CKD

Remote I/O
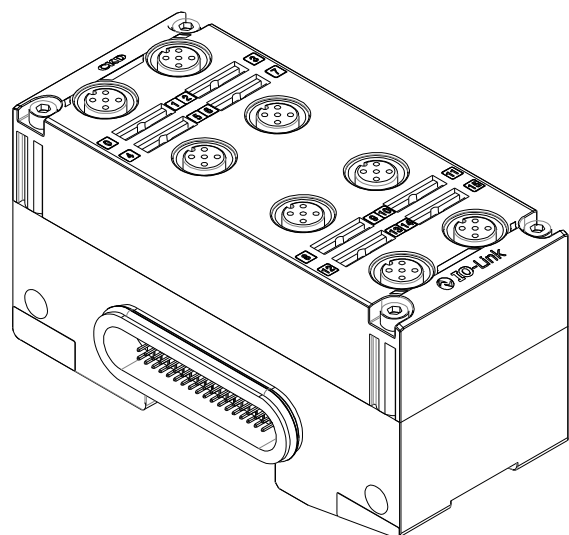**RT series**

IO-Link Master Unit

INSTRUCTION MANUAL

SM-A46344-A/3

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD株式会社

PREFACE

Thank you for purchasing CKD's "RT Series". This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

> - This product is intended to be used by persons with sufficient knowledge and experience in the following areas.
>   CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to them.
>   - Electricity (qualified electrician or equivalent)
>   - The industrial network communications used
>   - FA systems in general
>   - Each of the systems that use manifold solenoid valves, IO-Link, etc.
> - Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them.
>   Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

The names of companies and products in this text are the registered trademarks or trademarks of their respective companies.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the pneumatic or water control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

  ISO4414, JIS B8370, JFPS2008 (the latest edition of each standard),
  the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards relevant laws and regulations.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠**DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠**WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

✏	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Do not use the product for the following applications.
- Medical devices involved in sustaining or managing people's lives or physical health.
- Mechanisms and mechanical devices used for the purpose of moving and transporting people
- Important safety parts for mechanical devices.

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.
The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.
The product must not be used beyond its specifications.
This product is intended for use in general industrial machinery, equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.
- Use for applications where safety is required
- In applications for nuclear power, railroads systems, aviation, ships, vehicles, medical equipment
- In applications for equipment that directly touches beverages or food
- For safety measures for amusement equipment, emergency shut-off circuits, press machines, or brake circuits
- Use for applications where life or assets could be significantly affected, and applications where special safety measures are required

(An exception will be made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Never modify or additionally machine this product.
These may cause failure or malfunction. In addition, they are not covered by our warranty.

Do not handle the product or remove pipes and devices until safety is confirmed.
The product may operate in an unexpected way, causing injury to people or damage to equipment.
- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Observe the warnings and cautions on the following pages to prevent accidents.

⚠ **CAUTION**

Do not use the product for transactions.
Do not use the product for commerce transactions because it does not comply with the Japanese Measurement Act and each country's laws and regulations equivalent to the Japanese Measurement Act.

Do not use the product for precise measurements.
The product is designed as a device for general industrial machinery, so operating the product for precise measurements will not be guaranteed.
In addition, CKD cannot respond to calibration and other requests.

Use the product in a specified manner.
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CONTENTS

INSTRUCTION MANUAL FOR THIS PRODUCT

The manuals related to the Remote I/O RT Series are separated by purpose as follows.
(1) Entire RT remote I/O system, and the PC software
(2) Device unit for each industrial network
(3) Each I/O unit

"Remote I/O RT Series Instruction Manual: System Construction" is mandatory. Other manuals are not mandatory but must be referred to according to the units used.

Purpose	Manual

(1) Entire RT remote I/O system, and the PC software
▶ "Remote I/O RT Series Instruction Manual: System"
"Setting Software Instruction Manual: RTXTools"

(2) Device unit for each industrial network
▶ "EtherCAT® Compatible Device Unit Instruction Manual"
"EtherNet/IP™ Compatible Device Unit Instruction Manual"
"PROFINET™ Compatible Device Unit Instruction Manual"
"WebAPI Compatible Device Unit Instruction Manual"
"OPC UA® Compatible Device Unit Instruction Manual"

(3) Each I/O unit
▶ "Digital I/O Unit Instruction Manual"
"Analog I/O Unit Instruction Manual"
"IO-Link Master Unit Instruction Manual"
"Valve I/F Unit Instruction Manual"

(4) Related software
▶ "Certificate Generate Tool/ Certificate Write Tool Instruction Manual"

List of Related Instruction Manuals

Instruction Manual No.	Instruction Manual name	Description
SM-A46342-A	"Remote I/O RT Series Instruction Manual: System Construction"	Instruction manual for the entire remote I/O RT Series system. Includes explanations of the PC software RTXTools, the power supply unit RT-XP24A01N, and the End unit RT-XEE□N00N
SM-A90084-A	Setting Software Instruction Manual: RTXTools	Instruction manual for the RTXTools: setting software
SM-A46343-A	EtherCAT® Compatible Device Unit Instruction Manual	Instruction manual for the EtherCAT compatible device unit RT-XTECN00N
SM-A71112-A	EtherNet/IP™ Compatible Device Unit Instruction Manual	Instruction manual for the EtherNet/IP compatible device unit RT- XTENN00N
SM-A87934-A	PROFINET Compatible Device Unit Instruction Manual	Instruction manual for the PROFINET compatible device unit RT-XTEPN00N
SM-A95119-A	WebAPI Compatible Device Unit Instruction Manual	Instruction manual for the WebAPI compatible device unit RT-XTEAN00N
SM-B03355-A	OPC UA Compatible Device Unit Instruction Manual	Instruction manual for the OPC UA compatible device unit RT-XTEUN00N
SM-A46344-A	IO-Link Master Unit Instruction Manual (this manual)	Instruction manual for the IO-Link master unit RT-XLMSA08N
SM-A46345-A	Digital I/O Unit Instruction Manual	Instruction manual for the digital I/O unit RT-X□DG□□□□
SM-A46347-A	Analog I/O Unit Instruction Manual	Instruction Manual for the analog I/O unit RT-X □ AGA0 2N
SM-A46346-A	Valve I/F Unit Instruction Manual	Instruction manual for the valve I/F unit TVG□P-TB-□-KA1□
SM-B04196-A	Certificate Generate Tool/ Certificate Write Tool Instruction Manual	Instruction manual for "Certificate General Tool" and "Certificate Write Tool" for OPC UA

Always read the instruction manual for each product connected to the remote I/O RT Series.
The product types that can be connected are:
• Upper controller in each industrial network (connected to a device unit)
• IO-Link devices (connected to the IO-Link master unit)
• Manifold solenoid valves (connected to the Valve I/F unit)
• Other sensors/actuators (connected to a digital I/O unit, analog I/O unit, or IO-Link master unit)

A video is available to show how to assemble the units, install the software, and how the LEDs blink.
If necessary, refer to the video at the following URL:

RT product page:
https://www.ckd.co.jp/kiki/en/product/detail/1064

TERMS RELATED TO THE IO-LINK MASTER UNIT

Therm	Definition
IO-Link master	A device that performs IO-Link communication with IO-Link devices and also serves as a following device in communication with upper controller. When referring to a unit, write "IO-Link master unit".
IO-Link device	A device that can perform IO-Link communication with the IO-Link master, such as a sensor or actuator.
SIO device	An existing general purpose I/O device that is not compatible with IO-Link.
I/O device	A generic term for an IO-Link or SIO device.
IO-Link communication	A general term for the following three types of communication: - Process I / O communication - ISDU communication - Event communication
Pin2 digital input function	Refers to the function to input digital signals in parallel with IO-Link communication when in IO-Link mode. "Pin2" refers to using pin number 2.
Process I / O communication	In IO-Link communication, this refers to the cyclic communication from the IO-Link master to the IO-Link device.
Process data	Data that can allow reading and writing by IO-Link process I/O communications. A generic term for process input and output data.
Process output data	Data transferred cyclically from the IO-Link master to the IO-Link device.
Process input data	Data transferred cyclically from the IO-Link device to the IO-Link master.
Fixed-length process data	Of the data that the IO-Link master unit cyclically communicates to the device unit, this refers to the digital input/output and the input/output for each unit.
IO-Link process data	Of the data that the IO-Link master unit cyclically communicates to the device unit, this refers to the input/output through IO-Link communication.
IO-Link error flag	In IO-Link mode, this refers to a flag indicating an error or normality.
IO-Link input data enable flag	In IO-Link mode, this refers to a flag indicating whether process input data for each port is valid or invalid.
ISDU communication	In IO-Link communication, this refers to acyclic communication that requests reading, writing or other commands from the IO-Link master to the service data of an IO-Link device.
Event communication	In IO-Link communication, this refers to acyclic communication that sends notifications from an IO-Link device to the IO-Link master.
Event	Refers to errors, warnings, and notifications related to IO-Link communication.
Event code	In IO-Link mode, this refers to the code of the event detected by each IO-Link device.
Error log	In IO-Link communication, this refers to the generic term for errors in event communication and ISDU communication.
Error log update flag	A flag that is 1 (ON) when an event occurs on the IO-Link device or when the IO-Link master unit receives an ISDU communication error response.
Error log clear flag	A flag to clear error logs in the IO-Link master unit (event codes of IO-Link devices and error response logs in ISDU communication). At the same time, it makes the "error log update flag" 0 (OFF).
Operation mode selection	Specifies the operation of IO-Link communication or digital input/output with external devices (IO-Link or SIO devices) connected to the IO-Link master unit (this product).
Communication cycle time	Refers to the cycle time of the IO-Link communication.
Synchronization of cycle time between ports	A function of the IO-Link master unit to sync between multiple IO-Link devices in IO-Link communication.
Service Data	Data in IO-Link devices that can be read and written by IO-Link ISDU communication. Specifies an index/sub-index in IO-Link devices.
Device verification	A function to verify information registered in the IO-Link master unit against information of connected IO-Link devices. A verification target can be selected.
Vendor ID	An ID that identifies the manufacturer of the IO-Link device.
Device ID	An ID that identifies the model of the IO-Link device.
Revision	A protocol version of the IO-Link implemented on the IO-Link devices.
Power line error	An error that occurs when an over current or short circuit is detected on the pin 1 line (unit/input 24 V (+)) when the "Power line error detection" setting is "Enable".

Therm	Definition
Signal line error	An error that occurs when an over current or short circuit is detected on the pin 4 line (Digital output 1) when the "Signal line error detection" setting is "Enable".
Data mapping error	An error when the process data size of the entire IO-Link master unit is as follows: - The process data size (input) for the entire unit has exceeded 64 bytes. - The process data size (output) of the entire unit has exceeded 64 bytes.
Process data size error	An error that occurs when the IO-Link process data size of the connected IO-Link device is larger than the setting size of the IO-Link master unit.
Reflect setting waiting	Occurs when it is necessary to turn the power off and on again to reflect the setting.
Allocation error	Occurs when the IO-Link master unit is not assigned correctly to the device unit or when the IO-Link master unit is initialized and started up.
Unable to detect IO-Link devices	A status in which the IO-Link communication has not been established since startup.

1. PRODUCT OVERVIEW

The RT series IO-Link master unit is an advanced unit that functions as the IO-Link master in a remote I/O system.

Up to eight IO-Link devices can be connected to perform IO-Link process data (cyclic) communication and ISDU (message) communication.

If connecting the PC software (free of charge) to the device unit via USB, it is possible to check the information and status of the entire remote I/O system, and the settings and status of each unit.
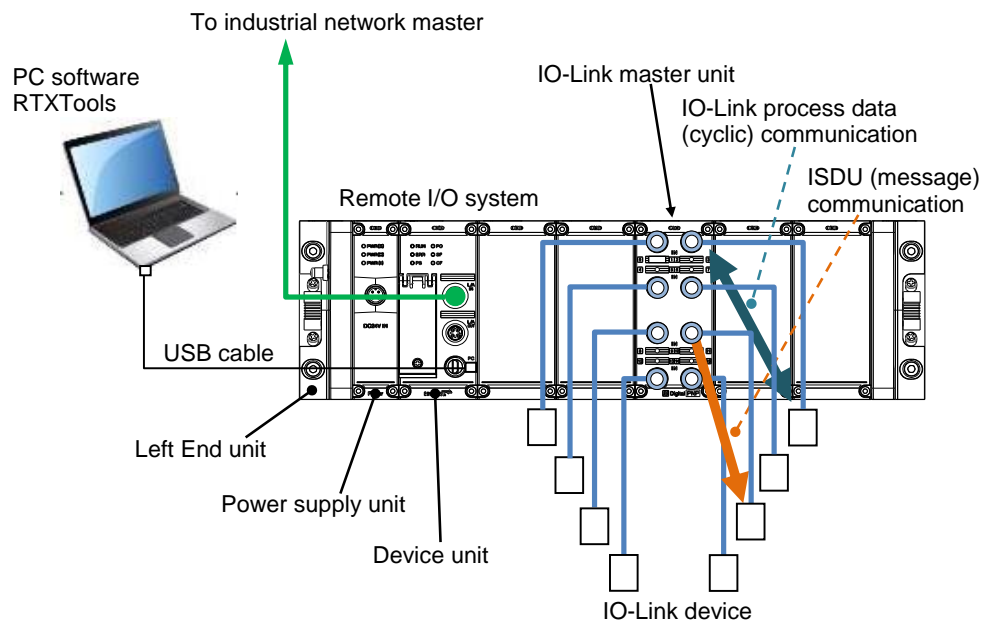
1.1　Features

Features include:
- The timing of communication between ports can be synced in the IO-Link communication.
- The IO-Link process data size can be set in accordance with the connected IO-Link device.
- Configuration information of the connected IO-Link device can be stored and verified.
- IO-Link communication cycle time can be set
- Output operation to be performed in the event of a communication error can be specified for the entire remote I/O system or per unit.
- Setting data of the connected IO-Link device can be backed up and restored.
- Service data of IO-Link devices can be read and written via the PC software and industrial network.

