D3RF/D3WF fiber amplifier writes setting values requested via this unit to EEPROM before returning a response. As a result, the response time changes depending on the setting value as follows.

- D3RF

D3RF object (class ID: 65 h) instance attribute ID	Setting value name	Conditions	Number of words written	Writing time (ms) ^{*1}
6C h	Display settings		1	5
6E h	Output 1 teaching mode		1	5
6F h	Output 2 teaching mode		1	5
70 h	Response speed setting	Single output type	8	40
		Single output zone teaching	10	50
		Double output type	10	50
		One zone of double output	12	60
		Both zones of double output	14	70
71 h	Emitting power setting		4	20
72 h	External input setting		3	15
73 h	Lock level setting		1	5
74 h	Output 1 operation mode		1	5

75 h	Output 2 operation mode		1	5
76 h	Lower threshold (Far) setting for output 1	Edge detection	1	5
		Other	2	10
77 h	Upper threshold (Near) setting for output 1		2	10
78 h	Lower threshold (Far) setting for output 2		2	10
79 h	Upper threshold (Near) setting for output 2		2	10
7A h	One-shot timer specification for output 1		2	10
7B h	One-shot timer specification for output 2		2	10
7C h	Off delay timer time for output 1		2	10
7D h	On delay timer time for output 2		2	10
7E h	Off delay timer time for output 2		2	10
7F h	On delay timer time for output 2		2	10
83 h	Hysteresis setting	Single output type	2	10
		Single output zone teaching	3	15
		Double output type	3	15
		One zone of double output	4	20
		Both zones of double output	5	25
85 h	ASC setting (automatic sensitivity correction)		1	5
86 h	Eco mode setting		3	15
87 h	Reverse display setting		1	5

*1: The time varies by several ms depending on the EtherNet/IP communication cycle

- D3WF

D3WF object (class ID: 66 h) instance attribute ID	Setting value name	Conditions	Number of words written	Writing time (ms) ^{*1}
6C h	Display settings		1	5
6E h	Output 1 teaching mode		1	5
70 h	Response speed setting	Single output type	8	40
		Single output zone teaching	10	50
		Double output type	10	50
		One zone of double output	12	60
		Both zones of double output	14	70
71 h	Emitting power setting		4	20
72 h	External input setting		3	15
73 h	Lock level setting		1	5
74 h	Output 1 operation mode		1	5
76 h	Lower threshold (Far) setting for output 1	Edge detection	1	5
		Other	2	10
7A h	One-shot timer specification for output 1		2	10
7C h	Off delay timer time for output 1		2	10
7D h	On delay timer time for output 1		2	10
81 h	Synchronization		2	5
83 h	Sensitivity		2	5
85 h	ASC setting (automatic sensitivity correction)		1	5
86 h	Eco mode setting		3	15
87 h	Reverse display setting		1	5

*1: The time varies by several ms depending on the EtherNet/IP communication cycle.

● Data Processing Time of CDA

The CDA displacement sensor amplifier unit writes CDA parameters requested via this unit to EEPROM before returning a response. The response time is 5 ms.

● Data Processing Time of CD22

The CD22 compact laser displacement sensor writes CD22 parameters requested via this unit to EEPROM before returning a response. The response time changes depending on the communication speed setting for communication between CDA and RS-485 as follows.

Communication speed	Writing time
9.6 kbps	20 ms
19.2 kbps	10 ms
Other (38.4 to 1250 kbps)	5 ms

● Data Processing Time of TD1

The TD1 through-beam edge sensor writes TD1 parameters requested via this unit to EEPROM before returning a response. The response time changes depending on the communication speed setting for communication between CDA and RS-485 as follows.

Communication speed	Writing time
9.6 kbps	20 ms
19.2 kbps	10 ms
Other (38.4 to 1250 kbps)	5 ms

