E3X-DRT21 (DeviceNet)
E3X-SRT21 (CompoBus/S)
E3X-CIF11 (RS-422)

Fiber Amplifier Sensor Communication Units

OPERATION MANUAL

OMRON

E3X-DRT21 (DeviceNet)
E3X-SRT21 (CompoBus/S)
E3X-CIF11 (RS-422)
Fiber Amplifier Sensor
Communication Units

Operation Manual

Revised November 2005

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ **DANGER**	Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.

⚠ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

⚠ **CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense.

The abbreviation "PLC" means Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes the installation and operation of the E3X-DRT21 (DeviceNet), E3X-SRT21 (CompoBus/S), and E3X-CIF11 (RS-422) Fiber Amplifier Sensor Communication Units. These Units enable optical fiber communications for OMRON E3X-DA-N Digital Fiber Amplifiers and E39-TM1 Terminal Block Units.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate a Fiber Amplifier Sensor Communication Unit. Be sure to read the precautions provided in the following section.

Precautions provides general precautions for using a Fiber Amplifier Sensor Communication Unit and related devices.

Section 1 provides an overview of the Fiber Amplifier Sensor Communication Units for DeviceNet, CompoBus/S, and RS-422 communications, including their features, system configurations, specifications, and connection methods. This section also covers the differences between different models.

Section 2 provides details on the Fiber Amplifier Sensor Communication Unit for DeviceNet communications, including procedures and application examples for remote I/O communications and explicit messages used by the Unit, part names and functions, operation procedures, wiring, and applications available from the DeviceNet Configurator.

Section 3 provides details on the Fiber Amplifier Sensor Communication Unit for CompoBus/S communications, including procedures and application examples for CompoBus/S remote I/O communications used by the Unit, part names and functions, operation procedures, and wiring.

Section 4 provides details on the Fiber Amplifier Sensor Communication Unit for RS-422 communications, including information on the models, procedures, settings, and application examples of CompoWay/F message communications used by the Unit, part names and functions, operation procedures, and wiring.

Section 5 describes the procedure used to mount the Fiber Amplifier Sensor Communication Unit to DIN Track and provides the dimensions of the Units.

Section 6 provides information for each Communication Unit on the types of errors that may occur, including details on the indicator status, probable causes, and remedies.

The *Appendices* provide information on communications timing, monitoring incident light levels of E3X-DA6-P Sensors, DeviceNet connection settings, and the device protocol for DeviceNet.

⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

PRECAUTIONS

This section provides general precautions for using the Fiber Amplifier Sensor Communication Units and related devices.

The information contained in this section is important for the safe and reliable application of the Fiber Amplifier Sensor Communication Units. You must read this section and understand the information contained before attempting to set up or operate a Fiber Amplifier Sensor Communication Unit.

1   Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

2   General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for installing and operating OMRON Fiber Amplifier Sensor Communication Units. Be sure to read this manual before operation and keep this manual close at hand for reference during operation.

⚠ **WARNING** It is extremely important that a Fiber Amplifier Sensor Communication Unit be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a Fiber Amplifier Sensor Communication Unit to the above mentioned applications.

3   Safety Precautions

⚠ **WARNING** Provide external emergency stop circuits, interlock circuits, limit circuits, and other safety circuits in addition to any provided within the control system to ensure safety in the event of product failure or errors resulting from external causes. Incorrect or unexpected operation may result in serious accidents.

4   Operating Environment Precautions

Do not operate the control system in the following places.

- Where the Fiber Amplifier Sensor Communication Unit is exposed to direct sunlight.
- Where the ambient temperature or humidity exceed the specified ranges.
- Where condensation may occur due to radical temperature changes.
- Where there is any corrosive or inflammable gas.
- Where there is excessive dust, saline air, or metal powder.
- Where any water, oil, or chemical may splash on the Fiber Amplifier Sensor Communication Unit.
- Where the Fiber Amplifier Sensor Communication Unit is subject to direct vibration or shock.

⚠ **Caution** The operating environment of the Fiber Amplifier Sensor Communication Unit can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the Fiber Amplifier Sensor Communication Unit. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5   Application Precautions

Observe the following precautions when using the Fiber Amplifier Sensor Communication Unit.

⚠ **Caution** Failure to abide by the following precautions could lead to faulty operation of the Fiber Amplifier Sensor Communication Unit or the system or could damage the Fiber Amplifier Sensor Communication Unit. Always heed these precautions.

- Provide proper shielding when installing in the following locations:
  - Locations subject to static electricity or other sources of noise.
  - Locations subject to strong electromagnetic fields.
  - Locations subject to possible exposure to radiation.
  - Locations near power supply lines.
- Do not clean the Fiber Amplifier Sensor Communication Unit with organic solvents, such as paint thinner. Organic solvents will dissolve and discolor the surface of the Unit.
- Take measures to stabilize the power supply to conform to the rated supply (the voltage, frequency, etc.) if it is not stable.
- Do not attempt to take a Fiber Amplifier Sensor Communication Unit apart, to repair a Fiber Amplifier Sensor Communication Unit, or to modify a Fiber Amplifier Sensor Communication Unit in any way.
- Never attempt to wire a Fiber Amplifier Sensor Communication Unit while power is being supplied. Doing so may result in serious electrical shock or electrocution.
- Do not drop a Fiber Amplifier Sensor Communication Unit or subject it to excessive shock or vibration. Unit failure or malfunction may result.
- Use the specified communications cables.

- Wire communications within the specified distances.
- Do not wire communications cables near or in parallel with high-voltage or high-current lines.
- Do not bend cables past their natural bending radius or pull on cables.
- Check all wiring carefully and completely before supplying power.
- Confirm that the correct polarity has been used in wiring the terminals and that the communications and power lines have been otherwise wired correctly. Incorrect wiring may result in Unit failure.
- Do not connect or disconnect connectors while the power supply is turned ON. Doing so may result in Unit failure or malfunction.
- Use the specified power supply voltage.
- Do not turn ON or OFF the power supply to the Mobile Console during communications. Doing so may result in communications errors.
- Tighten the screws on the communications connector securely. The tightening torque is 0.5 to 0.6 N·m.

SECTION 1
Overview

This section provides an overview of the Fiber Amplifier Sensor Communication Units for DeviceNet, CompoBus/S, and RS-422 communications, including their features, system configurations, specifications, and connection methods. This section also covers the differences between different models.

1-1 Features and System Configuration

1-1-1 Overview

The Fiber Amplifier Sensor Communication Units are Communication Units for E3X-DA-N-series Digital Fiber Amplifier Units or E39-TM1 Terminal Block Units. (See note.) The following three models are available.

- E3X-DRT21 for DeviceNet (functions as a DeviceNet slave)
- E3X-SRT21 for CompoBus/S (functions as a CompoBus/S slave)
- E3X-CIF11 for RS-422 (functions as a CompoWay/F slave)

Note In this manual, Digital Fiber Amplifier Units and Terminal Block Units are referred to collectively as Fiber Amplifier Units.

The Fiber Amplifier Sensor Communication Units can be connected to Fiber Amplifier Units with Connectors. Connecting a Fiber Amplifier Sensor Communication Unit to the left side of one or more Fiber Amplifier Units allows data to be exchanged with the Fiber Amplifier Sensor Units via optical communications.

Note When using a Fiber Amplifier Sensor Communication Unit for DeviceNet or CompoBus/S communications, however, a Slave Connector with Cord cannot be connected to a Fiber Amplifier Unit with a Connector. Use a Cordless Slave Connector instead.

The E3X-MC11 Mobile Console for Fiber Amplifier Units can also be connected to a Fiber Amplifier Sensor Communication Unit.

1-1-2 Features

Communications between a Host and Optical Sensors

The Fiber Amplifier Sensor Communication Unit enables communications between optical sensors and a host, such as an OMRON PLC (CS-series, CJ-series, C200HX/HG/HE, or other OMRON PLC), other manufacturer's PLCs that support DeviceNet, and personal computers.

Remote I/O Communications

Information on the Fiber Amplifier Unit's ON/OFF output signals and incident light levels can be sent to the host PLC (master) using remote I/O communications without any special programming (supported only for Fiber Amplifier Units for DeviceNet and CompoBus/S communications).

Message Communications

Sending commands from the PLC allows reading parameters (such as those for incident light levels), writing parameters (such as those for thresholds), and various teaching operations. (DeviceNet models use explicit messages, and RS-422 Communication Units use CompoWay/F commands.)

Setting, Monitoring, and Operating Sensors from the Configurator

With DeviceNet models, the DeviceNet Configurator (Ver. 2.10 or higher) can be used to set Fiber Amplifier Sensor Communication Unit parameters (Communication Unit settings and Sensor settings) and download them to the Communication Unit and Fiber Amplifier Unit as a batch.

Mobile Console Connection

The E3X-MC11 Mobile Console for Fiber Amplifier Units can be connected to the Communication Unit. The head for connecting to the Mobile Console is not required when it is connected to a Communication Unit.

Note The Mobile Console can be used in conjunction with monitoring ON/OFF output signals through remote I/O communications. The Mobile Console cannot be used, however, in conjunction with remote I/O communications for monitoring incident light levels, message communications, and using the Configurator for transferring device parameters.

1-1-3   System Configuration

E3X-DRT21 for DeviceNet Communications

DeviceNet Configurator

CS/CJ-series DeviceNet Unit

PLC

Serial connector
(For setting, monitoring, and operating Sensors)

Explicit message

DeviceNet

Fiber Sensors

DeviceNet slave

E3X-MC11 Mobile Console

E3X-DRT21 Fiber Amplifier Sensor Communication Unit for DeviceNet

E3X-DA-N Digital Fiber Amplifier Unit (Uses a Cordless Slave Connector.)
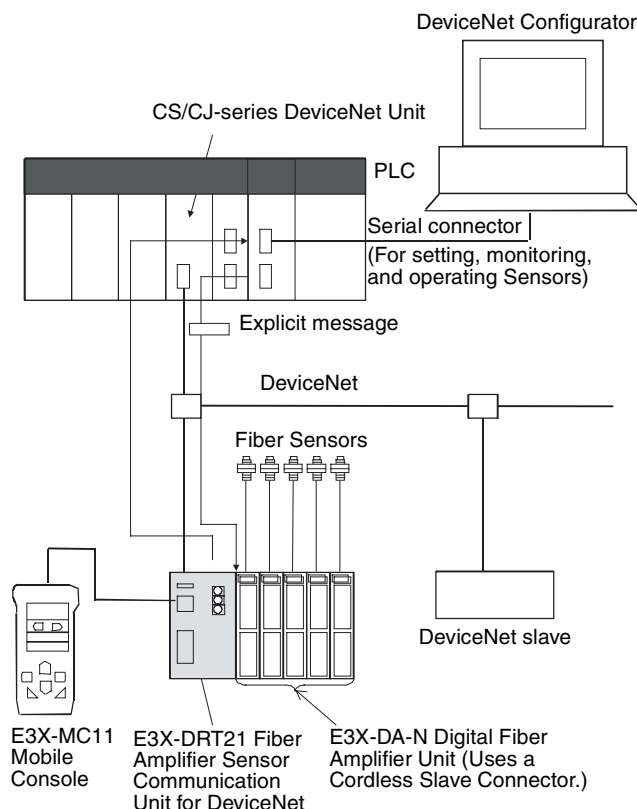
Note The Mobile Console cannot be used at the same time as explicit messages communications and setting, monitoring, and operating from Configurator.

E3X-SRT21 for CompoBus/S Communications

CompoBus/S Master Unit

PLC

Remote I/O communications

CompoBus/S

Fiber Sensors

CompoBus/S slave

E3X-MC11 Mobile Console

E3X-DA-N Digital Fiber Amplifier Unit (Uses a Cordless Slave Connector.)

E3X-SRT21 Fiber Amplifier Sensor Communication Unit for CompoBus/S

3
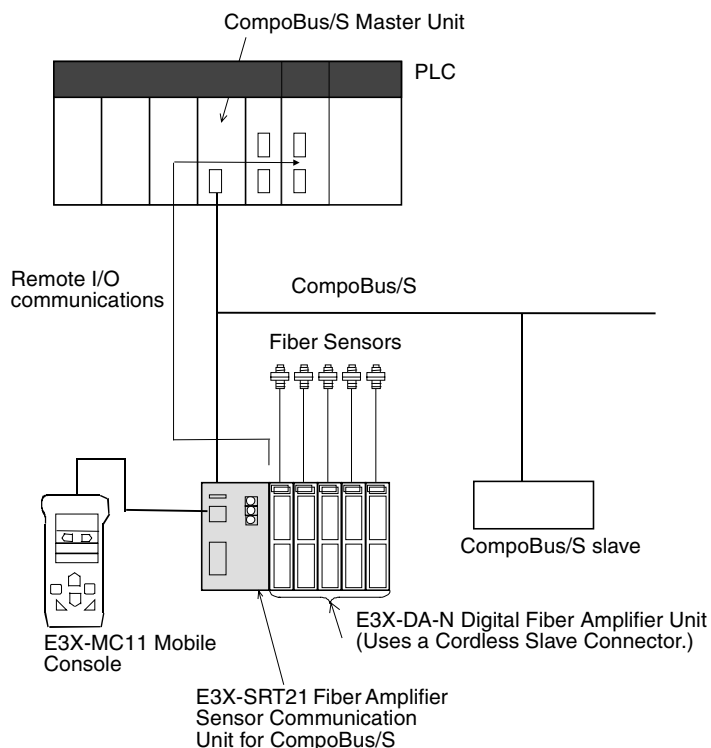
E3X-CIF11 for RS-422 Communications

With PLC as Master
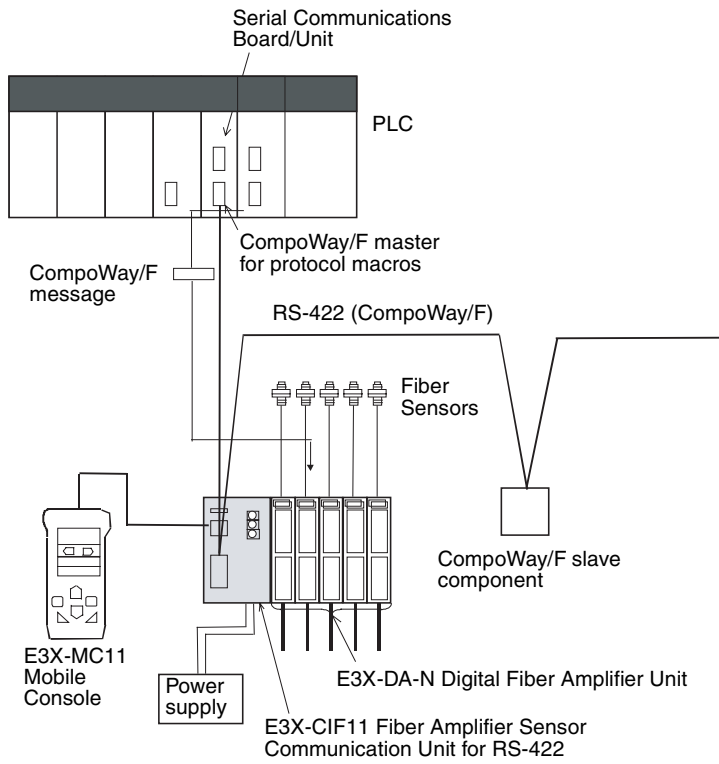
Serial Communications Board/Unit

PLC

CompoWay/F master for protocol macros

CompoWay/F message

RS-422 (CompoWay/F)

Fiber Sensors

CompoWay/F slave component

E3X-MC11 Mobile Console

Power supply

E3X-DA-N Digital Fiber Amplifier Unit

E3X-CIF11 Fiber Amplifier Sensor Communication Unit for RS-422

Note The Mobile Console cannot be used at the same time as CompoWay/F message communications.

With Personal Computer as Master

Personal computer

RS-232C

B500-AL004

CompoWay/F message

RS-422 (CompoWay/F)

Fiber Sensors

CompoWay/F slave component

E3X-MC11 Mobile Console

Power supply

E3X-DA-N Digital Fiber Amplifier Unit

E3X-CIF11 Fiber Amplifier Sensor Communication Unit for RS-422
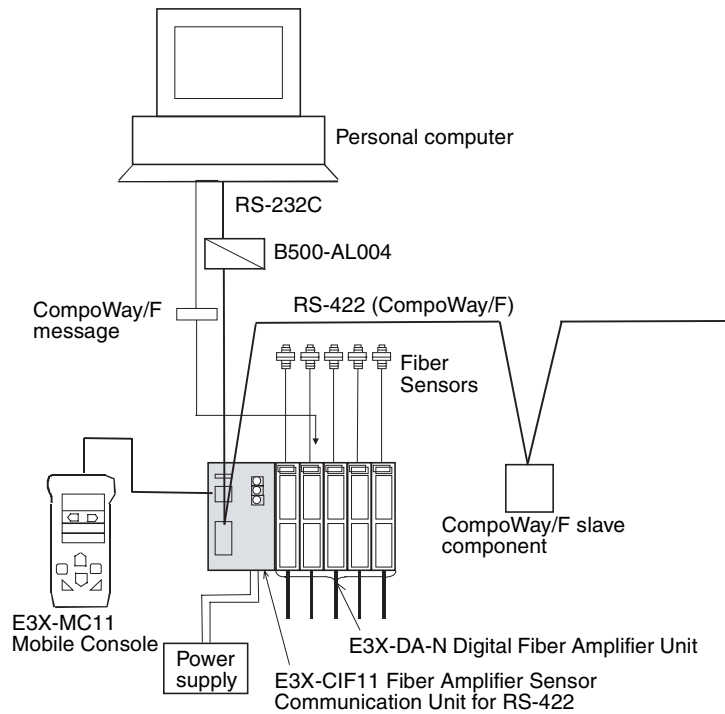
Note The Mobile Console cannot be used at same time as CompoWay/F message communications.

1-2 Specifications

1-2-1 Performance Specifications

Item		Specification		
		E3X-DRT21	**E3X-SRT21**	**E3X-CIF11**
Communications method		DeviceNet	CompoBus/S	RS-422
Communications	Remote I/O communications	ON/OFF data, status, and monitoring incident light levels (Functions as DeviceNet slave.)	ON/OFF data and status (Functions as CompoBus/S slave.)	No
	Messages communications	Explicit messages	No	Functions as CompoWay/F slave.
	Setting, monitoring, and operating Sensors from Configurator	Supported from DeviceNet Configurator (depends on the parameter editing and device monitoring functions of the slave).	No	No
Mobile Console connection		Yes		
		Cannot be used at the same time as monitoring incident light levels from remote I/O communications, using explicit messages communications, or setting, monitoring, or operating Sensors from the Configurator.	---	Cannot be used at the same time as CompoWay/F message communications.
Power supply (Shared by Communication Unit and all Fiber Amplifier Units connected to it.)		From DeviceNet communications connector	From CompoBus/S communications connector	From power supply cable
Maximum number of Sensors that can be connected per Unit. (See note 1.)		13 or 16 (depending on the mode used)	6 or 14 (depending on the setting for maximum number of Sensors)	16
Applicable Fiber Amplifier Units		The following Fiber Amplifier Units with Connectors are supported (See note 2.): E3X-DA6 E3X-DAB6 E3X-DAG6 E3X-DA6TW E39-TM1 E3X-DA6-P E3X-DA8 E3X-DAB8 E3X-DAG8 E3X-DA8TW		
Applicable Slave Connectors for Fiber Amplifier Units		E3X-CN02 Cordless Slave Connector only	E3X-CN02 Cordless Slave Connector only	E3X-CN12 Slave Connector with Cord or E3X-CN02 Cordless Slave Connector
Power supply cable		None	None	Provided.

Note
1. Fiber Amplifier Units that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.
2. Prewired models (E3X-DA11/21/41/51-N, E3X-DAB11-N, etc.) and water-resistant models cannot be used. Connecting these Units will disable the power reset switch.

3. The following Fiber Amplifier Units can be connected to products from specific lots (or later) only:
   E3X-DA6, E3X-DA8, E3X-DAB6, E3X-DAB8, E3X-DAG6, E3X-DAG8, E3X-DA6TW, and E3X-DA8TW

   Even one Unit from a previous lot cannot be connected. The Units that can be connected must have the following lot numbers or later.

Lot No. 18 6 01 ── Manufactured on June 18, 2001

Year of manufacture expressed as last two digits of the year.

Month of manufacture. Oct., Nov., and Dec. are expressed as X, Y, and Z respectively.

Day of manufacture.
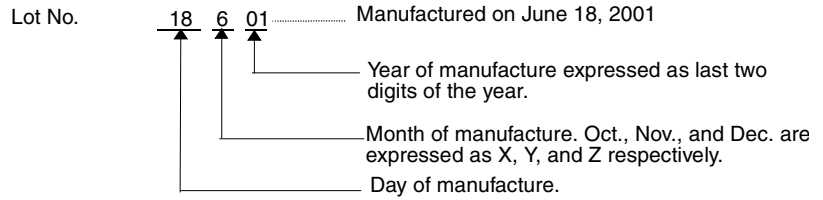
Another method for distinguishing which Units can be connected is by checking whether the printed information "MADE IN JAPAN" on the front is underlined or not. This information is underlined for those Units that can be connected.

• Underlined   • Not underlined

Brown :
12 to 24 VDC
Blue : 0 V

Black :
OUTPUT

MADE IN JAPAN

Brown :
12 to 24 VDC
Blue : 0 V

Black :
OUTPUT
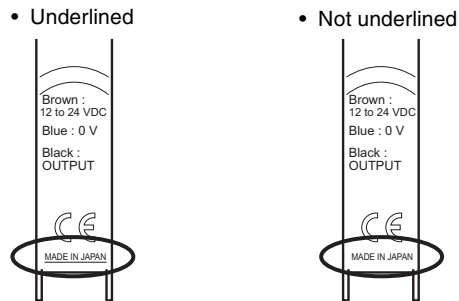
MADE IN JAPAN

The printed information "MADE IN JAPAN" indicates whether connection is possible, as follows:

• Underlined: Can be connected to Communication Unit.

• Not underlined: Cannot be connected to Communication Unit.

1-2-2   General Specifications

Model	E3X-DRT21	E3X-SRT21	E3X-CIF11
Communications method	DeviceNet	CompoBus/S	RS-422
Power supply voltage	11 to 25 VDC	14 to 26.4 VDC	11.4 to 26.4 VDC (12 VDC −5% to 24 VDC +10%)
Internal current consumption (per Communication Unit) (See note.)	70 mA max.	30 mA max.	40 mA max.
Ambient temperature	−20 to 55°C		
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)		
Storage temperature	−30 to 70°C		
Dimensions	30 × 34.6 × 71.3 mm (W × H × D)		
Weight (packed state)	Approx. 150 g	Approx. 150 g	Approx. 200 g

Note The current supplied to the Sensor is not included in the specification.

1-3 Connecting Fiber Amplifier Units

1-3-1 Identifying Sensors (Fiber Amplifier Units)

Fiber Amplifier Units are connected serially to the right side of the Fiber Amplifier Sensor Communication Unit, as shown in the following diagram.

Unit numbers in ascending order from the left.
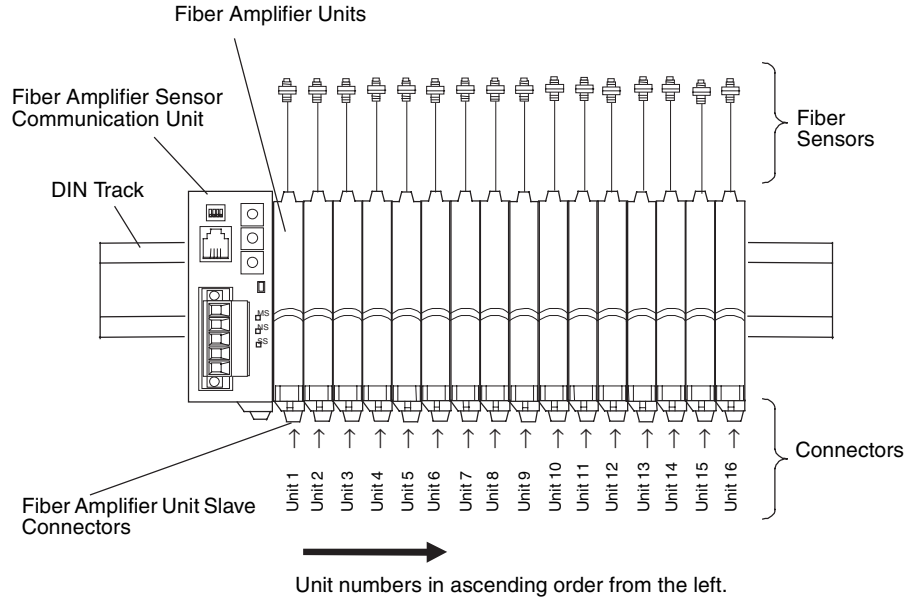
The Fiber Amplifier Units connected to the Communication Unit are identified according to their unit numbers. Unit numbers are automatically assigned to the Units in order from unit number 1 starting from the Unit next to the Communication Unit.

Some Fiber Amplifier Units, i.e., the E3X-DA6TW and E3X-DA8TW, are assigned two unit numbers.

1-3-2 Number of Sensors Connected

The number of Sensors (i.e., the number of Fiber Amplifier Units) that can be connected depends on the type of Communication Unit used and its settings as follows:

Model	Setting	Number of Sensors connected
E3X-DRT21 for DeviceNet	Remote I/O communications (one-word mode)	13 max.
	Remote I/O communications (two-word mode or two-word mode with incident light level monitoring)	16 max.
E3X-SRT21 for Compo-Bus/S	One allocated node address	6 max.
	Two allocated node addresses	14 max.
E3X-CIF11 for RS-422	---	16 max.

Note Fiber Amplifier Units that are allocated two unit numbers (E3X-DA6TW, E3X-DA8TW) must be counted as two Units when counting the number Sensors.

1-3-3   Supported Fiber Amplifier Units

The Communication Unit can be connected to the following Fiber Amplifier Units.

Model number	Unit type	Output type	Monitor output	Number of thresholds	Number of allocated unit numbers
E3X-DA6	Standard model	NPN	None	1	1
E3X-DA8		PNP			
E3X-DA6-P	ON/OFF incident light level-monitoring model (See note 1.)	NPN			
E3X-DA6TW	Twin-output model	NPN		2	2
E3X-DA8TW		PNP			
E3X-DAB6	Mark-detecting model (blue LED)	NPN		1	1
E3X-DAB8		PNP			
E3X-DAG6	Mark-detecting models (green LED)	NPN			
E3X-DAG8		PNP			
E39-TM1	Terminal Block Unit	NPN/PNP	---	---	

Note   1.   The incident light level can be monitored when Unit is turned ON or OFF.

2.   Prewired Units (E3X-DA11/21/41/51-N, E3X-DAB11-N, etc.) and Water-resistant Units (such as E3X-DA14V) cannot be used. Connecting these Units will disable the power reset switch.

3.   Connections of E3X-DA6/8, E3X-DAB6/8, E3X-DAG6/8, E3X-DA6TW, and E3X-DA8TW are restricted depending on the lot number. Refer to page 6 for details on restrictions.

4.   Install the E39-TM1 Terminal Block Unit as far away from the Communication Unit as possible.

1-3-4   Slave Connectors for Fiber Amplifier Units

Fiber Amplifier Units must be used with Slave Connectors (purchased separately). When connecting a Fiber Amplifier Sensor Communication Unit, however, the Slave Connector that can be connected to the Fiber Amplifier Unit is restricted according to the Communication Unit used, as shown in the following table.

(Yes: Can be used; No: Cannot be used)

Fiber Amplifier Sensor Communication Unit	Slave Connector for Fiber Amplifier Unit		
	Cordless	With 1-wire cord	With 2-wire cord
	E3X-CN02	**E3X-CN12**	**E3X-CN22**
E3X-DRT21 (DeviceNet)	Yes	No	No
E3X-SRT21 (CompoBus/S)	Yes	No	No
E3X-CIF11 (RS-422)	Yes	Yes	No

Note   Do not use a E3X-CN11 or E3X-CN21 Master Connector with a Fiber Amplifier Unit.

1-3-5   Power Supply for Sensors

The Communication Unit supplies power to the Fiber Amplifier Units. The following table shows the methods used to supply power to the Communication Unit and all Fiber Amplifier Units connected to it.

Model	Power supply method
E3X-DRT21 (DeviceNet)	From DeviceNet communications power supply.
E3X-SRT21 (CompoBus/S)	From CompoBus/S communications power supply.
E3X-CIF11 (RS-422)	From power supply cable.

1-3-6   Registering the Number of Sensors

To detect whether communications with Fiber Amplifier Units are normal, the number of Fiber Amplifier Units connected must be registered. When the number of Fiber Amplifier Units connected is registered, errors can be detected when there is no optical communications response from Sensors due to malfunctions in Fiber Amplifier Units. The errors can be detected by the difference between the number of Fiber Amplifier Units communicating and the number registered as connected.