1.2 External Dimensions

106

55.8

46.1

Unit: mm

Dimensional unit: mm

1.3   Names and Functions of Each Part

IO-Link master unit

M12 connector x 8 ports
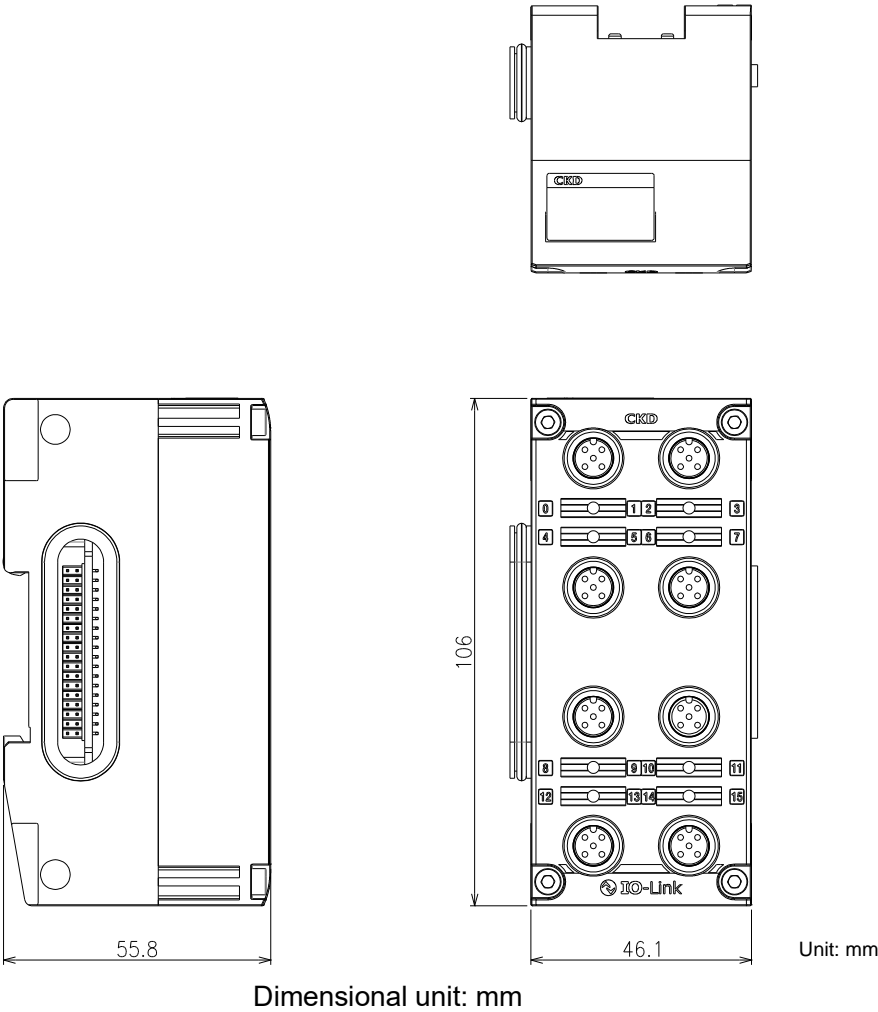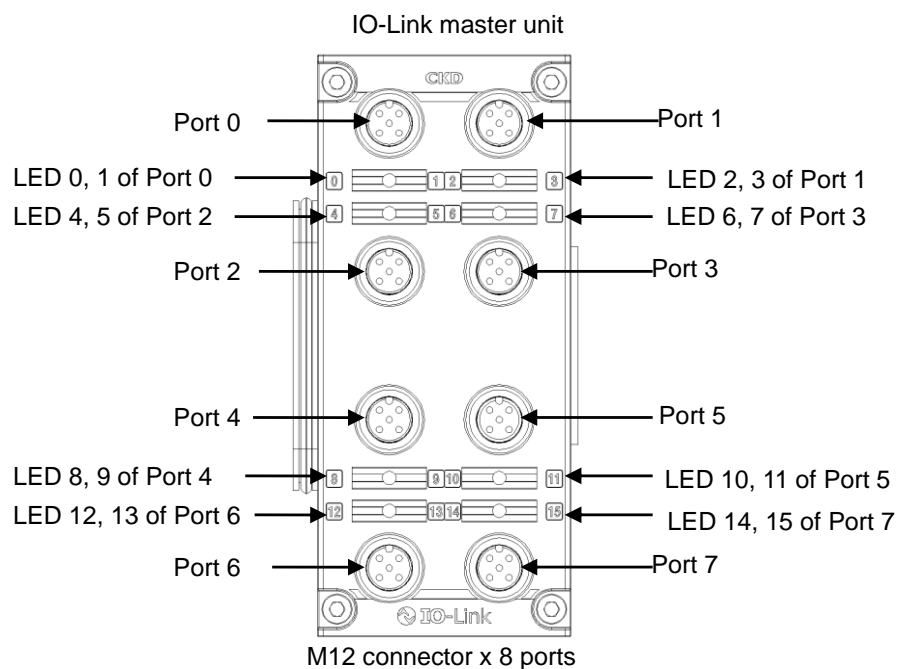
■ LED

Specification list

Name	LED number	Overview		
		Illumination color	Operation mode	Description
Even number (left) LED	0,2,4,6,8,10,12,14	Red, Green, Yellow (Refer to the next table)	IO-Link mode	Indicates the communication status of IO-Link on pin 4.
			Digital input (PNP) mode Digital input (NPN) mode	Indicates the status of digital input 1 on pin 4.
			Digital output (PNP) mode Digital output (NPN) mode	Indicates the status of digital output 1 on pin 4.
Odd number (right) LED	1,3,5,7,9,11,13,15	yellow (Refer to the next table)	IO-Link mode Digital input (PNP) mode Digital input (NPN) mode	Indicates the status of digital input 2 on pin 2.

Status list

Status	Meaning	
	Even number (left) LED	**Odd number (right) LED**
Red on	Internal bus communication disconnected	-
Red blinking (fast)	Memory read/write error	-
Red blinking (slow)	One of the following: - Power line error detection - Signal line error detection	-
Yellow on	One of the following: - Digital input 1: ON state - Digital output 1: ON state	Digital input 2: ON state
Yellow blinking (fast)	Allocation error	Reflect setting waiting
Yellow blinking (slow)	One of the following: - Process data size error (system error) - Device mismatch (unit input error)	None
Green blinking (slow)	One of the following: - Unable to detect IO-Link devices - IO-Link COMM error (unit input error)	-
Green on	In IO-Link communication	-
Off	One of the following: - Power OFF state - In disable mode - Digital input 1: OFF state - Digital output 1: OFF state - When WDT is reset	One of the following: - Power OFF state - In disable mode - Digital input 2: OFF state - When WDT is reset

> ✎ A video is available to show how the LEDs flash.
> If necessary, refer to the video at the following URL.
>
> RT product page:: https://www.ckd.co.jp/kiki/en/product/detail/1064

■ For M12 connector

M12(A) 5-pin female	Pin number	IO-Link mode	Digital input mode	Digital output mode
	1 (L+)	Unit/input 24 V (+) (Note 1)	Unit/input 24 V (+) (Note 1)	
	2 (DI)	Digital input 2	Digital input 2	NC
	3 (L-)	Unit/input 24 V (-)	Unit/input 24 V (-)	
	4 (C/Q)	IO-Link communication	Digital input 1	Digital output 1 (Note 2)
	5	NC		

Note 1: An over current or short circuit can be detected by the "power line error detection" function. For more information, refer to "5.1 Function List".

Note 2: An over current or short circuit can be detected by the "signal line error detection" function. For more information, refer to "5.1 Function List".

■ External wiring

IO-Link mode	Digital input mode (PNP)	
	When connecting to a 3-wire system	When connecting to a 2-wire system

Note 1: For IO-Link devices capable of the Pin 2 digital input function in IO-Link mode, digital input 2 is connected.

Note 2: When connecting two-output type sensors in digital input mode, digital input 2 is connected.

Digital Input Mode (NPN)	
When connecting to a 3-wire system	When connecting to a 2-wire system

Digital output mode (PNP)	Digital output mode (NPN)

■ Recommended cables

Product name	Specifications	Number of cores	Cable extraction method	Manufacturer	OMRON Corporation model No.
XS2H cable with round waterproof connector at one end (M12 straight to open-end-cable)	M12 plug (male) to open-end-cable, for DC	4 cores	Straight to open-end-cable	OMRON Corporation	XS2H-D421-□

■ Waterproof cap

Always put a waterproof cap on unused M12 connectors.
The waterproof cap (RT-CM12) must be used properly to achieve a degree of protection of IP65/IP67.
Purchase RT-CM12 separately.

1.4   Unit Specifications

Item		Description
Type		IO-Link master
Number of connectors		8 connectors
Operation mode		For each port, the following operation modes can be selected. For more information, refer to "1.4.1 Operation mode". - IO-Link mode - Digital input mode - Digital output mode - Disable mode
Port-to-port sync communication		Synchronizes the communication timing with IO-Link devices between ports.
Forced input/output setting		Sets input values regardless of the actual inputs, and outputs regardless of the process data.
Connector shape		M12 (Class A) 5-pin female
Device power supply	Power supply voltage	(Power supply voltage) - less than 1 V Note: Use unit/input power supply (rated power supply voltage 24 VDC).
	Supply current	0.2 A or less per port
	Protection function	Overvoltage protection and overcurrent protection (Note 1)
insulation		Between the connectors: None Between IO-Link circuit and internal bus: Yes
IO-Link specifications	Communication related	Refer to "1.5 IO-Link Communication Specifications".
	Number of port	8 ports
	Rated Input voltage	24 VDC
	Rated input current	Depending on the polarity, specifications differ as follows: [PNP: 5 TYP/ NPN: 4 TYP]
Digital input	Input type	PNP/NPN
	Maximum number of Input points	16 points
	Rated input current	Depending on the pin number and polarity, specifications differ as follows: 4-pin PNP: 5 mA TYP. 4-pin NPN: 4 mA TYP. 2-pin PNP: 5 mA TYP. 2-pin NPN: 4 mA TYP.
	ON voltage/ON current	Depending on the pin number and polarity, specifications differ as follows: 4-pin PNP: 15 V and over / 5 mA and over 4-pin NPN: 17 V and over / 2 mA and over 2-pin PNP: 15 V and over / 2 mA and over 2-pin NPN: 17 V and over / 2 mA and over
	OFF voltage	5 V or less
	Response time	(if there is no port with IO-Link mode) ON delay is less than 2 ms, OFF delay is less than 2 ms Note: The response time does not include the internal bus communication time.
Digital output	Output type	PNP/NPN
	Max. number of output points	8 points
	Max. load current	0.2 A per port
	Leakage current	0.3 mA or less
	Residual voltage	1.5 V or less
	Response time	(if there is no port with IO-Link mode)ON delay is less than 0.5 ms, OFF delay is less than 0.5 ms Note: The response time does not include the internal bus communication time.
	Protection function	Short circuit protection and overvoltage protection (Note 1)

Item	Description
Output power supply	Use unit/input power supply
LED	16 (2 per port)
Working temperature range	-10°C to +55°C
Relative humidity	30% to 85% RH
Ambient atmosphere	No corrosive gases or heavy dust
Installation location	Indoor use
Altitude	Up to 2000m
Pollution degree	3
Degree of protection	IP65/IP67 (when connected to other units) Note[2]
Internal current consumption	Unit/input power supply: 100 mA or less (24 V equivalent) Note: Does not include external loads.
Size (W x H x D)	46.1 × 106 × 55.8 (mm)
Net weight	Approx. 230 g (including RT-TR-1)
Standard accessories	RT-TR-1 (Two tie rods for I/O unit)

Note 1: It does not provide protection against all overcurrent conditions. Pay attention to avoid short circuits, etc. when carrying out wiring.
Note 2: IP65/IP67 is not part of the UL certification.