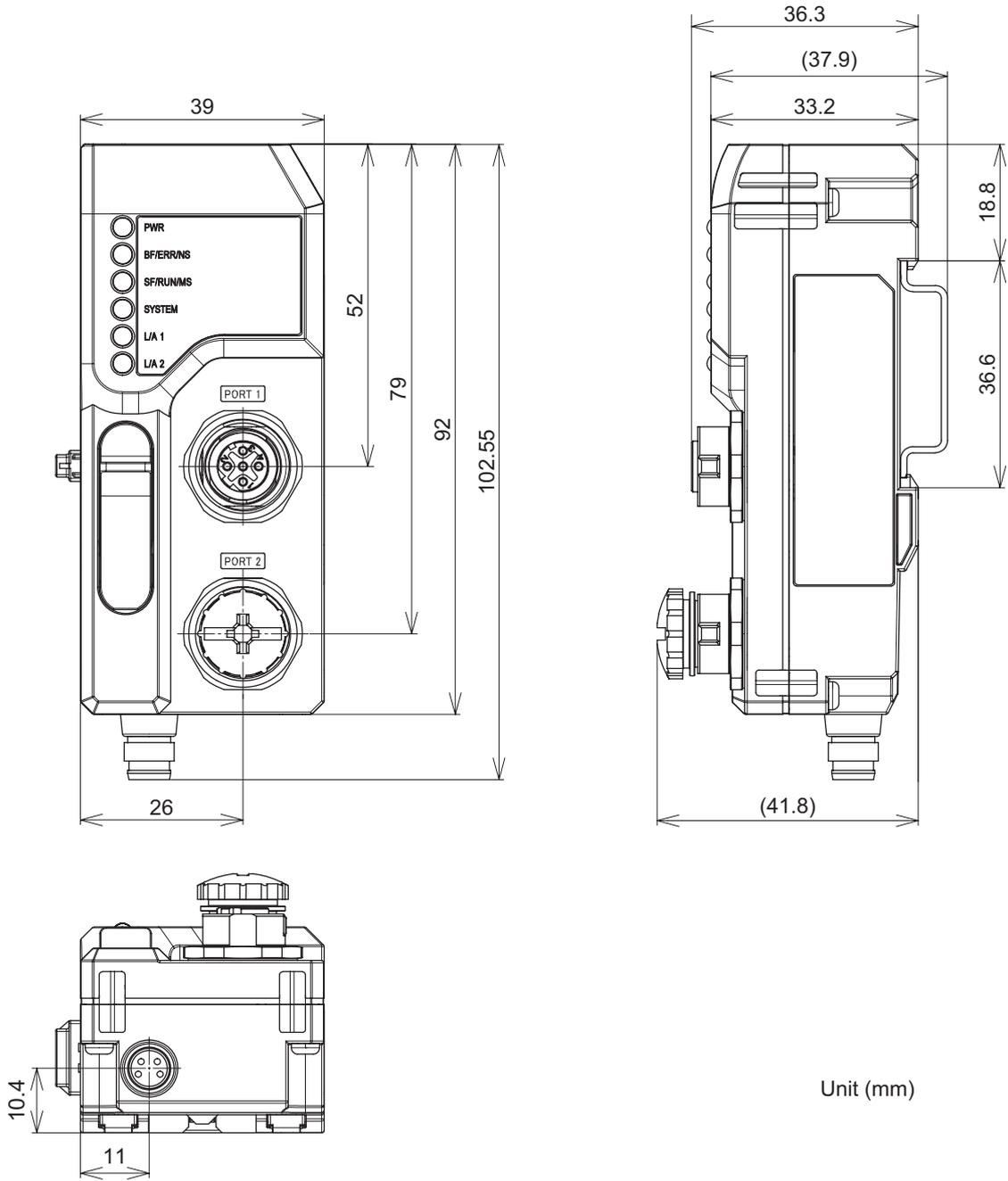
■ Data Processing Time of This Unit

The following processing time is required between detection of the applicable sensor and transmission of data to the EtherNet/IP master.

Number of units connected	Processing time
1 to 4	160 μ s
5 to 8	320 μ s
9 to 12	480 μ s
13 to 16	640 μ s

4-3 Dimensions

■ UC1-EP





5

Troubleshooting

This chapter describes troubleshooting methods for specific errors.

5-1 List of Error Codes for This Unit and Each Sensor

Error codes for this unit and each sensor are stored in this unit.

Error code types, storage locations, and storage conditions for this unit and each sensor are as follows.

Error codes can be read using acyclic communication from the master when needed.

Device	Storage location in this unit	Storage conditions
Latest error code for this unit	This unit's object (class ID: 64 h) attribute ID: 6A h (Error Code)	This unit's object (class ID: 64 h) attribute ID: D3 h (Global Diagnosis) set to 1 (Enabled)
Latest error code for D4RF	D4RF object (class ID: 69 h) attribute ID: 6A h (Error Code)	Always
Latest error code for D3RF	D3RF object (class ID: 65 h) attribute ID: 6A h (Error Code)	
Latest error code for D3WF	D3WF object (class ID: 66 h) attribute ID: 6A h (Error Code)	
Latest error code for connection CD22	CD22 object (class ID: 67 h) attribute ID: 6A h (Error Code)	
Latest error code for connection TD1	CD22 object (class ID: 68 h) attribute ID: 6A h (Error Code)	

MEMO

- Error code data for this unit and each sensor will not be saved to non-volatile memory. Therefore, it will be cleared the next time the power is turned ON.

Each error code is shown below.

5-1-1 Error Codes for This Unit

Error code	Error name	Details
0006 h	Change in the number of connected sensor-amplifiers or sensors	The number of connected sensor-amplifier units or sensors changed (generally decreased) after the power was turned ON.
0008 h	Invalid connection order	The connection order of the sensor-amplifier unit is incorrect (D3□F is connected to the right-hand side of CDA). In this case, EtherNet/IP communication can be executed, however, the current values sent from the CDA to the left of the D3□F to the master will be incorrect, as will the setting value set by the master.

Note: Error codes will not be stored if more sensors than the maximum number of applicable sensors are connected (17 or more applicable sensors). Refer to "5-2 Troubleshooting List" for further information.

MEMO

- To enable error code diagnosis for this unit when a connection is established, Enable the Global Diagnosis configuration assembly instance (100) in the connection settings (on the target device) of the EtherNet/IP configuration software. When the connection is established, a CIP message is sent to the attribute ID: D3 h (Global Diagnosis) for this unit's object, allowing the enabled/disabled setting to be changed for error code diagnosis in this unit.