A difference between the number of Fiber Amplifier Units connected and the number of registered Units is indicated as follows:

- The SS indicator lights red.
- The Sensor Communications Error Flag turns ON.

The following table shows the method used to set the number of Sensors connected to the Unit.

Model	Setting method
E3X-DRT21 (DeviceNet)	When pin 3 on the DIP switch is OFF: Use the rotary switch.
	When pin 3 on the DIP switch is ON: Use the Configurator or explicit messages.
E3X-SRT21 (CompoBus/S)	Use the rotary switch.
E3X-CIF11 (RS-422)	When pin 3 on the DIP switch is OFF: Use the rotary switch.
	When pin 3 on the DIP switch is ON: Use CompoWay/F messages.

Note Fiber Amplifier Units that are allocated two unit numbers (E3X-DA6TW, E3X-DA8TW) must be counted as two Units when counting the number Sensors.

1-3-7   Sensor Reset Switch

The sensor reset switch is used to replace or add Fiber Amplifier Units without turning OFF power to the Fiber Amplifier Sensor Communication Unit.

With the Fiber Amplifier Sensor Communication Unit power ON, replace or perform required work on the Fiber Amplifier Units. After completing work, press the reset switch to reset all Fiber Amplifier Units and restart normal communications between the Fiber Amplifier Sensor Communication Unit and Fiber Amplifier Units.

SECTION 2
E3X-DRT21 for Device Net Communications

This section provides details on the Fiber Amplifier Sensor Communication Unit for DeviceNet communications, including procedures and application examples for remote I/O communications and explicit messages used by the Unit, part names and functions, operation procedures, wiring, and applications available from the DeviceNet Configurator.

2-1 Overview of DeviceNet Communications Model

2-1-1 Introduction

The E3X-DRT21 for DeviceNet communications is a Communication Unit that uses the DeviceNet to communicate with one or more Fiber Optical Sensors through Fiber Amplifier Units, including monitoring ON/OFF output signals and incident light levels, writing parameters, and controlling operation.

Remote I/O communications can be used to monitor ON/OFF output signals and incident light levels without special programming. Explicit messages can be used to read and write parameters and the DeviceNet Configurator enables transferring and monitoring parameters as a batch.

Note When DeviceNet Communication Units are used, however, Fiber Amplifier Units can output ON/OFF signals via communications only. (Fiber Amplifier Units can be connected to Cordless Slave Connectors only. They cannot be connected to Slave Connectors with Cords.)

Refer to the following manuals when using a DeviceNet Communication Unit:

DeviceNet Operation Manual (Cat. No. W267) and *DeviceNet Slave Manual* (Cat. No. W347).

2-1-2 DeviceNet Communications Overview

Remote I/O Communications

Words in the IN Area of the master can be allocated to the E3X-DRT21 Communication Unit for storage of the ON/OFF data, status data, and incident light levels of the Sensors.
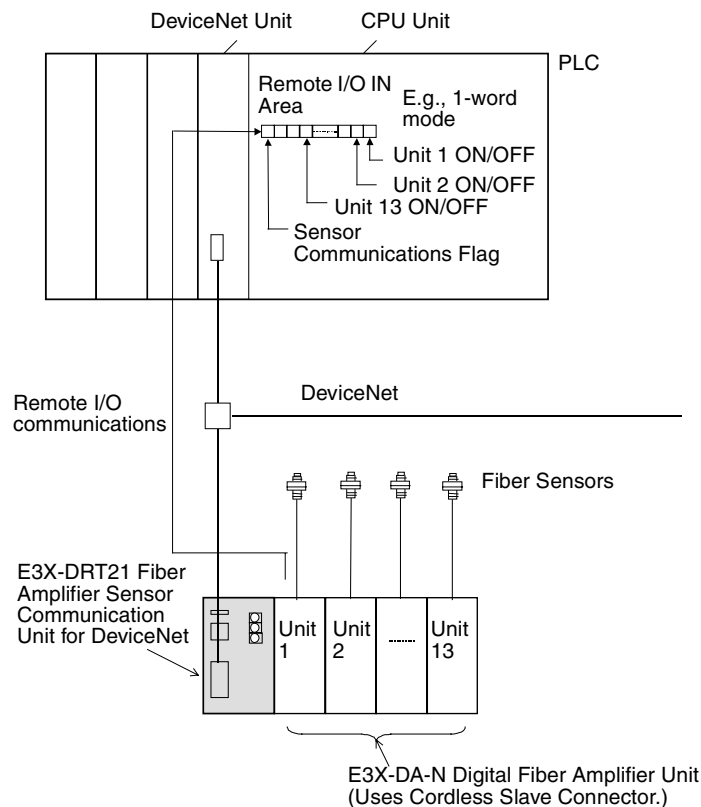
Communications mode	Words	Communications data	Number of Sensors	Conditions
Remote I/O communications one-word mode	One word in IN Area	Sent to the master: ON/OFF output signals for up to 13 Sensors.	13 max.	---
Remote I/O communications, two-word mode	Two words in IN Area	Sent to the master: ON/OFF output signals for up to 16 Sensors. Number of Sensors able to communicate. Number of Sensors connected.	16 max.	
Remote I/O communications two-word mode with incident light level monitoring	Two words in IN Area plus words for number of Sensors connected	Sent to the master: ON/OFF output signals for up to 16 Sensors. Number of Sensors able to communicate. Number of Sensors that are connected. Incident light levels of up to 16 Sensors.	16 max.	Incident light levels cannot be monitored if Mobile Console is connected.

Explicit Message Communications

Sending explicit messages to the E3X-DRT21 Communication Unit enables reading and writing Sensor parameters.
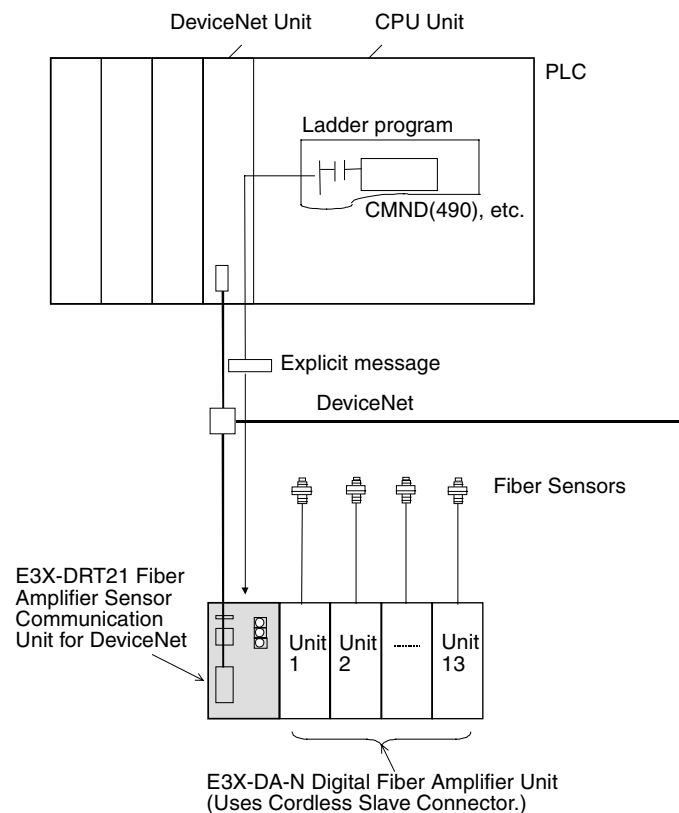
Message	Communication data	Conditions
Sends EXPLICIT READ command	Reads parameters, including ON/OFF data, incident light levels, and thresholds.	Cannot be used when a Mobile Console is connected.
Sends EXPLICIT WRITE command	Writes parameters, including maximum sensitivity, and thresholds.	
Sends EXPLICIT OPERATION command	Performs various operations including teaching and fine tuning.	

Transferring, Monitoring, and Operating from the DeviceNet Configurator

A DeviceNet Configurator (Ver. 2.10 or higher) can be used to read and write Sensor parameters from a personal computer.

DeviceNet Configurator

CS/CJ-series DeviceNet Unit

PLC

Serial connector

Operating and monitoring Sensor settings from Configurator
- Setting and downloading Sensor data.
- Monitoring Sensor ON/OFF data, incident light levels, etc.
- Performing Sensor teaching operations.

DeviceNet

Fiber Sensors

E3X-DRT21 Fiber Amplifier Sensor Communication Unit for DeviceNet

DeviceNet slave

Type	Communications contents	Conditions
Sensor parameter setting	Writes any parameters, including maximum sensitivity, and thresholds.	Cannot be used when Mobile Console is connected.
Sensor monitoring	Reads any parameters, including ON/OFF data, incident light levels, and thresholds.	
Sensor teaching	Performs various teaching operations.	

2-1-3   Using Remote I/O Communications: Example

The following example is for monitoring the ON/OFF output status of Fiber Amplifier Unit 1 using one-word mode (DIP switch pins 1 and 2 are OFF) and E3X-DRT21 DeviceNet node address 00.

CS1W-DRM21 DeviceNet Unit with fixed allocations for remote I/O communications

CS1 CPU Unit

IN Area

DeviceNet

Reflected in IN Area

Fiber Sensors

Unit 1 for which ON/OFF data is being monitored.

E3X-DRT21 Node address 00

IN Area (fixed allocation area 1)

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
CIO 3300																

Node address 00

Sensor ON/OFF output status for Unit 1
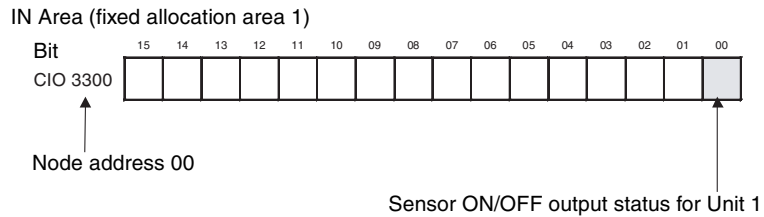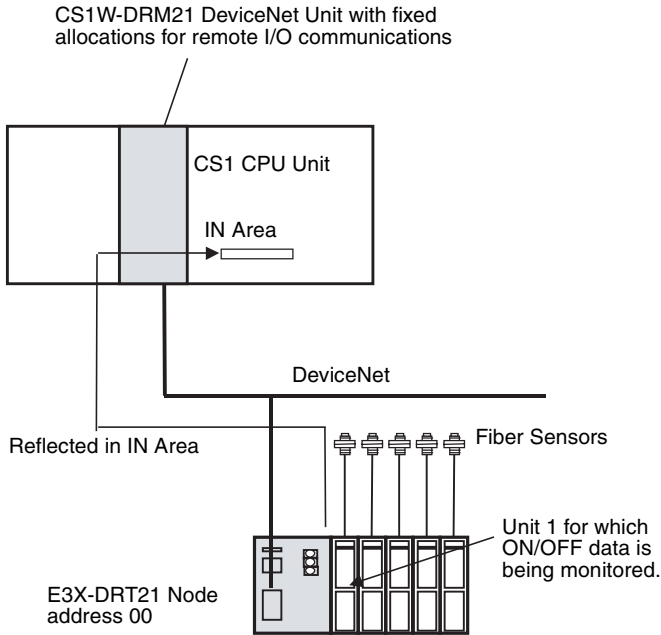
2-1-4   Using Explicit Message Communications: Example

The following example is for setting the maximum sensitivity of Unit 1.

CS1W-DRM21 DeviceNet Unit, Unit 0
(unit address: FE Hex or 10 Hex)
DeviceNet node address: 05

CS1 CPU Unit

CMND(490) instruction

DeviceNet

Fiber Sensors

Explicit message

Unit 1 for which maximum sensitivity is being set.

E3X-DRT21 Node address 00
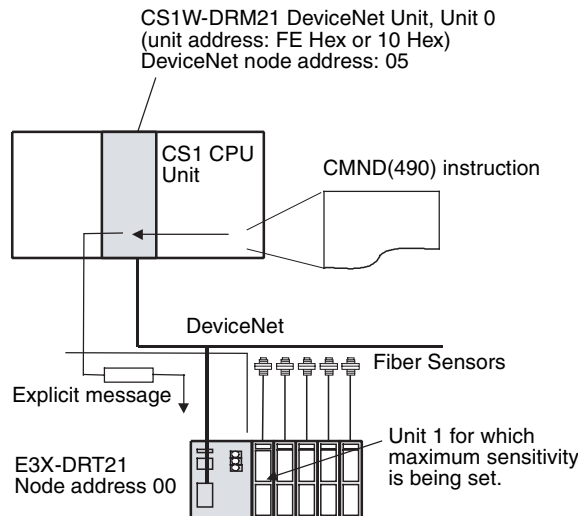
■ **Command Format for Setting Maximum Sensitivity**

Send the following explicit message.

Destination node address	Service Code	Class ID	Instance ID	Attribute ID	Data
00 Hex	16 Hex	009C Hex	0001 Hex	None	30 Hex

Note When using the CMND(490) instruction to send the attribute ID and data, set them in the rightmost byte (bits 00 to 07), and set the leftmost byte (bits 08 to 15) to 00 Hex. (In the above example, the data is set to 0030 Hex.)

When the explicit message has no attribute ID, omit the words for the attribute ID in the command data specified for the CMND(490) instruction.
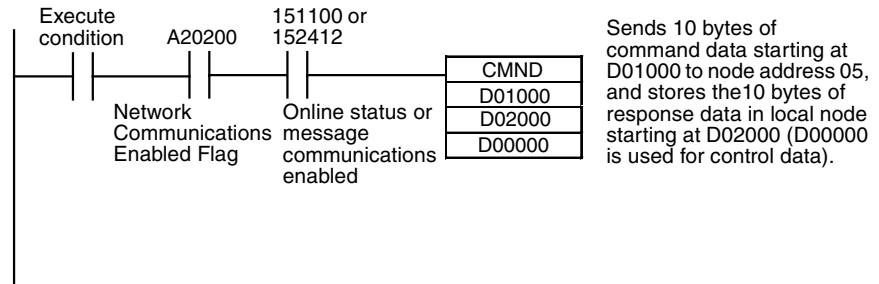
S	D01000	2 8 0 1		Command code
	D01001	0 0 1 6		Slave node address: 00, Service code: 16 Hex
	D01002	0 0 9 C		Class ID: 009C Hex
	D01003	0 0 0 1		Instance ID: 0001 Hex (unit number)
	D01003	3 0 0 0		Data: 30 Hex (fixed)
D	D02000			First word of response storage area.
C	D00000	0 0 0 9		Command data bytes: 9
	D00001	0 0 0 A		Response data bytes
	D00002	0 0 0 1		Destination network address: 1
	D00003	0 5 F E		Destination DeviceNet node address: 05 Hex Destination unit address: FE Hex (or 10 Hex)
	D00004	0 0 0 0		Response required, communications port No.: 0, retries: 0 Hex
	D00005	0 0 3 C		Response monitoring time: 6 s

2-2   DeviceNet Communication Unit Part Names and Functions
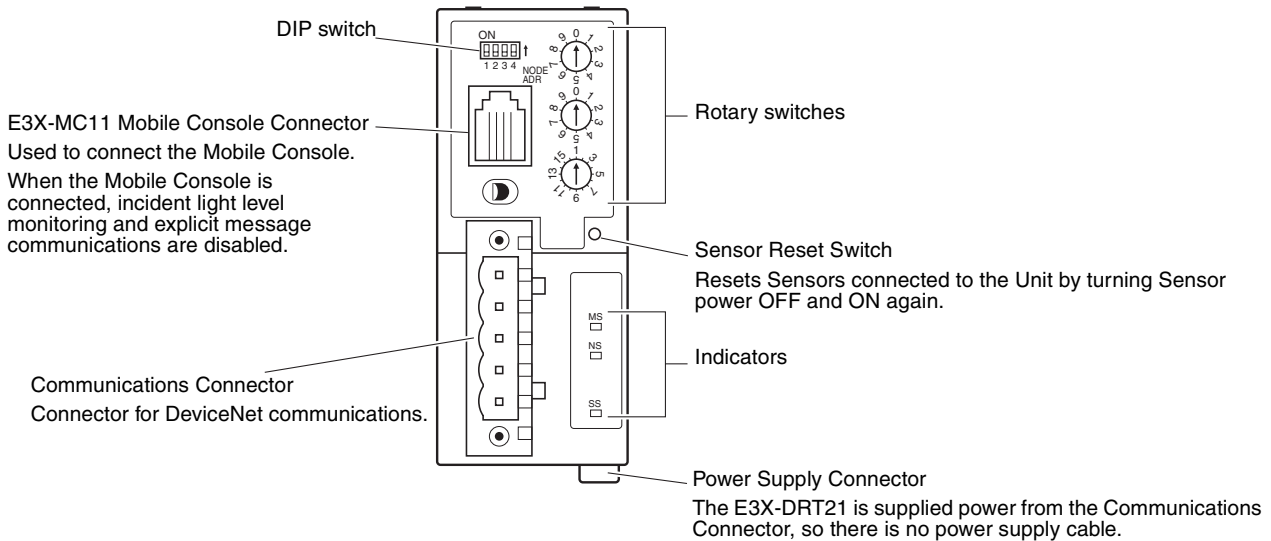
DIP switch

E3X-MC11 Mobile Console Connector
Used to connect the Mobile Console.
When the Mobile Console is connected, incident light level monitoring and explicit message communications are disabled.

Rotary switches

Sensor Reset Switch
Resets Sensors connected to the Unit by turning Sensor power OFF and ON again.

Communications Connector
Connector for DeviceNet communications.

Indicators

Power Supply Connector
The E3X-DRT21 is supplied power from the Communications Connector, so there is no power supply cable.

Note 1. Do not turn ON the power to the Communication Unit when the Mobile Console is connected. Communications will not be established with the Sensors if the Mobile Console is already connected when the Unit power is turned ON.

2. Always set the Sensors to RUN mode when using the Fiber Amplifier Sensor Communication Unit for DeviceNet. When other modes (SET or ADJ) are set, the Fiber Amplifier Sensor Communication Unit cannot read or write Sensor data.

3. A Sensor communications error will occur under the following conditions after the Mobile Console is connected with it's power turned ON.

   • When the power to the Mobile Console is turned OFF.

   • When the Mobile Console is left idle while connected, causing the power to automatically turn OFF.

   • When the Mobile Console battery goes low, causing the power to turn OFF.

   Do not allow the above conditions to occur when using the Mobile Console, or use the Mobile Console when problems will not occur even if a Sensor communications error occurs.

Indicators   The following table shows the operation of the indicators.

Indicator	Name	Color	Status	Meaning
MS	Module status	Green	Lit	Operating normally.
			Flashing	Not set.
		Red	Lit	A fatal error has occurred.
			Flashing	A non-fatal error has occurred.
		---	Not lit	The power is OFF.

Indicator	Name	Color	Status	Meaning
NS	Network status	Green	Lit	DeviceNet is online and communications are connected.
			Flashing	DeviceNet is online and communications are not connected.
		Red	Lit	A fatal DeviceNet communications error has occurred.
			Flashing	A non-fatal DeviceNet communications error has occurred.
		---	Not lit	DeviceNet is offline or power is OFF.
SS	Sensor communications status	Green	Lit	Unit is communicating with Sensors.
		Red	Lit	A Sensor communications error has occurred.
		---	Not lit	Sensor communications are on standby or power is OFF

Normal Status of Indicators

MS	Operation is normal when the MS indicator is lit green.
NS	Operation is normal when the NS indicator is lit green (online and communications connected).
SS	Sensors are communicating when the SS indicator is lit green.

Switches

Rotary Switches

X10

X1

DeviceNet Node Address Setting

Set the DeviceNet node address to between 00 and 63. (64 to 99 are not used.)

Connected Number of Sensors Setting

Registers the number of Sensors connected. By setting the number of Sensors, errors can be detected in the configuration.

When the DIP switch pin 3 is turned ON, however, this rotary switch is disabled. Instead, the values set from the DeviceNet Configurator or using explicit messages are enabled.

Note   Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

DIP Switch

ON

1 2 3 4

Operating mode (MODE0)
Operating mode (MODE1)
Method for setting number of Sensors
Reserved for system use.
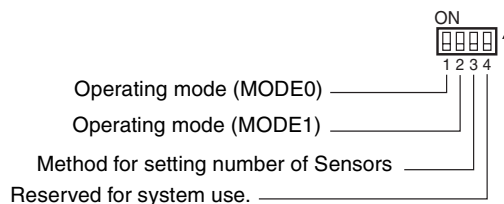
■ Pins 1 and 2: Operating Mode Setting

These pins set the operating mode. The data allocated in the master's IN Area depends on the operating mode. For further details, refer to *2-5 DeviceNet Remote I/O Communications*.

Pin 1 (MODE0)	Pin 2 (MODE1)	Operating mode setting	Number of Sensors
OFF	OFF	Remote I/O communications one-word mode	13 max.
ON	OFF	Remote I/O communications two-word mode	16 max.
OFF	ON	Remote I/O communications two-word mode with incident light level monitoring	16 max.
ON	ON	Cannot be set.	---

Note Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

■ Pin 3: Controlling the Setting of the Number of Connected Sensors

The number of Sensors connected is registered by using either a rotary switch or the Configurator.

When pin 3 is ON, registering the number of Sensors is enabled from Configurator or by using explicit messages enabled, and the value for the number of Sensors enabled for communications that is stored in the internal memory of the Fiber Amplifier Sensor Communication Unit is used. The default value in the internal memory is 16. This value can be changed from the DeviceNet Configurator. The setting methods are shown in the following table.

Pin 3	Method for setting the number of Sensors
OFF	Use rotary switch to register number of Sensors.
ON	Use Configurator or explicit messages to register number of Sensors.

Note When DIP switch pin 3 is ON (registering from Configurator or using explicit messages), pin 1 is OFF, and pin 2 is ON (remote I/O communications two-word mode with incident light level monitoring), the value in the internal memory of the Fiber Amplifier Sensor Communication Unit for the number of Units being monitored for incident light levels is used. The default value in the internal memory is 16. This value can be set to a different value from the number of Sensors connected. When pin 3 is OFF (registering from rotary switch), pin 1 is OFF, and pin 2 is ON, the rotary switch setting applies to both the number of Sensors connected and the number of Units monitoring incident light level.

■ Pin 4: Reserved for System Use

This pin must always be OFF.

Sensor Reset Switch

Press this switch to reset the connected Sensors by executing power interruption processing. This switch is used in the following case.

If the number of Sensors with communications enabled does not match the number of Sensors connected, one or more Sensors may have become disconnected. The power reset switch is required to enable the Sensors to be reconnected properly and for communications to be reestablished between Sensors. Turning OFF the power supply would disconnect the Fiber Amplifier Sensor Communication Unit from DeviceNet, which may effect the entire system. The Sensor reset switch is thus used to reestablish communications with the Sensors.

Note The E3X-DRT21 automatically uses the DeviceNet baud rate of the master. Therefore, the DIP switch is not required to set the baud rate.

2-3   Operating Procedure for DeviceNet Communication Unit

Step	Item	Details			
1	Mount the Communication Unit to the DIN Track.	Mount the Unit to the DIN Track. After mounting the Fiber Amplifier Units to the DIN Track, connect the Units to each other. Note: To remove the Units from the DIN Track, first slide the Units apart to disconnect them, and then remove the Units from the DIN Track.			
2	Connect the Fiber Amplifier Units to the Communication Unit.	Connect the Communication Unit to the Fiber Amplifier Units by sliding the Communication Unit until the clips on the end are aligned and a "click" sound is heard.			
3	Set the Sensors to RUN mode.	Set the mode switches to RUN mode.			
4	Connect the DeviceNet communications connector.	Connect the DeviceNet Communications Connector. Note: The DC power supply to the Communication Unit and all Fiber Amplifier Units connected to it is supplied from the DeviceNet communications power supply (V+, V−).			
5	Set the rotary switches.	Two upper switches	Sets the DeviceNet node address (0 to 63).		
		Lower switch	Sets the number of Sensors connected to the Unit (1 to 16). (Enabled when DIP switch pin 3 is OFF only.) Note 1: When DIP switch pin 3 is ON, set the number of Sensors connected using the Configurator or explicit messages. Note 2: Fiber Amplifier Units (E3X-DA6TW, E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of Sensors.		
6	Set the DIP switch.	**Pin 1**	**Pin 2**	Operating mode setting	Number of Sensors connected
		OFF	OFF	Remote I/O communications one-word mode	13 max.
		ON	OFF	Remote I/O communications two-word mode	16 max.
		OFF	ON	Remote I/O communications two-word mode with incident light level monitoring	16 max.
		Pin 3	Method for setting the number of Sensors.		
		OFF	Use the rotary switch to register setting.		
		ON	Use the Configurator or explicit messages to register settings.		
7	Turn ON the DC power supply (V+, V− DeviceNet communications power supply).	Disconnect the E3X-MC11 Mobile Console before turning ON the DC power supply.			
8	Check the indicators.	MS	Operating normally when lit green.		
		NS	Operating normally when lit green (DeviceNet online and communications connected).		
		SS	Communicating with Sensors when lit green.		
9	Start communications.	Remote I/O	Enable the scan list in the master and change the PLC to RUN mode.		
		Explicit messages	Send explicit messages from the master.		

2-4 Wiring the DeviceNet Model
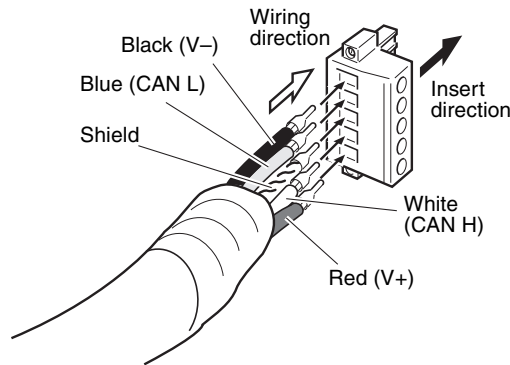
- The following table shows the relationship between the cable colors and signals.

Color	Signal	Symbol
Black	Communications power supply negative side	V–
Blue	Signal low side	CAN L
---	Shield	S
White	Signal high side	CAN H
Red	Communications power supply positive side	V+

Note 1. The DeviceNet communications power supply provides power to the Communication Unit and all the Sensors (Amplifier Units) connected to it. Select a power supply for the Communication Unit so that is has sufficient capacity for the current consumption of the Sensors.

2. The allowable current is 3 A for the DeviceNet thin cables and 8 A for the DeviceNet thick cables. For details on calculating the power supply for the DeviceNet system, refer to the *DeviceNet Operation Manual* (Cat. No. W267)*.*

2-5 DeviceNet Remote I/O Communications

2-5-1 Master Word Allocations

The E3X-DRT21 data is stored in the IN Area of the DeviceNet master. Select one of the following three operating modes using the DIP switch.

Pin 1	Pin 2	Operating mode setting	Number of Sensors
MODE0	MODE1		
OFF	OFF	Remote I/O communications one-word mode	13 max.
ON	OFF	Remote I/O communications two-word mode	16 max.
OFF	ON	Remote I/O communications two-word mode with incident light level monitoring	16 max.
ON	ON	Cannot be set.	---

The DeviceNet Configurator can be used to set the connection type. The Fiber Amplifier Sensor Communication Unit supports bit-strobe, polling, COS, and cyclic connections. Refer to *Appendix C DeviceNet Connection Settings* for details.

Remote I/O Communications One-word Mode (Pins 1 and 2 OFF)

Up to 13 Sensors can be connected in this mode. One word is allocated to each Sensor in the IN Area of the master. Fiber Amplifier Units are automatically assigned unit numbers in ascending order starting from the Communication Unit (left side).

Bit	Contents
00	Unit 1 ON/OFF data
01	Unit 2 ON/OFF data
02	Unit 3 ON/OFF data
03	Unit 4 ON/OFF data
04	Unit 5 ON/OFF data
05	Unit 6 ON/OFF data
06	Unit 7 ON/OFF data
07	Unit 8 ON/OFF data
08	Unit 9 ON/OFF data
09	Unit 10 ON/OFF data
10	Unit 11 ON/OFF data
11	Unit 12 ON/OFF data
12	Unit 13 ON/OFF data
13	Mobile Console Communications Flag
14	Sensor Communications Error Flag
15	Sensor Communications Flag

■ Mobile Console Communications Flag

Bit 13 turns ON when the Mobile Console is connected to the Communication Unit. When the Mobile Console is connected, the DeviceNet Configurator or explicit message communications cannot be used to perform setting and monitoring operations.

■ Sensor Communications Error Flag

Bit 14 turns ON when the registered number of Sensors does not match the number of Sensors that are enabled to communicate, or when a communications error occurs after communications have been established with the Sensors.

■ **Sensor Communications Flag**

Bit 15 turns ON when communications are established with the Sensors.

Remote I/O Communications Two-word Mode (Pin 1 ON, Pin 2 OFF)

Up to 16 Sensors can be connected in this mode. Two words are allocated to each Sensor in the IN Area of the master.