1.4.1 Operation mode

Operation mode	Function
IO-Link mode	- Operates as the IO-Link master port. - The pin 2 digital input function operates simultaneously with IO-Link communication (for a connection with pin 2 compatible IO-Link devices).
Digital input mode	- Operates as a port for digital inputs (2 points per port, PNP or NPN available).
Digital output mode	Operates as a port for digital outputs (1 point per port, PNP or NPN available).
Disable mode	- Does not use the target port. - Does not supply 24 V power to the port.

1.5   IO-Link Communication Specifications

Item	Specifications
Type	IO-Link master
Protocol	Version1.1
Transmission rate	4.8 kbps (COM1)/ 38.4 kbps (COM2)/ 230.4 kbps (COM3)
Response time	- Input:: 5 ms or less (if the process data size for both input/output is 64 bytes) - Output: 2 ms or less (if the process data size for both input/output is 64 bytes) Note: The response time does not include the internal bus communication time and delay time caused by IO-Link communication cycle. In addition, the smaller the process data size is, the shorter the response time is.
Minimum communication cycle time	1 ms (TMC ≤ 1 ms) TMC (TMC > 1 ms) Note: TMC is the minimum cycle time of the IO-Link device.
IO-Link process data size	- Input: 0 bytes to 32 bytes per port (default: 4 bytes per port) Note: The total for all ports is 0 bytes to 58 bytes.
	- Output: 0 bytes to 32 bytes per port (default: 4 bytes per port) Note: The total for all ports is 0 bytes to 62 bytes.
Data Storage Size	2k bytes per port
Cable length	20 meters or less (unshielded cable)

1.6 Process Data Specifications

Item		Specifications
Process data:	Fixed-length process data	The following data among the process data: - Inputs: Digital input 1, digital input 2, port error flag, IO-Link error flag, error log update, IO-Link input data enable flag - Output: Digital output 1, error log cleared
	IO-Link process data	The following data among the process data: - Input: IO-Link IN data of each IO-Link device - Output: IO-Link OUT data of each IO-Link device Note: IO-Link process data exists only when the port is in IO-Link mode
Process data size (The total size of fixed-length process data and IO-Link process data)		- Input: Up to 64 bytes per unit
		- Output: Up to 64 bytes per unit
Fixed-length process data size		- Input: Fixed at 6 bytes per unit
		- Output: Fixed at 2 bytes per unit

2. INSTRUCTIONS FOR USE

Instructions		Reference
Prior Checking	Check the I/O device configuration to connect to.	"1.4 Unit Specifications"
	Determine the operating mode of each port.	"3. SETTINGS"
	Check each output and input size of the IO-Link device to connect to.	Manual for each IO-Link device
	Determine settings such as IO-Link communication cycle time, synchronization of cycle time between ports, whether to restore configuration data of connected IO-Link devices, etc.	"3. SETTINGS"
	Check the setting if specifying the output operation individually by unit in the event of a communication error.	
↓	↓	-
Hardware installation and wiring	Connect the IO-Link master unit to the remote I/O system.	"Remote I/O RT Series Instruction Manual: System Construction"
	↓	-
	Connect I/O devices to the IO-Link master unit.	"1.3 Names and Functions of Each Part"
↓	↓	-
IO-Link master unit settings	Supply 24 V power to the power supply unit. Note: If there is more than one power supply unit, power them all on within 3 seconds.	"Remote I/O RT Series Instruction Manual: System Construction"
	↓	-
	Connect the PC software to the device unit with a USB cable.	"3.2 List of Settings" "Remote I/O RT Series Instruction Manual: System Construction"
	↓	
	Configure the IO-Link master unit by each port via the PC software (or the industrial network's message communication). Note: To change the setting in accordance with the actual device, use the "Set with device" button.	
	↓	
	Transfer the settings to the device unit by clicking the "Set all items" button in the PC software.	
↓	↓	-
Settings on the industrial network master side	On the configuration tool for the upper controller, set up the size for a basic unit of communication in accordance with the operation mode or the input/output size of each port of the IO-Link master unit (e.g. for EtherCAT, edit the PDO mapping).	"4.4 Assignment Method on the Upper Controller Side"
	↓	-
	- Reflect the configuration tool settings for the upper controller. - Power up the remote I/O system and the IO-Link device.	Manual for each industrial network master
↓	↓	-
Confirmation on IO-Link communication operation	- Check the IO-Link master unit and IO-Link device LEDs. - Check the process data between the upper controller and IO-Link device.	"1.3 Names and Functions of Each Part" "6. TROUBLESHOOTING" Manual for each industrial network master Manual for each industrial network master
Confirmation on IO-Link communication operation (Continued)	(If necessary) Check that data is read from and written to the remote I/O device via ISDU communication.	Manual for each industrial network master Manual for each device unit "Remote I/O RT Series Instruction Manual: System Construction"

Instructions		Reference
↓	↓	-
Backup of the IO-Link device setting data to the IO-Link master unit	To back up the setting data for the connected IO-Link device, choose "Yes" for "Backup settings". Note: It is recommended that the "Device verification settings" be set to something other than "0" (disable).	5.3 Details of the Backup/Restoration of Configuration Data for the Connected IO-Link Device"
↓	↓	-
Maintenance	Maintain IO-Link devices and replace them if necessary.	5.4 Details of the Error Log Function "5.3 Details of the Backup/Restoration of Configuration Data for the Connected IO-Link Device"
↓	↓	
Restoring IO-Link device setting data from the IO-Link master	To restore the setting data for the connected IO-Link device, choose "Yes" for "Restore settings". Note: It is recommended that the "Device verification settings" be set to something other than "0" (disable).	

3. SETTINGS

⚠WARNING

Check the settings of each unit before operating.
Setting the units incorrectly can cause malfunction, and result in personal injury or damage to equipment.

3.1   Setting Method

⚠CAUTION

In the IO-Link Master Unit settings, set the "Input Size" and "Output Size" settings to value equal to or greater than the process data size (PD) of the connected IO-Link device.
If the size set is smaller than the process data (PD) size of the connected IO-Link device, a "process data size error" occurs.

Adjust the settings so that the process data size of the connected IO-Link device is an even number.

If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

There are two ways to configure the IO-Link master unit: using the PC software and using industrial network communication

3.1.1   Using PC software

1 Select IO-Link master unit on the "Unit Configuration" main tab and click the [Settings] button.

2 Select the "Port-each SETS" tab

3 Be sure to set the following: Set other items as needed.

> ⚠ **CAUTION**
>
> **Adjust the settings so that the process data size of the connected IO-Link device is an even number.**
>
> If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

- "Operation mode selection"
- "Input size (bytes)" (when "IO-Link mode" is selected as the operation mode)
- "Output size (bytes)" (when "IO-Link mode" is selected as the operation mode)

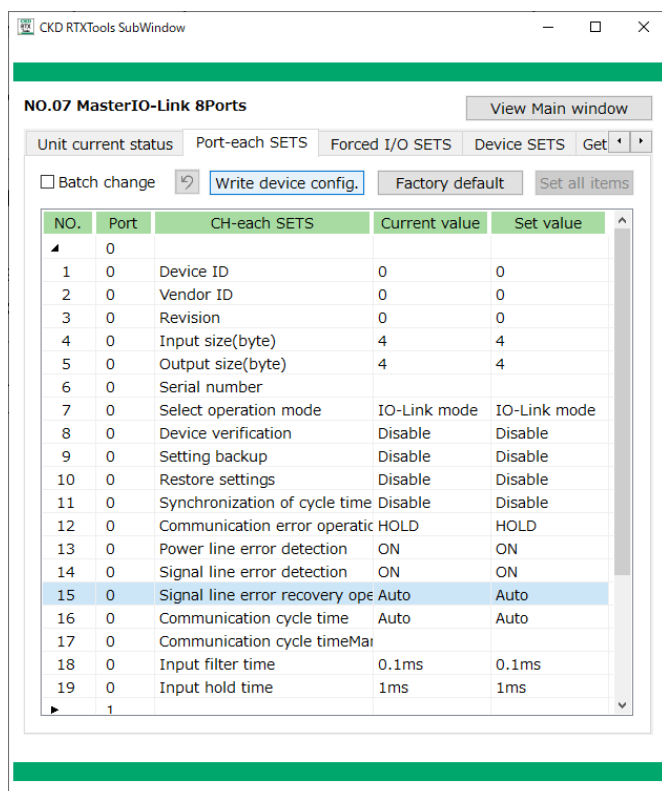## 3.1.2 Using industrial network communication

> ⚠ **CAUTION**
>
> **Adjust the settings so that the process data size of the connected IO-Link device is an even number.**
>
> If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

Set the parameters of the IO-Link master unit according to the message communication commands from the upper controller.

E.g.) In the case of EtherCAT, SDO communication commands are used to set up the IO-Link master unit's object dictionary.

The following table provides an example of the object dictionary for the IO-Link master unit.

Index	Sub-Index	Description	Value	Initial value
0x8XX0	5	Port 0 Input size	0x00 to 0x20	0x04
	6	Port 0 Output size	0x00 to 0x20	0x04
	8	Port 0 port-specific operation setting (Note [1])	0x0000 to 0xFFFF	0x0F01

* "XX" in the above Index is the unit position number (0x00 to 0x11).

Note 1: Port-specific operation settings are assigned to each bit of the data type WORD. E.g.) Bits 0 to 2: Operation mode selection)

The bit assignment is as follows:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved	Reserved	Reserved	Signal line error recovery operation	Signal line error detection	Power line error detection	Communication error operation	

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port-to-port sync	Backup settings	Restore settings	Device verification		Operation mode selection		

There are two ways to set the "Input size" and "Output size".

1) Automatic or manual setting using the PC software
   - Automatic setting:
   Perform "Set with device" on the PC software side. For more information on the operation,
   refer to "5.2.1 Register IO-Link device configuration information.
   - Manual settings:
     Set "Input size (byte)" or "Output size (byte)" in the "Port-each SETS" tab.

2) Manual setting using an upper controller

For information on how to perform setup using the configuration tool on the upper controller
side, refer to "4.4 Assignment Method on the Upper Controller Side".

For "Input size" or "Output size" settings for ports operating in IO-Link mode, it is possible to
select a value that is equal to or greater than the actual size of the connected IO-Link device.
In this case, the valid process data is placed at the beginning (lower-level byte), and the rest is
padded with zeros.
E.g.) When the upper controller specification requires that the process data size be a multiple
of 4, the "Input size" or "Output size" can be set after rounding it up to a multiple of 4.

3.2   List of Settings

> ✏️ When a setting change is made that changes the process data assignment, a "Reflect setting waiting" will occur.
> To reflect the setting change, power the remote I/O system off and on again.