5-1-2 Error Codes for Connected Sensor-amplifiers

D4RF

Error code		Details
High-order byte	Low-order byte	
00 h	00 h	No error
Applicable index number* ¹	01 h	The address number is out of range.
	02 h	The sub address number is out of range.
	03 h	An attempt was made to write a setting value that is out of range.
	04 h	Error attempting to write setting value to read-only address
	05 h	Error attempting to read setting value to write-only address
	06 h	Other functional errors
	07 h	Teaching request error
	08 h	Error during command processing
	FF h	Other errors

D3RF/D3WF

Error code		Details
High-order byte	Low-order byte	
00 h	00 h	No error
Applicable index number* ¹	01 h	The index number is out of range.
	02 h	The sub index number is not supported.
00 h	03 h	An attempt was made to write setting values to sensors that are all locked, or to initialize while locked.
	04 h	The teaching target output specification value (1 or 2) is incorrect.
	05 h	Teaching mode has no second teaching, or the first has not yet been executed
	06 h	The execution specification value (3) for restart and initialization is incorrect.
Applicable index number* ¹	07 h	An attempt was made to write a setting value that is out of range.
	08 h	The setting value write operation failed. (Attempted to write a read-only setting value)

00 h	09 h	Teaching to output 2 was attempted while output 2 was in counter mode.
	0B h	The amount of light received during teaching was too low.
	0C h	The amount of light received during teaching was saturated.
	0D h	There was too little difference in the amount of light received during 2-point teaching.
	0E h	A teaching operation other than auto-teaching was attempted in differential operation mode.
	0F h	A hardware error was detected.

*1: Refer to the respective manual for each device for information regarding the relevant index number.

5-1-3 Error Codes for Connected Sensors

● CD22/TD1

Error code		Details
High-order byte	Low-order byte	
00 h	00 h	No error
Applicable index number *1	01 h	The index number is out of range.
	02 h	The sub index number is not supported.
	03 h	The ETX code in the command string is invalid.
	04 h	A checksum error was detected.
	05 h	The command code is invalid.
	06 h	A non-regulated parameter was specified.
	07 h	An out of range numeric value was specified.
	08 h	Reserved
	09 h	

*1: Refer to the respective manual for each device for information regarding the relevant index number.

5-2 Troubleshooting List

This section provides information on the LEDs on the front of this unit, as well as on troubleshooting other issues.

5-2-1 Troubleshooting Based on LED Status

The following countermeasures should be performed according to the status of the LEDs on the front of this unit.

■ PWR LED

PWR	Cause	Countermeasure
Off	Power is not correctly supplied to this unit	Check and resolve the following potential causes of power interruption. Then, restart this unit according to the specifications of the connected master. <ul style="list-style-type: none"> • Is the power cable wired correctly? • Is the power cable broken? • Is the power supply voltage within the specified range? • Is the power capacity sufficient? • Is the power supply faulty?

■ NS/MS LED

NS	MS	Cause		Countermeasure
Lit red	Flashing red	IP address conflict within the network	Address Conflict Detection (ACD) enabled ^{*1}	Ensure that the IP address does not conflict with another device.
Off	Flashing green	IP address conflict within the network	Address Conflict Detection (ACD) disabled ^{*1}	Ensure that the IP address does not conflict with another device.
		Unable to receive IP address from BOOTP/DHCP server		It may not be possible to receive an IP address from the BOOTP/DHCP server. Confirm that the BOOTP/DHCP server in the network is operating normally.
Flashing green	Lit green	No connection established	Device file is incorrect	Confirm that the device file for this unit is being used on the master.
			Master configuration is invalid	<ul style="list-style-type: none"> • Confirm that the IP address for the device is configured correctly on the master. • Ensure that the network portion of the IP address is the same for the master and this unit. Example: For a subnet mask of 255.255.255.0: Master: <u>192.168.0</u>.2 This unit: <u>192.168.0</u>.1 the underlined portion is the network address.
Flashing red	Lit green	Exclusive Owner connection timeout		<ul style="list-style-type: none"> • Reset the power on this unit. • Reconnect the Exclusive Owner connection on the master.

*1: This depends on the TCP/IP Interface object (class ID: F5 h) attribute ID: 0A h (ACD function) (default value: enabled).

■ SYSTEM LED

SYSTEM	Cause	Countermeasure
Off	Hardware error	Press the reset button to reset the power. If the SYSTEM LED still does not turn on, there is a hardware failure. Replace this unit.

■ L/A1 or L/A2 LED

L/A1 or L/A2	Cause	Countermeasure
Off	The LAN cable is unplugged	Confirm that the L/A1 or L/A2 LAN cable is not unplugged.

5-2-2 Troubleshooting Other Issues

All issues described here occur only when communication has been established.

Therefore, the NS/MS LEDs on the front of this unit will both stay on both stay green.