Word m

Bit	Contents
00	Unit 1 ON/OFF data
01	Unit 2 ON/OFF data
02	Unit 3 ON/OFF data
03	Unit 4 ON/OFF data
04	Unit 5 ON/OFF data
05	Unit 6 ON/OFF data
06	Unit 7 ON/OFF data
07	Unit 8 ON/OFF data
08	Unit 9 ON/OFF data
09	Unit 10 ON/OFF data
10	Unit 11 ON/OFF data
11	Unit 12 ON/OFF data
12	Unit 13 ON/OFF data
13	Unit 14 ON/OFF data
14	Unit 15 ON/OFF data
15	Unit 16 ON/OFF data

Word m+1

Bit	Contents
00	Number of Sensors connected, 2^0
01	Number of Sensors connected, 2^1
02	Number of Sensors connected, 2^2
03	Number of Sensors connected, 2^3
04	Number of Sensors connected, 2^4
05	Method for setting number of Sensors
06	Always 0.
07	Always 0.
08	Number of Sensors that can communicate, 2^0
09	Number of Sensors that can communicate, 2^1
10	Number of Sensors that can communicate, 2^2
11	Number of Sensors that can communicate, 2^3
12	Number of Sensors that can communicate, 2^4
13	Mobile Console Communications Flag
14	Sensor Communications Error Flag
15	Sensor Communications Flag

■ **Number of Sensors Connected**

Bits 00 to 04 give the number of Sensors that are currently registered between 1 and 10 Hex (1 to 16 decimal).

■ <u>**Switching Method for Setting Number of Sensors Connected**</u>

Bit 05 gives the status of DIP switch pin 3, which controls the method for registering the number of Sensors connected. When this bit is OFF, pin 3 is OFF, and when the bit is ON, pin 3 is ON.

■ <u>**Number of Sensors That Can Communicate**</u>

Bits 08 to 12 give the number of Sensors that are currently able to communicate between 1 and 10 Hex (1 to 16 decimal). This setting enables the user to check how many Sensors are communicating normally when an error occurs.

■ <u>**Mobile Console Communications Flag**</u>

Bit 13 turns ON when the Mobile Console is connected to the Communication Unit. When the Mobile Console is connected, the Configurator or explicit message communications cannot be used to perform setting and monitoring operations.

■ <u>**Sensor Communications Error Flag**</u>

Bit 14 turns ON when the number of Sensors registered as connected does not match the number of Sensors that can communicate, or when a communications error occurs after communications have been established with the Sensors.

■ <u>**Sensor Communications Flag**</u>

Bit 15 turns ON when communications are established with the Sensors.

Note Fiber Amplifier Units (E3X-DA6TW, E3X-DA8TW) that are allocated two unit numbers are allocated two bits of ON/OFF data and are counted as two Units when counting the number of Sensors.

Remote I/O Communications Two-word with Incident Light Level Monitoring Mode (Pin 1 OFF, Pin 2 ON)

Up to 16 Sensors can be connected in this mode. The incident light level monitor default setting is to monitor all the Sensors that are connected. By turning ON pin 3 of the DIP switch, the number of Sensors being monitored for incident light levels can be changed from the DeviceNet Configurator or by using explicit messages.

When the number of Sensors to be monitored is set, the incident light level is monitored starting from the Unit next to the Fiber Amplifier Sensor Communication Unit up to the number of Sensors that is current set.

In addition to word m and word m+1, one word is allocated in the IN Area of the master for each Sensors to be monitored for incident light level.

Word m

Bit	Contents
00	Unit 1 ON/OFF data
01	Unit 2 ON/OFF data
02	Unit 3 ON/OFF data
03	Unit 4 ON/OFF data
04	Unit 5 ON/OFF data
05	Unit 6 ON/OFF data
06	Unit 7 ON/OFF data
07	Unit 8 ON/OFF data
08	Unit 9 ON/OFF data
09	Unit 10 ON/OFF data
10	Unit 11 ON/OFF data
11	Unit 12 ON/OFF data
12	Unit 13 ON/OFF data
13	Unit 14 ON/OFF data
14	Unit 15 ON/OFF data
15	Unit 16 ON/OFF data

Word m+1

Bit	Contents
00	Number of Sensors connected, 2^0
01	Number of Sensors connected, 2^1
02	Number of Sensors connected, 2^2
03	Number of Sensors connected, 2^3
04	Number of Sensors connected, 2^4
05	Method for setting number of Sensors
06	Always 0.
07	Always 0.
08	Number of Sensors that can communicate, 2^0
09	Number of Sensors that can communicate, 2^1
10	Number of Sensors that can communicate, 2^2
11	Number of Sensors that can communicate, 2^3
12	Number of Sensors that can communicate, 2^4
13	Mobile Console Communications Flag
14	Sensor Communications Error Flag
15	Sensor Communications Flag

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word m + 2	Unit 1 incident light level															
Word m + 3	Unit 2 incident light level															
Word m + 4	Unit 3 incident light level															
:	:															
:	:															
Word m + n	Unit n – 1 incident light level															
Word m + n + 1	Unit n incident light level															

Number of Sensors for incident light level monitoring: n

Note   1. When the number of Sensors for incident light level monitoring is greater than the value set for the number of Sensors connected for communications, the incident light level for the Sensors that are not connected will be 0000.

2. When the Mobile Console is connected, the incident light level data cannot be read and the data will be 7FFF.

3. When an error occurs in communications with Sensors, the incident light level data for the Sensors not communicating will be 7FFF.

4. The incident light level data for the E39-TM1 Terminal Block Units will be 7FFF. Monitoring incident light levels for Terminal Block Units causes a delay in the data refresh cycle. To speed up the refresh cycle, mount the Terminal Block Unit to the farthest position from the Fiber Amplifier Sensor Communication Unit, and use the DeviceNet Configurator or an explicit message to set the number of devices to be monitored for incident light level requirement so that the Terminal Block Unit is not monitored.

5. The refresh timing of Sensor ON/OFF data and incident light level data is not synchronized. Even if incident light level data is read while monitoring the ON/OFF status, the incident light level data may not be indicated for the ON and OFF status. To read incident light level data at ON and OFF, use the E3X-DA6-P Sensor. For details on this Sensor, refer to *Appendix B Monitoring Incident Light Levels of E3X-DA6-P Sensors*.

2-6 Explicit Message Communications

Sending DeviceNet explicit messages from the master to the Communication Unit enables reading or writing any parameters of Fiber Amplifier Units. The Communication Unit processes the command sent from the master and returns a response.

2-6-1 Basic Format of Explicit Messages

The basic formats of command and response blocks are shown here.

Command Block

Destination node address	Service Code	Class ID	Instance ID	Attribute ID	Data

Destination Node Address

Specifies the node address of the Unit to which the explicit message (command) is to be sent as a 1-byte hexadecimal value.

Service Code, Class ID, Instance ID, Attribute ID

Specify the command type, the Unit to receive the command, and other processing details. The Fiber Amplifier Sensor Communication Unit uses the instance ID to specify to Sensors for which the command is intended (Sensor unit number). Some commands do not require an attribute ID.

> Note The number of bytes specified for the class ID, instance ID, and attribute ID depend on the master used. When the command is sent from an OMRON DeviceNet Unit (master), the class ID and instance ID are specified as 2 bytes (4 digits) each, and the attribute ID as 1 byte (2 digits).

Data

Data is not required for the READ command.

Response Block

Normal Block

Number of received bytes	Source node address	Service Code	Data

Error Block

Number of received bytes fixed at 0004 Hex	Source node address	Service Code	Error Code

Number of Received Bytes

The number of data bytes received starting from the source node is returned as a hexadecimal value. When an error response is returned to an explicit message, this value will be 0004 Hex.

Source Node Address

Returns the node address of the node from which the command was sent as a hexadecimal value.

Service Code

When the command is completed normally, the value specified in the command with leftmost bit of the service code turned ON is stored as shown in the following table.

Command service code	Response service code
10 Hex	90 Hex
0E Hex	8E Hex
16 Hex	96 Hex
06 Hex	86 Hex
07 Hex	87 Hex
05 Hex	85 Hex

When an error response is returned to an explicit message, this value will be 94 Hex.

Data

Used to store read data only when a READ command has been sent.

Error Code

Specifies the explicit message error code. For details, refer to *2-6-5 List of Error Codes.*

Note Set the DeviceNet message monitoring timer in the Fiber Amplifier Sensor Communication Unit to 6 s minimum.

The procedure for setting the timer is as follows:

Using a CS1W-DRM21 or CJ1W-DRM21

Use the following procedure to set the timer from the DeviceNet Configurator.

1,2,3... 1. Place the Configurator online by selecting **Network** and **Connection**.

2. Select and double-click either CS1W-DRM21 or CJ1W-DRM21.

3. Set the Fiber Amplifier Sensor Communication Unit node monitoring timer to 6,000 ms.
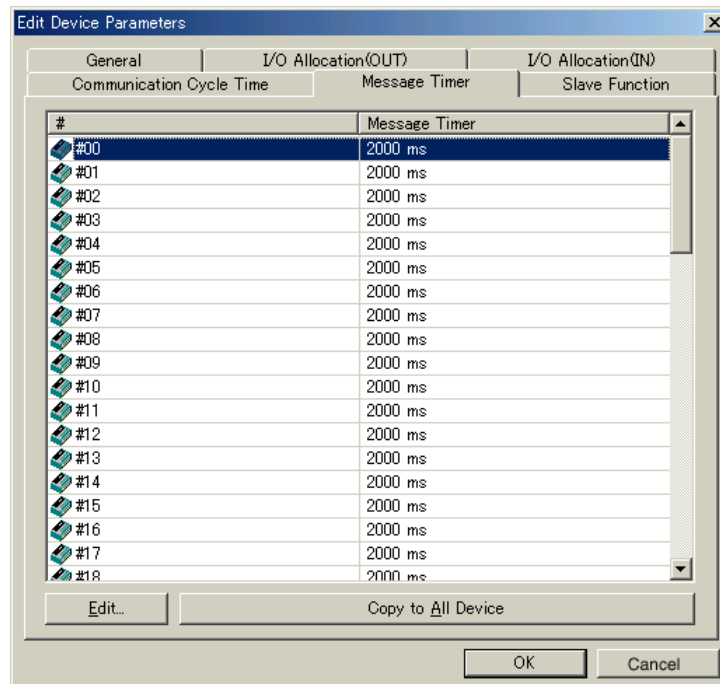
4. Set the response monitoring time to 6,000 ms minimum using the CMND(490) instruction to send an explicit message.

Using C200HW-DRM21 or CVM1-DRM21

Set the response monitoring time to 6,000 ms using the IOWR(223) instruction to send an explicit message. (The message monitoring timer does not need to be set with the DeviceNet Configurator.)

2-6-2 READ Command

The READ command is used to read data from the Fiber Amplifier Sensor Communication Unit or the Sensors connected to it. When an OMRON master is used, the formats of the command and response blocks are as follows:

Command Block

Destination node address / Service Code / Class ID / Instance ID / Attribute ID

| | 0E fixed | | | |
|1 byte|1 byte|2 bytes|2 bytes|1 byte|

Response Block **Normal Format**

No. of received bytes / Destination node address / Service Code / Read data

| 0004 (See note.) | | 8E fixed | |
|2 bytes|1 byte|1 byte|2 bytes (See note.)|
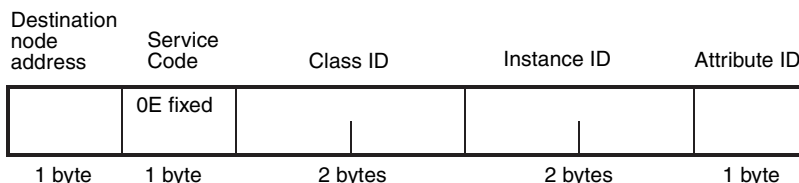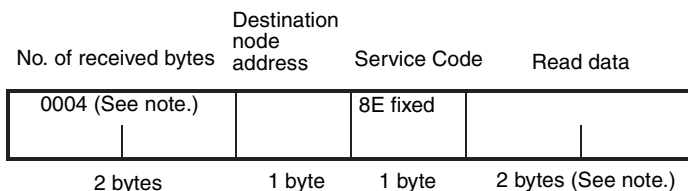
Note The bytes of read data for Batch Read Incident Light Levels and Batch Read Threshold Settings is twice the number of Sensors being read. The number of received bytes is two plus twice the number of Sensors being read.

Error Format

No. of received bytes / Destination node address / Service Code / Error Code

| 0004 | | 94 fixed | |
|2 bytes|1 byte|1 byte|2 bytes|
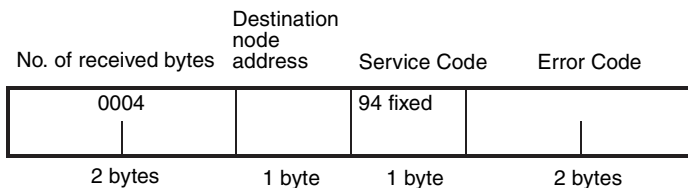
List of READ Commands

The following table lists the explicit message READ commands.

Explicit message	Function	Class ID	Instance ID	Attribute ID
Read ON/OFF Data	Reads the ON/OFF status of connected Sensors	009C	0000	01
Read Status	Reads the status of the Fiber Amplifier Sensor Communication Unit	009C	0000	02
Read Incident Light Level	Specifies the unit number as the instance ID and reads the incident light level.	009C	Unit number	03
Batch Read Incident Light Levels	Reads incident light levels of connected Sensors in a batch.	009C	0000	67

Explicit message	Function	Command		
		Class ID	Instance ID	Attribute ID
Read ON Incident Light Level (See note 2.)	Specifies the unit number as the instance ID and reads the incident light levels when Sensor is ON.	009C	Unit number	04
Read OFF Incident Light Level (See note 2.)	Specifies unit number as the instance ID and reads the incident light level when Sensor is OFF.	009C	Unit number	05
Batch Read ON Incident Light Levels (See note 2.)	Reads the ON incident light levels of connected Sensors in a batch.	009C	0000	68
Batch Read OFF Incident Light Levels (See note 2.)	Reads the OFF incident light levels of connected Sensors in a batch.	009C	0000	69
Read Threshold Setting	Specifies the unit number as the instance ID and reads the threshold value.	009C	Unit number	11
Batch Read Threshold Settings	Reads the threshold values of the connected Sensors in a batch.	009C	0000	75
Read Basic Settings	Specifies the unit number as the instance ID and reads basic settings.	009C	Unit number	12
Read Timer Setting	Specifies the unit number as the instance ID and reads the timer.	009C	Unit number	13
Read Hysteresis Width	Specifies the unit number as the instance ID and reads the hysteresis width.	009C	Unit number	16
Read Custom Flags	Specifies the unit number as the instance ID and reads the Custom Flags.	009C	Unit number	17
Read Special Flags (See note 3.)	Specifies the unit number as the instance ID and reads the Special Flags.	009C	Unit number	1C
Read Number of Sensors	Reads the number of Sensors connected.	009C	0000	30
Read Number of Incident Light Level Monitor Units	Reads the number of Units monitoring incident light levels.	009D	0000	31

The unit number specified by the instance ID must be set between 0001 Hex and 0010 Hex.

Note 1. The E39-TM1 Terminal Block Unit has no parameters that can be read, so an error will occur if the unit number of a Terminal Block Unit is specified.

2. An error will occur if the (Batch) Read ON/OFF Incident Light Levels command is executed when the unit number of a Unit other than an E3X-DA6-P is specified.

3. An error will occur if the Read Special Flags command is executed when the unit number of a Unit other than an E3X-DA6TW or E3X-DA8TW is specified.

The following tables and explanations provide the data format for each item.

Read ON/OFF Data

Bit	Contents
00	Unit 1 ON/OFF data
01	Unit 2 ON/OFF data
02	Unit 3 ON/OFF data
03	Unit 4 ON/OFF data
04	Unit 5 ON/OFF data
05	Unit 6 ON/OFF data
06	Unit 7 ON/OFF data
07	Unit 8 ON/OFF data
08	Unit 9 ON/OFF data
09	Unit 10 ON/OFF data
10	Unit 11 ON/OFF data
11	Unit 12 ON/OFF data
12	Unit 13 ON/OFF data
13	Unit 14 ON/OFF data
14	Unit 15 ON/OFF data
15	Unit 16 ON/OFF data

Read Status

Bit	Contents
00	Number of Sensors connected, 2^0
01	Number of Sensors connected, 2^1
02	Number of Sensors connected, 2^2
03	Number of Sensors connected, 2^3
04	Number of Sensors connected, 2^4
05	Method for setting number of Sensors
06	Always 0.
07	Always 0.
08	Number of Sensors that can communicate, 2^0
09	Number of Sensors that can communicate, 2^1
10	Number of Sensors that can communicate, 2^2
11	Number of Sensors that can communicate, 2^3
12	Number of Sensors that can communicate, 2^4
13	Mobile Console Communications Flag
14	Sensor Communications Error Flag
15	Sensor Communications Flag

■ **Number of Sensors Connected**

Bits 00 to 04 give in hexadecimal the number of Sensors that are currently registered.

■ **Switching Method for Setting Number of Sensors Connected**

Bit 05 gives the status of DIP switch pin 3, which controls the method for registering the number of Sensors connected. When this bit is set OFF, pin 3 is OFF, and when the bit is ON, pin 3 is ON.

■ **Number of Sensors That Can Communicate**

Bits 08 to 12 give the number of Sensors that are currently able to communicate in hexadecimal. This setting enables the user to check how many Sensors are communicating normally when an error occurs.

■ **Mobile Console Communications Flag**

Bit 13 turns ON when the Mobile Console is connected to the Communication Unit. When the Mobile Console is connected, explicit message communications cannot be used.

■ **Sensor Communications Error Flag**

Bit 14 turns ON when the number of Sensors registered as connected does not match the number of Sensors that can communicate, or when a communications error occurs after communications have been established with the Sensors.

■ **Sensor Communications Flag**

Bit 15 turns ON when communications are established with the Sensors.

Read (ON/OFF) Incident Light Level

Reads the incident light level of the Sensor for the unit number specified in the instance ID. The data is given as a 2-byte (4-digit) hexadecimal value, and negative data is expressed as its two's complement.

Data for the Read ON/OFF Incident Light Level commands can be read when using an E3X-DA6-P Sensor only. For details on ON/OFF incident light levels, refer to *Appendix B Monitoring Incident Light Levels of E3X-DA6-P Sensors.*

Batch Read (ON/OFF) Incident Light Levels

Reads as a batch the Sensor data starting from unit number 1 for the number of Sensors specified as connected. The data is given as hexadecimal values, with 16 bits of data for each Unit. Negative data is expressed as its two's complement.

Unit number 1 incident light level	Unit number 2 incident light level		Unit number N + 1 incident light level	Unit number N incident light level

Units numbers specified as number of connected Sensors: N Units

The Batch Read Incident Light Level command cannot be used when one or more E39-TM1 Terminal Block Units is connected.

Data for the Batch Read ON/OFF Incident Light Level commands can be read only if all Sensors are E3X-DA6-P Sensors. The command cannot be used if one or more Sensors other than E3X-DA6-P Sensors are connected. For details on ON/OFF incident light levels, refer to *Appendix B Monitoring Incident Light Levels of E3X-DA6-P Sensors.*

Read Threshold Setting

Reads the threshold setting of the Sensor for the unit number specified in the instance ID. The data is given as a 2-byte (4-digit) hexadecimal value, and negative data is expressed as its two's complement.

Batch Read Threshold Settings

Reads as a batch the Sensor data starting from unit number 1 for the number of Sensors specified as connected. The data is given as hexadecimal values, with 2 bytes (4 digits) of data for each Unit. Negative data is expressed as its two's complement.

Unit number 1 threshold setting	Unit number 2 threshold setting		Unit number N − 1 threshold setting	Unit number N threshold setting

Units numbers specified as number of connected Sensors: N Units

This command cannot be used if one or more E39-TM1 Terminal Block Units is connected.

Read Basic Settings   Reads the basic settings of the Sensor for the unit number specified in the instance ID. The data contents are as follows:

Bit	Contents
00	Display Contents:
01	0: Digital incident level
	1: Digital percentage
	2: Analog incident level
02	Display Orientation:
	0: Standard
	1: Reversed
03	Hold Setting:
04	0: OFF
	2: Peak
	3: Bottom
05	Flashing Setting:
	0: OFF
	1: ON
06	Sensing Setting:
07	0: Standard
	2: Super long-distance
	3: Super high-speed
08	Timer Mode:
09	1: OFF-delay
	2: ON-delay
	3: One-shot
10	Number of Display Digits:
11	0: 4 digits
12	1: 3 digits
	2: 2 digits
	3: 1 digit
	4: 0 digits
13	Always 0.
14	Teaching during RUN
	0: OFF
	1: ON
15	Eco Mode
	0: OFF
	1: ON

Read Timer Settings   Reads the OFF-delay, ON-delay, and one-shot timers of the Sensor for the unit number specified in the instance ID. The data is given as a 2-byte (4-digit) hexadecimal value. The value is given in ms.

Read Hysteresis Width   Reads the hysteresis width of the Sensor for the unit number specified in the instance ID. The data is given as a 3-digit hexadecimal value. Bits 14 and 15 are used to display the sensing setting.

Bit	Contents
00 to 11	Hysteresis Width
12	Always 0.
13	Always 0.
14	Sensing Setting:
15	0: Standard
	2: Super long-distance
	3: Super high-speed

Read Custom Flags   Reads whether the following settings for the Sensor of the unit number specified in the instance ID can be set or monitored from the sensor key switch.

Bit	Contents
00	Hold Setting:
01	0: Enable
	1: Not displayed
	2: Disable
02	Flashing Setting:
03	0: Enable
	1: Not displayed
	2: Disable
04	OFF-delay Timer Setting:
05	0: Enable
	1: Not displayed
	2: Disable
06	Sensing Setting:
07	0: Enable
	1: Not displayed
	2: Disable
08	Sensitivity Adjustment:
	0: Enable
	1: Disable
09	Teaching:
	0: Enable
	1: Disable
10	Display Contents:
	0: Enable
	1: Disable
11	Zero Reset:
	0: Enable
	1: Disable
12	Monitor Focus Range:
13	0: Enable
	1: Not displayed
	2: Disable
14	Display Orientation:
15	0: Enable
	1: Not displayed
	2: Disable

Read Special Flags

Reads the status of the following settings for the Sensor of the unit number specified in the instance ID. This command is possible with E3X-DA6TW and E3X-DA8TW Sensors only. Executing this command for any other sensor will cause an error to occur.

Bit	Contents
00	0 or 1
01	0 or 1
02	Always 0.
03	Always 0.
04	Operating Mode Flag (one-word): 0: Dark-ON 1: Light-ON
05	Operating Mode Flag (two-word): 0: Dark-ON 1: Light-ON
06	Area Setting Flag: 0: AREA OFF 1: AREA ON
07	0 or 1
08	Always 0.
09	Always 0.
10	Always 0.
11	Always 0.
12	Always 0.
13	Always 0.
14	Always 0.
15	Always 0.

Note Bits 00, 01, and 07 are read as 0 or 1 according to the internal status of the Sensor.

Read Number of Sensors

Reads the number of Sensors that are connected. The data is given as a 2-byte (4-digit) hexadecimal value. When pin 3 is ON (registration using explicit messages or Configurator), the values from the internal memory are read, and when pin 3 is OFF (registration using rotary switch), the setting from the rotary switch is read. The data range is from 0001 Hex to 0010 Hex.

Read Number of Light Level Monitoring Units

Reads the number of Units monitoring incident light levels when using two-word mode with incident light level monitoring (i.e., when DIP switch pins 1 and 2 are OFF). The data is given as a 2-byte (4-digit) hexadecimal value. When pin 3 is ON, the values from the internal memory are read, and when pin 3 is OFF, the values from the rotary switch are read. The data range is from 0000 Hex to 0010 Hex.

2-6-3   WRITE Command

The WRITE command is used to write data to the Fiber Amplifier Sensor Communication Unit or the Sensors connected to it. When an OMRON master is used, the formats of the command and response blocks are as follows:

Command Block

Destination node address	Service Code	Class ID	Instance ID	Attribute ID	Write data
	10 (fixed)				
1 byte	1 byte	2 bytes	2 bytes	1 byte	2 bytes

Response Block

Normal Format

Number of received bytes	Destination node address	Service Code
0002 (fixed)		90 (fixed)
2 bytes	1 byte	1 byte

Error Format

Number of received bytes	Destination node address	Service Code	Error Code
0004		94 (fixed)	
2 bytes	1 byte	1 byte	2 bytes
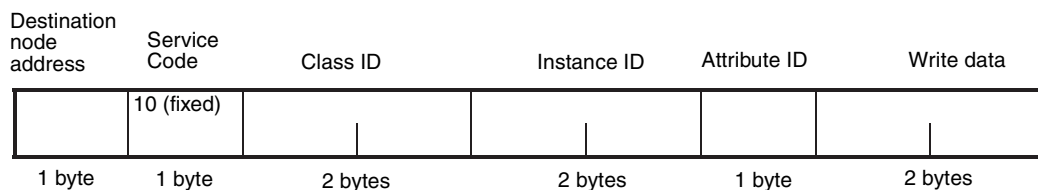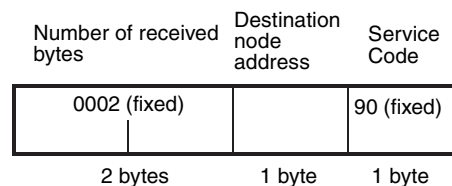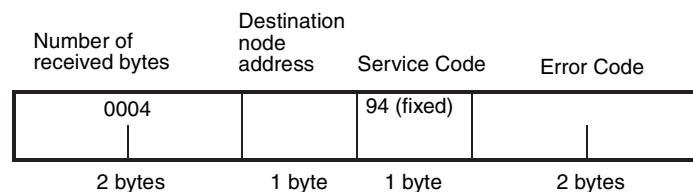
List of WRITE Commands

The following table lists the explicit message WRITE commands.

Explicit message	Function	Command		
		Class ID	Instance ID	Attribute ID
Write Threshold Setting	Specifies the unit number as the instance ID and writes threshold value.	009C	Unit number	11
Write Basic Settings	Specifies the unit number as the instance ID and writes basic settings.	009C	Unit number	12
Write Timer Setting	Specifies the unit number as the instance ID and writes timer.	009C	Unit number	13
Write Hysteresis Width	Specifies the unit number as the instance ID and writes hysteresis width.	009C	Unit number	16
Write Custom Flags	Specifies the unit number as the instance ID and writes Custom Flags.	009C	Unit number	17
Write Special Flags	Specifies the unit number as the instance ID and writes Special Flags.	009C	Unit number	1C
Write Number of Sensors	Writes the number of Sensors connected.	009C	0000	30
Write Number of Light Level Monitor Units	Writes the number of Units monitoring incident light levels.	009D	0000	31

Note	1.	The unit number specified by the instance ID must be set between 0001 Hex and 0010 Hex.
	2.	An error will occur if the unit number of an E39-TM1 Terminal Block Unit is specified.
	3.	When WRITE commands are executed, the settings are written to the internal memory. The number of times that data can be written to the internal memory is limited. The internal memory may be corrupted if more than one million (1,000,000) write operations are performed for each Sensor and parameter. Therefore, when using WRITE commands, be sure to create a communications program that prevents the number of writing operations from exceeding one million (1,000,000) for each Sensor and parameter.
	4.	Do not send commands for attribute ID that are not specified. Accidentally sending such commands may overwrite internal parameters. If the internal parameters of a connected Sensor are overwritten, execute the Initialize Sensor Settings operation command. If the internal parameters of the Fiber Amplifier Sensor Communication Unit are overwritten, write 0000 Hex for the following attribute ID settings to clear them.

Explicit message	Command		
	Class ID	Instance ID	Attribute ID
Internal parameter 1	009D	0000	32
Internal parameter 2	009D	0000	33

The following explanations provide the data format for each item.

Write Threshold Setting

Writes the threshold setting of the Sensor for the unit number specified in the instance ID to the Sensor's internal memory. The data is given as a 2-byte (4-digit) hexadecimal value, and negative data is expressed as its two's complement.

Note	1.	The Write Threshold Setting command cannot be executed when the Zero Reset setting is enabled. Disable Zero Reset to execute the Write Threshold Setting command.
	2.	The setting range of Write Threshold Setting command changes when the Write Hysteresis Width command is executed. An error will occur if the value written is outside the setting range.

Write Basic Settings

Sets the basic settings of the Sensor for the unit number specified in the instance ID. The data contents is shown in the following table.

Bit	Contents
00	Display Contents:
01	0: Digital incident level
	1: Digital percentage
	2: Analog incident level
02	Display Orientation:
	0: Standard
	1: Reversed
03	Hold Setting:
04	0: OFF
	2: Peak
	3: Bottom

Bit	Contents
05	Flashing Setting: 0: OFF 1: ON
06 07	Sensing Setting: 0: Standard 2: Super long-distance 3: Super high-speed
08 09	Timer Mode: 1: OFF-delay 2: ON-delay 3: One-shot
10 11 12	Number of Display Digits: 0: 4 digits 1: 3 digits 2: 2 digits 3: 1 digit 4: 0 digits
13	Always 0.
14	Teaching during RUN 0: OFF 1: ON
15	Eco Mode 0: OFF 1: ON

Write Timer Setting

Writes the timer setting for the OFF-delay, ON-delay, or one-shot timer of the Sensor for the unit number specified in the instance ID. The data is given as a 2-byte (4-digit) hexadecimal value. The value is set in ms. The setting range is 0000 Hex to 00C8 Hex, but the possible settings are restricted as follows:

Timer setting	Setting interval
0 to 20 ms	1-ms increments
20 to 200 ms	5-ms increments

An error will occur if a value is written that does not meet the above setting interval conditions.