The following can be set for each port:

Port-each setting	Description	Value	Factory setting	Enabled operation mode	Required setting	Required setting at device verification
Device ID	The type of connected IO-Link device (Note 1).	0x000000 to 0xFFFFFF	0x000000	IO-Link mode	-	●
Vendor ID	The vendor ID of the connected IO-Link device (Note 1).	0x000000 to 0xFFFFFF	0x0000	IO-Link mode	-	●
Revision	The revision of the connected IO-Link device (Note 1).	0x00 to 0xFF Bit 0 to 3: Minor revision Bit 4 to 7: Major revision	0x00	IO-Link mode	-	●
Input size	Sets the input process data size (bytes) of the connected IO-Link device. If the size set is smaller than the process data (PD) size of the connected IO-Link device, a "process data size error" occurs (Note [1]).	0 bytes to 32 bytes Note1: The total for all ports is 0 bytes to 58 bytes. Note 2: Set in an even byte.	4 bytes	IO-Link mode	●	-
Output size	Sets the size (bytes) of the output process data of the connected IO-Link device. If the size set is smaller than the process data (PD) size of the connected IO-Link device, a "process data size error" occurs (Note [1]).	0 bytes to 32 bytes Note1: The total for all ports is 0 bytes to 62 bytes. Note 2: Set in an even byte.	4 bytes	IO-Link mode	●	-
Serial number	The serial number of the connected IO-Link device (Note [1]).	Read as ASCII code or UTF-8. Up to 16 characters.	00	IO-Link mode	-	●
Operation mode selection	Selects which operation mode is to be used for each port on the IO-Link master unit. Note: In the case that the upper network is EtherCAT, edit the PDO on the upper controller side in accordance with the process data assignment.	0: Disable mode 1: IO-Link mode 2: Digital input mode (PNP) 3: Digital input mode (NPN) 4: Digital output mode (PNP) 5: Digital output mode (NPN)	1: IO-Link mode	All modes	●	-

Port-each setting	Description	Value	Factory setting	Enabled operation mode	Required setting	Required setting at device verification
Device verification	Verifies the IO-Link device configuration memorized by the IO-Link master unit against the connected IO-Link device configuration. In case that the "device mismatch" is detected, sets the "IO-Link error flag" to 1 (ON).	0: Disable (Do not verify) 1:3 types verification (verify device ID, vendor ID, and revision) 2: 4 types verification (Verify device ID, vendor ID, revision, and serial number)	0:Disable (Do not verify)	IO-Link mode	-	●
Backup settings	Whether to back up setting data for the connected IO-Link device.	0: Disable (Do not back up) 1: Enable (Back up the data)	0: Disable (Do not back up)	IO-Link mode	-	-
Restore settings	Whether to restore setting data for the connected IO-Link device.	0: Disable (Do not restore) 1: Enable (Restore the data)	0: Disable (Do not restore)	IO-Link mode	-	-
Synchronization of cycle time between ports	Sets whether to sync or not between ports in IO-Link mode.	0: Disable (async) 1: Enable (sync)	0: Disable (async)	IO-Link mode	-	-
Communication error operation	Sets the digital output in case a communication error with upper controller or internal bus communication error occurs. (For more information, refer to "7.1.1 Communication error")	0: OFF 1: ON 2: HOLD	2: HOLD	Digital output mode	-	-
Power line error detection	Sets whether to detect power line errors. (For more information, refer to "7.1.1 Communication error").	0:Disable 1:Enable	1:Enable	IO-Link mode Digital input mode Digital output mode	-	-
Signal line error detection	Sets whether to detect signal line errors.	0:Disable 1:Enable	1:Enable	Digital output mode	-	-
Signal line error recovery operation	After recovery from a signal line error, sets whether to maintain the behavior in the event of the error or return to the normal state from the first data update. If "1" (Manual) is selected, the system will wait for the user to turn the power off and on again.	0: Auto (Do not maintain the behavior in the event of an error) 1: Manual (Maintain the behavior in the event of an error)	0: Auto (Do not maintain the behavior in the event of an error)	Digital output mode	-	-
Communication cycle time	Sets the IO-Link communication cycle. It is possible to choose whether to rely on the minimum communication cycle time of the connected IO-Link device or to communicate for a manually set time.	0: Auto (automatic setting) (Note 2) 1 to 9: Unable to set 10 to 255: Manual (manual setting) (Note 3)	0: Auto (Automatic setting)	IO-Link mode	-	-

| Input filter time | Sets the input filter time. | 0: 0.1 ms
1: 1 ms
2: 5 ms
3: 10 ms
4: 20 ms | 0: 0.1 ms | Digital input mode | - | - |
| Input hold time | Sets the input hold time. | 0: 1 ms
1: 15 ms
2: 100 ms
3: 200 ms | 0: 1 ms | Digital input mode | - | - |

Note 1: To automatically set up the following data from the actual device, click the "Set with device" button on the PC software to retrieve the actual configuration data, select the port number to write to, and click the "OK" button.
- Device ID
- Vendor ID
- Revision
- Input size
- Output size
- Serial number

If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

Note 2:
If TMC $\leq$ 1 ms: 1 ms
If TMC > 1 ms : TMC
(TMC is the minimum communication cycle time (ms) for IO-Link devices.

Note 3:
Set the communication cycle time using the following formula:
Formula: Set value $\times$ 0.1 ms
  E.g.: If the set value is 20, the communication cycle time is 2.0 ms
However, if the cycle time is between 6.4 ms and 25.5 ms, it can only be set in 0.4 ms increments due to the IO-Link specifications.
If it is less than a multiple of 0.4 ms, it is rounded down to a multiple of 0.4 ms.
  E.g.: If the set value is 101, the cycle time is 10.1 ms, but the value is rounded down to a multiple of 0.4 ms, 10.0 ms.

4. I/O ASSIGNMENT

4.1   Details of the Process Data Assignment

> ### ⚠ CAUTION
>
> **Adjust the settings so that the process data size of the connected IO-Link device is an even number.**
>
> If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

The cyclic communication area of the IO-Link master unit assigned to the upper controller is shown below.

The data size depends on the operation mode settings for the port and the type and number of connected IO-Link devices.

4.1.1   input

data	Description	Size
Digital input 1 (Digital input mode)	Digital input value corresponding to pin number 4. 1 means ON state, and 0 means OFF state. Note: If the target port is not in digital input mode, all will be 0 (OFF).	1 byte fixed
Digital input 2 (IO-Link mode or digital input mode)	Digital input value corresponding to pin number 2. 1 means ON state, and 0 means OFF state. Note: If the target port is not in IO-Link or digital input mode, all will be 0 (OFF).	1 byte fixed
Port error flag (All modes)	The flag is 1 (ON) for each port when a power line error, signal line error to an external output device, or memory read/write error occurs.	1 byte fixed
IO-Link error flag (IO-Link mode)	In IO-Link mode, the flag is 1 (ON) when any of the following occurs: - IO-Link COMM error - Device mismatch - Unable to detect IO-Link devices	1 byte fixed
Error log update flag (IO-Link mode)	The flag is 1 (ON) when an event occurs in IO-Link communication (Note 1). Note: The information can be read from the PC software or upper controller. Refer to"6.2 Reading IO-Link Device Error Log" for more information.	1 byte fixed
IO-Link input data enable flag (IO-Link mode)	A flag indicating whether the process input data of each port is enable or disable. It is 0 (OFF) when any of the following occurs: - IO-Link COMM error -Process data size error - Device mismatch It is 1 (ON) when the process input data is enabled. Therefore, it is recommended to program to use the process input data when this flag is 1 (ON).	1 byte fixed
Process data port 0 (IO-Link mode)	Process input data for port 0.	N bytes (N = 0 to 32) (Note 2) Default: 4 bytes
...	...	...
Process data port 7 (IO-Link mode)	Process input data for port 7.	N bytes (N = 0 to 32) (Note 2) Default: 4 bytes

Note 1: While "Error log clear flag" is ON, the "Error log update flag" remains as 0 (OFF).

Note 2: The total for port 0 to 7 must be 58 bytes or less. When a setting change that makes the size 59 bytes or larger is requested, a "data mapping error" occurs for all ports in IO-Link mode and the setting change request is discarded.

Digital input 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

Digital input 2 (Pin2 input)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

Port error flag

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

IO-Link error flag

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

Error log update flag

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

IO-Link input data enable flag

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

4.1.2 Output

data	Description	Size
Digital output 1 (Digital output mode)	Digital output value corresponding to pin number 4. 1 means ON state, and 0 means OFF state. Note: If the target port is not in the digital output mode, all will be 0 (OFF).	1 byte fixed
Error log clear flag (IO-Link mode)	A flag that clears error logs in the IO-Link master unit at the time of startup from 0 (OFF) to 1 (ON). At the same time, the "Error log update flag" will be 0 (OFF). Note: While "Error log clear flag" is 1 (ON), the "Error log update flag" remains as 0 (OFF).	1 byte fixed
Process data port 0 (IO-Link mode)	Process output data for port 0.	N bytes (N = 0 to 32) (Note 1) Default: 4 bytes
...	...	...
Process data port 7 (IO-Link mode)	Process output data for port 7.	N bytes (N = 0 to 32) (Note 1) Default: 4 bytes

Note 1: The total for port 0 to 7 must be 62 bytes or less. When a setting change that makes the size 63 bytes or larger is requested, a "data mapping error" occurs and the setting change request is discarded.

* The data for digital output 1 on ports that is not in the corresponded operation mode will be disabled.

* All of the above outputs will be 0 until the unit completes its start-up process.

Digital output 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

Error log clear flag

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

4.2   Process Data Assignment Rules

> ### ⚠ CAUTION
>
> **Adjust the settings so that the process data size of the connected IO-Link device is an even number.**
>
> If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

The I/O from the IO-Link master unit to the device unit is assigned in accordance with the following rules:

4.2.1   Input order

It is assigned in the following order, without gaps.
1. One byte of digital input 1
2. One byte of digital input 2
3. One byte of port error flag
4. One byte of IO-Link error flag
5. One byte of Error log update flag
6. One byte of IO-Link input data enable flag
7. N bytes in the total of process input data in IO-Link mode (N = 0 to 58, 32 bytes by default (4 bytes x 8 ports))

4.2.2   Output order

It is assigned in the following order, without gaps.
1. One byte of the digital output
2. One byte of the Error log update flag
3. N bytes in the total of process output data in IO-Link mode (N = 0 to 62, 32 bytes by default (4 bytes x 8 ports))

4.3   Examples of the Process Data Assignment

> ⚠ **CAUTION**
>
> **Adjust the settings so that the process data size of the connected IO-Link device is an even number.**
>
> If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

Process data configuration examples under the following conditions are shown below.
Configuration example: One device unit, one IO-Link master unit

4.3.1   Assignment example for each port

■ Settings of process data size for IO-Link master unit

Port	Mode	Size settings for IO-Link master unit	
		Output	input
0	IO-Link	0 bytes	4 bytes
1	Digital output	-	-
2	IO-Link	0 bytes	8 bytes
3	Digital input	-	-
4	IO-Link	6 bytes	16 bytes
5	Digital input	-	-
6	IO-Link	8 bytes	8 bytes
7	Digital input	-	-

■ Process data size of the connected IO-Link device

Port	Mode	Process data size of the connected IO-Link device	
		Output	input
0	IO-Link	0 bytes	4 bytes
1	Digital output	-	-
2	IO-Link	0 bytes	8 bytes
3	Digital input	-	-
4	IO-Link	5 bytes (Note 2)	15 bytes (Note 2)
5	Digital input	-	-
6	IO-Link	8 bytes	6 bytes (Note 1)
7	Digital input	-	-

Note 1: If the actual IO-Link size is less than the setting size, as shown in the input of port 6 in the above example, the valid process data is placed at the beginning (lower-level byte), and the rest is padded with zeros.

Note 2: If the size of the connected IO-Link is odd, as shown in the port 4 in the above example, set the value by adding 1 byte. The valid process data is placed at the beginning (lower-level byte). For input process data, it is padded with trailing zeros. For output process data, 1 byte is truncated from the trailing end before communicating with IO-Link device.

4.3.2 Examples of process data assignment

■ Input

Gray part: Fixed   Yellow part: Variable size (remains at the

Orange part: Variable size (additional change

from the default is necessary)

Area order	Assigned memory position (below are byte units)							
	0	1	2	3	4	5	6	7
1	Digital input 1	Digital input 2 (Pin2 input)	Port error flag	IO-Link error flag	Error log update	Input data: enable flag	IO-Link IN data <Port 0>	
2	IO-Link IN data <Port 0>		IO-Link IN data <Port 2>					
3			IO-Link IN data <Port 4>				IO-Link IN data <Port 6>	
4	IO-Link IN data <Port 6>				0x0000 (Note 1)			

※   <Port X> means a port number.

Note 1: If the actual IO-Link size is less than the setting size, as shown in the input of port 6 in the above example, the
valid process data is placed at the beginning (lower-level byte), and the rest is padded with zeros.

■ Output

Gray part: Fixed   Yellow part: Variable size (remains at the

Yellow part: Variable size (remains at the default 4 bytes)

Area order	Assigned memory position (below are byte units)							
	0	1	2	3	4	5	6	7
1	Digital output 1	Error log cleared	IO-Link OUT data <Port 4>				IO-Link OUT data <Port 6>	
2	IO-Link OUT data <Port 6>							

* <Port X> means a port number.

4.4 Assignment Method on the Upper Controller Side

⚠ CAUTION

If using an IO-Link master unit, the size of the basic unit of communication on the side of a configuration tool of an upper industrial network controller (e.g. "PDO" for EtherCAT) should match the data size on the IO-Link master unit side.

Mismatching prevents correct communication. (For EtherCAT, a mismatch results in an "incorrect SyncManager settings" and the condition requested from the master unit cannot be maintained.)
If a mismatch occurs, the communication unit on the upper controller side must be edited (add or delete PDO entries).
There are two cases where mismatches occur:
1) When the operation mode of the port on the IO-Link master unit is in the "IO-Link mode".
   The "input size" or "output size" of the IO-Link master unit does not match the size of the upper controller's basic unit of communication (e.g. "PDO" for EtherCAT).
2) When the operation mode of the port on the IO-Link master unit is "other than IO-Link mode" (Note 1).
   Even though there is no input/output on the IO-Link master unit side to perform IO-link communication with IO-Link devices, there is a basic unit of communication (e.g. "PDO" for EtherCAT) that has assigned it on the upper controller side.

   Note 1: Note 1: Modes "other than IO-Link mode" means digital input mode, digital output mode, and disable mode.

Adjust the settings so that the process data size of the connected IO-Link device is an even number.