Phenomenon	Error code for this unit	Error description	Cause	Countermeasure
One connection is unable to use cyclic communication when using multiple connections.	None	Assembly instance conflict	The same instance ID is configured for multiple connections during cyclic communication. Note: One connection will be established, so the LED will behave the same as during normal communication.	Ensure that the same instance ID is not configured for multiple connections.
Unable to use cyclic communication with sensors in all slots.	None	Maximum number of connected applicable sensors exceeded	17 applicable sensors are connected.	Connect 16 sensors or less.
Cyclic communication can be performed, however, the read/write data is invalid (the read/write data is from an unexpected device).	None		18 or more applicable sensors are connected. The 18th will be recognized as slot 0, the 19th as slot 1, and so on. Cyclic communication cannot be performed with applicable sensors beginning with the 17th.	
Cannot perform acyclic communication to an applicable sensor object. The CIP error response indicates the general error code "Path destination unknown" (09 h).	None		Acyclic communication was performed with a sensor object (class ID: 65 h, 66 h, 67 h, or 68 h) with 17 or more connected.	

Phenomenon	Error code for this unit	Error description	Cause	Countermeasure
Cyclic communication can be performed, however, the current value and setting value of the CDA is invalid	0008 h	Invalid connection order	D3RF or D3WF is interconnected to the right-hand side of the CDA or D4RF.	Connect D3RF or D3WF to the left of the CDA or D4RF and reset the power.
Cyclic communication can be performed, however, read/write cannot be performed for some sensors.	0006 h	Change in the number of connected sensor-amplifiers or sensors	The number of connected sensor-amplifier units or sensors changed (generally decreased) after the power was turned ON.	There may have been a sensor-amplifier unit or sensor failure, or the power supply may have been turned OFF. Check all connected sensor-amplifiers and sensors and their respective power supplies.

5-2-3 Notes on Communication Method and Communication Speed

- Ensure that the communication method and communication speed of this unit matches that of the other device (master, hub, etc.).
- Packet loss will occur if the communication method differs. The devices will be unable to communicate if the communication speed differs.
- This unit is set to auto negotiation by default. It is recommended to set the other device to auto negotiation as well.
- The communication method and communication speed of this unit can be set and confirmed using the Ethernet Link object (class ID: F6 h) attribute ID: 06 h. Refer to “3-6-9 Ethernet Link Object (Class ID: F6 h)” for further information.



Appendix

6-1 Installing Additional Applicable Sensor-amplifier Units

This chapter describes how to install additional applicable sensor-amplifier units.

CAUTION

- Changing the slot number for the addition of the sensor-amplifier requires changing the variables and programs on the master side. If there is a change in the slot number after you add a sensor-amplifier, make sure to change the variables or programs on the master side.
- To add an applicable sensor-amplifier to this unit after the system is operational, turn OFF the power of this unit.

Install additional applicable sensor-amplifiers to the right of existing applicable sensor-amplifier units when possible so that the slot numbers of existing applicable sensor-amplifiers do not change.

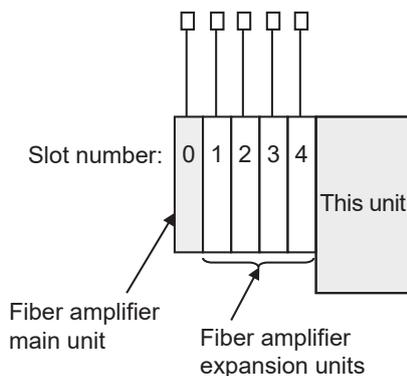
The method depends on the situation as follows.

■ Adding Fiber Amplifiers to a Configuration Containing Only Fiber Amplifiers

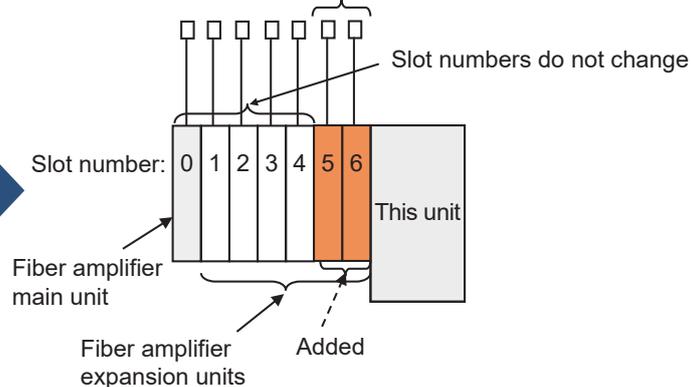
- Add fiber amplifier expansion units between the existing fiber amplifiers and this unit. This allows the addition of additional fiber amplifiers without changing the slot numbers of the existing fiber amplifiers.
- D4RF and D3RF/D3WF series can be added; when adding D4RF and D3RF/D3WF mixed together, make sure that D4RF is next to this unit.