Write Hysteresis Width

Writes the hysteresis width of the Sensor for the unit number specified in the instance ID. The data is given as a 2-byte (4-digit) hexadecimal value.

Write Custom Flags

Set whether the following settings for the Sensor of the unit number specified in the instance ID can be set or monitored from the sensor key switch.

Bit	Contents
00 01	Hold Setting: 0: Enable 1: Not displayed 2: Disable
02 03	Flashing Setting: 0: Enable 1: Not displayed 2: Disable

Bit	Contents
04	OFF-delay Timer Setting:
05	0: Enable
	1: Not displayed
	2: Disable
06	Sensing Setting:
07	0: Enable
	1: Not displayed
	2: Disable
08	Teaching:
	0: Enable
	1: Disable
09	Sensitivity Adjustment:
	0: Enable
	1: Disable
10	Zero Reset:
	0: Enable
	1: Disable
11	Display Contents:
	0: Enable
	1: Disable
12	Monitor Focus Range:
13	0: Enable
	1: Not displayed
	2: Disable
14	Display Orientation:
15	0: Enable
	1: Not displayed
	2: Disable

Write Special Flags

Writes the following settings for the Sensor of the unit number specified in the instance ID. This command is possible with E3X-DA6TW and E3X-DA8TW Sensors only. Writing this command for any other sensor will cause an error.

Bit	Contents
00	Always 0.
01	Always 0.
02	Always 0.
03	Always 0.
04	Operating Mode Flag (one-word):
	0: Dark-ON
	1: Light-ON
05	Operating Mode Flag (two-word):
	0: Dark-ON
	1: Light-ON
06	Area Setting Flag:
	0: Area OFF
	1: Area ON
07	Always 0.
08	Always 0.
09	Always 0.

Bit	Contents
10	Always 0.
11	Always 0.
12	Always 0.
13	Always 0.
14	Always 0.
15	Always 0.

Write Number of Sensors Writes to the Fiber Amplifier Sensor Communication Unit's internal memory the number of Sensors that are connected. An error will occur if this command is executed when pin 3 is OFF. The data is given as a 2-byte (4-digit) hexadecimal value between 0001 Hex and 0010 Hex. The default setting is 16 Sensors.

Write Number of Light Level Monitor Units Writes to the Fiber Amplifier Sensor Communication Unit's internal memory the number of Units to be monitored for incident light levels when using two-word mode with incident light level monitoring (DIP switch pin 1 OFF and 2 ON). When pin 3 is ON, the value that was written for the number of Units to be monitored for incident light levels is enabled. The data is given as a 2-byte (4-digit) hexadecimal value between 0000 Hex and 0010 Hex. The default setting is 16 Units.

2-6-4 Operation Commands

Executes teaching and other operations for the Sensors connected to the Communication Unit. When an OMRON master is used, the formats of the command and response blocks are as follows:

Command Block

Destination node address	Service Code	Class ID	Instance ID	Operation data
		009C (fixed)		
1 byte	1 byte	2 bytes	2 bytes	1 byte

Response Block **Normal Format**

Number of received bytes	Destination node address	Service Code
0002		90 (fixed)
2 bytes	1 byte	1 byte

Error Format

Number of received bytes	Destination node address	Service Code	Error Code
0004		94 (fixed)	
2 bytes	1 byte	1 byte	2 bytes
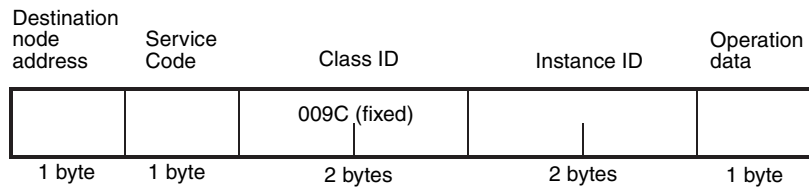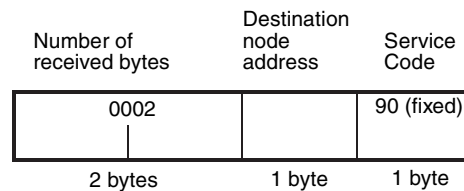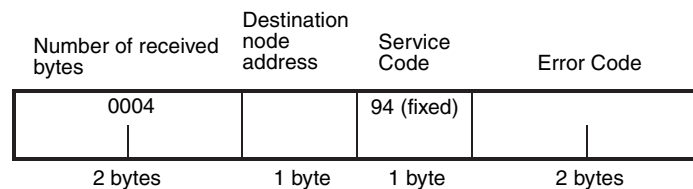
List of Operation Commands

The following table lists the explicit messages operation commands.

Explicit message	Function	Command		
		Service code	Instance ID	Operation command data
Adjust Maximum Sensitivity	Specifies the unit number as the instance ID, and sets the maximum sensitivity when the command is sent.	16	Unit number	30
Teach One Point	Specifies the unit number as the instance ID, and teaches one point when the command is sent.	16	Unit number	31
Teach First Point	Specifies the unit number as the instance ID, and teaches the first point of two-point teaching when the command is sent.	16	Unit number	32
Teach Second Point	Specifies the unit number as the instance ID, and teaches the second point of two-point teaching when the command is sent.	16	Unit number	33
Teach First Position	Specifies the unit number as the instance ID, and teaches the first position when the command is sent.	16	Unit number	34
Teach Second Position	Specifies the unit number as the instance ID, and teaches the second position when the command is sent.	16	Unit number	35
Start Zero Reset	Specifies the unit number as the instance ID, and starts the zero reset operation when the command is sent.	06	Unit number	50
Start Flashing	Specifies the unit number as the instance ID, and starts flashing when the command is sent.	16	Unit number	53
Disable Zero Reset	Specifies the unit number as the instance ID, and disables the zero reset operation when the command is sent.	07	Unit number	60
Stop Flashing	Specifies the unit number as the instance ID, and stops flashing when the command is sent.	07	Unit number	63
Initialize Sensor Settings	Specifies the unit number as the instance ID, and resets all the Sensor internal settings to the default settings when the command is sent.	05	Unit number	None
Reset	When the command is sent, all the connected Sensors are reset by turning the power OFF and then ON again.	05	00	None

1. The unit number specified by the Instance ID must be set to between 0001 Hex and 0010 Hex.

2. An error will occur if the unit number of an E39-TM1 Terminal Block Unit is specified.

3. An error will occur when performing two-point teaching or two-position teaching if the command for the second point is sent without sending the command for the first point/position. Send the command for the first point/ position before sending the command for the second one.

4. The Initialize Sensor Settings command will return the settings for each Sensor to its default value. The Sensor Reset command interrupts the power by turning the Sensor power OFF and ON again.

2-6-5   List of Error Codes

Response codes	Error name	Cause
08FF	Service not supported	There is an error in the service code.
09FF	Invalid attribute value	The specified attribute ID is not supported. The write data is outside the data range. • Threshold setting is outside setting range. • Basic settings are outside setting range. • Timer is not set according to restrictions. • Hysteresis width is set outside range. • Custom Flags are set outside range. • Special Flags are set outside range. • Number of Sensors connected is not set between 1 and 16. • Number of Units monitoring incident light are not set between 1 and 16.
16FF	Object does not exist	The specified instance ID is not supported. • Number of Units specified in instance ID is greater than number of Sensors connected.
15FF	Too much data	Size of data is longer than specified size.
13FF	Not enough data	Size of data is shorter than specified size.
0CFF	Object state conflict	Specified command cannot be executed. • Mobile Console is connected. • Error has occurred in communications with Sensor. • Sensor is not set to RUN mode. • The command for the second point/position of a Two-point Teaching or Two-position Teaching commands was executed without executing the command for the first one. • An unsupported command was sent. (For example, a Read Incident Light Level command was sent to a Terminal Block Unit.)
20FF	Invalid parameter	The specified operation data is not supported.
0EFF	Attribute not settable	A write service code was specified for a read-only attribute ID.

2-6-6   Using Explicit Messages: Example

The following example is for sending explicit messages using a CS1W-DRM21 DeviceNet Unit.

DeviceNet Unit, unit number: 0

CMND(490)

CPU Unit

Node address: 05
Unit address: FE Hex or 10 Hex

Explicit message

Fiber Amplifier Sensor Communication Unit, node address: 11
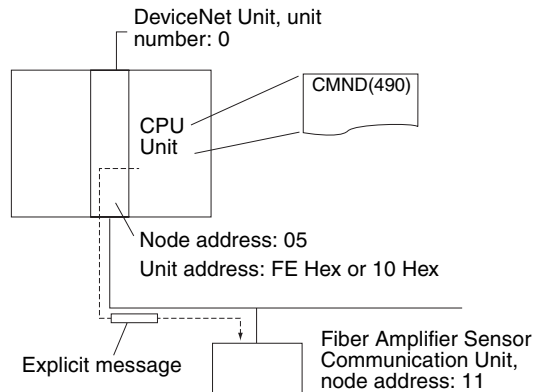
Operation
- The threshold of the Sensor for unit number 1 connected to the Fiber Amplifier Sensor Communication Unit is written.
- The EXPLICIT MESSAGE SEND (2801) command is used to read data.
- The command data is written starting at D01000 in the CPU Unit, and the response data is stored starting at D02000.
- When a command is not executed properly, the end code is stored in D00006, and the command is resent.

Command Details

[CMND   S   D   C]

S	D01000+ 0:	2801 Hex	Command code
	+ 1:	0B10 Hex	Fiber Amplifier Sensor Communication Unit, node address: 11, Service code: 10 Hex
	+ 2:	009C Hex	Class ID: 009C Hex
	+ 3:	0001 Hex	Instance ID: 0001 Hex
	+ 4:	11FF Hex	Attribute ID: 11 Hex and write data in rightmost byte: FF Hex
	+ 5:	0700 Hex	Write data in leftmost byte: 07 Hex
D	D02000:	First word where response stored	
C	D00000+ 0:	000B Hex	Number of command data bytes
	+ 1:	0008 Hex	Number of response data bytes
	+ 2:	0001 Hex	Destination network address: 1
	+ 3:	05FE Hex	Destination node address: 5 Destination unit address: FE Hex (or 10 Hex)
	+ 4:	0000 Hex	Response request, communications port No.: 0, retries: 0 Hex
	+ 5:	003C Hex	Response monitoring time: 6 s

Response

D	D02000 + 0:	2801 Hex	
	+ 1:	0000 Hex	
	+ 2:	0002 Hex	
	+ 3:	0B90 Hex	Response source node address: 11 (0B Hex) Normal completion: 90 Hex

Ladder Program Example

000000 A20011 — First Cycle Flag	(071) BSET #0000 D00000 D02999 — #0000 set in D00000 to D02999.
	(021) MOV #000B D00000 — #000B set in D00000 (send data bytes: 11).
	(021) MOV #0008 D00001 — #0008 set in D00001 (receive data bytes: 8).
	(021) MOV #0001 D00002 — #0001 set in D00002 (destination network address: 01)
	(021) MOV #05FE D00003 — #05FE set in D00003 (destination node address: 05, destination unit address: FE)
	(021) MOV #0000 D00004 — #0000 set in D00004 (response required, communications port No.: 0, retries: 0).
	(021) MOV #003C D00005 — #003C set in D00005 (response monitoring time: 6 s)
	(021) MOV #2801 D01000 — #2801 set in D01000 (explicit command).
	(021) MOV #0B10 D01001 — #0B10 set in D01001.
	(021) MOV #009C D01002 — #009C set in D01002.
	(021) MOV #0001 D01003 — #0001 set in D01003.
	(021) MOV #11FF D01004 — #11FF set in D01004.
	(021) MOV #0700 D01005 — #0700 set in D01005.
	(021) MOV #0001 0000 — #0001 set in CIO 0000.

Command data (D01000–D01005)

Execute conditions

000014 000000 A20200 151100 — Network Communications Enabled Flag / Online status (word n + 1, bit 00)	(490) CMND D01000 D02000 D00000 — 11 bytes of command data is sent from D01000 to destination node address 05, and 8 bytes of response data is stored in D02000 of the local node. (D00000 is control data).
	(025) ASL 0000 — Contents of CIO 0000 is shifted one bit to the left. (CIO 000001 turns ON)
000019 000001 A20200 A21900 — Network Communications Enabled Flag / Network Communications Error Flag	(021) MOV A203 D00006 — A203 (Network Communications Response Code) is stored in D00006.
	(026) ASR 0000 — Contents of CIO 0000 is shifted one bit to the right and retry executed in next cycle. (CIO 000000 turns ON).
000025	(001) END

END

2-7 Setting, Monitoring, and Operating Sensors from the DeviceNet Configurator

2-7-1 Overview

The DeviceNet Configurator (Ver. 2.10 or higher) can be used to edit and monitor device parameters to support the following setting, monitoring, and operating functions.

Setting and Downloading from the Communication Unit

- Setting the number of Sensors connected.
- Setting the number of Units monitoring incident light levels.

The above settings, however, are enabled only when pin 3 of the Communication Unit DIP switch is ON.

Setting and Downloading Sensor Settings

- Threshold settings
- Basic settings
- Timer setting
- Hysteresis width
- Custom Flags
- Special Flags (E3X-DA6TW and E3X-DA8TW)

Monitoring the Communication Unit

- Sensor ON/OFF data
- The following status:
  - Normal communications with E3X
  - Communications errors with E3X
  - Number of Sensors that can communicate
  - Switching method for setting number of Sensors connected
  - Number of Sensors connected

Sensor Operations

- Adjusting the maximum sensitive
- Teaching one point
- Teaching the first point for two-point teaching
- Teaching the second point for two-point teaching
- Teaching the first position for two-position teaching
- Teaching the second position for two-position teaching
- Starting a zero reset
- Disable zero reset
- Start flashing
- Stop flashing
- Initializing Sensor settings
- Reset

Note If the number of Sensors connected to the Communication Unit does not match the number of Sensors that are enabled to communicate, the response time is substantially delayed when the Configurator is put online and information uploaded from the Communication Unit.

2-7-2 Setting the Communication Unit and Sensors, and Downloading

Use the following procedure to set the Communication Unit and each Sensor.

1,2,3...   1. Select and double-click the applicable Communication Unit to display the following Edit Device Parameters Dialog Box.
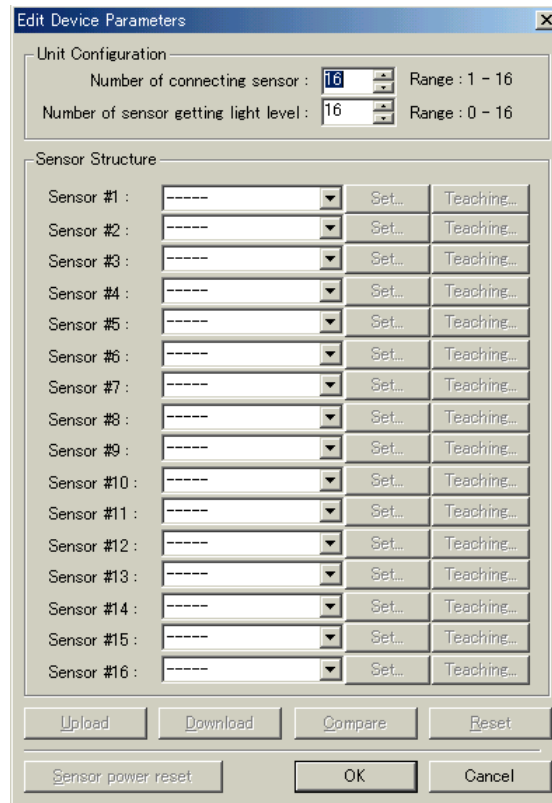
2. Edit the parameters.

Communication Unit Settings

Under *Unit Settings*, set the number of Sensors connected in the *Number of Sensors* Field and the number of Units monitoring incident light in the *Incident Light Monitoring Units* Field.

Sensor Settings

a) Under *Sensor Structure*, select the field to the right of the relevant Sensor number (Sensor #□, where the box is the unit number), click the down arrow, and select the Fiber Amplifier Unit model number from the pull-down menu.
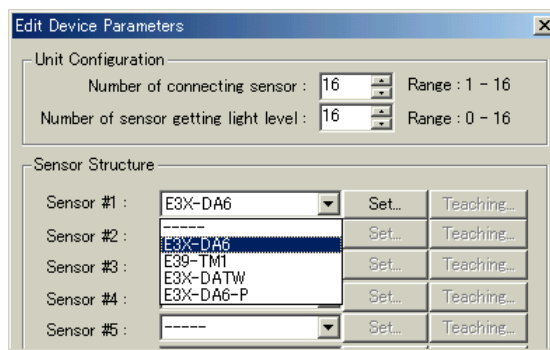
Note Select **E3X-DA6** for the E3X-DA8, E3X-DAB6, E3X-DAB8, E3X-DAG6, and E3X-DAG8. Select **E3X-DATW** for the E3X-DA6TW and E3X-DA8TW.

b) Click the **Settings** Button to the right of the registered Fiber Amplifier Unit to display the following Edit Sensor Parameters Dialog Box.

Note There are no settings for E39-TM1 Terminal Block Units, so the Settings Button is disabled.
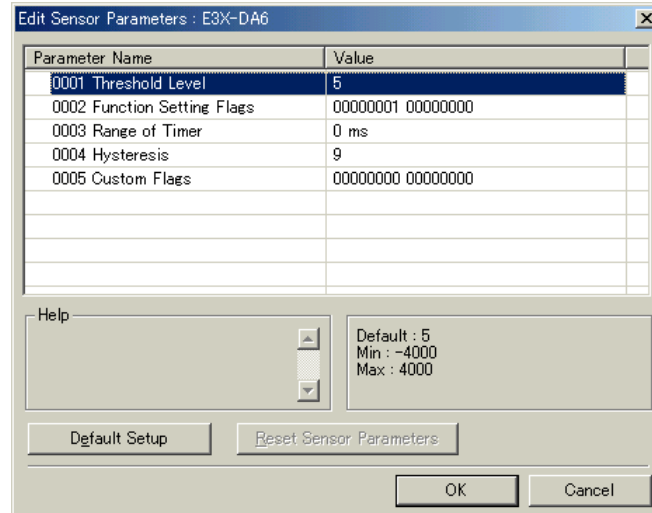
c) Set the following items from the Edit Sensor Parameters Dialog Box. (The items displayed will vary according to the Fiber Amplifier Unit model used.)

• Threshold Level: Threshold Settings

• Function Setting Flags: Basic Settings

• Range of Time: Timer Setting

• Monitor Output Upper Limit

• Monitor Output Lower Limit

• Hysteresis: Hysteresis Width

• Custom Flags

• Special Flags

For Basic Settings (Function Setting Flags), double-click the **Function Setting Flags** Field to display the following dialog box. Set the basic settings, such as Eco Mode (see note below), for each Sensor.
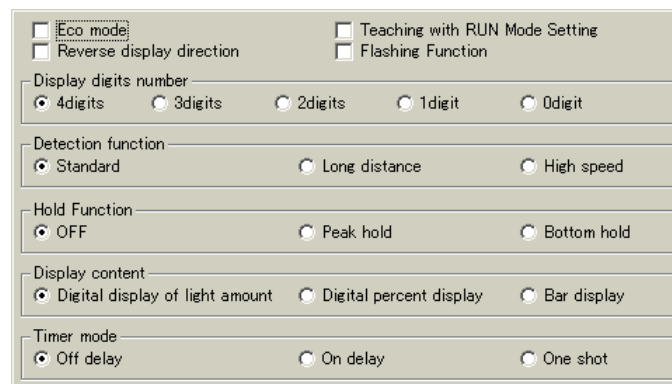
Note "Eco Mode" is a power-saving mode and stands for "ecologically friendly" mode.

For Custom Flags, double-click the **Custom Flags** Field to display the following dialog box. Set the Sensor Custom Flags such as the Hold Setting (Hold function).

3. After completing all settings, return to the Edit Device Parameters Dialog Box.

4. Switch the Configurator to online mode by selecting **Network** and **Connection**.

5. Click the **Download** Button in the Edit Device Parameters Dialog Box.

2-7-3 Uploading to Communication Unit and Monitoring/Setting Parameters Online

Use the following procedure to monitor the Communication Unit.

Communication Unit Monitoring

1,2,3...   1. Switch the Configurator to online mode by selecting **Network** and **Connection**.

2. Select **Network** and **Upload** to upload the network configuration.

3. Select and double-click the applicable Communication Unit.
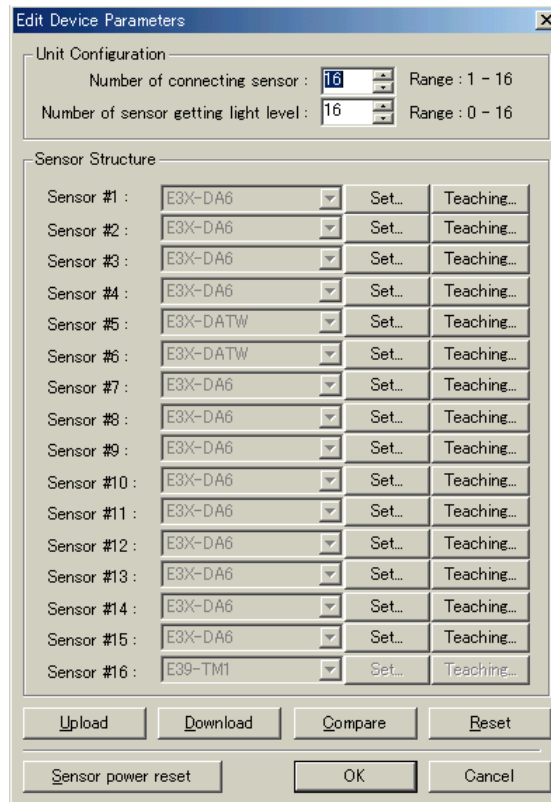
4. Click the **Settings** Button to the right of the Fiber Amplifier Unit model to monitor the current settings.
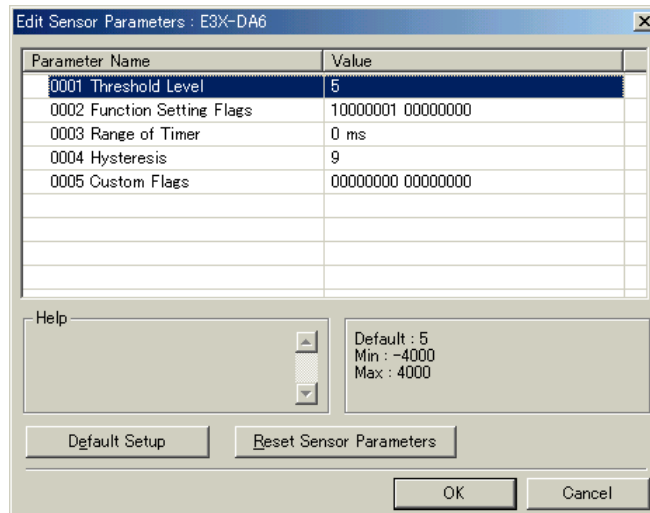
5. Change the settings and then click the **Download** Button in the Edit Device Parameters Dialog Box.

2-7-4 Sensor Operations

1,2,3...   1. Switch the Configurator to online mode by selecting **Network** and **Connection**.

2. Select and double-click the Communication Unit.

3. From the Edit Device Parameters Dialog Box, click the **Teaching** Button to the right of the Fiber Amplifier Unit model.
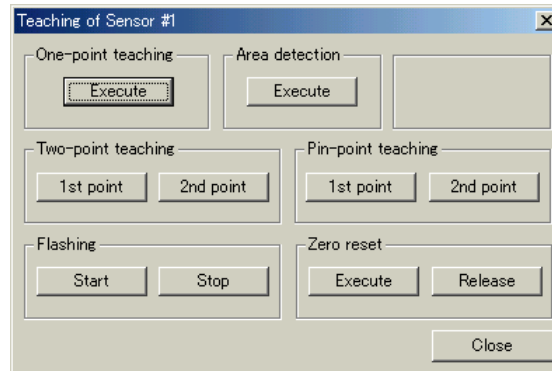
4. Set the following items from in the Sensor Teaching Dialog Box.
   - One-point Teaching
   - Maximum Sensitivity Adjustment
   - Zero Reset
   - Two-point Teaching
   - Pin-point Teaching
   - Flashing

2-7-5   Online Monitoring

Use the following procedure to monitor the Communication Unit.

1,2,3...   1. Switch the Configurator to online mode by selecting **Network** and **Con-nection**.

2. Select the applicable Communication Unit, click the right mouse button, and select **Monitor**.

3. Monitor the Units from the following screen.

Monitor incident light levels for each Sensor

Monitor ON/OFF statuses. Blue indicates ON status, and gray indicates OFF status.

SECTION 3
E3X-SRT21 for CompoBus/S Communications

This section provides details on the Fiber Amplifier Sensor Communication Unit for CompoBus/S communications, including procedures and application examples for CompoBus/S remote I/O communications used by the Unit, part names and functions, operation procedures, and wiring.

3-1 Overview of CompoBus/S Communications Model

3-1-1 Introduction

The E3X-SRT21 for CompoBus/S communications is a Communication Unit that uses the CompoBus/S to monitor the ON/OFF output signals of one or more Fiber Optical Sensors through Fiber Amplifier Units. Remote I/O communications can be used to monitor ON/OFF output signals without any special programming.

Note When using CompoBus/S Communication Units, do not read ON/OFF signals via the Fiber Amplifier Unit cable. (Fiber Amplifier Units can be connected to Cordless Slave Connectors only. They cannot be connected to Slave Connectors with Cords.)

Refer to the following manual when using the CompoBus/S Communication Unit:

CompoBus/S Operation Manual (W266).

3-1-2 CompoBus/S Communications Overview

Words in the IN Area of the master can be allocated to the E3X-SRT21 Communication Unit for storage of the ON/OFF data and status data of the Sensors for CompoBus/S remote I/O communications.
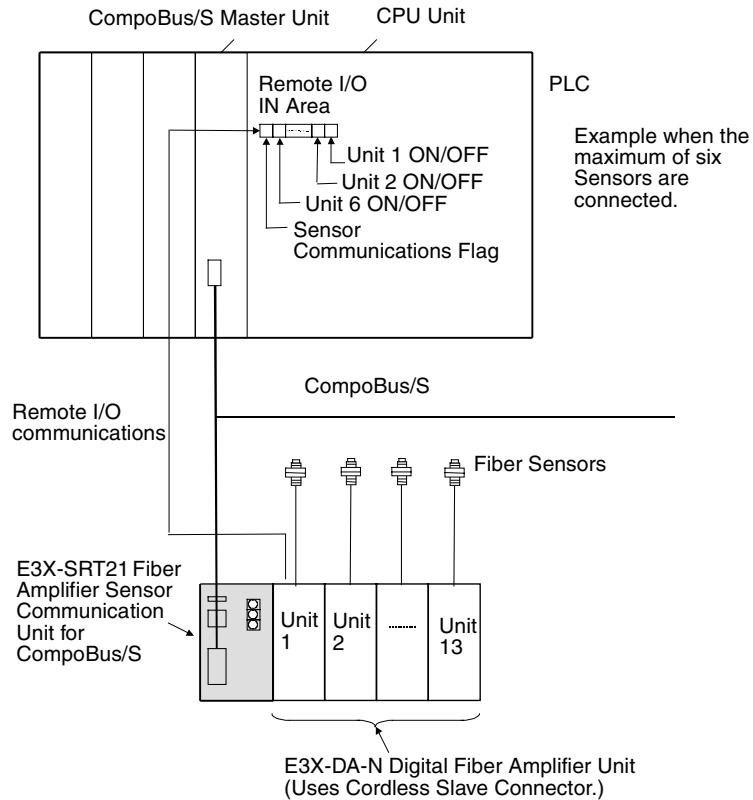
Communications method	Communications mode		Allocated words	Communications data	Number of Sensors
Remote I/O communications (functions as CompoBus/S slave)	Up to 6 Sensors	High-speed communications	One node in IN Area	Sends following data to master: ON/OFF output signals for up to 6 Sensors	6 max.
		Long-distance communications			
	Up to 14 Sensors	High-speed communications	Two nodes in IN Area	Sends following data to master: ON/OFF output signals for up to 14 Sensors	14 max.
		Long-distance communications			

3-1-3   Using CompoBus/S Remote I/O Communications: Example

The following example is for monitoring the ON/OFF output status of Fiber Amplifier Unit number 1, with DIP switch pin 1 OFF, E3X-SRT21 CompoBus/S node address 00, and CompoBus/S Master Unit Special I/O Unit number 0. The IN Area starts at CIO 2000 and runs through the rightmost byte (bits 00 to 07) of CIO 2004 (word n + 4) in the IN Area. The eight bits of the Communication Unit slave 00 are allocated bits 00 to 07 of CIO 2004.