If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.
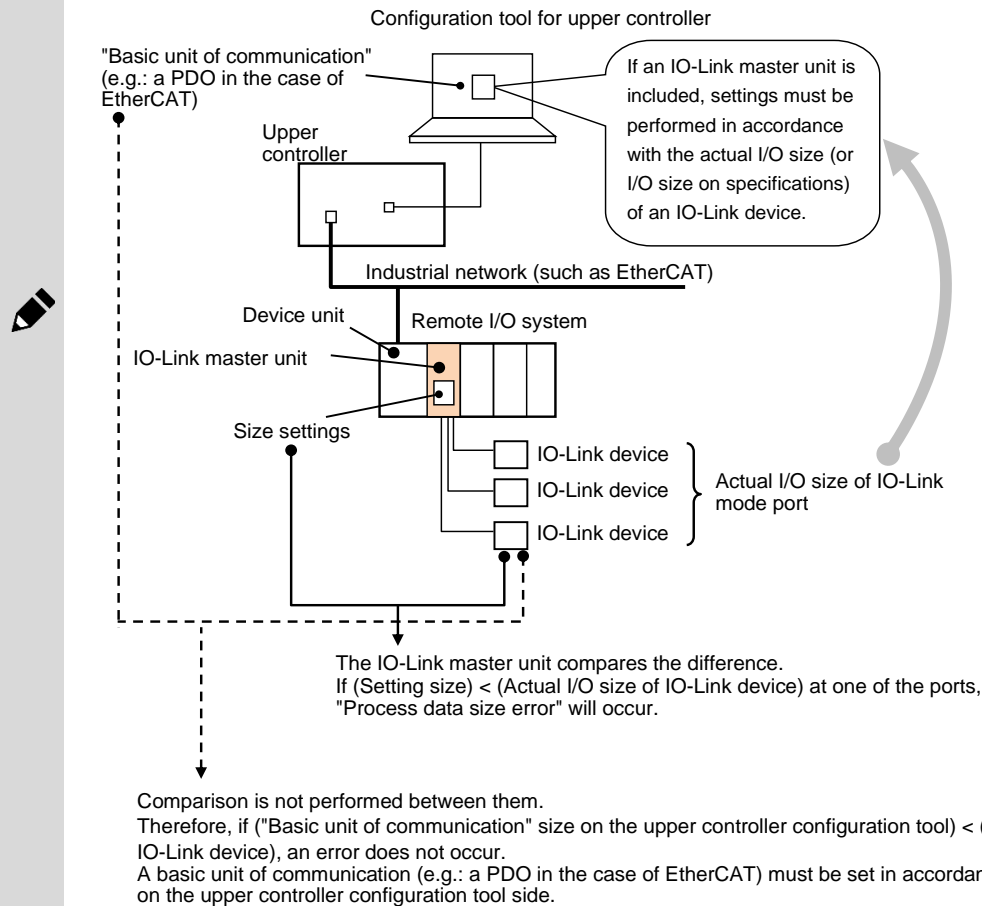

On the IO-Link master unit, the data size for cyclic communication with the upper controller varies depending on the operation mode or the input/output size settings.

In order to successfully communicate with the upper controller, the configuration tool for the upper controller must be used and the variable size portion (PDO for EtherCAT) must be set in accordance with the operation mode or input/output size of each port of the IO-Link master unit.

If the size of each port on the IO-Link master unit is set smaller than the process data size of the connected IO-Link device, a "process data size error" occurs.
This error does not occur on upper controllers because it occurs for communications between the IO-Link master unit and IO-Link devices.
If the remote I/O system is connected to an EtherCAT master, and the result of comparing the size of the PDO on the upper controller with the size of the PDO on the remote I/O system is a mismatch, an EtherCAT settings error ("PDO size error") occurs. Therefore, EtherCAT communication is not performed.

Configuration tool for upper controller

"Basic unit of communication" (e.g.: a PDO in the case of EtherCAT)

If an IO-Link master unit is included, settings must be performed in accordance with the actual I/O size (or I/O size on specifications) of an IO-Link device.

Upper controller

Industrial network (such as EtherCAT)

Device unit

Remote I/O system

IO-Link master unit

Size settings

IO-Link device
IO-Link device
IO-Link device

Actual I/O size of IO-Link mode port

The IO-Link master unit compares the difference.
If (Setting size) < (Actual I/O size of IO-Link device) at one of the ports, "Process data size error" will occur.

Comparison is not performed between them.
Therefore, if ("Basic unit of communication" size on the upper controller configuration tool) < (Actual I/O size of the IO-Link device), an error does not occur.
A basic unit of communication (e.g.: a PDO in the case of EtherCAT) must be set in accordance with the actual I/O size on the upper controller configuration tool side.

4.4.1 Example of actual machine operation

The following is an example where the industrial network is EtherCAT and the configuration tool for the upper controller is Sysmac Studio from Omron Corporation.

1 After importing the ESI file for this product into Sysmac Studio, register the product in the EtherCAT system.

2 Select the IO-Link master unit (model No. RT-XLMSA08N) as the module.
The mapped PDO entries (set values) are displayed on the right.
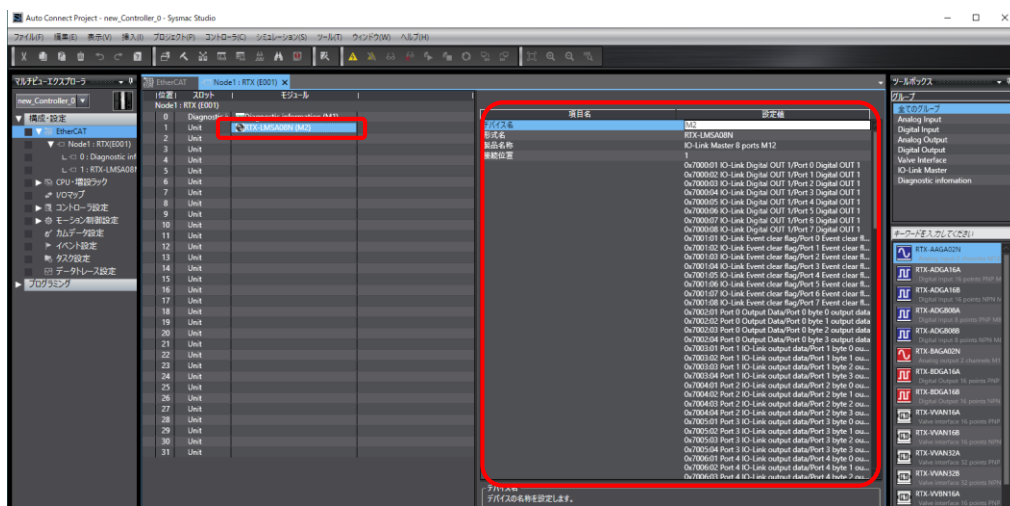
3 Scroll the set value display to the bottom and click the [Edit PDO Mapping Settings] button.
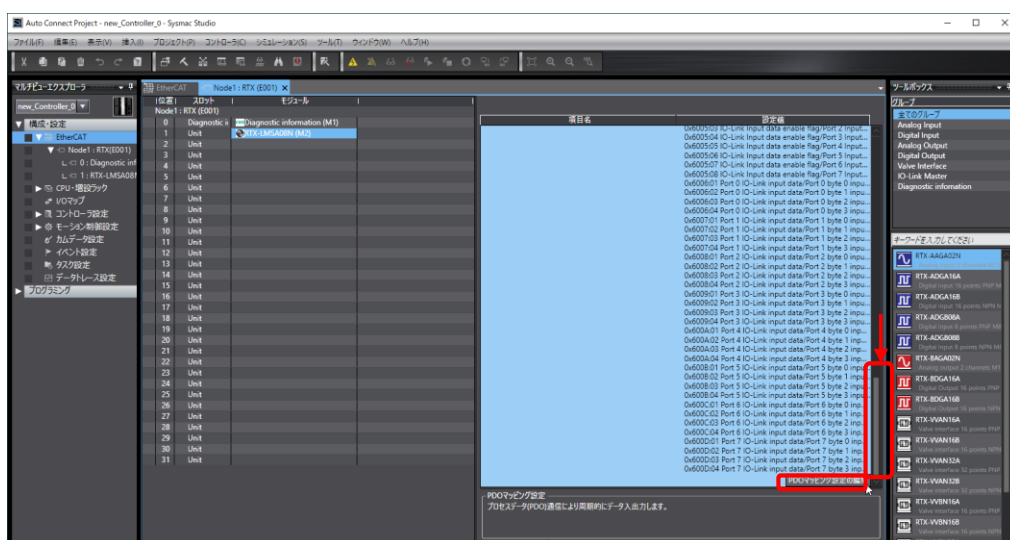
4 4   The PDO list (per module) for the IO-Link master unit is displayed as follows:
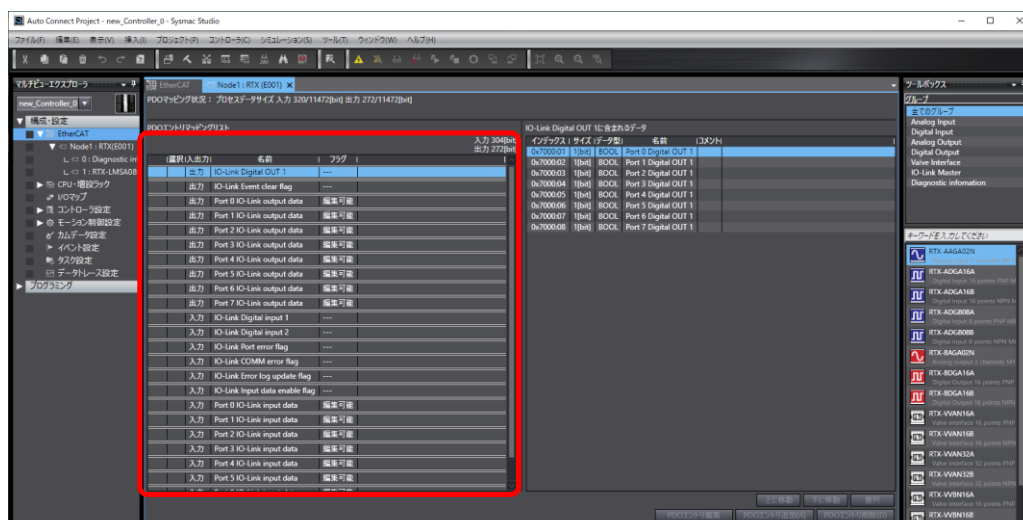
■ **When the port operation mode is "IO-Link mode"**

The PDO size (per module) corresponding to the port set to IO-Link mode must be changed in accordance with the process data size of the connected IO-Link device.

The default PDO size (per port) is 4 bytes each for input/output.
If the process input data of the connected IO-Link device is greater than 4 bytes, or the process output data is greater than 4 bytes, add a PDO entry on the PDO mapping settings edit screen to change the size in accordance with the size of the process input data or process output data of the IO-Link device.