Example:

Configuration containing only fiber amplifiers



Added fiber amplifiers

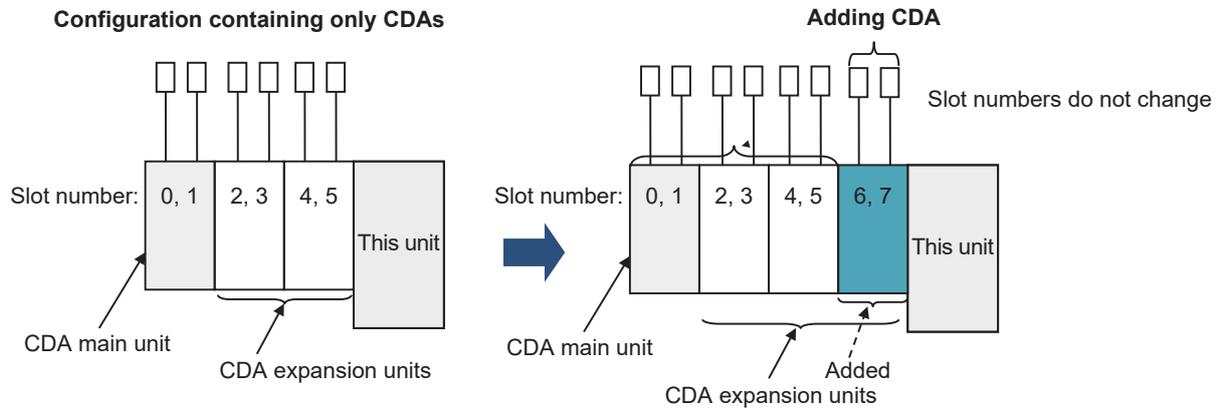


*: If the existing fiber amplifier is the D4RF and to be added is the D3RF or D3WF, add a D3RF or D3WF at the slot number: 0 position. For details, refer to “Configuration to Interconnect Only Fiber Amplifiers” (page 2-4).

■ Adding CDA to a Configuration Containing Only CDA

- Add CDA expansion units between the existing CDA and this unit. This means that the slot numbers of the existing CDA will not be changed.

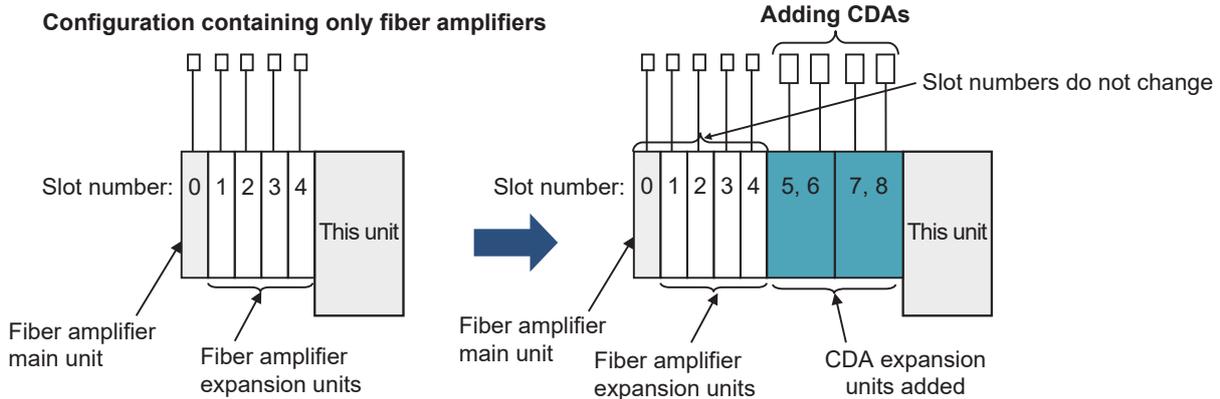
Example:



■ Adding CDA to a Configuration Containing Only Fiber Amplifiers

- Add CDA expansion units between the existing fiber amplifiers and this unit. This means that the slot numbers of the existing fiber amplifiers will not be changed.

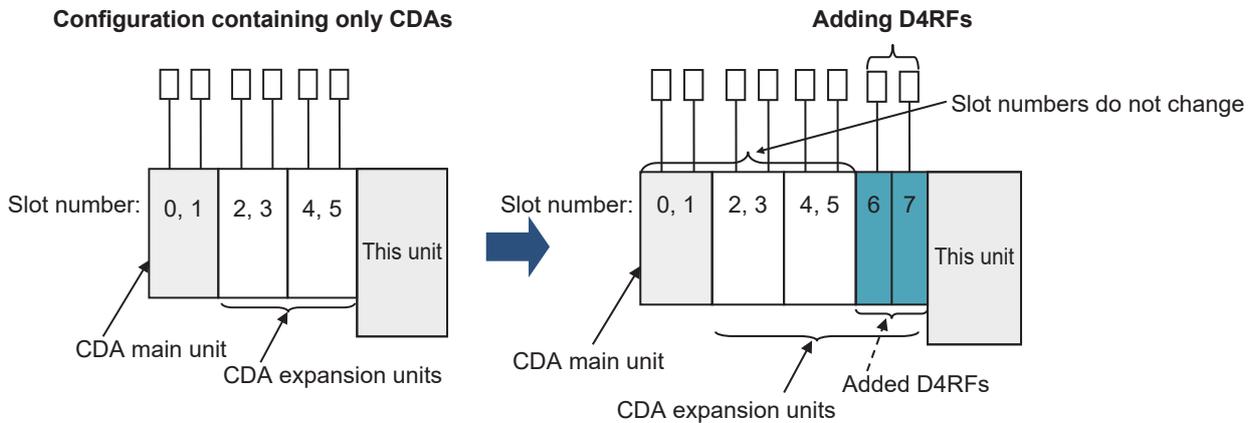
Example:



■ Adding D4RF to a Configuration Containing Only CDA

Insert D4RF expansion units between the existing CDA and this unit. This means that the slot numbers of the existing CDA will not be changed.