C200HW-SRM21-V1 CompoBus/S Unit remote I/O communications

CS1 CPU Unit

IN Area

CompoBus/S

Reflected in IN Area

Fiber Sensors

Unit 1 for which ON/OFF data is being monitored.

E3X-SRT21 node address 00

IN Area (When Special I/O Unit unit number of CompoBus/S Master Unit is 0)

Bits

| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |

CIO 2004

Sensor ON/OFF output status for Unit 1

Node address 00

3-2 CompoBus/S Communication Unit Part Names and Functions

DIP switch

E3X-MC11 Mobile Console Connector
Used to connect the Mobile Console.

Rotary switches

Sensor Reset Switch
Resets Sensors connected to the Unit by turning Sensor power OFF and ON again.

Indicators

Communications Connector
Connector for CompoBus/S communications. Power is supplied to all Sensors connected to the Communication Unit through the CompoBus/S communications power supply terminals.

Power Supply Connector
The E3X-SRT21 is supplied power from the Communications Connector, so there is no power supply cable.

Note
1. Do not turn ON the power to the Communication Unit when the Mobile Console is connected. Communications will not be established with the Sensors if the Mobile Console is already connected when the Unit power is turned ON.

2. Always set the Sensors to RUN mode when using the Fiber Amplifier Sensor Communication Unit for CompoBus/S.

3. A Sensor communications error will occur under the following conditions after the Mobile Console is connected with it's power turned ON.

   • When the power to the Mobile Console is turned OFF.

   • When the Mobile Console is left idle while connected, causing the power to automatically turn OFF.

   • When the Mobile Console battery goes low, causing the power to turn OFF.

   Do not allow the above conditions to occur when using the Mobile Console, or use the Mobile Console when problems will not occur even if a Sensor communications error occurs.

Indicators

The following table shows the operation of the indicators

Indicator	Name	Color	Display	Meaning
PWR	Power	Green	Lit	Communications power supply is ON.
			Not lit	Communications power supply is OFF.
COMM	Communi-cating	Yellow	Lit	CompoBus/S communications are normal.
			Not lit	A CompoBus/S communications error has occurred or communications are on standby.
ERR	Communi-cations error	Red	Lit	A CompoBus/S communications error has occurred.
			Not lit	CompoBus/S communications are normal or communications are on standby.

Indicator	Name	Color	Display	Meaning
U.ERR	Unit error	Red	Lit	An error has occurred in the Unit.
			Not lit	The Unit is communicating normally or on standby.
SS	Sensor communications status	Green	Lit	The Sensors are communicating.
		Red	Lit	A Sensor communications error has occurred.
		---	Not lit	Sensor communications are on standby or power is OFF.

Normal Status of Indicators

PWR	Communications power supply is ON when the PWR indicator is lit green.
COMM	CompoBus/S communications are normal when the COMM indicator is lit yellow.
ERR	Operation is normal when the ERR indicator is not lit (no CompoBus/S communications error).
U.ERR	Operation is normal when the U.ERR indicator is not lit (no Unit error).
SS	Sensors are communicating when the SS indicator is lit green.

Switches

Rotary Switches

CompoBus/S Node Address Setting

Connected Number of Sensors Setting

Registers the number of Sensors connected. By setting the number of Sensors, errors can be detected in the network configuration.

The maximum number of Fiber Amplifier Units that can be connected is 14, so an error will occur if the number of Sensors is set to 15 or 16.

Note Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

DIP Switch

ON

1 2 3 4 †

Operating mode ⎯⎯

Communications mode ⎯⎯

Reserved for system use.⎯⎯

Reserved for system use.⎯⎯
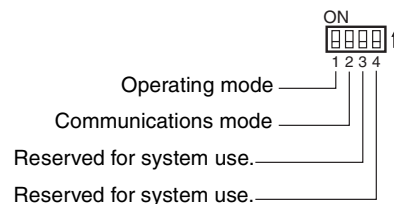
Pin 1: Operating Mode

This pin sets the operating mode. The maximum number of Fiber Amplifier Units that can be connected and the number of allocated nodes depends on the operating mode, as shown in the following table.

Pin 1 (MODE)	Number of Fiber Amplifier Units	Allocated nodes
OFF	6 max.	One node in IN Area
ON	14 max.	Two nodes in IN Area

Note Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

Pin 2: Communications Mode

This pin selects the CompoBus/S communications mode.

Pin 2 (DR)	Communications mode
OFF	High-speed mode
ON	Long-distance mode

Reserved for System Use (Pins 3 and 4)

These pins must always be OFF.

Sensor Reset Switch

Press this switch to reset the connected Sensors by executing power interruption processing. This switch is used in the following case.

If the number of Sensors with communications enabled does not match the number of Sensors connected, one or more Sensors may have become disconnected. The power reset switch is required to enable the Sensors to be reconnected properly and for communications to be reestablished between Sensors. Turning OFF the power supply would disconnect the Fiber Amplifier Sensor Communication Unit from CompoBus/S, which may effect the entire system. The Sensor reset switch is thus used to reestablish communications with the Sensors.

3-3   Operating Procedure for CompoBus/S Communication Unit

Step	Item		Details		
1	Mount the Communication Unit to the DIN Track.		Mount the Unit to the DIN Track. After mounting the Fiber Amplifier Units to the DIN Track, connect the Units to each other.		
			Note: To remove the Units from the DIN Track, first slide the Units apart to disconnect them, and then remove the Units from the DIN Track.		
2	Connect the Fiber Amplifier Units to the Communication Unit.		Connect the Communication Unit to the Fiber Amplifier Units by sliding the Communication Unit until the clips on the end are aligned and a "click" sound is heard.		
3	Set the Sensors to RUN mode		Set the mode switches to RUN mode.		
4	Connect the CompoBus/S communications connector.		The DC power supply to the Communication Unit and all Fiber Amplifier Units connected to it is supplied from the CompoBus/S communications power supply (BS+, BS–).		
5	Set the rotary switches.		Upper switch	Sets the CompoBus/S node address (0 to F).	
			Lower switch	Sets the number of Sensors connected to the Unit (1 to 14).	
6	Set the DIP switch		**Pin 1**	Maximum number of Sensors connected	Allocated node address
			OFF	6	One node in IN Area
			ON	14	Two nodes in IN Area
			Pin 2	CompoBus/S communications mode	
			OFF	High-speed mode	
			ON	Long-distance mode	
7	Turn ON the DC power supply (BS+, BS– CompoBus/S communications power supply).		Disconnect the E3X-MC11 Mobile Console before turning ON the DC power supply.		
8	Check the indicators.		PWR	Communications power supply is ON when the PWR indicator is lit green.	
			COMM	CompoBus/S communications are normal when the COMM indicator is lit yellow.	
			ERR	Operation is normal when the ERR indicator is not lit (no CompoBus/S communications error).	
			U.ERR	Operation is normal when the U.ERR indicator is not lit (no Unit error).	
			SS	Sensors are communicating when the SS indicator is lit green.	
9	Start communications	Remote I/O communications	Change the PLC to RUN mode.		

3-4 Wiring the CompoBus/S Communication Unit

3-4-1 Wiring
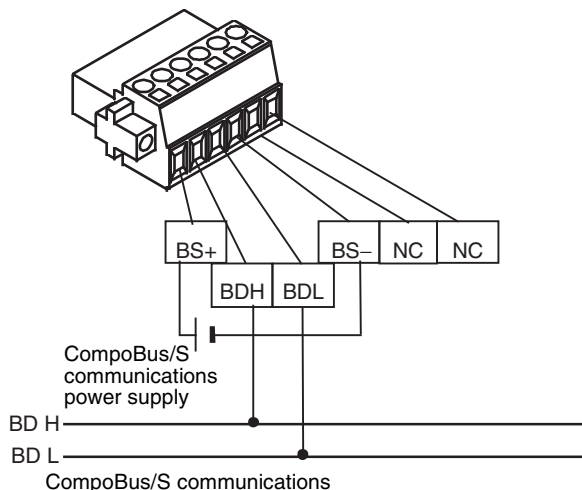
Note The CompoBus/S communications power supply provides power to the Communication Unit and all the Sensors connected to it. Select a power supply for the Communication Unit so that it has sufficient capacity for the current consumption of the Sensors.

The Unit can be supplied power from the CompoBus/S Network. Power is supplied from a special Flat Cable. Be sure to confirm that the power supply capacity of the Flat Cable is not exceeded.

The following crimp terminals are recommended (from Weidmuller).

Sleeve (part No.: 046290)   Two-wire insertion type (part No.: 901851)

The following tool is recommended.

Manufacturer: Weidmuller

PZ1.5 Crimper (Part No. 900599)

Contact: Weidmuller Inc., Nihon Weidmuller Co.Ltd., phone: 03-5820-5748

The tightening torque is 0.2 to 0.4 N·m.

3-5 CompoBus/S Remote I/O Communications

3-5-1 Master Word Allocations

The E3X-SRT21 data is stored in the IN Slave Area of the CompoBus/S master. Select the data by setting pin 1 of the DIP switch as shown in the following table.

Pin 1	Maximum number of Sensors Connected	Number of allocated nodes
OFF	6	One node in IN Area
ON	14	Two nodes in IN Area

Note Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

Pin 1 OFF (Six Sensors Max.)

Up to six Sensors can be connected in this mode. The Sensors are allocated 8 bits of data as the IN Area, which functions as the area for the designated node address as follows:

Bit	Contents
00	Unit 1 ON/OFF data
01	Unit 2 ON/OFF data
02	Unit 3 ON/OFF data
03	Unit 4 ON/OFF data
04	Unit 5 ON/OFF data
05	Unit 6 ON/OFF data
06	Sensor Communications Error Flag
07	Sensor Communications Flag

Sensor Communications Error Flag

Bit 06 turns ON when the number of Sensors registered as connected does not match the number of Sensors able to communicate, or when a communications error occurs after communications have been established with the Sensors.

Sensor Communications Flag

Bit 07 turns ON when communications are established with the Sensors.

Pin 1 ON (14 Sensors Max.)

Up to 14 Sensors can be connected in this mode. The Sensors are allocated 16 bits of data as the IN Area, as follows:

Node address setting	Node address used
Odd number	From the designated node address −1 to the set node address
Even number	From the designated node address to the designated node address +1

Node address: Odd number	Node address: Even number	Bit	Contents
Node address – 1	Node address	00	Unit 1 ON/OFF data
		01	Unit 2 ON/OFF data
		02	Unit 3 ON/OFF data
		03	Unit 4 ON/OFF data
		04	Unit 5 ON/OFF data
		05	Unit 6 ON/OFF data
		06	Unit 7 ON/OFF data
		07	Unit 8 ON/OFF data
Node address	Node address +1	00	Unit 9 ON/OFF data
		01	Unit 10 ON/OFF data
		02	Unit 11 ON/OFF data
		03	Unit 12 ON/OFF data
		04	Unit 13 ON/OFF data
		05	Unit 14 ON/OFF data
		06	Sensor Communications Error Flag
		07	Sensor Communications Flag

Note If DIP switch pin 1 is ON (up to 14 Sensors connected), the same internal processing is performed as for an Analog Terminal. Therefore, calculate the I/O response time as for the Analog Terminal. (Calculate the I/O response time as a normal Terminal when pin 1 is OFF.)

When DIP switch pin 1 is ON and the following masters are connected, the Sensor Communications Error Flag and Sensor Communications Flag are not synchronized with the ON/OFF data for Units 1 to 8.

- C200HW-SRM21 (pre-version 1) and CQM1-SRM21 (pre-version 1) Master Control Units.
- SRM1-C0□ (pre-version 1) and SRM1-C0□-V1 Programmable Controllers
- 3G8B3-SRM0□ VME Board
- C200PC-ISA□2-SRM SYSMAC Board
- SDD-CS1 Uniwire Send Unit (Manufactured by NKE Ltd.)

When a communications error occurs, for example, the data for Units 1 to 8 may be set to 0 before the Sensor Communications Error Flag has been turned ON. If this is a problem, do not use the Unit with pin 1 set to ON (up to 14 Sensors connected).

SECTION 4
E3X-CIF11 for RS-422 Communications

This section provides details on the Fiber Amplifier Sensor Communication Unit for RS-422 communications, including information on the models, procedures, settings, and application examples of CompoWay/F message communications used by the Unit, part names and functions, operation procedures, and wiring.

4-1 Overview of RS-422 Communication Unit

4-1-1 Introduction

The E3X-CIF11 for RS-422 communications is a Communication Unit that uses RS-422 to communicate with one or more Fiber Optical Sensors through Fiber Amplifier Units, including monitoring incident light levels, writing parameters, and controlling operation. Using CompoWay/F messages allows reading and writing parameters.

4-1-2 RS-422 Communications Overview

Sending CompoWay/F commands from the CompoWay/F master to the Communication Unit, which functions as a CompoWay/F slave, allows reading and writing of parameters for the connected Sensors using CompoWay/F message communications.
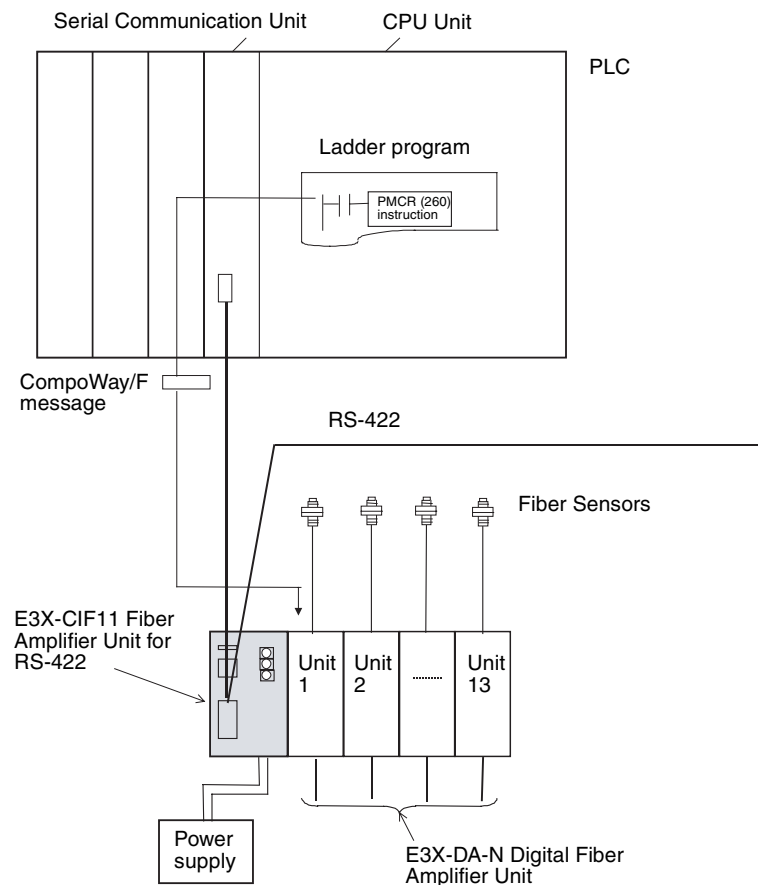
The following types of CompoWay/F messages communications are supported.

Operation	Communications details	Number of Sensors	Conditions
Reading from variable area, parameter area, and other data	Reads parameters, such as status data, incident light levels, and thresholds.	16 max.	Not possible when Mobile Console is connected.
Writing to parameter area	Writes (sets) parameters, such as the maximum sensitivity and thresholds.		
Operation commands	Perform operations such as teaching and fine-tuning		

Note The following table lists the CompoWay/F commands that can be sent to the Communication Unit.

Command	Details
Read from Variable Area	Executes Read Status Data, Read Incident Light Level, Read ON Incident Light Level, and Read OFF Incident Light Level.
Read from Parameter Area	Executes Read Number of Sensors Connected, Read Threshold Setting, Read Basic Settings, Read Timer Setting, Read Hysteresis Width, Read Custom Flags, and Read Special Flags.
Write to Parameter Area	Executes Write Number of Sensors Connected, Write Threshold Setting, Write Basic Settings, Write Timer Setting, Write Hysteresis Width, Write Custom Flags, and Write Special Flags.
Read Model Attributes	Reads Communication Unit model information.
Read Controller Status	Reads the operating status and the number of Sensors that can communicate.
Echoback Test	Executes Echoback Test.
Operation commands	Executes Adjust Maximum Sensitivity, Teach One Point, Teach First Point, Teach Second Point, Teach First Position, Teach Second Position, Start Zero Reset, Disable Zero Reset, Start Flashing, Stop Flashing, Initialize Sensor Settings, and Reset.

Note When using a PLC as the master to send CompoWay/F message communications, CompoWay/F commands are executed from the Serial Communications Board or Unit using the following standard system protocol macros.

Sequence No.	Communications sequence name	Summary
600	Send/receive with ASCII conversion (with response)	Converts the data following the specified command codes (MRC, SRC) into ASCII and sends it to the specified Unit. The response is converted into hexadecimal and stored in the specified words.
601	Broadcast with ASCII conversion (with no response)	Executes sequence number 600 as a broadcast without waiting for a response.

4-1-3   Using RS-422 Communication Unit: Example

The following example is for executing Adjust Maximum Sensitivity for unit number 1.
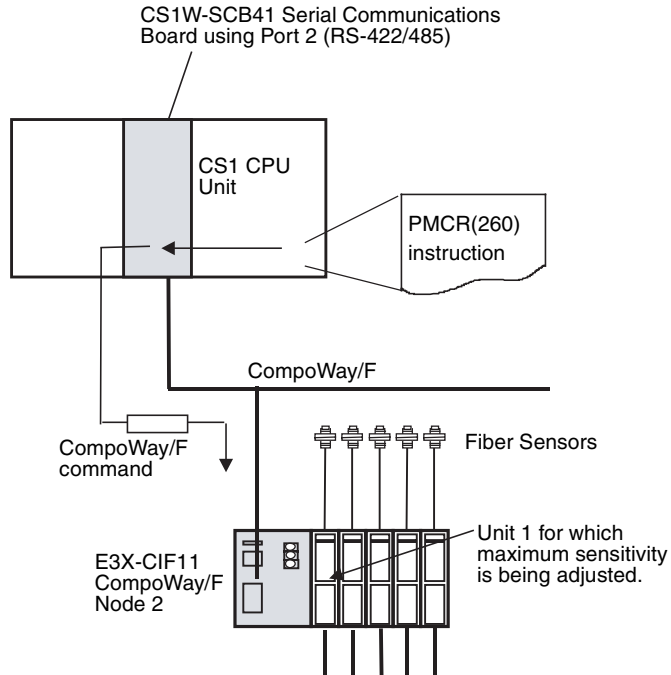
Adjust Maximum Sensitivity Command Block

The following CompoWay/F command block is executed.

STX	Compo-Way/F node No.	Sub-address	SID	MRC	SRC	Com-mand code	Related informa-tion
02 Hex	"02"	"00"	"0"	"30"	"05"	"30"	Unit No.

Note When using the PMCR(260) instruction to send messages, the data from the command block shown in bold is stored in word S onwards in the order shown in the following diagram.

Example: Sending communications sequence 600 (with ASCII conversion)
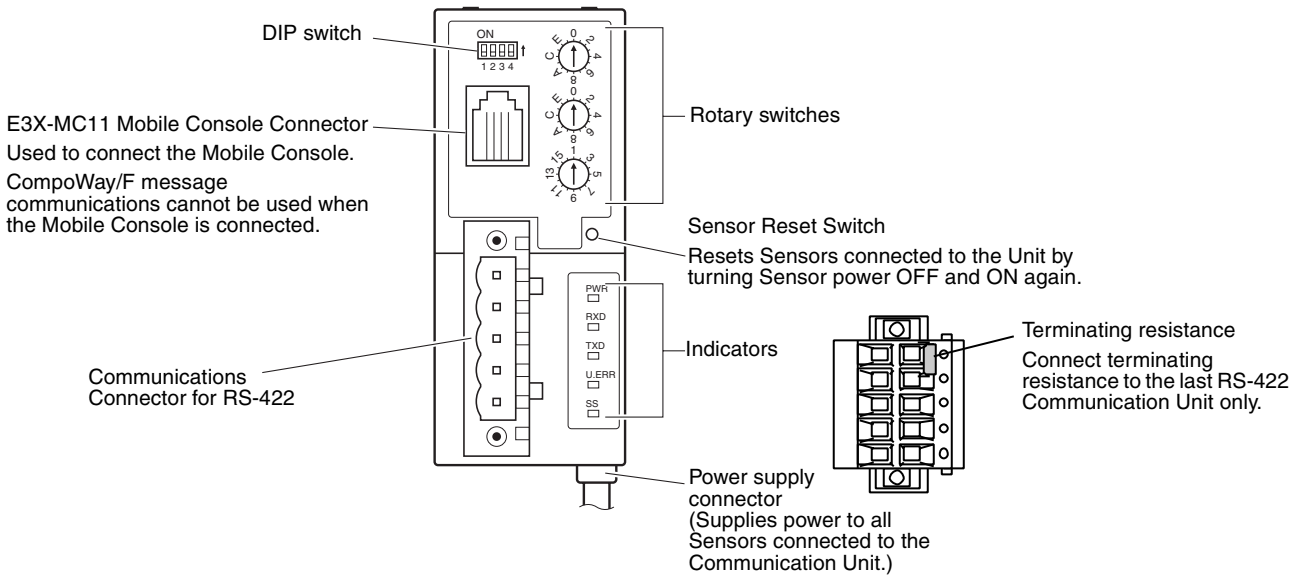

```
        15            08 07            00
S       Number of send data words
S+1  | Not used.        | Node number    |
S+2  | MRC              | SRC            |
S+3  | Number of send bytes             |
S+4  | Send data (data following MRC and SRC) |
     |                                  |
```

```
Execution
condition      A20200        191915                              Command data from
  ┤├────────────┤├────────────┤├──────────────[ PMCR  ]          D01000 is sent to
                                                [ #02E1 ]          CompoWay/F node
              Network        Protocol Macro    [ #0258 ]          number 02, and
              Communications Executing Flag     [ D01000 ]         response data is stored
              Enabled Flag                      [ D02000 ]         in D02000.
```

```
 S   D01000 | 0 | 0 | 0 | 5 |   Send data words: 5
     D01001 | 0 | 0 | 0 | 2 |   CompoWay/F node number: 02
     D01002 | 3 | 0 | 0 | 5 |   MRC: 30, SRC: 05
     D01003 | 0 | 0 | 0 | 2 |   Number of send bytes: 2
     D01003 | 3 | 0 | 0 | 1 |   Command code: 30 Hex, unit number: 01 Hex
```

4-2 RS-422 Communication Unit Part Names and Functions

Note 1. Do not turn ON the power to the Communication Unit when the Mobile Console is connected. Communications will not be established with the Sensors if the Mobile Console is already connected when the Unit power is turned ON.

2. Always set the Sensors to RUN mode when using the Fiber Amplifier Sensor Communication Unit for RS-422. When other modes (SET or ADJ) are set, the Fiber Amplifier Sensor Communication Unit cannot read or write Sensor data.

3. A Sensor communications error will occur under the following conditions after the Mobile Console is connected with it's power turned ON.

   • When the power to the Mobile Console is turned OFF.

   • When the Mobile Console is left idle while connected, causing the power to automatically turn OFF.

   • When the Mobile Console battery goes low, causing the power to turn OFF.

   Do not allow the above conditions to occur when using the Mobile Console, or use the Mobile Console when problems will not occur even if a Sensor communications error occurs.

Indicators

The following table shows the operation of the indicators.

Indicator	Name	Color	Display	Meaning
PWR	Power	Green	Lit	Power supply is ON.
			Not lit	Power supply is OFF.
RXD	Receiving serial communications	Yellow	Lit	Receiving serial communications.
			Not lit	Not receiving serial communications.
TXD	Transmitting serial communications	Yellow	Lit	Transmitting serial communications.
			Not lit	Not transmitting serial communications.

Indicator	Name	Color	Display	Meaning
U.ERR	Unit error	Red	Lit	An error has occurred in the Unit.
			Not lit	The Unit is communicating normally or is on standby.
SS	Sensor communications status	Green	Lit	The Sensors are communicating.
		Red	Lit	A Sensor communications error has occurred.
		---	Not lit	Waiting for Sensor communications or power is OFF.

Normal Status of Indicators

PWR	Communications power supply is ON when the PWR indicator is lit green.
RXD	Receiving serial communications when the RXD indicator is lit yellow.
TXD	Transmitting serial communications when the TXD indicator is lit yellow.
U.ERR	Operating normally when the U.ERR indicator is not lit (no Unit error).
SS	Sensors communicating when the SS indicator is lit green.

Switches

Rotary Switches

CompoWay/F Node Number Setting
Sets the CompoWay/F node number. Set in combination with DIP switch pin 4.

CompoWay/F Communications Mode Setting
Sets the CompoWay/F communications mode.

Connected number of Sensors Setting
Registers the number of Sensors connected. By setting the number of Sensors, errors can be detected in the network configuration.
This switch is disabled when DIP switch pin 3 is ON. The value set using CompoWay/F message communications is enabled instead.

Note Fiber Amplifier Units (E3X-DA6TW and E3X-DA8TW) that are allocated two unit numbers must be counted as two Units when counting the number of connected Sensors.

CompoWay/F Node Number Setting

This switch sets the CompoWay/F node number. The CompoWay/F node number is set by setting the rotary switch in combination with DIP switch pin 4.

Pin 4	Rotary switch	CompoWay/F node number
OFF	0	0
OFF	1	1
OFF	2	2
OFF	3	3
OFF	4	4
OFF	5	5
OFF	6	6
OFF	7	7
OFF	8	8
OFF	9	9
OFF	A	10
OFF	B	11
OFF	C	12
OFF	D	13
OFF	E	14
OFF	F	15

Pin 4	Rotary switch	CompoWay/F node number
ON	0	16
ON	1	17
ON	2	18
ON	3	19
ON	4	20
ON	5	21
ON	6	22
ON	7	23
ON	8	24
ON	9	25
ON	A	26
ON	B	27
ON	C	28
ON	D	29
ON	E	30
ON	F	31

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<u>CompoWay/F Communications Mode Setting</u>

This switch is used to select the settings for CompoWay/F data bits, parity, and stop bits according to the following table.

Rotary switch	Communications mode		
	Data bits	Parity	Stop bits
0	7	Even	2
1	7	Odd	2
2	7	None	2
3	7	Even	1
4	7	Odd	1
5	7	None	1
6	8	Even	2
7	8	Odd	2
8	8	None	2
9	8	Even	1
A	8	Odd	1
B	8	None	1
C to F	Must not be set.		

DIP Switch Settings
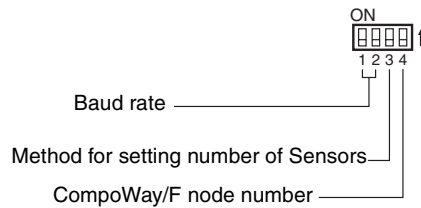
<u>Pins 1 and 2: Baud Rate Setting</u>

Pin 1 (DR0)	Pin 2 (DR1)	Baud rate
OFF	OFF	9,600 bps
ON	OFF	19,200 bps
OFF	ON	38,400 bps
ON	ON	57,600 bps

<u>Pin 3: Method for Setting the Number of Connected Sensors</u>

This pin sets whether the number of Sensors connected is set from the rotary switch or by using CompoWay/F message communications. The CompoWay/F message used is the Write to Parameter Area command for Write Number of Sensors Connected (MRC = "02", SRC = "02", parameter type 4005).

When pin 3 is ON (registration using CompoWay/F messages), the value for the number of Sensors able to communicate that is stored in the internal memory of the Fiber Amplifier Sensor Communication Unit is enabled. The default value in the internal memory is 16 Sensors. This value can be changed using CompoWay/F message communications. The setting methods are shown in the following table.

Pin 3	Method for setting number of Sensors
OFF	Use the rotary switch to register the number of Sensors.
ON	Use CompoWay/F messages to register the number of Sensors.

<u>Pin 4: CompoWay/F Node Number Setting</u>

This pin sets the unit number when set in combination with the rotary switch.

Sensor Reset Switch   Press this switch to reset the connected Sensors by executing power interruption processing. This switch is used in the following case.

If the number of Sensors with communications enabled does not match the number of Sensors connected, one or more Sensors may have become disconnected. The power reset switch is required to enable the Sensors to be reconnected properly and for communications to be reestablished between Sensors. Turning OFF the power supply would result in no response to CompoWay/F, which may effect the entire system. The Sensor reset switch is thus used to reestablish communications with the Sensors.