Note: If changing the "Input size" or "Output size" settings on the IO-Link master unit side in accordance with the actual

IO-Link device, run "Write device config." on the PC software. For more information on operation, refer to "5.2.1

Register IO-Link device configuration information" and "■ Automatic settings from the actual device".
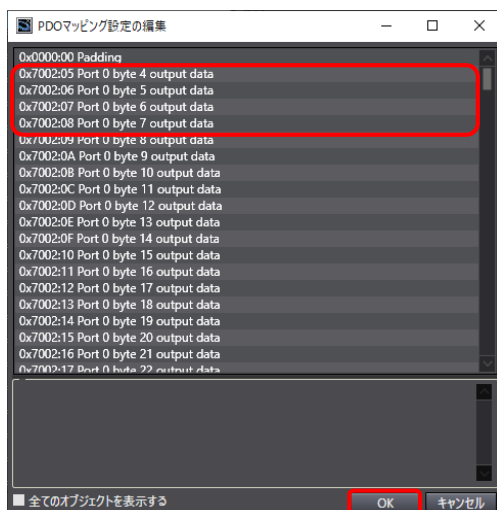
1 Select the PDO (per module) corresponding to the port for which the size is to be edited.
E.g.) If port 0 is in IO-Link mode and the process output data of the IO-Link device connected to it is greater than 4 bytes
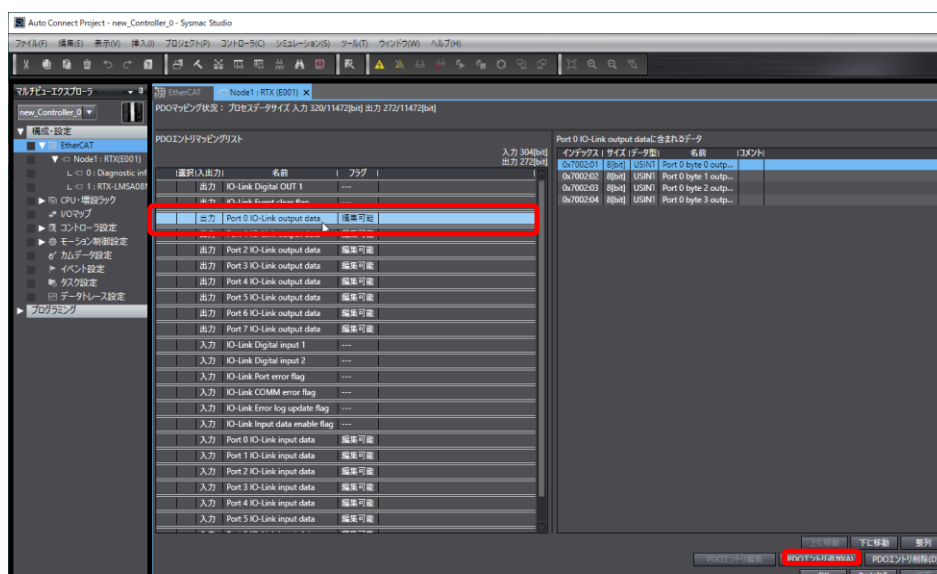
2   Click the [Add PDO Entry] button.
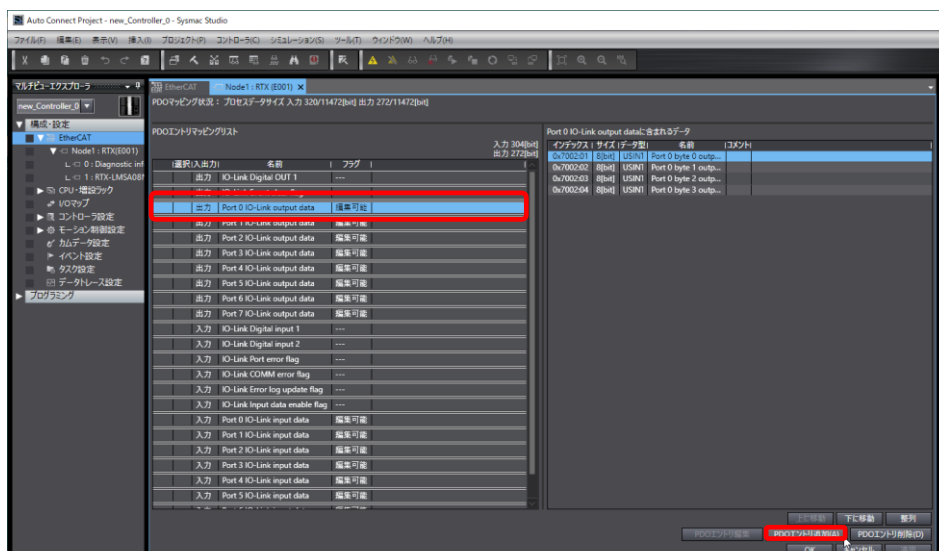
3   A list of objects held by the IO-Link master unit is displayed. Select the object to add and click the [OK] button.

For example, if the output size of the IO-Link device on port 0 is 8 bytes for the PDO "Port 0 IO-Link output data" per module, perform edits as follows:

- ・   Add 4 bytes to the PDO per port (The default size of the PDO "Port 0 IO-Link output data" per port, is 4 bytes.)
- ・   Because the default PDO entries are "Port 0 byte 0 output data" to "Port 0 byte 3 output data", add the remaining PDO entries "Port 0 byte 4 output data" to "Port 0 byte 7 output data".

4   Transfer the settings from the Sysmac Studio to the upper controller.

■ **When the operation mode of the port is "other than IO-Link mode"**

The size of the PDO (per port) corresponding to the port set to digital input / digital output mode or disable mode must be set to 0, i.e. the PDO entry must be deleted.

1   Select the PDO (per port) that corresponds to the port other than IO-Link mode.
E.g.) When port 2 is in digital input mode
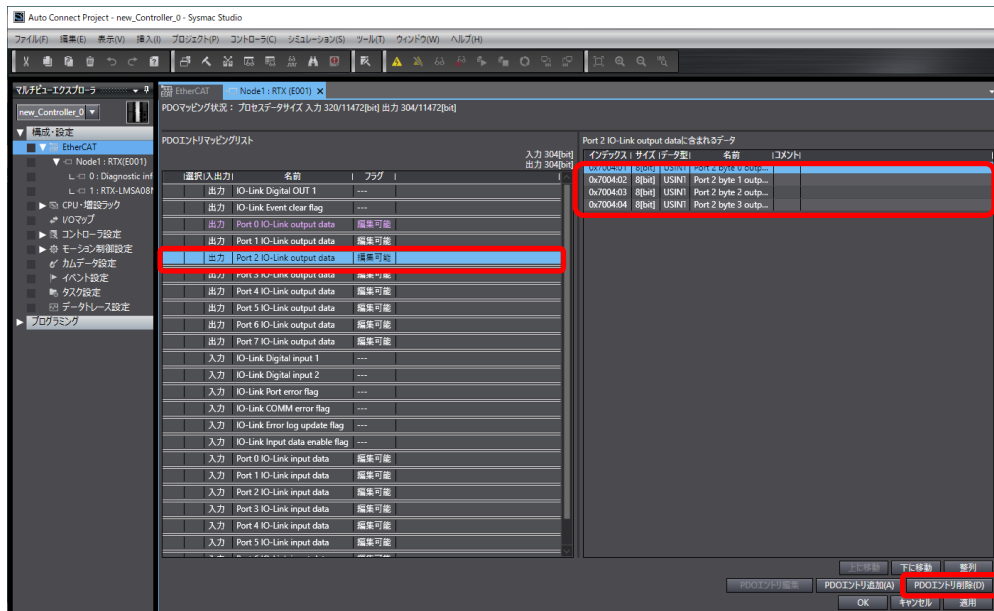
2   Click the [Delete PDO Entry] button.

Delete the default PDO entries "Port 2 byte 0 output data" to "Port 2 byte 3 output data".

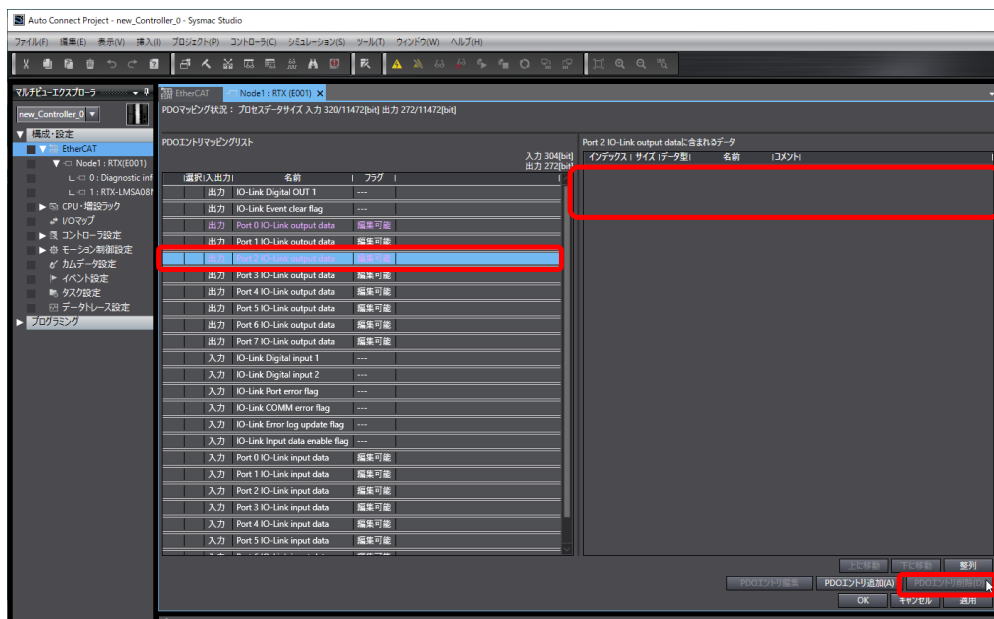**3**   Transfer the settings from the Sysmac Studio to the upper controller.

4.4.2 Example of an assignment to the connected upper controller

An example of assigning a remote I/O system including an IO-Link master unit to an upper controller is shown below.

■ Example of a system configuration
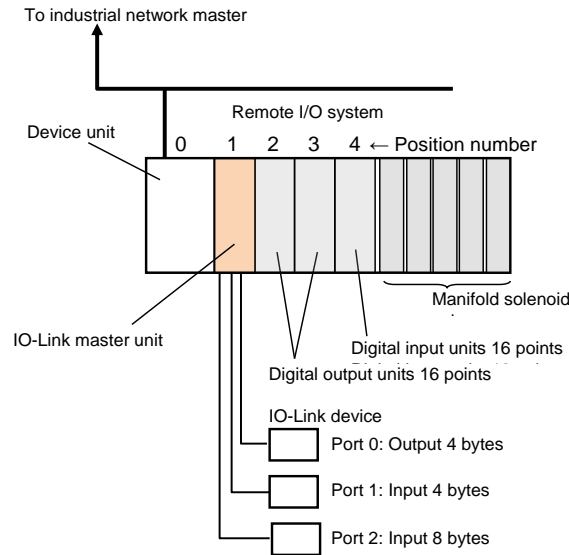
In this example, the size of the process input on port 2 is 8 bytes. So the size of the communication unit (e.g., PDO for EtherCAT) must be changed from the default 4 bytes to 8 bytes on the configuration tool of the upper controller.

■ Settings in the upper controller configuration tool (e.g. EtherCAT)

■ Assignment of remote I/O system to an upper controller

ビット→	7	6	5	4	3	2	1	0	Information	Unit name	
									Digital output 1	IO-Link master unit	Output area
									Error log cleared		
									IO-Link mode Port 0 Process output		
									Digital output	Digital output unit	
									Digital output		
									Remote I/O diagnostic information	Slave unit	
									Digital input 1	IO-Link master unit	Input area
									Digital input 2		
									Port error flag		
									IO-Link error flag		
									Error log update		
									Process data IN error flag		
									IO-Link mode Port 1 Process input		
									IO-Link mode Port 2 Process input		
									Digital input	Digital input unit	
									Digital input		

* The assignment for port 3 to 7 is omitted here.

▢ (gray) : Fixed size

▢ (yellow) : Variable size (default)

▢ (orange) : Variable size (Additional change from the default is necessary)

■ Assignment size for each unit

Position number	Unit name	Output size	Input size
0	Device unit	0 bytes	1 byte
1	IO-Link Master Unit	6 bytes	18 bytes
2	Digital output unit	2 bytes	0 bytes
3	Digital output unit	2 bytes	0 bytes
4	Digital input unit	0 bytes	2 bytes

* The assignment for port 3 to 7 is omitted.

4.5 Process Data Name

Process data names are displayed on the upper controller's configuration tool as follows, based on the ESI file:

E.g.)