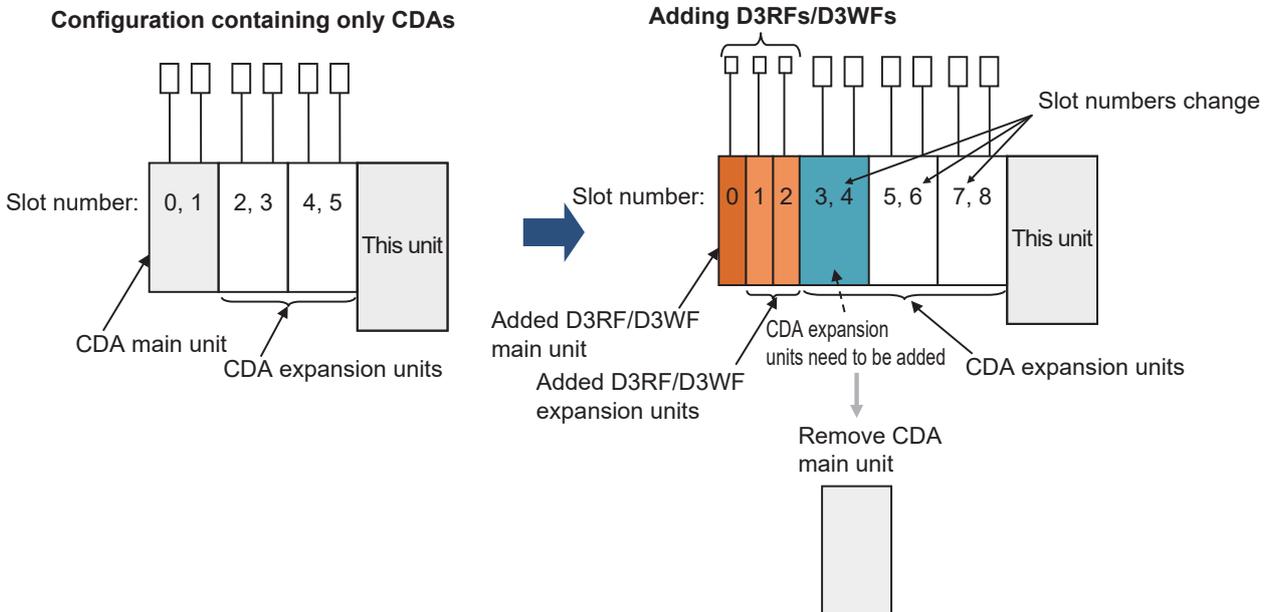
Example:



■ Adding D3RF or D3WF to a Configuration Containing Only CDA

- Add a D3RF or D3WF main unit in the leftmost position.
- The existing CDA main unit needs to be removed from the interconnection configuration and replaced with a CDA expansion unit.
- If necessary, D3RF or D3WF expansion units can be added to the right of the D3RF or D3WF main unit.
- Change all variables on the master side and all slot numbers in the program.

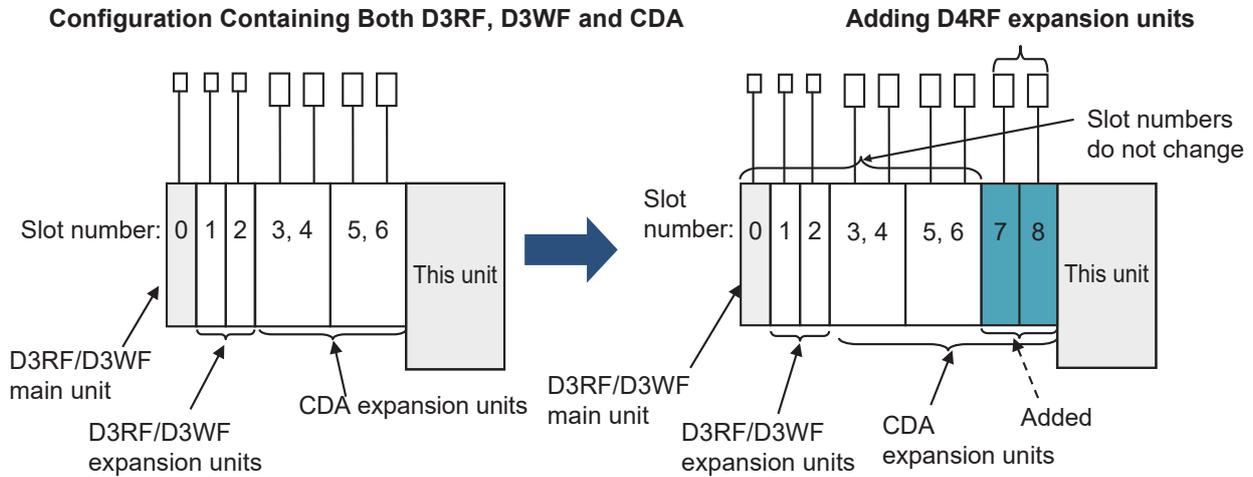
Example:



■ Adding D4RF to a Configuration Containing Both D3RF, D3WF and CDA

- Add D4RF expansion units between the existing CDA and this unit. This means that the slot numbers of the existing D3RF, D3WF and CDA will not be changed.