4-3   Operating Procedure for RS-422 Communication Unit

| Step	Item		Details
1	Mount the Communication Unit to the DIN Track.		Mount the Unit to the DIN Track. After mounting the Fiber Amplifier Units to the DIN Track, connect the Units to each other.
			Note: To remove the Units from the DIN Track, first slide the Units apart to disconnect them, and then remove the Units from the DIN Track.
2	Connect the Fiber Amplifier Units to the Communication Unit.		Connect the Communication Unit to the Fiber Amplifier Units by sliding the Communication Unit until the clips on the end are aligned and a "click" sound is heard.
			Note: Turn OFF the DC power supply before connecting the Units.
3	Set the Sensors to RUN mode		Set the mode switches to RUN mode.
4	Connect the RS-422 connector.		Connect the connector for RS-422 communications.
			Note: Be sure to connect terminating resistance to the last Communication Unit for RS-422.
5	Set the rotary switches.	Upper switch	Sets the CompoWay/F node number (0 to 31); set in combination with pin 4 of the DIP switch.
		Middle switch	Sets the CompoWay/F communications mode (0 to F).
		Lower switch	Sets the number of Sensors for communications (1 to 16). This switch is enabled only when pin 3 of the DIP switch is OFF.
			Note: If pin 3 of the DIP switch is ON, the number of Sensors is set using a CompoWay/F message.
6	Set the DIP switch.	**Pin 1**	**Pin 2**	Baud rate setting
		OFF	OFF	9,600 bps
		OFF	ON	19,200 bps
		ON	OFF	38,400 bps
		ON	ON	57,600 bps
		Pin 3	Method for setting number of Sensors connected
		OFF	Use the rotary switch to register the number of Sensors.
		ON	Use CompoWay/F messages to register the number of Sensors.
7	Turn ON the DC power supply.		Disconnect the E3X-MC11 Mobile Console before turning ON the DC power supply.
8	Check the indicators.	PWR	Communications power supply is ON when the PWR indicator is lit green.
		RXD	Receiving serial communications when the RXD indicator is lit yellow.
		TXD	Transmitting serial communications when the TXD indicator is lit yellow.
		U.ERR	Operating normally when the U.ERR indicator is not lit (no Unit error).
		SS	Sensors communicating when the SS indicator is lit green.
9	Start communications	CompoWay/F message communications	Sends CompoWay/F messages from the master.

4-4 Wiring RS-422 Communication Units

4-4-1 RS-422 Communications Wiring

The RS-422 Connector pin arrangement is as follows:
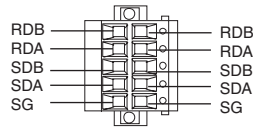
- Multidrop wiring can be used. (The left and right terminals are internally connected to allow multidrop connections).

- Connect the RS-422 in a 1:1 or a 1: N configuration.
  For a 1:N configuration, up to 32 nodes can be connecting, including the host computer or PLC.

- The total cable length is 500 m max.

- Use shielded, twisted-pair cables with a wire gauge of AWG24 to AWG12.

Connect terminating resistance to the last Communication Unit.
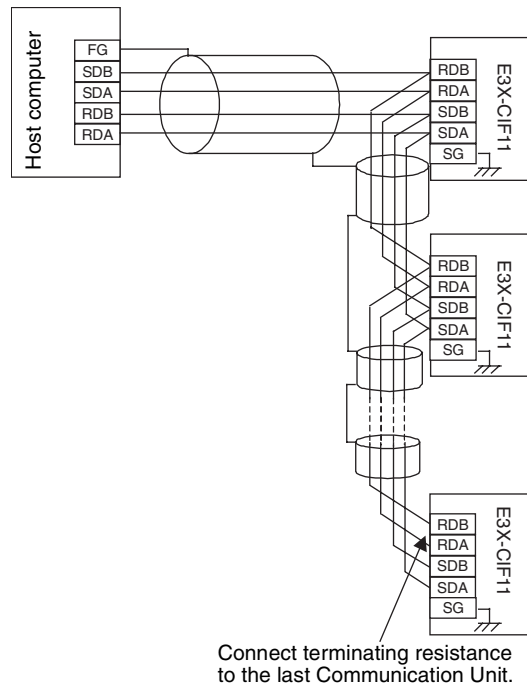
Note 1. The following crimp terminals are recommended for cables.

- Phoenix Contact AI Series

  AI0, 5-8 (AWG20) or other (Use a crimp terminal appropriate for the wire diameter)

  The following tool is recommended.

  ZA3 manufactured by Phoenix Contact

- Nichifu TC Series

  TME TC-1.25-11 (AWG22 to AWG16) or other (Use a crimp terminal appropriate for the wire diameter.)

  The following tool is recommended.

  NH-32 manufactured by Nichifu

2. The following Adaptors are recommended when converting from RS-232C to RS-422.

   • Connecting to PLC: OMRON NT-AL001 Link Adaptor

   • Connecting to computer: OMRON B500-AL004 Link Adapter

4-4-2   Connecting Terminating Resistance

Connect the provided terminating resistance (220 Ω ±1%) between the RDA and RDB terminals of the last Commmunications Unit for RS-422. Do not connect terminating resistance to any other Unit.

Provided terminating resistance
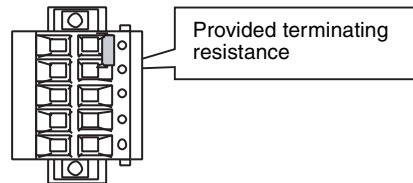
4-4-3   Wiring the Power Supply

Wire the power supply as shown in the following diagram.

Blue   Brown

0V   24V
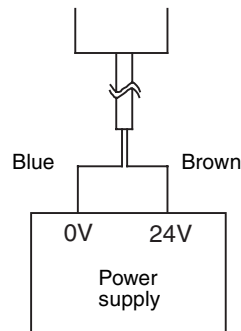
Power supply

Note 1. The power supply provides power to the Communication Unit and all the Sensors that are connected to it. Select a power supply for the Communication Unit so that it has sufficient capacity for the current consumption of the Sensors.

2. Do not remove the power supply connector.

   Disconnecting the power supply connector and then accidentally connecting the E3X-CN11 Master Connector to the Fiber Amplifier Sensor Communication Unit or connecting the disconnected cables to the Fiber Amplifier Unit may damage the Fiber Amplifier Sensor Communication Unit or the Fiber Amplifier Unit.

4-5 CompoWay/F Message Communications

Sending CompoWay/F messages from the master to the Communication Unit allows reading and writing parameters of a specified Fiber Amplifier Unit. The Communication Unit processes the commands sent by the master and returns responses.

4-5-1 CompoWay/F Services: Command Text

CompoWay/F allows the following services to be specified using the command text. The service is defined in the command text using the MRC (Main Request Code) and SRC (Sub-request Code) at the beginning of the command text.

MRC	SRC	Service name	Processing
"01"	"01"	Read from Variable Area	Reads data from the variable area.
"02"	"01"	Read from Parameter Area	Reads data from the parameter area.
"02"	"02"	Write to Parameter Area	Writes data to the parameter area.
"05"	"03"	Read Unit Attributes	Reads model and version information.
"06"	"01"	Read Controller Status	Reads the operation status of the controller.
"08"	"01"	Echoback Test	Performs an echoback test.
"30"	"05"	Operation Command	Sends an operation command.

4-5-2 Command and Response Formats

The formats of command and response blocks for CompoWay/F messages are shown here. Numeric values followed by Hex, such as 02 Hex, indicate hexadecimal values. Numeric values in double quotation marks, such as "02", or without any other indication are ASCII values.

Command Block
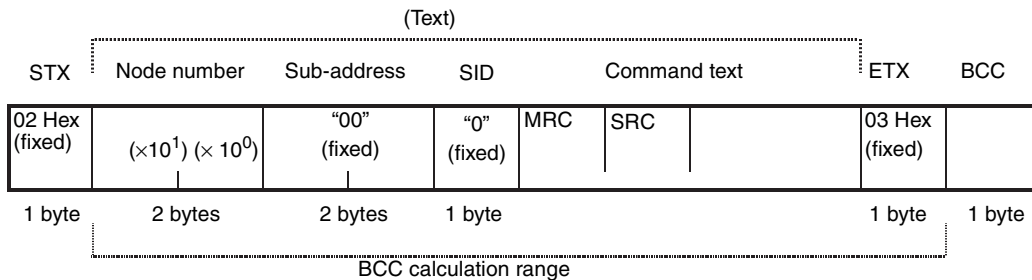
STX	This code (02 Hex) indicates the beginning of the communications block.
	Always set these characters in the first byte.
	When STX is received again during reception, reception is repeated from the point where STX was received.
Node number	This number specifies the transmission destination.
	Specify an E3X-CIF11 CompoWay/F node number.
Sub-address	This is not used for the E3X-CIF11. Always set the sub-address to "0".
SID (Service ID)	This is not used for the E3X-CIF11. Always set the service ID to "00".
Command text	This is the command text area.
ETX	This code (03 Hex) indicates the end of the text.
BCC	Block Check Character
	The BCC result is obtained by calculating an exclusive OR (XOR) of the bytes from the node number up to the ETX.

BCC Calculation Example

BCC = 30 Hex + 30 Hex + 30 Hex + 30 Hex + 30 Hex + 33 Hex + 30 Hex + 30 Hex + 35 Hex + 33 Hex + 30 Hex + 30 Hex + 31 Hex + 03 Hex = 37 Hex

The "+" indicates an exclusive OR (XOR).

Response Block

1 byte   2 bytes   2 bytes   2 bytes   1 byte 1 byte

The response end codes are as follows:

End code	Name	Description	Error detection priority
"00"	Normal completion	The command ended normally without error.	None
"0F"	Command error	The specified command could not be executed. The response code should indicate why the command could not be executed.	8
"10"	Parity error	A parity error occurred during reception of one of the characters.	2
"11"	Framing error	A framing error occurred during reception of one of the characters.	1
"12"	Overrun error	An overrun error occurred during reception of one of the characters.	3

End code	Name	Description	Error detection priority
"13"	BCC error	Received an incorrect BCC value.	5
"14"	Format error	• The command text contains characters other than 0 to 9, or A to F. (This error is not applicable to the echoback test.) • No SID and command text. • No command text. • No MRC/SRC included in command text.	7
"16"	Sub-address error	• Received a block with an unsupported sub-address. • No sub-address, SID, and command text. • Sub-address is less than two characters, and there is no SID and command text.	6
"18"	Frame length error	The received frame length exceeds the fixed number of bytes.	4

An end code is returned for each command block addressed to the local node. A response is not returned if the characters in the response block are incomplete up to the ETX and BCC. The error detection priority indicates the order by which errors are detected when multiple errors occur simultaneously.

Note
1. Noise interference may prevent a response being returned or cause an error response to occur. Always perform retry processing from the master if noise interferes with responses.

2. The response time after sending a command can be as much as 6 s. If a response has not been returned, wait 6 s before sending the next command.

Examples of End Codes when Errors Occur

The following examples show an end codes for commands that did not end normally.

Example 1: Illegal Sub-address, No SID, and No Command Text

Command Block

STX	Node number	Sub-address		ETX	BCC
02 Hex		"0"	"A"	03 Hex	

Response Block

STX	Node number	Sub-address		End code		ETX	BCC
02 Hex		"0"	"A"	"1"	"6"	03 Hex	

The end code is 16 (sub-address error). This end code is used because the sub-address was received and the error detection priority of a sub-address error is higher than a format error.

Example 2: No Command Text

Command Block

STX	Node number	Sub-address	SID	ETX	BCC
02 Hex		"0"	"0"	"0"	03 Hex	

Response Block

STX	Node number	Sub-address		End code		ETX	BCC
02 Hex		"0"	"0"	"1"	"4"	03 Hex	

The end code is 14 (format error).

Example 3: Node Number Missing

Command Block

STX		ETX	BCC
02 Hex		03 Hex	
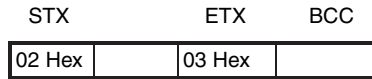
The node number is missing one character.

Response Block

There is no response.

Example 4: No Sub-address and Incorrect BCC

Command Block

STX	Node number	ETX	BCC
02 Hex		03 Hex	Err

Response Block

STX	Node number	Sub-address		End code		ETX	BCC
02 Hex		"0"	"0"	"1"	"3"	03 Hex	
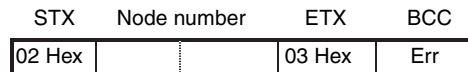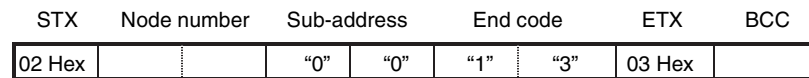
The sub-address is 00 and the end code is 13 (BCC error).

4-5-3 Read from Variable Area (MRC = "01", SRC = "01")

This service reads from the variable area.

Item	Description	Variable type	Read start address	Bit position	Number of elements
Read Status	Reads status of Sensors.	"81"	"0000"	"00"	"0001"
Read Incident Light Level (See note 1.)	Specifies unit number in read start address and reads incident light levels for the specified number of elements.	"82"	Unit number	"00"	"0001" to "0010"
Read ON Incident Light Level (See note 2.)	Specifies unit number in read start address and reads ON incident light levels for the specified number of elements.	"83"	Unit number	"00"	"0001" to "0010"
Read OFF Incident Light Level (See note 2.)	Specifies unit number in read start address and reads OFF incident light levels for the number of elements.	"84"	Unit number	"00"	"0001" to "0010"

Note 1. An error will occur if the Read Incident Light Level command is sent with the unit number of an E39-TM1 Terminal Block Unit.

2. An error will occur if the Read ON/OFF Incident Light Level command is sent with the unit number for a Unit other than the E3X-DA6-P.

Command Block The following diagram shows the command text in the CompoWay/F command block.

MRC	SRC	Variable type	Read start address	Bit position	Number of elements
"01"	"01"			"00"	
2 bytes	2 bytes	2 bytes	4 bytes	2 bytes	4 bytes

Response Block

The following diagram shows the command text in the CompoWay/F response block.

MRC	SRC	Response code	Read data
"01"	"01"		
2 bytes	2 bytes	4 bytes	Number of elements
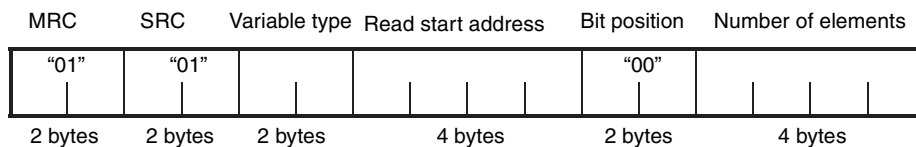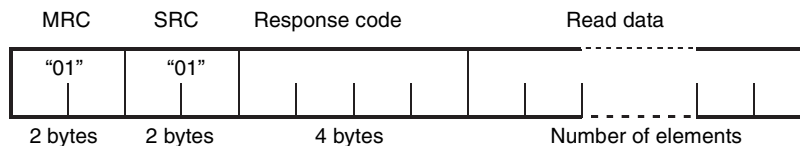
Read Start Address

Specifies as hexadecimal ASCII the unit number of the Sensor that is to be read from. For example, to specify unit number 10, set the address to "000A" (30303041 Hex). The read start address is always "0000" for commands that do not require a unit number to be specified.

Bit Position

Bit access is not supported by the E3X-CIF11. This setting is always "00".

Number of Elements

Specifies as hexadecimal ASCII the number of Units after the specified unit number that are to be read from. The number of elements for Read ON/OFF Data and Read Status can be set to "0001" only.

Read Data

Provides the data read in hexadecimal ASCII.

The following information describes the data format for each item.

Read Status

Bit	Contents
00	Number of Sensors connected, 2^0
01	Number of Sensors connected, 2^1
02	Number of Sensors connected, 2^2
03	Number of Sensors connected, 2^3
04	Number of Sensors connected, 2^4
05	Method for setting number of Sensors
06	Always 0.
07	Always 0.
08	Number of Sensors that can communicate, 2^0
09	Number of Sensors that can communicate, 2^1
10	Number of Sensors that can communicate, 2^2
11	Number of Sensors that can communicate, 2^3
12	Number of Sensors that can communicate, 2^4
13	Mobile Console Communications Flag
14	Sensor Communications Error Flag
15	Sensor Communications Flag

Number of Sensors Connected

Bits 00 to 04 give the number of Sensors that are currently registered in hexadecimal.

Method for Setting Number of Sensors

Bit 05 gives the status of DIP switch pin 3, which determines the method for registering the number of Sensors connected. When this bit is OFF, pin 3 is OFF, and when the bit is ON, pin 3 is ON.

Number of Sensors That Can Communicate

Bits 08 to 12 gives the number of Sensors that are currently able to communicate in hexadecimal. This setting allows the user to check how many Sensors are communicating normally when an error occurs.

Mobile Console Communications Flag

Bit 13 turns ON when the Mobile Console is connected to the Communication Unit. Communications cannot be used when the Mobile Console is connected.

Sensor Communications Error Flag

Bit 14 turns ON when the number of Sensors registered as connected does not match the number of Sensors that can communicate, or when a communications error occurs after communications have been established with the Sensors.

Sensor Communications Flag

Bit 15 turns ON when communications are established with the Sensors.

Read (ON/OFF) Incident Light Level

Reads the incident light levels as a batch for the number of Units specified in the number of elements starting from the unit number specified in the read start address. The data is given in 16-bit (4-digit) hexadecimal data for each Unit. Negative data is expressed as its two's complement.

The incident light levels of E39-TM1 Terminal Block Units cannot be read. Do not specify the Terminal Block Unit when sending the Read Incident Light Level command.

Read ON Incident Light Level and Read OFF Incident Light Level can be sent when using E3X-DA6-P Sensors only. Do not specify any other model of Sensor when sending the Read ON/OFF Light Level commands. For details on ON and OFF incident light levels, refer to *Appendix B Monitoring Incident Light Levels of E3X-DA6-P Sensors.*

Unit number N incident light level	Unit number N + 1 incident light level		Unit number N + M − 2 incident light level	Unit number N + M − 1 incident light level

Unit number specified for the read start address: Unit number N
Number of Units specified in the number of elements: M Units

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

Response code	Error name	Cause
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.
"1101"	Area type error	The area type is wrong.
"1103"	Start address out-of-range error	The read start address is out of range. • The unit number of an unconnected Sensor is specified as the read start address. The bit position is set to other than "00".
"1104"	End address out-of-range error	The unit number of the Sensor specified as the read end address (the read start address + the number of elements) is not connected.
"2203"	Operation error	The specified command could not be executed. • A Sensor communications error has occurred. • The Sensors are not able to communicate (teaching in progress, etc.) • The Mobile Console is connected.

4-5-4   Read from Parameter Area (MRC = "02", SRC = "01")

This service reads from the parameter area.

Item	Variable type	Read start address	Number of elements
Read Number of Sensors Connected	"8005"	"0000"	"8001"
Read Response Delay Time	"8006"	"0000"	"8001"
Read Threshold Setting	"8011"	Unit number	"8001" to "8010"
Read Basic Settings	"8012"	Unit number	"8001"
Read Timer Setting	"8013"	Unit number	"8001"
Read Hysteresis Width	"8016"	Unit number	"8001"
Read Custom Flags	"8017"	Unit number	"8001"
Read Special Flags	"801C"	Unit number	"8001"

Note   1.   An error will occur if the Read from Parameter Area command is sent with the unit number of an E39-TM1 Terminal Block Unit.

2.   An error will occur if the Read Special Flags command is sent with a unit number of a Unit other than the E3X-DA6TW or E3X-DA8TW.

<u>Command Block</u>   The following diagram shows the command text in the CompoWay/F command block.

MRC	SRC	Variable type	Read start address	Bit position	Number of elements
"02"	"01"			"00"	
2 bytes	2 bytes	4 bytes	4 bytes	2 bytes	4 bytes

Response Block   The following diagram shows the command text in the CompoWay/F response block.

MRC   SRC   Response code   Parameter type   Read start address

"02"	"01"						

2 bytes   2 bytes   4 bytes   4 bytes   4 bytes
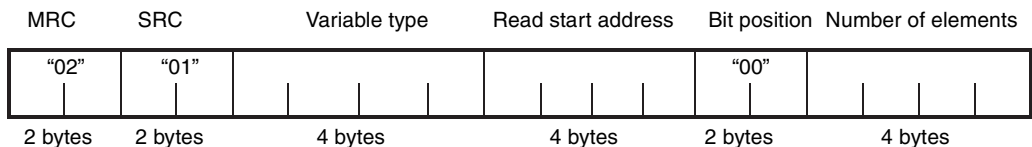
Number of elements   Read data

4 bytes   Number of elements
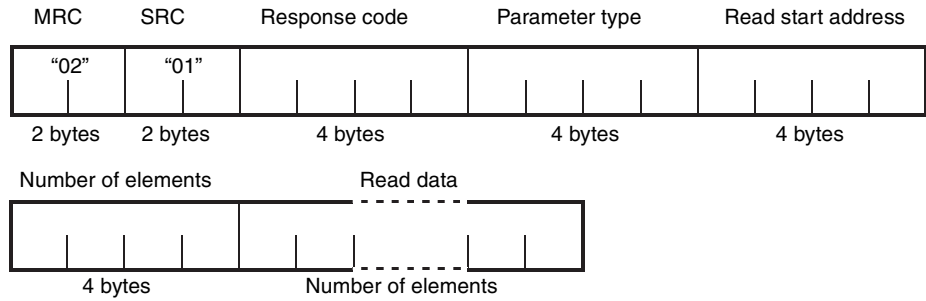
Number of Elements

Specifies as hexadecimal ASCII the number of Units starting from the specified unit number that are to be read from. The leftmost bit is set to 1. Therefore, the number of elements is set to "8001" to read one Unit. Unless executing Read Threshold Setting, the number of elements can be set to "8001" only.

Read Data

Gives the data read in hexadecimal ASCII.

The following information describes the data format for each item.

Read Number of Sensors Connected

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Number of Sensors connected														

Reads as a 4-digit hexadecimal value the number of Sensors connected. When DIP switch pin 3 is ON, the value is read from the internal memory, and when pin 3 is OFF, it is read from the rotary switch setting. The data range is 0001 Hex to 0010 Hex (1 to 16 Units).

Read Response Delay Time

Reads as a 4-digit hexadecimal value the Communication Unit's response delay time (time for a CompoWay/F response to be returned). The unit is ms. Some CompoWay/F masters, such as CQM1H Serial Communications Boards, cannot read responses that are returned too quickly. For such masters, the Communication Unit response delay time can be set by using the Write Response Delay Time command. The default setting is 0 ms.

Read Threshold Setting

Reads as a batch the threshold settings for the number of Sensors specified in the number of elements after the unit number specified in read start address. The data is given as a 2-byte (4-digit) hexadecimal value for each Unit, and negative data is expressed as its two's complement.

Unit number N Threshold	Unit number N +1 Threshold		Unit number N + M − 2 Threshold	Unit number N + M − 1 Threshold

Unit number specified in the read start address: Unit number N

Number of Units specified in the number of elements: M Units

Read Basic Settings   Reads the basic settings as shown in the following table.

Bit	Contents
00	Display Contents:
01	0: Digital incident level
	1: Digital percentage
	2: Analog incident level
02	Display Orientation:
	0: Standard
	1: Reversed
03	Hold Setting:
04	0: OFF
	2: Peak
	3: Bottom
05	Flashing Setting:
	0: OFF
	1: ON
06	Sensing Setting:
07	0: Standard
	2: Long-distance
	3: High-speed
08	Timer Mode:
09	1: OFF-delay
	2: ON-delay
	3: One-shot
10	Number of Display Digits:
11	0: 4 digits
12	1: 3 digits
	2: 2 digits
	3: 1 digit
	4: 0 digits
13	Always 0.
14	Teaching during RUN
	0: OFF
	1: ON
15	Eco Mode
	0: OFF
	1: ON

Read Timer Setting   Reads the timer setting of the OFF-delay, ON-delay, or one-shot timer as a 4-digit hexadecimal value. The value is set in ms.

Read Hysteresis Width   Reads the hysteresis width as a 3-digit hexadecimal value. Bits 14 and 15 are used to display the sensing setting.

Bit	Contents
00 to 11	Hysteresis Width
12	Always 0.
13	Always 0.
14	Sensing Setting:
15	0: Standard
	2: Long-distance
	3: High-speed

Read Custom Flags Reads whether the following settings can be set or monitored from the sensor key switch.

Bit	Contents
00	Hold Setting:
01	0: Enable
	1: Not displayed
	2: Disable
02	Flashing Setting:
03	0: Enable
	1: Not displayed
	2: Disable
04	OFF-delay Timer Setting:
05	0: Enable
	1: Not displayed
	2: Disable
06	Sensing Setting:
07	0: Enable
	1: Not displayed
	2: Disable
08	Teaching:
	0: Enable
	1: Disable
09	Sensitivity Adjustment:
	0: Enable
	1: Disable
10	Zero Reset:
	0: Enable
	1: Disable
11	Display Contents:
	0: Enable
	1: Disable
12	Monitor Focus Range:
13	0: Enable
	1: Not displayed
	2: Disable
14	Display Orientation:
15	0: Enable
	1: Not displayed
	2: Disable

Read Special Flags   Reads the status of the following setting items. This command is possible with E3X-DA6TW and E3X-DA8TW Sensors only. An error will occur if this command is executed for any other Sensor.

Bit	Contents
00	0 or 1
01	0 or 1
02	Always 0.
03	Always 0.
04	Operating Mode Flag (one-word): 0: Dark-ON 1: Light-ON
05	Operating Mode Flag (two-word): 0: Dark-ON 1: Light-ON
06	Area Setting Flag: 0: AREA OFF 1: AREA ON
07	0 or 1
08	Always 0.
09	Always 0.
10	Always 0.
11	Always 0.
12	Always 0.
13	Always 0.
14	Always 0.
15	Always 0.

Note Bits 00, 01, and 07 are read as 0 or 1 according to the internal status of the Sensor.

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

Response code	Error name	Cause
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.
"1003"	Number of elements/ data mismatch	The number of data does not match the number of elements.
"1101"	Area type error	The area type is wrong.
"1103"	Start address out-of-range error	The read start address is out of range. The unit number of an unconnected Sensor is specified as the read start address. The bit position is set to other than "00".
"1104"	End address out-of-range error	The specified number of elements is out of range.

Response code	Error name	Cause
"2203"	Operation error	• A Sensor communications error has occurred. • The Sensor response indicated a communications prohibited error. • The Sensor did not respond. • The Mobile Console is connected.

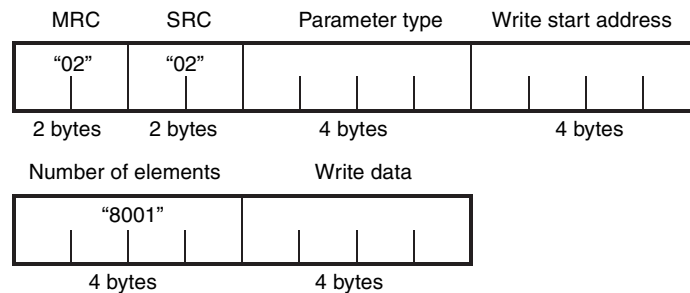## 4-5-5 Write to Parameter Area (MRC = "02", SRC = "02")

Writes the following data to the parameter area.

Item	Variable type	Read start address	Number of elements
Write Number of Sensors Connected	"8005"	"0000"	"8001"
Write Response Delay Time	"8006"	"0000"	"8001"
Write Threshold Setting	"8011"	Unit number	"8001"
Write Basic Settings	"8012"	Unit number	"8001"
Write Timer Setting	"8013"	Unit number	"8001"
Write Hysteresis Width	"8016"	Unit number	"8001"
Write Custom Flags	"8017"	Unit number	"8001"
Write Special Flags	"801C"	Unit number	"8001"

Note An error will occur if the unit number of an E39-TM1 Terminal Block Unit is specified.

Command Block

The following diagram shows the command text in the CompoWay/F command block.

MRC "02" (2 bytes), SRC "02" (2 bytes), Parameter type (4 bytes), Write start address (4 bytes)

Number of elements "8001" (4 bytes), Write data (4 bytes)

Response Block

The following diagram shows the command text in the CompoWay/F response block.

MRC "02" (2 bytes), SRC "02" (2 bytes), Response code (4 bytes)
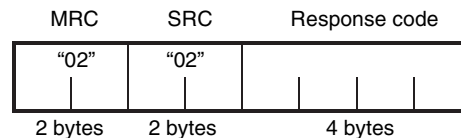
Note 1. When WRITE commands are executed, the settings are written to the internal memory. The number of times that data can be written to the internal memory is limited. The internal memory may be corrupted if more than one million (1,000,000) write operations are performed for each Sensor and parameter. Therefore, when using the Write to Parameter Area, be sure to create a communications program that prevents the number of writing operations from exceeding one million (1,000,000) for each Sensor and parameter

2. Do not send commands that are not specified for variable types. Accidentally sending such commands may cause internal parameters to be overwritten. If the internal parameters of a connected Sensor are overwritten, execute the Initialize Sensor Settings operation command.

Number of Elements

Specifies as hexadecimal ASCII the number of Units after the specified unit number that are to be written. The leftmost bit is set to 1. Therefore, the number of elements is set to "8001" to write one Unit. The number of elements for writing parameters can be set to "8001" only.