Unit model No. (module name)	Input/ Output	data Size	data	Data name on the ESI file for EtherCAT	Data type
RT-XLMSA08N	input	1 byte	Port 0 Digital input 1	Port 0 Digital IN 1	BOOL
			...	...	...
			Port 7 Digital input 1	Port 7 Digital IN 1	BOOL
		1 byte	Port 0 Digital input 2	Port 0 Digital IN 2	BOOL
			...	...	...
			Port 7 Digital input 2	Port 7 Digital IN 2	BOOL
		1 byte	Port 0 Port error flag	Port 0 Error flag	BOOL
			...	...	...
			Port 7 Port error flag	Port 7 Error flag	BOOL
		1 byte	Port 0 IO-Link error flag	Port 0 COMM error flag	BOOL
			...	...	...
			Port 7 IO-Link error flag	Port 7 COMM error flag	BOOL
		1 byte	Port 0 Error log update flag	Port 0 Error log update flag	BOOL
			...	...	...
			Port 7 Error log update flag	Port 7 Error log update flag	BOOL
		1 byte	Port 0 IO-Link Input data enable flag	Port 0 Input data enable flag	BOOL
			...	...	...
			Port 7 IO-Link Input data enable flag	Port 7 Input data enable flag	BOOL
		0 bytes to 32 bytes (initial value 4 bytes)	Port 0 Process data input byte 0	Port 0 Byte 0 input data	BYTE
			...	...	...
			Port 0 Process data input byte 31	Port 0 Byte 31 input data	BYTE
			...	...	...
		0 bytes to 32 bytes (initial value 4 bytes)	Port 7 Process data input byte 0	Port 7 Byte 0 input data	BYTE
			...	...	...
			Port 7 Process data input byte 31	Port 7 Byte 31 input data	BYTE
	Output	1 byte	Port 0 Digital output 1	Port 0 Digital OUT 1	BOOL
			...	...	...
			Port 7 Digital output 1	Port 7 Digital OUT 1	BOOL
		1 byte	Port 0 Error log clear flag	Port 0 Event clear flag	BOOL
			...	...	...
			Port 7 Error log clear flag	Port 7 Event clear flag	BOOL
		0 bytes to 32 bytes (initial value 4 bytes)	Port 0 Process data output byte 0	Port 0 Byte 0 output data	BYTE
			...	...	...
			Port 0 Process data output byte 31	Port 0 Byte 31 output data	BYTE
			...	...	...
		0 bytes to 32 bytes (initial value 4 bytes)	Port 7 Process data output byte 0	Port 7 Byte 0 output data	BYTE
			...	...	...
			Port 7 Process data output byte 31	Port 7 Byte 31 output data	BYTE

5. FUNCTIONS

5.1   Function List

Function	Description	Related settings (Note 1)	Operation mode
Port operation setting	Selects an operation mode for each port on an IO-Link device. Select one of the following: - IO-Link mode 　　Note: If the IO-Link device supports the digital input Pin 2 function, the digital signal is assigned to digital input 2. - Digital input mode (PNP) - Digital input mode (NPN) - Digital output mode (PNP) - Digital output mode (NPN) - Disable mode	[Operation mode selection]	(Common for all modes)
Port diagnostic information for the unit	The diagnostic information for each of the IO-Link master unit's port. 16 bits per port, and each bit corresponds to an error type. If an error is detected, the corresponding bit is 1 (ON). The information can be read from the PC software or upper controller. The types of errors are as follows: Bit: Error description (genres of device diagnostics) 15: Power line error (power failure) 14: Signal line error (unit output error) 13: Memory read/write error (hardware error) 12:IO-Link COMM error (unit input error) 　Or on signal line error recovery, same behavior maintained as during error (operation waiting) 11: Process data size error (system error) 10: Data mapping error (system error) 9: Device mismatch (unit input error) 8: Reflect setting waiting (operation waiting) 7: Allocation error (system error) 6: Manual output (waiting to be set) Note: Bits 5 to 0 are not used.	-	(Common for all modes)
Device information acquisition	Allows users to register the configuration information for IO-Link device to an IO-Link master unit by the PC software In IO-Link mode.	Device ID Vendor ID Revision Input size Output size Serial number	IO-Link mode
Device verification	If the "Device verification" setting is "ON" (Verify) in IO-Link mode, this verifies if the configuration information at startup (Note 2) matches with the one recorded in the IO-Link master unit. If the configuration information does not match, communication stops at PREOPERATE. At the same time, the IO-Link error flag will be 1 (ON) because of a device mismatch. For more information, refer to "5.3 Details of the Backup/Restoration of Configuration Data for the Connected IO-Link Device". Note 2: The IO-Link device configuration information consists of the following:Device ID, vendor ID, revision, and serial number	[Device verification]	IO-Link mode
Backup/restoring settings data of a connected IO-Link device	Saves (backs up) the setting data of the connected IO-Link device in non-volatile memory in the IO-Link master unit If no device mismatch error occurs in IO-Link mode. In addition, if no device mismatch error occurs, it restores the setting data of the IO-Link device that is backed up to the IO-Link master unit to the IO-Link device. For more information, refer to "5.3 Details of the Backup/Restoration of Configuration Data for the Connected IO-Link Device".	[Backup settings] [Restore settings]	IO-Link mode

Function	Description	Related settings (Note 1)	Operation mode
IO-Link communication cycle time setting (automatic/manual)	Sets the communication cycle time per port to one of the following in IO-Link mode.	[Communication cycle time]	IO-Link mode
Synchronization of cycle time between ports	Enables synchronization between ports in IO-Link mode. To use the function, select "Sync" for the "Sync" settings. For the communication timing, the shorter cycle time communication with the IO-Link device matches the longer cycle time communication with the IO-Link device. Examples of how the function can be used: - Synchronous control of two electric actuators. - Sampling different sensor data at the same timing.	[Synchronization of cycle time between ports]	IO-Link mode
Error log	Stores error notifications from IO-Link devices through event communication or ISDU communication with IO-Link devices in IO-Link mode. For more information, refer to "5.4 Details of the Error Log Function"	-	IO-Link mode
Input filter time in digital input mode	In digital input mode, sets the time before ON or OFF of the input signal is confirmed. Select from 0.1 ms, 1 ms, 5 ms, 10 ms, or 20 ms.	[Input filter time]	Digital input mode
Input hold time	In digital input mode, sets the minimum hold time after the input signal has been confirmed ON or OFF. Select from 1 ms, 15 ms, 100 ms, or 200 ms.	[Input hold time]	Digital input mode
Power line error detection	Detects an over-current or short-circuit on the pin 1 line (unit/input 24 V (+)).	[Power line error detection]	IO-Link mode Digital input mode Digital output mode
Signal line error detection	Detects an over current or short circuit on the pin 4 line (digital output 1)	[Signal line error detection]	IO-Link mode Digital output mode
Forced input settings	Forces the IO-Link process input data or digital input signal of the IO-Link master unit to be either ON or OFF (regardless of the actual input) from the PC software(common for all modes). Note: Forced I/O settings only reflect the settings that match the operating mode.	-	(Common except for disable mode
Forced output settings	Forces the IO-Link process output data or digital output signal of the IO-Link master unit to be either ON or OFF (regardless of the actual process output data) from the PC software. (Only settings that match the operating mode are reflected).	-	(Common except for disable mode
Output settings in the event of a communication error.	Specifies one of the following in the event of a communication error (EtherCAT communication or internal bus communication), if the DIP switch setting SW3 (output settings in the event of a communication error / priority to hardware) on the device unit is OFF: - 0: Switch OFF the digital output of the IO-Link master unit - 1: Switch ON the digital output of the IO-Link master unit - 2: Hold the digital output of the IO-Link master unit	[Communication error operation]	Digital output mode

Note 1: Refer to "3.2 List of Settings".

5.2　Procedures for Device Verification

If using the device verification function of the IO-Link master unit, register the IO-Link device configuration information to the IO-Link master unit, and select "verify" ("3 types verification" or "4 types verification") for "Device verification". (only when in IO-Link mode).

5.2.1　Registration of IO-Link device configuration information

Register the configuration information for IO-Link device manually or from the actual device to the IO-Link master unit.

■ Manual settings

Manually set the following configuration information for the IO-Link master unit using the PC software.
　Device ID, vendor ID, revision, input size, output size, and serial number

■ Automatic settings from the actual device

Automatically set the configuration information for the designated port of the IO-Link master unit based on the connected IO-Link device.

IO-Link master unit

IO-Link device

Port 0

Port 1

IO-Link device configuration information:
　Device ID, vendor ID, revision, input size, output size, serial number

Registered IO-Link device configuration information　Select the [Set with device] button and a port number.
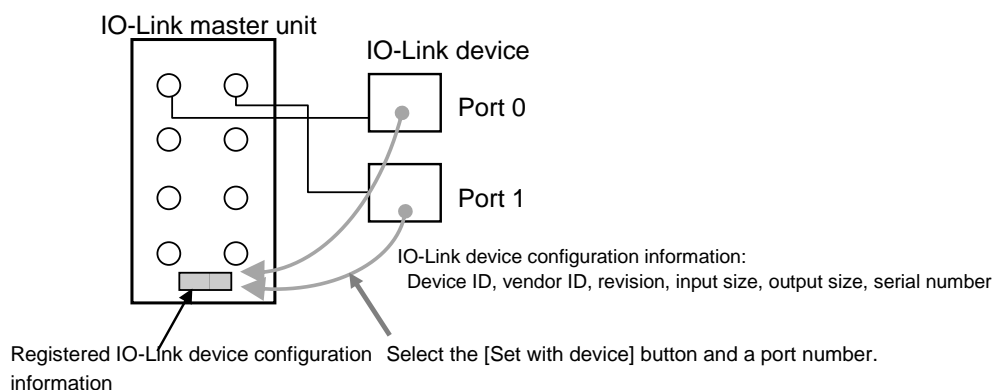
Perform the following operations:

4　On the PC software, click the "Set with device" button on the "Port-each sets" tab of the IO-Link master unit.

Click the [Set with device] button.
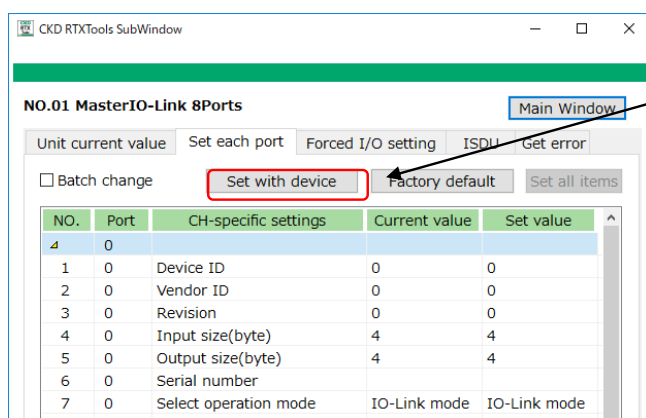
2   Select the target port number (for obtaining and writing the configuration information), then click the [OK] button.

Select a target port number.
(You can select multiple port numbers.)

Click the [OK] button.
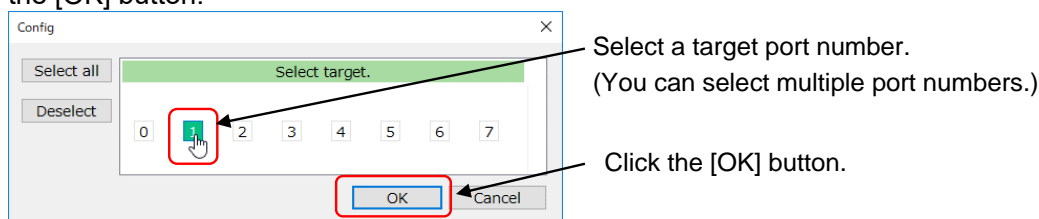
3   The IO-Link master unit reads the configuration information of the actual IO-Link device connected to the selected port. The configuration settings are automatically overwritten with the read values.
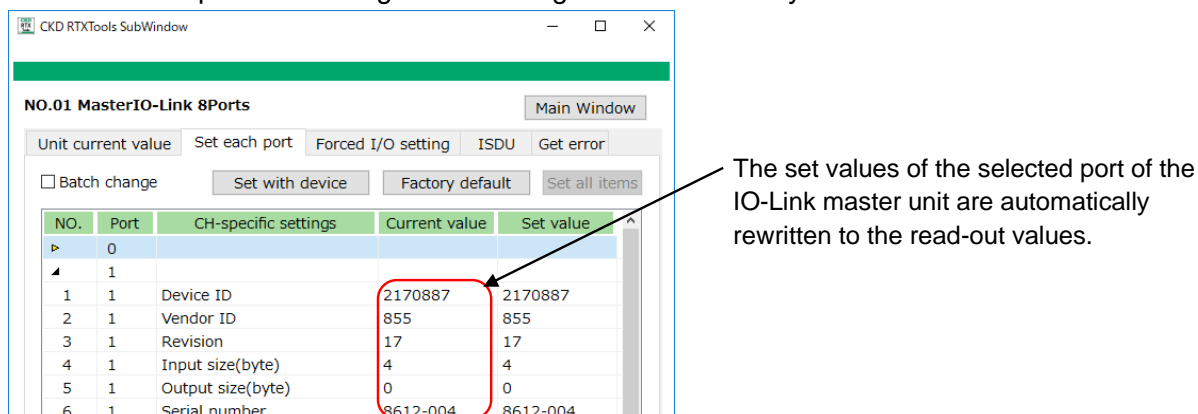
The set values of the selected port of the IO-Link master unit are automatically rewritten to the read-out values.

⚠ **CAUTION**

Adjust the settings so that the process data size of the connected IO-Link device is an even number.

If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

5.2.2 IO-Link device verification

The configuration information registered on the IO-Link master unit and the configuration information of the actual IO-Link device connected at that time are verified.

Perform the following operations:

1 Set the IO-Link device verification (for each port) as either 3 types verification or 4 types verification.
- 3 types verification: Verify device ID, vendor ID, and revision.
- 4 types verification: Verify device ID, vendor ID, revision, and serial number

2 Turn the power on.
Alternatively, connect the IO-Link device to a powered-on IO-Link master unit via IO-Link communication.
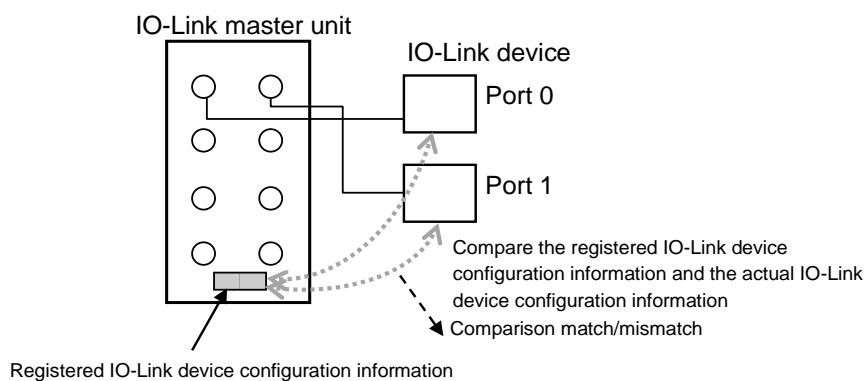
In the event of a mismatch, the "IO-Link error flag" will be 1 (ON).