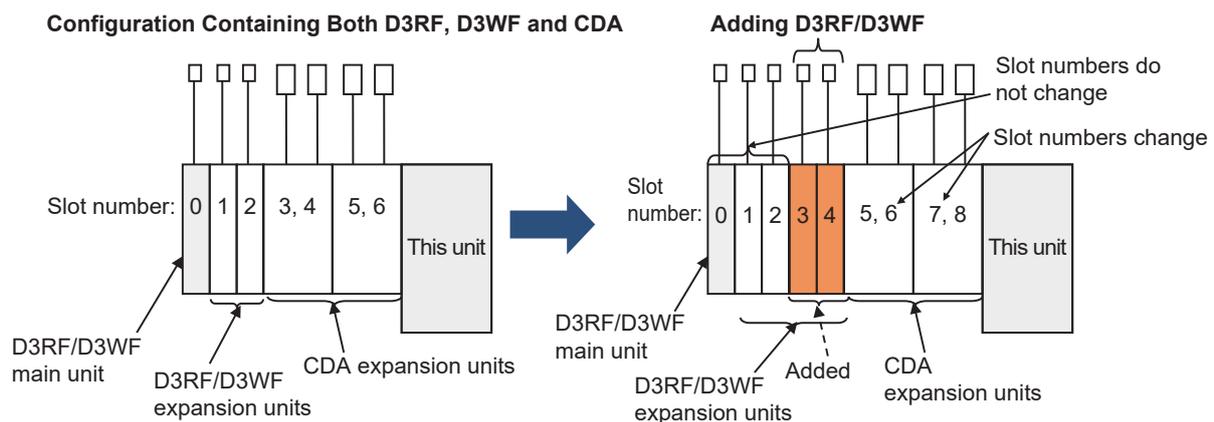
Example:



■ Adding D3RF and D3WF to a Configuration Containing Both D3RF, D3WF and CDA

- Add expansion units for D3RF or D3WF between the existing D3RF or D3WF and the existing CDA. This allows the slot number for the existing D3RF or D3WF to be added without changing the slot number, but the slot numbers of the variables and programs on the master side of the added D3RF or D3WF and the existing CDA must be changed.

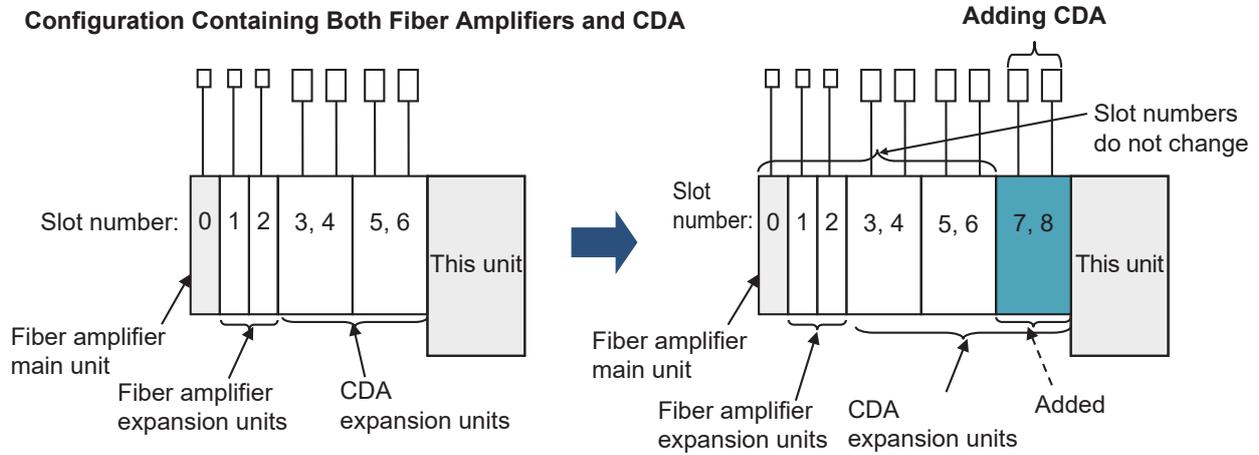
Example:



■ Adding CDA to a Configuration Containing Both Fiber Amplifiers and CDA

- Add CDA expansion units between the existing CDA and this unit. This means that the slot numbers of the existing Fiber Amplifiers and CDA will not be changed.

Example:



6-2 Reset Function

This section describes how to reset this unit.

This unit can be reset (in order to reconnect with the master) or reset to factory settings.