Write Data

Gives the write data in hexadecimal ASCII.

The following information describes the data format for each item.

Write Number of Sensors Connected

Writes as a 4-digit hexadecimal value the number of registered Sensors to the internal memory. The number of registered Sensors that is written to the internal memory is enabled when DIP switch pin 3 is ON. If a write operation is attempted when pin 3 is OFF, an error will occur. The data setting range is "0001" to "0010" (1 to 16 Units), and the default setting is 16 Units.

Write Response Delay Time

The Communication Unit's response delay time (time for a CompoWay/F response to be returned) is set as a 4-digit hexadecimal value. The unit is ms and the data setting range is "0000" to "0064" (0 to 100 ms). The default setting is 0 ms.

Some CompoWay/F masters, such as CQM1H Serial Communications Boards, cannot read responses that are returned too quickly. If using this type of master, set a response delay time (time taken by the Communication Unit to return a response). The default setting is 0 ms.

Write Threshold Setting

Writes the threshold value to the Sensor's internal memory as 4-digit hexadecimal value. Negative data is expressed as its two's complement.

Note

1. The Write Threshold Setting command cannot be executed when the Zero Reset setting is enabled. Disable Zero Reset to execute the Write Threshold Setting command.

2. The setting range of Write Threshold Setting command changes when the Write Hysteresis Width command is executed. An error will occur if a value is written outside the setting range.

Write Basic Settings   The data contents are shown in the following table.

Bit	Contents
00	Display Contents:
01	0: Digital incident level
	1: Digital percentage
	2: Analog incident level
02	Display Orientation:
	0: Standard
	1: Reversed
03	Hold Setting:
04	0: OFF
	2: Peak
	3: Bottom
05	Flashing Setting:
	0: OFF
	1: ON
06	Sensing Setting:
07	0: Standard
	2: Long-distance
	3: High-speed
08	Timer Mode:
09	1: OFF-delay
	2: ON-delay
	3: One-shot
10	Number of Display Digits:
11	0: 4 digits
12	1: 3 digits
	2: 2 digits
	3: 1 digit
	4: 0 digits
13	Always 0.
14	Teaching during RUN
	0: OFF
	1: ON
15	Eco Mode
	0: OFF
	1: ON

Write Timer Setting   Writes the timer setting for the OFF-delay, ON-delay, or one-shot timer as a 4-digit hexadecimal value. The setting range is "0000" to "00C8" (0 to 200 ms), but the possible settings are restricted as follows:

Timer setting	Setting interval
0 to 20 ms	1-ms increments
20 to 200 ms	5-ms increments

An error will occur if a write operation is executed using a setting interval that does not meet the restrictions.

Write Hysteresis Width   Writes the hysteresis width as a 4-digit hexadecimal value.

Write Custom Flags Sets whether the following settings can be set or monitored using the sensor key switch.

Bit	Contents
00 01	Hold Setting: 0: Enable 1: Not displayed 2: Disable
02 03	Flashing Setting: 0: Enable 1: Not displayed 2: Disable
04 05	OFF-delay Timer Setting: 0: Enable 1: Not displayed 2: Disable
06 07	Sensing Setting: 0: Enable 1: Not displayed 2: Disable
08	Teaching: 0: Enable 1: Disable
09	Sensitivity Adjustment: 0: Enable 1: Disable
10	Zero Reset: 0: Enable 1: Disable
11	Display Contents: 0: Enable 1: Disable
12 13	Monitor Focus Range: 0: Enable 1: Not displayed 2: Disable
14 15	Display Orientation: 0: Enable 1: Not displayed 2: Disable

Write Special Flags   Writes the following settings for the Sensor of the specified unit number. This command is possible with E3X-DA6TW and E3X-DA8TW Sensors only. An error will occur if this command is written for any other Sensor.

Bit	Contents
00	Always 0.
01	Always 0.
02	Always 0.
03	Always 0.
04	Operating Mode Flag (one-word): 0: Dark-ON 1: Light-ON
05	Operating Mode Flag (two-word): 0: Dark-ON 1: Light-ON
06	Area Setting Flag: 0: AREA OFF 1: AREA ON
07	Always 0.
08	Always 0.
09	Always 0.
10	Always 0.
11	Always 0.
12	Always 0.
13	Always 0.
14	Always 0.
15	Always 0.

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

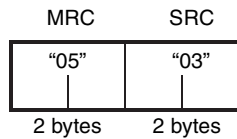| Response code	Error name	Cause
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.
"1003"	Number of elements/data mismatch	The number of data does not match the number of elements.
"1100"	Parameter error	The write data setting is out of range. • Threshold setting out of range. • Basic settings are out of range. • Timer setting is not within limits. • Hysteresis width is out of range. • Custom Flags are out of range. • Special Flags are out of range. • Number of Sensors connected is more than 16. • Response delay time is set to more than 100 ms.

Response code	Error name	Cause
"1101"	Area type error	The area type is wrong.
"1103"	Start address out-of-range error	The write start address is out of range.
		The unit number of an unconnected Sensor is specified as the write start address.
"1104"	End address out-of-range error	The number of elements is not "8001".
"2203"	Operation error	• A Sensor communications error has occurred.
		• The Sensor response indicated a communications prohibited error.
		• The Sensor did not respond.
		• The Mobile Console is connected.
		• The Write Number of Sensors Connected command was sent with DIP switch pin 3 OFF.

4-5-6   Read Model Attributes (MRC = "05", SRC = "03")

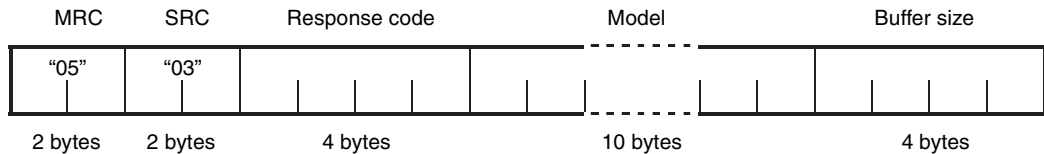This service reads the model and version information for the Fiber Amplifier Sensor Communication Unit.

Command Block

The following diagram shows the command text in the CompoWay/F command block.

```
  MRC        SRC
┌────────┬────────┐
│  "05"  │  "03"  │
└────────┴────────┘
 2 bytes   2 bytes
```

Response Block

The following diagram shows the command text in the CompoWay/F response block.

```
  MRC      SRC     Response code              Model                 Buffer size
┌──────┬──────┬──────────────────┬ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┬──────────────────┐
│ "05" │ "03" │ │ │ │ │          │                     │ │ │ │ │          │
└──────┴──────┴──────────────────┴ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┴──────────────────┘
 2 bytes 2 bytes      4 bytes              10 bytes              4 bytes
```

Model: The device model number is expressed in 10-byte ASCII.

```
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│ E │ 3 │ X │ – │ C │ I │ F │ 1 │ 1 │   │
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
```

The last byte is a space (20H).

Buffer size: The size the smaller of the CompoWay/F communications buffers is expressed as 4-digit hexadecimal and returned as 4-digit ASCII.

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

Response code	Name	Description
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.

4-5-7   Read Controller Status (MRC = "06", SRC = "01")

This service reads the operating status and number of Sensors able to communicate.
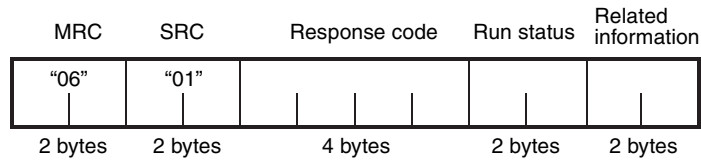
Command Block

The following diagram shows the command text in the CompoWay/F command block.

```
        MRC        SRC
      ┌────────┬────────┐
      │  "06"  │  "01"  │
      └────────┴────────┘
       2 bytes   2 bytes
```

Response Block

The following diagram shows the command text in the CompoWay/F response block.

```
        MRC       SRC     Response code   Run status   Related
                                                        information
      ┌───────┬───────┬───────────────┬───────────┬───────────┐
      │  "06" │  "01" │   │   │   │    │    │      │    │      │
      └───────┴───────┴───────────────┴───────────┴───────────┘
       2 bytes  2 bytes     4 bytes       2 bytes     2 bytes
```
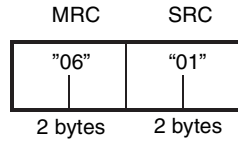
Operating Status

"00": Sensors communicating normally.

"01": Sensor communications error.

"02": Mobile Console is connected.

Related Information

The related information is 00 unless the operating status is "01".

The information varies according to the type of error, as follows:

Code	Description
"00"	No response from unit number 1 onwards.
"01"	All Units up to unit number 1 are operating normally. No response from unit number 2 onwards.
"02"	All Units up to unit number 2 are operating normally. No response from unit number 3 onwards.
"03"	All Units up to unit number 3 are operating normally. No response from unit number 4 onwards.
"04"	All Units up to unit number 4 are operating normally. No response from unit number 5 onwards.
"05"	All Units up to unit number 5 are operating normally. No response from unit number 6 onwards.
"06"	All Units up to unit number 6 are operating normally. No response from unit number 7 onwards.
"07"	All Units up to unit number 7 are operating normally. No response from unit number 8 onwards.
"08"	All Units up to unit number 8 are operating normally. No response from unit number 9 onwards.
"09"	All Units up to unit number 9 are operating normally. No response from unit number 10 onwards.
"10"	All Units up to unit number 10 are operating normally. No response from unit number 11 onwards.
"11"	All Units up to unit number 11 are operating normally. No response from unit number 12 onwards.
"12"	All Units up to unit number 12 are operating normally. No response from unit number 13 onwards.

Code	Description
"13"	All Units up to unit number 13 are operating normally. No response from unit number 14 onwards.
"14"	All Units up to unit number 14 are operating normally. No response from unit number 15 onwards.
"15"	All Units up to unit number 15 are operating normally. No response from unit number 16 onwards.
"16"	All Units up to unit number 16 are operating normally onwards.

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

Response code	Name	Description
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.

4-5-8 Echoback Test (MRC = "08", SRC = "01")

This service performs the echoback test.

Command Block

The following diagram shows the command text in the CompoWay/F command block.

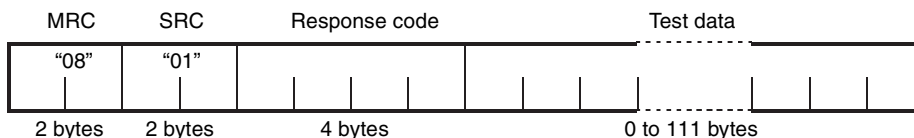MRC "08" 2 bytes   SRC "01" 2 bytes   Test data 0 to 111 bytes
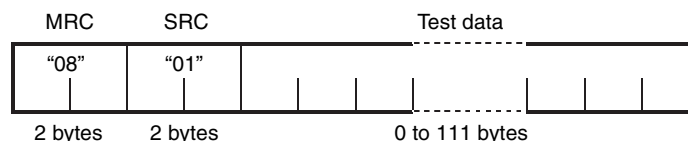
Test Data

Sets any test data from 0 to 111 bytes.

Response Block

The following diagram shows the command text in the CompoWay/F response block.

MRC "08" 2 bytes   SRC "01" 2 bytes   Response code 4 bytes   Test data 0 to 111 bytes

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

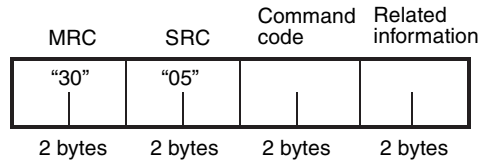| Response code	Name	Description
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.

4-5-9   Operation Commands (MRC = "30", SRC = "05")

This service executes operation commands, such as Teach and Zero Reset commands.

Command	Command code	Related information
Adjust Maximum Sensitivity	"30"	Unit number
Teach One Point	"31"	Unit number
Teach First Point	"32"	Unit number
Teach Second Point	"33"	Unit number
Teach First Position	"34"	Unit number
Teach Second Position	"35"	Unit number
Start Zero Reset	"50"	Unit number
Disable Zero Reset	"60"	Unit number
Start Flashing	"53"	Unit number
Stop Flashing	"63"	Unit number
Initialize Sensor Settings	"36"	Unit number
Reset	"70"	None

**Note** An error will occur if the unit number of an E39-TM1 Terminal Block Unit is specified.

Command Block   The following diagram shows the command text in the CompoWay/F command block.

	MRC	SRC	Command code	Related information
	"30"	"05"		
	2 bytes	2 bytes	2 bytes	2 bytes

Response Block   The following diagram shows the command text in the CompoWay/F response block.

	MRC	SRC	Response code
	"30"	"05"	
	2 bytes	2 bytes	4 bytes
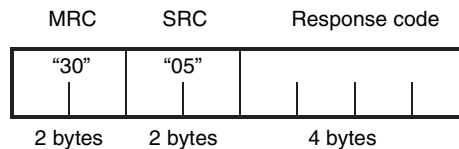
Note 1. Teaching operations for the second point or position can only be performed after sending the commands for the first point/position. Be sure to send the command for the first point/position before sending that for the second one.

2. The Reset command will return the Sensor settings to their default values. The Reset command resets the Sensors by turning their power OFF and ON again.

Response Codes

Normal Completion

Response code	Name	Description
"0000"	Normal completion	No error has occurred.

Error Completion

Response code	Error name	Cause
"1001"	Command too long	The command is too long.
"1002"	Command too short	The command is too short.
"1101"	Area type error	The command code is wrong.
"1103"	Start address out-of-range error	The unit number of an unconnected Sensor is specified in the related information.
"2203"	Operation error	• A Sensor communications error has occurred. • The Sensor response indicated a communications prohibited error. • The Sensor did not respond. • The Mobile Console is connected. • The WRITE command for the second point/position of Teach operations was sent before executing the command for the first one.

SECTION 5
Installation and Dimensions

This section describes the procedure used to mount the Fiber Amplifier Sensor Communication Unit to DIN Track and provides the dimensions of the Units.

5-1   Mounting

Use DIN Track for mounting the Units.


Units in ascending order starting from unit 1 on the left side.
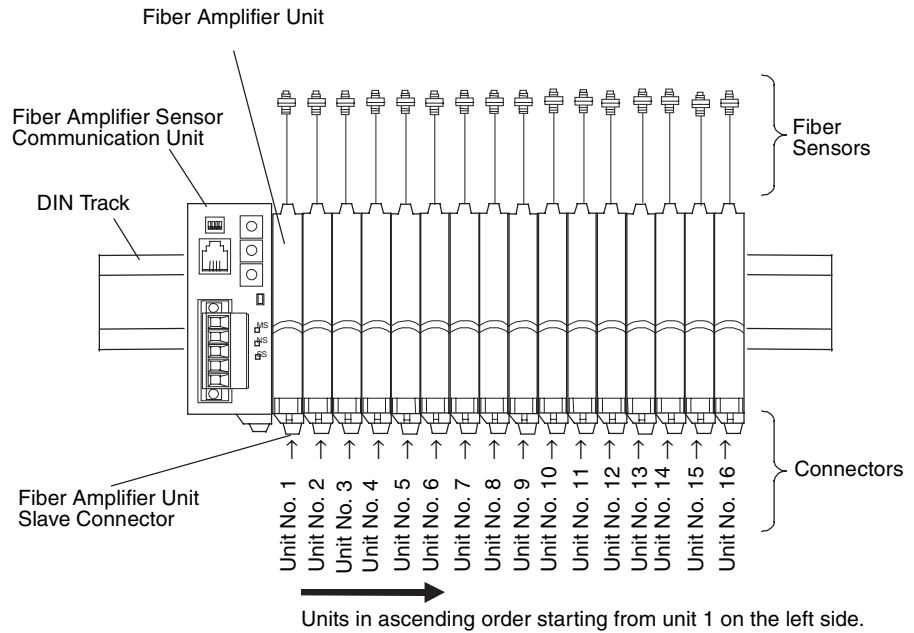
Note   1.   The number of Fiber Amplifier Units that can be connected depends on the model of Communication Unit that is used.

2.   Connect the Communication Unit to the left side of the Fiber Amplifier Units.

3.   The Fiber Amplifier Units all function as slaves (the Fiber Amplifier Units connected to Slave Connectors). When connecting a Fiber Amplifier Sensor Communication Unit, the Slave Connector used to connect the Fiber Amplifier Units depends on the model of Fiber Amplifier Sensor Communication Unit.

Applicable Slave Connectors (Yes: Can be used; No: Cannot be used)

Fiber Amplifier Sensor Communication Unit	Slave Connector for Fiber Amplifier Unit		
	Cordless	Cord with 1 wire	Cord with 2 wires
	E3X-CN02	E3X-CN12	E3X-CN22
E3X-DRT21 (DeviceNet)	Yes	No	No
E3X-SRT21 (CompoBus/S)	Yes	No	No
E3X-CIF11 (RS-422)	Yes	Yes	No

Always use the Slave Connectors specified in the above table. Do not use the Slave Connectors listed as not being applicable.

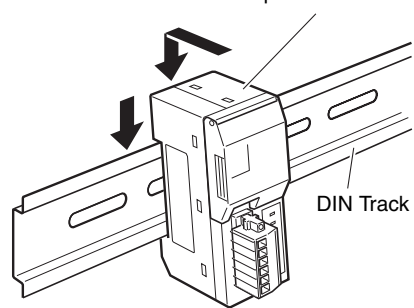| DeviceNet or CompoBus/S Communication Units	RS-422 Communication Unit
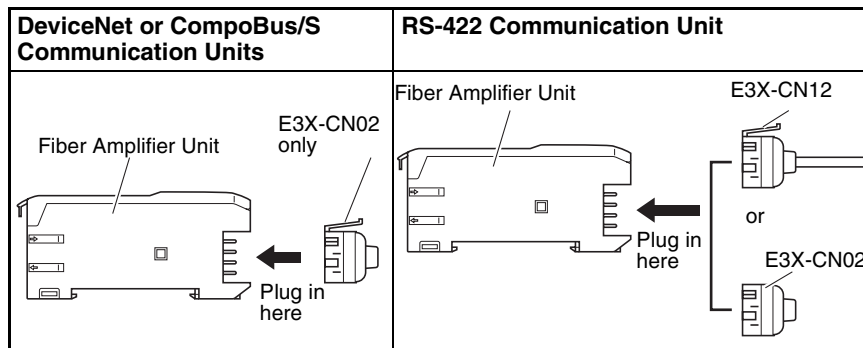
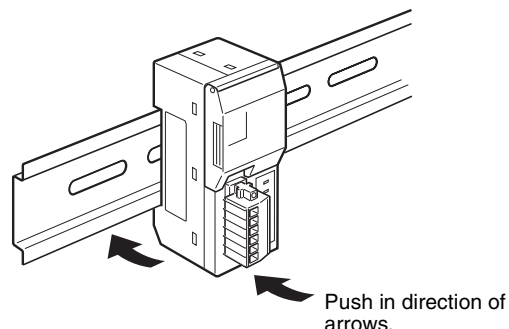4. Connect the Fiber Amplifier Units to each other only after mounting the Units to the DIN Track.

5-1-1 Mounting Procedure

Use the following procedure to mount the Fiber Amplifier Sensor Communication Unit.

*1,2,3...*   1. Hook the top of the Unit onto the DIN Track.

2. Push the bottom of the Unit onto the DIN Track.

3. Connect the Fiber Amplifier Units to the Communication Unit side by side by sliding the Fiber Amplifier Units until the clips on the end and the clips on the Connector are aligned with the Communication Unit and a "click" sound is heard.
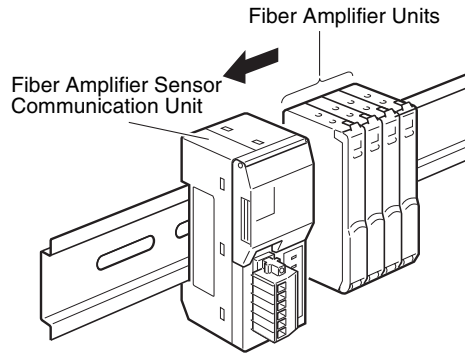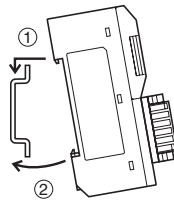

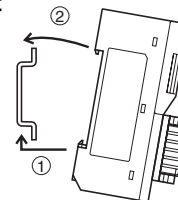4. Use PFP-M End Plates (order separately) to secure both ends.
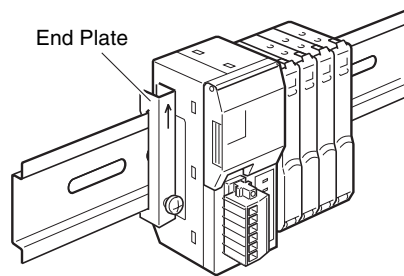
Note Use the correct procedure to mount the Units, performing step 1 before step 2. Reversing these steps may reduce the mounting strength.

Correct

Mounting point 1 before point 2 is the correct order.
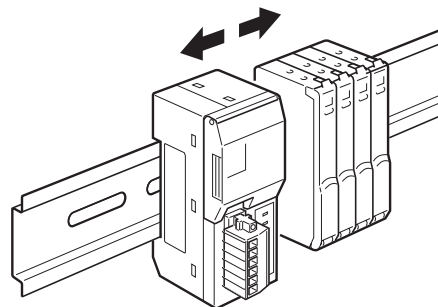
Incorrect

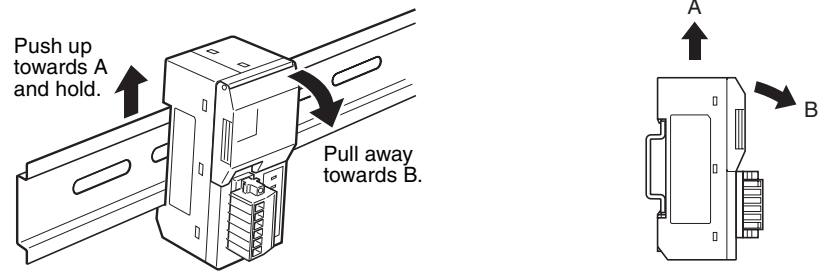Do **NOT** mount point 1 before point 2.

5-1-2 Removing the Units

Use the following procedure to remove the Units.

1,2,3... 1. Slide the Fiber Amplifier Units away from the Communication Unit to disconnect them.

2. Push the Communication Unit up towards A and hold in this position while pulling the Unit away towards B to remove it.

5-1-3 Precautions for Replacing the Unit

The following parameters for the E3X-DRT21 and E3X-CIF11 are stored in the internal memory of the Communication Unit. If parameters have been changed from the default values, be sure to reset the parameters after replacing the Unit.

E3X-DRT21

• Number of connected Sensors

• Number of Sensors being monitored for incident light levels

E3X-CIF11

• Number of connected Sensors

• Response delay time

5-2 Dimensions

E3X-DRT21

Unit: mm
(Dotted lines indicate Connector.)

E3X-SRT21

30

34.6

71.3

16

34.8

(106)

(75)

(44)

(65)

omron

PWR
COMM
ERR
U.ERR
SS

Unit: mm
(Dotted lines indicate Connector.)

E3X-CIF11

30

34.6

71.3

16

34.8

(106)

(75)

(46)

(65)

(5)

omron

PWR
RXD
TXD
U.ERR
SS

Unit: mm
(Dotted lines indicate Connector.)
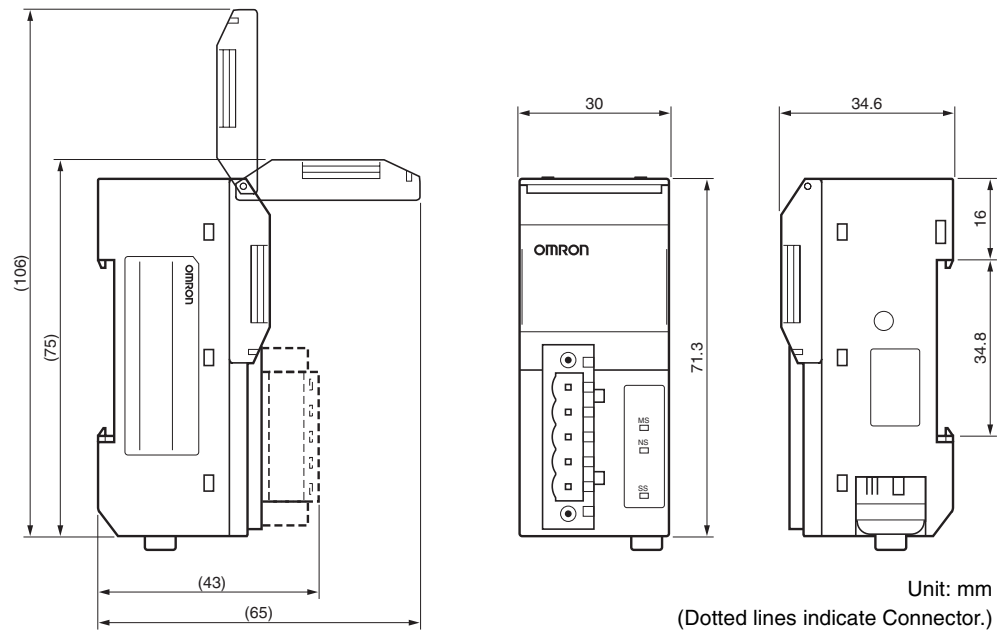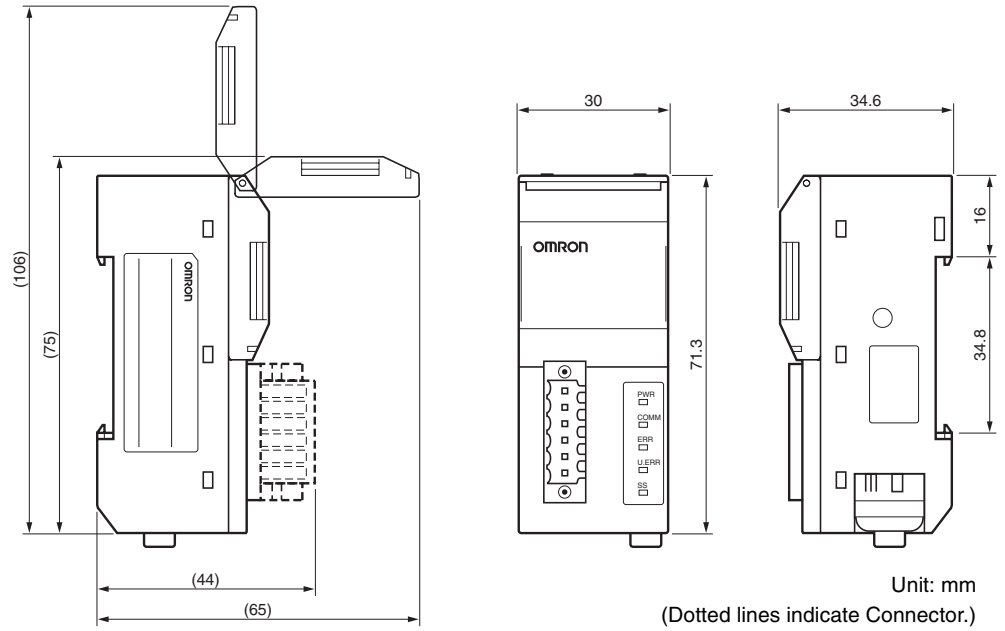
SECTION 6
Errors and Troubleshooting

This section provides information for each Communication Unit on the types of errors that may occur, including details on the indicator status, probable causes, and remedies.

6-1 Errors and Troubleshooting

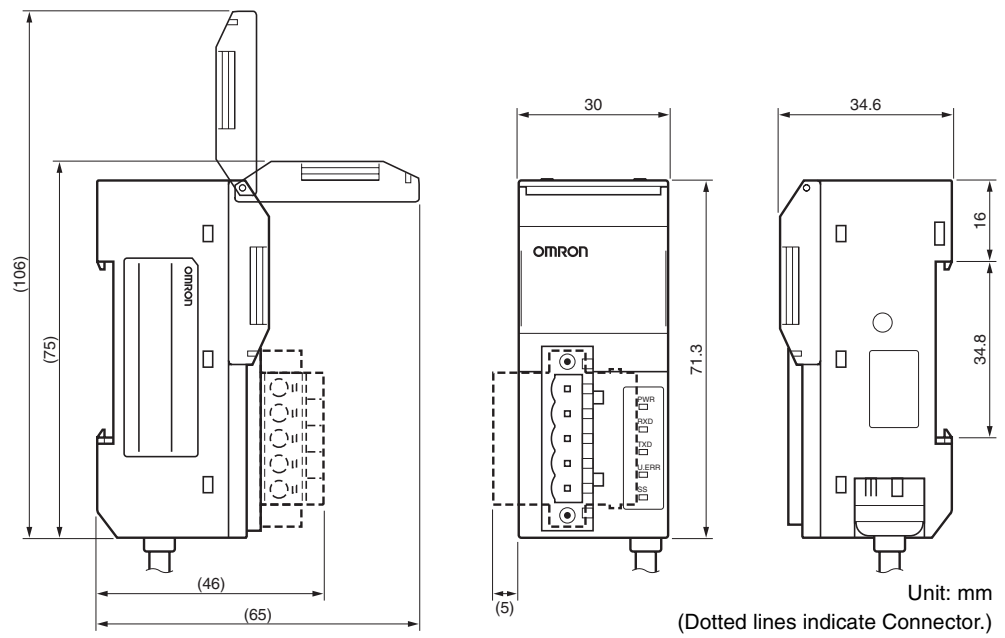The following tables list the indicator statuses, probable causes, and remedies for errors that may occur in each Communication Unit.