■ Resetting to Reconnect with Master

This unit can be reconnected with the same setting values by executing service code 05 h (Reset) and parameter “0” (Reset type 0) from the Identity object (class ID: 01 h).

■ Resetting to Factory Settings

Doing any of the following will reset this unit to factory settings.

- Press and hold the reset button on the front of this unit for at least three seconds.
- Execute service code 05 h (Reset) and parameter “1” (Reset type 1) from the Identity object (class ID: 01 h)
- Write “3” to Factory Reset in this unit’s object (class ID: 64 h) attribute ID: DC h (Initialize to factory settings)

The following parameters will be initialized if any of the above methods are used to reset this unit to its factory settings.

Object	Instance attribute ID
QoS object (class ID: 48 h)	01 h: 802.1Q Tag Enable 04 h: DSCP Urgent 05 h: DSCP Scheduled 06 h: DSCP High 07 h: DSCP Low 08 h: DSCP Explicit
TCP/IP Interface object (class ID: F5 h)	03 h: Configuration Control 05 h: Interface Configuration 06 h: Host Name 08 h: TTL Value 09 h: Mcast Config 0A h: Select ACD 0B h: LastConflictDetected 12: Quick Connect 13: Encapsulation Inactivity Timeout
Ethernet Link object (class ID: F6 h)	06 h: Interface Control 09 h: Admin State
This unit’s object (class ID: 64 h)	D3 h: Global Diagnosis

6-3 INDEX

A

Acyclic Communication	3-12
Address Conflict Detection (ACD) function.....	3-29
Assembly instance conflict	5-6
assembly instances	3-3
Assembly Object (Class ID: 04 h).....	3-23

B

BOOTP	3-6, 3-28
-------------	-----------

C

Calculating Power Consumption	2-18
CD22	1-5
CD22 Object (Class ID: 67 h).....	3-41
CD22/TD1 error code	5-4
CDA.....	1-5
Change in the number of connected sensor-amplifiers or sensors	5-2
Class ID (model code).....	3-12, 3-13
Configuration limitations of applicable sensor-amplifiers and sensors	2-4
Connecting the communication Cable.....	2-13
Connection I/O.....	3-3
Connection Manager Object (Class ID: 06 h).....	3-25
Connection power supply cable.....	2-15
Connection type.....	2-13, 3-5
Cyclic communication.....	3-8
Cyclic communication data.....	3-8

D

D3RF/D3WF	1-3
D3RF/D3WF error code.....	5-3
D3RF/D3WF Fiber Amplifiers	1-3
D3RF Object (Class ID: 65 h).....	3-36
D3WF Object (Class ID: 66 h).....	3-39
D4RF	1-4
D4RF error code.....	5-3
D4RF fiber amplifier.....	1-3
D4RF object (Class ID: 69 h).....	3-52
Data processing time.....	4-4

DHCP	3-6, 3-28
Dimensions.....	4-8
Displacement sensor amplifier units CDA	1-5
DLR object (Class ID: 47 h).....	3-25

E

EDS file.....	3-6
Error code.....	5-2
error code diagnosis for this unit	3-4, 3-7
Error codes for this unit	5-2
Ethernet/IP Connectors	1-7
EtherNet/IP system configuration example	1-2
Ethernet link object (Class ID: F6 h).....	3-30

I

Identity object (class ID: 01 h)	6-7
Installing additional applicable sensor-amplifier units..	6-2
Installing on a DIN Rail.....	2-11
Invalid connection order	5-2, 5-7
IP address	3-6, 3-29
IP address configuration method.....	3-18, 3-28
IP address conflict	5-5
IP address default value	3-6

L

L/A1 LED	1-7
L/A2 LED	1-7
LED Display.....	1-6

M

M84CN-□S.....	xii, 2-15
Maximum connected exceeded.....	5-6
Message router object (Class ID: 02 h)	3-23
MS LED	1-6

N

NS LED.....	1-6
-------------	-----

P

Power connector.....	1-8
Power supply cable	xii
Product code	3-14, 3-59

PWR LED 1-6

Q

QoS object (Class ID:48 h)..... 3-26

R

Reset function..... 6-7

Reset switch 1-8

S

Slot number 2-2

Specifications 4-2

Static IP address 3-6, 3-28

SYSTEM LED..... 1-6

T

TCP/IP interface object (Class ID: F5 h) 3-27

TD1 1-5

TD1 Object (Class ID: 68 h) 3-48

This Unit's Object (Class ID: 64 h) 3-34

Troubleshooting List 5-5

Type/number of applicable sensor-amplifier units 1-2



Attention: Not to be Used for Personnel Protection.

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death. These sensors do not include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Please consult our distributors about safety products which meet OSHA, ANSI and IEC standards for personnel protection.

- Specifications are subject to change without prior notice.
- Specifications and technical information not mentioned here are written in Instruction Manual. Or visit our website for details.
- All the warnings and cautions to know prior to use are given in Instruction Manual.



OPTEX FA CO., LTD.

91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN

TEL. +81-75-325-1314 FAX. +81-75-325-2936

<https://www.optex-fa.com>

The information in this user's manual is correct as of August 2024

UC1EP_UM-E-002-2408