6-1-1 Errors in the E3X-DRT21

Indicator status	Probable cause	Remedy
MS and NS indicators not lit.	Power is not supplied to the Unit.	Supply the communications power to the Unit through the DeviceNet Communications Connector.
	The current and voltage are outside the permissible range.	Use the current and voltage within the permissible range.
	The Unit is faulty.	Replace the Unit.
MS indicator lit red	The Unit is faulty.	Replace the Unit.
MS indicator lit green, NS indicator flashing green	The Unit is waiting for connection to DeviceNet communications.	Check the following items and then restart the Unit. • Are cable lengths (trunk/branch lines) suitable? • Are cables shorted, broken, or loose? • Is the wiring configuration correct? • Is terminating resistance connected to both ends of the trunk line only? • Is there too much noise? • Is the power turned ON to the master?
	The Unit is faulty.	Replace the Unit.
MS indicator lit green, NS indicator lit red	DeviceNet has gone into Busoff status.	Check the following items and then restart the Unit. • Are cable lengths (trunk/branch lines) suitable? • Are cables shorted, broken, or loose? • Is terminating resistance connected to both ends of the trunk line only? • Is there too much noise?
	The same node address has been allocated to two or more nodes.	Set the node addresses correctly.
	The Unit is faulty.	Replace the Unit.
MS indicator lit green, NS indicator flashing red	A communications timeout error has occurred.	Check the following items and then restart the Unit. • Are cable lengths (trunk/branch lines) suitable? • Are cables shorted, broken, or loose? • Is terminating resistance connected to both ends of the trunk line only? • Is there too much noise?
	The Unit is faulty.	Replace the Unit.
SS indicator not lit.	No Sensors are connected.	Connect the Sensors correctly.
	The Sensor adjacent to the Fiber Amplifier Sensor Communication Unit is faulty.	Replace the Unit adjacent to the Communication Unit.
	The power was turned ON while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.

Indicator status	Probable cause	Remedy
SS indicator lit red.	One or more of the connected Sensors is faulty.	Replace the Sensor. Determine which Sensors are faulty by checking the number of Sensors able to communicate.
	One or more of the connected Sensors has been disconnected.	Connect the Sensors correctly. Determine the Sensor error location by checking the number of Sensors able to communicate.
	The number of registered Sensors is incorrect.	Register the number of Sensors correctly.
	Pin 3 of the DIP switch is incorrectly set.	Set DIP switch pin 3 correctly. Pin 3 OFF: Set using rotary switch. Pin 3 ON: Set using Configurator.
	One or more of the connected Fiber Amplifier Units is from an unsupported lot number.	Replace the unsupported Fiber Amplifier Units with those from supported lot numbers. (Refer to *1-3-3 Supported Fiber Amplifier Units*.)
	The number of connected Sensors is more than the limit.	Connect a number of Sensors that is within the limit.
	The reset switch was pressed while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.

6-1-2   Errors in the E3X-SRT21

Indicator status	Probable cause	Remedy
PWR indicator not lit.	Power is not supplied to the Unit.	Supply the communications power to the Unit through the CompoBus/S Communications Connector.
	The current and voltage are outside the permissible range.	Use the current and voltage within the permissible range.
	The Unit is faulty.	Replace the Unit.
U.ERR indicator lit red.	The Unit is faulty.	Replace the Unit.
ERR indicator lit red.	A communications error has occurred in a slave communicating on the CompoBus/S network, and the slave has been disconnected from communications.	Check the following items and then restart the Unit. • Are cable lengths (trunk/branch lines) suitable? • Are cables shorted, broken, or loose? • Is terminating resistance connected to the end of the communications line only? • Is there too much noise?
	The Unit is faulty.	Replace the Unit.
PWR indicator lit green, COMM, ERR, U.ERR indicators not lit.	A CompoBus/S communications error has occurred.	Check the following items and then restart the Unit. • Are cable lengths (trunk/branch lines) suitable? • Are cables shorted, broken, or loose? • Is the wiring configuration correct? • Is terminating resistance connected to both ends of the trunk line only? • Is there too much noise? • Is the node address setting correct? • Are the master and slave using the same communications mode? • Is the power turned ON to the master?
	The Unit is faulty.	Replace the Unit.
SS indicator not lit.	No Sensors are connected.	Connect the Sensors correctly.
	The Sensor adjacent to the Fiber Amplifier Sensor Communication Unit is faulty.	Replace the Unit adjacent to the Communication Unit.
	The power was turned ON while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.
SS indicator lit red.	One or more of the connected Sensors is faulty.	Replace the Sensor.
	One or more of the connected Sensors has been disconnected.	Connect the Sensors correctly.
	The number of registered Sensors is incorrect.	Register the number of Sensors correctly.
	One or more of the connected Fiber Amplifier Units is from an unsupported lot number.	Replace the unsupported Fiber Amplifier Units with those from supported lot numbers. (Refer to *1-3-3 Supported Fiber Amplifier Units*.)
	The number of Sensors connected is more than the permissible number.	Connect a number of Sensors that is within the limit.
	The reset switch was pressed while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.

6-1-3   Errors in the E3X-CIF11

Indicator status	Probable cause	Remedy
PWR indicator not lit.	Power is not supplied to the Unit.	Supply the power to the Unit through the power supply cable.
	The current and voltage are outside the permissible range.	Use the current and voltage within the permissible range.
	The Unit is faulty.	Replace the Unit.
U.ERR indicator lit red.	The Unit is faulty.	Replace the Unit.
RXD indicator not lit.	The data to be received through serial communications has not arrived.	Check the following items and then restart the Unit. • Are communications commands being sent from the master? • Are cable lengths suitable? • Are cables shorted, broken, or loose? • Is the wiring configuration correct? • Is terminating resistance connected to both ends of the communications line only? • Is there too much noise?
	The Unit is faulty.	Replace the Unit.
RXD indicator flashing yellow, TXD indicator not lit.	A serial communications error has occurred.	Check the following items and then restart the Unit. • Is the unit number set correctly on the rotary switch? • Is the baud rate of the Unit the same as that of the master? • Are the communications settings of the Unit the same as that of the master? • Is the master sending the correct commands? • Is the response delay time too short? • Are cable lengths suitable? • Are cables shorted, broken, or loose? • Is the wiring configuration correct? • Is terminating resistance connected to both ends of the trunk line only? • Is there too much noise?
	The Unit is faulty.	Replace the Unit.
SS indicator not lit.	No Sensors are connected.	Connect the Sensors correctly.
	The Sensor adjacent to the Fiber Amplifier Sensor Communication Unit is faulty.	Replace the Unit adjacent to the Communication Unit.
	The power was turned ON while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.

Indicator status	Probable cause	Remedy
SS indicator lit red.	One or more of the connected Sensors is faulty.	Replace the Sensors. Determine which Sensors are faulty by checking the number of Sensors able to communicate.
	One or more of the connected Sensors has been disconnected.	Connect the Sensors correctly. Determine the Sensor error location by checking the number of Sensors able to communicate.
	The number of registered Sensors is incorrect.	Register the number of Sensors correctly.
	Pin 3 of the DIP switch is incorrectly set.	Set DIP switch pin 3 correctly. Pin 3 OFF: Set using rotary switch. Pin 3 ON: Set using CompoWay/F message communications.
	One or more of the connected Fiber Amplifier Units is from an unsupported lot number.	Replace the unsupported Fiber Amplifier Units with those from supported lot numbers. (Refer to *1-3-3 Supported Fiber Amplifier Units*.)
	The number of Sensors connected is more than the permissible amount.	Connect a number of Sensors that is within the limit.
	The reset switch was pressed while the Mobile Console was connected.	Temporarily disconnect the Mobile Console.
	The Unit is faulty.	Replace the Unit.

Appendix A
Communications Timing

Communications Timing

This appendix describes the internal processing times for the Fiber Amplifier Sensor Communication Unit. For details on communications timing for DeviceNet and CompoBus/S masters, refer to the relevant operation manuals.

Maximum ON/OFF Data Input Delay Time

The maximum delay time for the Fiber Amplifier Sensor Communication Unit is as follows:

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- With up to 8 Sensors connected:
  Maximum ON/OFF data input delay time for Unit $n = 0.1 \times n + 1.5$ (ms)
- With 9 or more Sensors connected:
  Maximum ON/OFF data input delay time for Unit $n = 0.2 \times n + 1.5$ (ms)

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- With up to 8 Sensors connected:
  Maximum ON/OFF data input delay time for Unit $n = 0.1 \times n + 2.5$ (ms)
- With 9 or more Sensors connected:
  Maximum ON/OFF data input delay time for Unit $n = 0.2 \times n + 2.5$ (ms)

Maximum Refresh Cycle of Incident Light Level Data (E3X-DRT21 Only)

The following tables list the maximum values for the refresh cycle of incident light level monitoring when the Unit is operating with remote I/O communications in two-word mode with incident light level monitoring (DIP switch pin 1 OFF and pin 2 ON). The maximum refresh cycle of incident light level monitoring depends on whether explicit messages are used and on the number of Sensors that are connected, as shown in the tables.

Using Explicit Messages

Number of Sensors connected	Maximum refresh cycle of incident light level monitoring (ms)
1	50
2	100
3	160
4	240
5	330
6	430
7	540
8	670
9	2300
10	2500
11	3000
12	3300
13	3600
14	4200
15	4600
16	4900

Explicit messages are also used when the DeviceNet Configurator is connected.

Not Using Explicit Messages

Number of Sensors connected	Maximum refresh cycle of incident light level monitoring (ms)
1	20
2	40
3	60
4	90
5	110
6	140
7	170
8	200
9	1500
10	1900
11	2000
12	2200
13	2300
14	2400
15	3000
16	3200

Note Normally, the incident light level refresh cycle is much shorter than the values listed in these tables.The refresh cycles can be extended, however, with some timing settings. Consider the maximum refresh cycle when designing the system.

Appendix B

Monitoring Incident Light Levels of
E3X-DA6-P Sensors

When E3X-DA6-P Sensors are used, the incident light levels for Sensor output ON and Sensor output OFF can be monitored along with standard incident light levels. The following table shows the typical values for ON/OFF incident light levels.

Type	Mode	Typical value
ON incident light level	L.ON	ON interval peak value
	D.ON	ON interval bottom value
OFF incident light level	L.ON	OFF interval bottom value
	D.ON	OFF interval peak value

Details on ON/OFF incident light level monitoring are provided below.

Note When incident light levels are read using standard incident light level monitoring through communications, the communications can cause a delay. When the Sensors ON/OFF switching interval is short, this delay can cause only Sensor OFF data to be read, for example, resulting in the inability to read ON data (in the same way, it is possible that only ON data is read, and OFF data cannot be read). When E3X-DA6-P Sensors are used, in addition to standard incident light levels, incident light levels for Sensor output ON and Sensor output OFF can also be monitored.
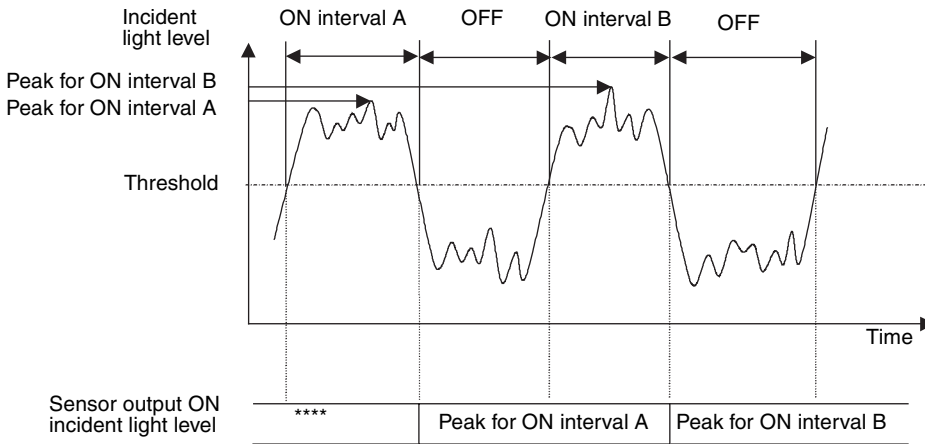
Incident light   Incident light   Incident light
level monitoring   level monitoring   level monitoring

| ON | OFF | ON | OFF | ON | OFF | ON | OFF |
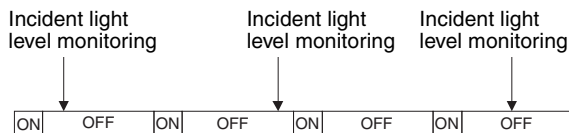
Sensor Output ON Incident Light Level Monitoring

This function distinguishes automatically whether the Sensor's operating mode switch is set to L.ON (light-ON) or D.ON (dark-ON).

- For L.ON (light-ON), the peak incident light level for when the Sensor output is ON is indicated as the Sensor output ON incident light level monitoring data.
- For D.ON (dark-ON), the bottom incident light level for when the Sensor output is ON is indicated as the Sensor output ON incident light level monitoring data.

The following graph shows the incident light levels when the Sensor output is ON and the Sensor is set to L.ON (light-ON).

The incident light level for D.ON (dark-ON) when the Sensor output is ON is the bottom instead of the peak.

This operation is as follows:

1. The peak value in ON interval A is held.
2. The moment that the output turns OFF after the ON interval A ends the ON incident light level monitoring value is refreshed as the peak value for ON interval A.

Note The value of the ON incident light level for the period from the time the power is ON until the Sensor output turns ON and OFF again is as follows:
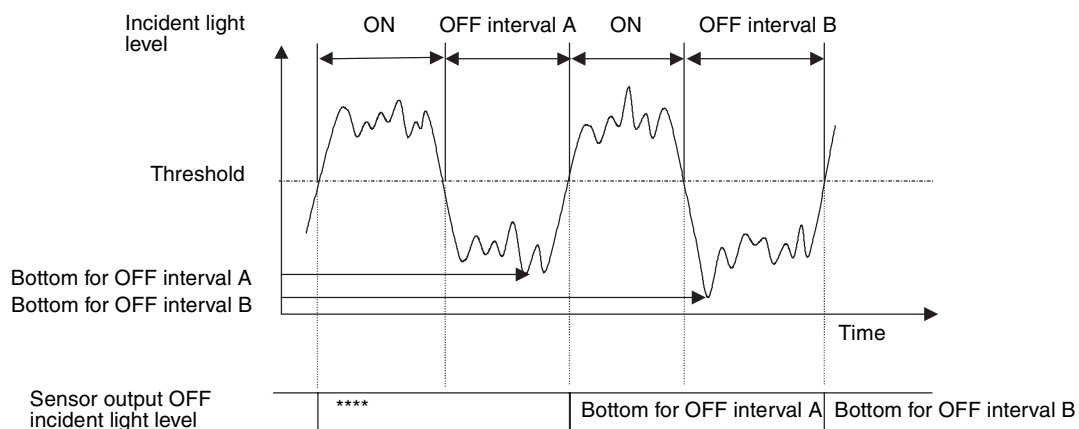Light-ON: 0000, Dark-ON: 4000
The above values will change, however, if Zero Reset is enabled.

Sensor Output OFF Light Incident Level Monitoring

This function distinguishes whether the Sensor's operating mode switch is set to L.ON (light-ON) or D.ON (dark-ON).

- • For L.ON (light-ON), the bottom incident light level for when the Sensor output is OFF is indicated as the Sensor output OFF incident light level monitoring data.
- • For D.ON (dark-ON), the peak incident light level for when the Sensor output is OFF is indicated as the Sensor output OFF incident light level monitoring data.

The following graph shows the incident light levels when the Sensor output is OFF and the Sensor is set to L.ON (light-ON).

Incident light level	ON	OFF interval A	ON	OFF interval B

Threshold

Bottom for OFF interval A
Bottom for OFF interval B

Time

Sensor output OFF incident light level	****	Bottom for OFF interval A	Bottom for OFF interval B

The incident light level for D.ON (dark-ON) when the Sensor output is OFF is the peak instead of the bottom.

This operation is as follows:

1. The bottom value for OFF interval A is held.
2. The moment that the output turns ON after the OFF interval A ends the OFF incident light level monitoring value is refreshed as the bottom value for OFF interval A.

Note The value of the OFF incident light level for the period from the time power is ON until the Sensor output turns OFF and ON again, is as follows:
Light-ON: 4000, Dark-ON: 0000
The above values will change, however, if Zero Reset is enabled.

Appendix C
DeviceNet Connection Settings

DeviceNet supports different protocols for remote I/O communications between master and slave devices. Connections are used to manage those protocols. The connections can be set from the DeviceNet Configurator. The DeviceNet remote I/O communications protocol supports four types of connection: Poll, bit-strobe, COS (change of state), and cyclic. The features of these connections are listed in the following table. The Communication Unit supports all of these.

Connection	Contents	
Poll	Used for basic I/O.	
Bit-Strobe	Used for input of 8 bytes or less. Sends broadcasting requests from master and receives input from slaves.	Poll and Bit-Strobe connections cannot be used at the same time.
COS (Change of state)	This connection can be used to send data to the master from the Fiber Amplifier Sensor Communication Unit only when the data changes. Transmission timing is determined by a heartbeat timer. Data can be sent only when required, thereby reducing the communications load on the network.	COS and Cyclic connections cannot be used at the same time.
Cyclic	Communications timing is determined by regular cycles (heartbeat timer). The Communication Unit will send data at a regular cycle.	

Note To use COS and cyclic connections with the Communication Unit, the DeviceNet master must also support them. Confirm that the master supports COS and cyclic connections before using them. OMRON masters, such as the CS1W-DRM21 and CJ1W-DRM21, support COS and cyclic connections.

Setting Connections without Using Configurator

The connections used for all the IN data of the Fiber Amplifier Sensor Communication Unit are as follows:

- Data of 8 bytes or less: Bit-Strobe
- Data of more than 8 bytes: Poll

Changing Connections Using the Configurator

When a CS1W-DRM21 is used as the DeviceNet master, the OMRON DeviceNet Configurator (Ver. 2.10 or higher) can be used to change the connections. The procedure is as follows:

Step 1: Connecting the Configurator

1. Connect the DeviceNet Configurator.
   The parameters of the master as well as the Fiber Amplifier Sensor Communication Unit settings can be changed, so connect the master that will actually be used.
2. Turn ON the power, and put the Configurator online.
3. Upload the network configuration.

Step 2: Selecting the Group

The Fiber Amplifier Sensor Communication Unit divides IN data allocations into the following groups.

.

Group	Data	Number of bytes	Connection path
1	ON/OFF data with status	Always 2 bytes.	200424013003
2	ON/OFF data	Always 2 bytes.	200424023003
3	Status data	Always 2 bytes.	200424033003
4	Incident light level data	2 bytes × number of Units monitored for incident light levels	200424043003
5	ON/OFF data + status data	Always 4 bytes.	200424053003
6	Status data + incident light level data	2 bytes + (2 bytes × number of Units monitored for incident light levels)	200424063003
7	ON/OFF data + status data + incident light level data	4 bytes + (2 bytes × number of Units monitored for incident light levels)	200424073003

The data contents for each group is as follows:

1. ON/OFF Data with Status

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Sensor Communications Flag	Sensor Communications Error Flag	Mobile Console Communications Flag	Unit No. 13 ON/OFF data	Unit No. 12 ON/OFF data	Unit No. 11 ON/OFF data	Unit No. 10 ON/OFF data	Unit No. 9 ON/OFF data	Unit No. 8 ON/OFF data	Unit No. 7 ON/OFF data	Unit No. 6 ON/OFF data	Unit No. 5 ON/OFF data	Unit No. 4 ON/OFF data	Unit No. 3 ON/OFF data	Unit No. 2 ON/OFF data	Unit No. 1 ON/OFF data

2. ON/OFF Data

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unit No. 16 ON/OFF data	Unit No. 15 ON/OFF data	Unit No. 14 ON/OFF data	Unit No. 13 ON/OFF data	Unit No. 12 ON/OFF data	Unit No. 11 ON/OFF data	Unit No. 10 ON/OFF data	Unit No. 9 ON/OFF data	Unit No. 8 ON/OFF data	Unit No. 7 ON/OFF data	Unit No. 6 ON/OFF data	Unit No. 5 ON/OFF data	Unit No. 4 ON/OFF data	Unit No. 3 ON/OFF data	Unit No. 2 ON/OFF data	Unit No. 1 ON/OFF data

3. Status Data

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Sensor Communications Flag	Sensor Communications Error Flag	Mobile Console Communications Flag	Number of Sensors that can communicate, 2^4	Number of Sensors that can communicate, 2^3	Number of Sensors that can communicate, 2^2	Number of Sensors that can communicate, 2^1	Number of Sensors that can communicate, 2^0	Always 0.	Always 0.	Method for setting number of Sensors	Number of Sensors connected, 2^4	Number of Sensors connected, 2^3	Number of Sensors connected, 2^2	Number of Sensors connected, 2^1	Number of Sensors connected, 2^0

4. Incident Light Level Data

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Word m	Unit 1 incident light level															
Word m + 1	Unit 2 incident light level															
Word m + 2	Unit 3 incident light level															
: :	: :															
Word m + n − 2	Unit n − 1 incident light level															
Word m + n − 1	Unit n incident light level															

Number of Sensors for incident light level monitoring: n

5. ON/OFF Data + Status Data

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Word m	ON/OFF data (Same contents as for Group 2)															
Word m + 1	Status Data (Same contents as for Group 3)															

6. Status + Incident Light Level Data

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Word m	Status data (Same contents as Group 3)															
Word m + 1	Unit 1 incident light level															
Word m + 2	Unit 2 incident light level															
: :	: :															
Word m + n − 1	Unit n − 1 incident light level															
Word m + n	Unit n incident light level															

7. ON/OFF Data + Status Data + Incident Light Level Data

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Word m	ON/OFF data (Same contents as Group 2)															
Word m + 1	Status data (Same contents as Group 3)															
Word m + 2	Unit 1 incident light level															
: :	: :															
Word m + n	Unit n − 1 incident light level															
Word m + n + 1	Unit n incident light level															

Number of Sensors for incident light level monitoring: n

Allocate any two of the groups as using a poll, bit-strobe, COS, or cyclic connection. Poll and bit-strobe, however, cannot be used at the same time. COS and cyclic also cannot be used at the same time. If bit-strobe is used, no more than 8 bytes of data can be allocated.
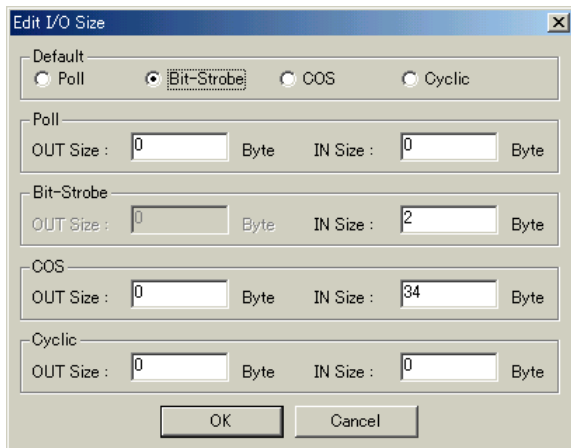
Example:

Bit-strobe: Group 2 ON/OFF data

COS: Group 6 status data + incident light level data

Step 3: Setting the Fiber Amplifier Sensor Communication Unit

1. Set the number of bytes for each connection.

2. Select the Fiber Amplifier Sensor Communication Unit to be set from the Configurator screen, and then click the right mouse button.

3. Select *Property* from the menu.

4. Select the **I/O Information** Tab.

5. Click the **Edit** Button.

6. The following dialog box will be displayed. Set the connection and number of bytes to be used.

Example:

Bit-strobe:	ON/OFF data
COS:	Status data + incident light level data

When number of Sensors for incident light level monitoring is 16, settings for this example are as follows:

Bit-strobe:	2 bytes
COS:	34 bytes (2 bytes $\times$ 16 units + 2 bytes)

Note The above items will be returned to the default settings when the Configurator is restarted or a configuration is uploaded. Therefore, errors may occur when operating the Configurator. Be sure to reset the above items to prevent errors from occurring.

Step 4: Setting the DeviceNet Master

1. Select and double-click the DeviceNet master.
2. Register the Fiber Amplifier Sensor Communication Unit if it has not been previously registered.
3. Select the Fiber Amplifier Sensor Communication Unit and click the **Advanced Setting** Button.
4. Click the **Connection** Tab.
5. The following dialog box will be displayed. Select *User Setup* and set the connection path.
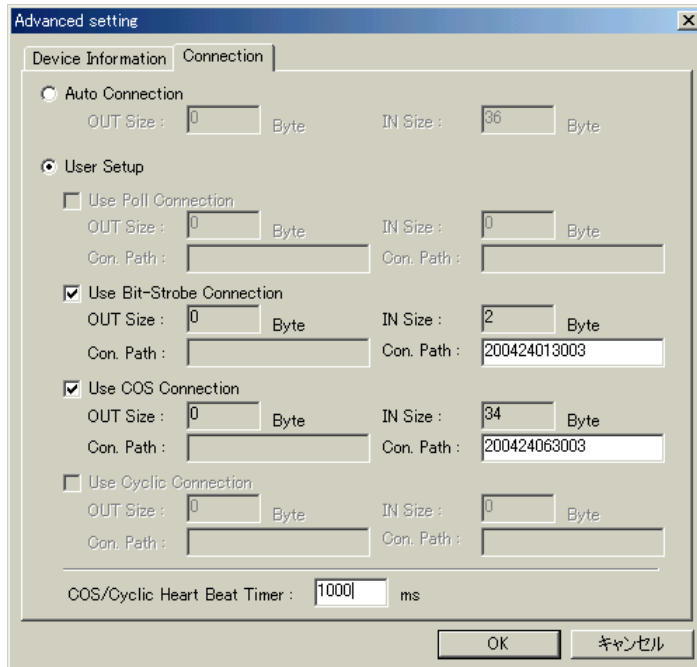
Step 5: Setting the COS/Cyclic Heartbeat Timer

From the screen displayed in step 4, set the COS/Cyclic heartbeat timer.

1. For a cyclic connection, data is periodically sent by the slave in a cycle determined by this setting.
2. For a COS connection, data is periodically sent by the slave in a cycle determined by this setting even if the data has not changed, and checks that a communications error has not occurred. The higher the value, the lesser the load on the network. The time required to detect errors, however, is longer with higher values.

Step 6: Master I/O Allocations

1. Select *I/O Allocation (IN)* to display the following screen.
2. Select and double-click the Fiber Amplifier Sensor Communication Unit to be allocated.
3. The following screen will be displayed. Set the values for each field to allocate I/O. (If memory block 2 is used, click the **Setup** Button, and set the area.)

Appendix D
DeviceNet Device Profile

Device Profile

General data	Compatible DeviceNet specifications	Volume I - Release 2.0 Volume II - Release 2.0	
	Vendor name	OMRON Corporation	Vendor ID = 47
	Device profile name	Communication Adapter	Profile number = 12
	Manufacturer catalog number		
	Manufacturer revision	1.01	
Physical conformance data	Network current consumption	24 VDC, 70 mA max. (See note.)	
	Connector type	Open plug	
	Physical insulation	No	
	Supported indicators	Module, Network	
	MAC ID setting	DIP switch	
	Default MAC ID	0	
	Baud rate setting	Automatic follow-up	
	Supported baud rates	125 kbit/s, 250 kbit/s, and 500 kbit/s	
Communications data	Predefined master/slave connection set	Group 2 only server	
	Dynamic connection support (UCMM)	No	
	Explicit message fragmentation support	Yes	

Note Excluding Sensor current supply.

Mounted Objects

Identify Object (01 Hex)

Object class	Attribute	Not supported.
	Service	Not supported.

Object instance	Attribute	ID	Contents	Get	Set	Value
		1	Vendor	Yes	No	47
		2	Product type	Yes	No	12
		3	Product code	Yes	No	145
		4	Revision	Yes	No	1.01
		5	Status (bits supported)	Yes	No	---
		6	Serial number	Yes	No	Unique for each Unit
		7	Product name	Yes	No	E3X-DRT21
		8	State	No	No	---
	Service	DeviceNet service		Parameter option		
		05	Reset	No		
		0E	Get_Attribute_Single	No		

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. Z152-E1-02

Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	September 2001	Original production
02	November 2005	**Page iv:** Warranty and liability information added. **Page v:** Signal word information altered. **Inside back cover:** Contact information updated.

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