5.3 Backup and Restore Details for the Connected IO-Link Device Settings

> ⚠ **CAUTION**
>
> **Note that if the IO-Link device settings are backed up to the IO-Link master unit and the operation mode is changed to something other than IO-Link mode, and then a start-up is performed, the backed-up IO-Link device settings will be erased.**
> The IO-Link device settings backed up to the IO-Link master unit (storage data) are automatically deleted when it is started up in an operation mode other than IO-Link mode (digital input mode, digital output mode, or disable mode).

In IO-Link mode, when the configuration information of the IO-Link devices matches, the setting data of the actual IO-Link device connected to the IO-Link master unit can be backed up to the IO-Link master unit.

In the same way, when the configuration information matches, the setting data backed up to the IO-Link master unit can be restored to the actual IO-Link device connected to the IO-Link master unit.

■ Conditions where backup/restore can be performed

Settings
Set "yes" for "Backup settings" or "Restore settings".

Configuration information matching
If the configuration information matches under the above condition, the "IO-Link error flag" will be 0 (OFF).

■ Timing of backup/restore

Back up	Restore
A backup is performed in the event of one of the following - In a state where "Backup settings" is enabled, immediately after the IO-Link master unit detects an IO-Link device - When a setting is changed by an operation on the IO-Link device side - Immediately after the "Backup settings" is changed from "no" to "yes" during IO-Link communication - When the DS_UPLOAD_REQ event from the IO-Link device occurred. - If the IO-Link device settings are changed via ISDU communication from the IO-Link master unit, the settings are automatically backed up after 10 seconds.	A restoration is performed in the event of one of the following. - In a state where "Restore settings" is enabled, immediately after the IO-Link master unit detects an IO-Link device - Immediately after the "Restore settings" are changed from [No] to [Yes] during IO-Link communication. - When the DS_UPLOAD_REQ event from the IO-Link device occurred.
 IO-Link master unit IO-Link device Port 0 Port 1 IO-Link device setting data Backed-up IO-Link device settings (storage data) Devices match, and immediately after the IO-Link master unit detects an IO-Link device, in the state that "Exp/Imp Setting" is enabled.	 IO-Link master unit IO-Link device Port 0 Port 1 IO-Link device setting data Backed-up IO-Link device settings (storage data) Devices match, and immediately after the IO-Link master unit detects an IO-Link device, in the state that "Restore settings" is enabled.

■ List of operations

The actual operations required for each condition are as follows:

Condition					Actual operation
Device verification result	**Whether there is backup data in the IO-Link master unit**	**Settings**		**Checksum match, or match between IO-Link master unit and IO-Link device settings**	**Backup/restore operation**
		Backup settings	**Restore settings**		
Match	Yes	Disable (no)	Disable (no)	-	No operation
			Enable (yes)	Valid	No operation
				Invalid	Restore
		Enable (yes)	Disable (no)	Valid	No operation
				Invalid	Back up again
			Enable (yes)	Valid	No operation
				Invalid	Refer to "Note 1 " below.
	None	Disable (no)	Disable (no)	-	No operation
			Enable (yes)	-	Back up
		Enable (yes)	Disable (no)	-	Back up
			Enable (yes)	-	Back up
Mismatch	Yes or, None	Disable (no) or, Enable (yes)	Disable (no) or, Enable (yes)	-	No operation
Undefined	Yes or, None	Disable (no) or, Enable (yes)	Disable (no) or, Enable (yes) (Note 2)	-	No operation

Note 1: If the conditions are met, a backup or restore operation is performed at the following timings:

Timing	**Backup/restore operation**
Immediately after IO-Link device is detected	Restore
Immediately after the "Backup settings" or "Restore settings" are changed from "Disable" to "Enable" while IO-Link communication is in "OPERATE"	Restore
When the IO-Link device settings are changed from the IO-Link master unit via ISDU communication, 10 seconds after a checksum mismatch occurs	Back up
When a DS_UPLOAD_REQ event occurs from the IO-Link device	Back up

Note 2: Select "Disable restore〞when backing up, and select "Disable back up" when restoring.

5.4   Details of the Error Log Function

The IO-Link master unit notifies the upper controller of any of the following errors with a flag ("Error log update flag") when it occurs. It returns the error log after receiving an order from the upper controller. In addition, when the upper controller reads an error log, the IO-Link master unit clears the error log.

> Error: - When an IO-Link device event occurs
>   - When an ISDU communication response error is received
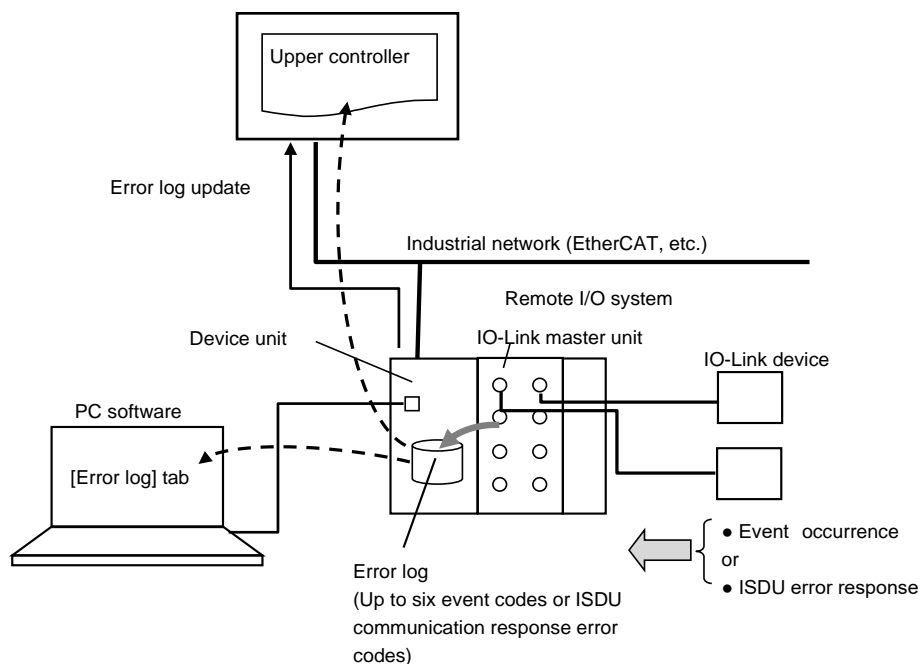
Up to six event codes or ISDU communication response error codes are stored in the device unit as an error log. They can be read using one of the following methods:

- "Get error log" tab on the PC software
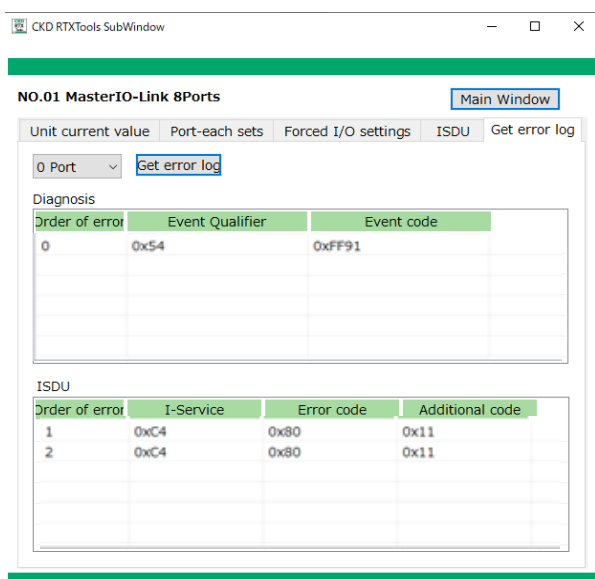
- (For EtherCAT) Read the following "IO-Link error log" of the "IO-Link master Module Specific Diagnosis" in the object dictionary via SDO communication from the upper controller.

Index	Sub-Index	Description	Data type	Read/write attributes	Value	Initial value
0xAXX2	0	Number of entries	UNSIGNED8	RO	0x08	0x08
	1	Target port to read	BIT3	RW	-	000
	3	Read complete	BOOLEAN	RO	-	0
	5	IO-Link error log 1 (Note 1)	UNSIGNED32	RO	-	0x00000000
	6	IO-Link error log 2 (Note 1)	UNSIGNED32	RO	-	0x00000000
	7	IO-Link error log 3 (Note 1)	UNSIGNED32	RO	-	0x00000000
	8	IO-Link error log 4 (Note 1)	UNSIGNED32	RO	-	0x00000000
	9	IO-Link error log 5 (Note 1)	UNSIGNED32	RO	-	0x00000000
	10	IO-Link error log 6 (Note 1)	UNSIGNED32	RO	-	0x00000000

* "XX" in the above Index is the unit position number (0x00 to 0x11).

Note 1: The bit allocation for the IO-Link error log is as follows.

The upper row is for IO-Link device events and the lower row is for error responses for ISDU communication. Refer to the IO-Link communication specifications for details on each data.

Bit 31	··	Bit 24	Bit 23	··	Bit 16	Bit 15	··	Bit 8	Bit 7	··	Bit 1	Bit 0
Event Code						Event Qualifier			0		IOLDEP(Note 2)	
Additional Code			Error Code			I-Service			0		IOLDEP(Note 2)	

The above Event Code may contain a unique value for the product.

Note 2: Details of IOLDEP (IO-Link Device Error Pattern) are as follows.

00: No error during IO-Link communication

01: Diagnosis

10: ISDU

The process data communication "Error log update flag" can be reset to 0 (OFF) by the "Error log clear flag" in the process data communication.

6. TROUBLESHOOTING

6.1   Unit Errors (Point Diagnostic Information)

The information can be read from the PC software or upper controller.

■ Error codes displayed in the PC software

The port diagnostic information can be checked in the following screen of the PC software as a hexadecimal "Error code" with the corresponding bit set to 1 (ON).
• "Code" on the "Errors" main tab
•〝Error Code" (in the error log)

■ Reading the diagnostic information area with message communication from the upper controller

 (For EtherCAT) The port diagnostic information is also stored in the diagnostic information area below in the object dictionary of the EtherCAT device unit. It can be read by port from the upper controller via SDO communication.

Index	Sub-Index	Description	Data type	Read/write attributes	Value	Initial value
0xAXX1	0	Number of entries	UNSIGNED8	RO	0x08	0x08
	1	Port 0 diagnostic information	WORD	RO	0x0000 to 0xFFFF	0x0000
	...	...	...	...	...	...
	8	Port 7 diagnostic information	WORD	RO	0x0000 to 0xFFFF	0x0000

 * "XX" in the above Index is the unit position number (0x00 to 0x11).

For the IO-Link master unit, the following errors can be checked for each port:

Bit	Error name	Description	Per port/ Common for ports	"Error type" in the device unit's "Remote I/O diagnostic information"
15	Power line error (by port)	An overcurrent or short circuit has been detected in pin 1 line (unit/input 24 V (+)) when the "Power line error detection" setting is "Enable". In this case, the〝Port error flag〟will be 1 (ON).	By port	Power failure
14	Signal line error (by port)	An overcurrent or short circuit has been detected in pin 4 line (Digital output 1) when the "Signal line error detection" setting is "Enable". In this case, the〝Port error flag〟will be 1 (ON).		Unit output error
13	Memory read/write error (entire IO-Link master unit)	A "memory read/write error" has occurred. In this case, the〝Port error flag〟will be 1 (ON) on all ports.	Common for ports	Hardware error
12	IO-Link COMM error (by port)	An error where communication with the IO-Link device cannot be performed when in IO-Link mode. In this case, "IO-Link input data enable flag" becomes 0 (OFF). The process input values for the IO-Link communication are not updated (they are held). If a status is detected where the communication frame cannot be received from the IO-Link device three consecutive times, it is considered as an error. The count is canceled if a communication frame is received within three times.	By port	Unit input error
11	Process data size error (by port)	An error where an IO-Link device that exceeds the setting size of the IO-Link master unit is connected. In this case, "IO-Link input data enable flag" becomes 0 (OFF).		System error

Bit	Error name	Description	Per port/ Common for ports	"Error type" in the device unit's "Remote I/O diagnostic information"
		In addition, an output disable notification will be issued to the IO-Link device via the IO-Link communication. In addition, the process input values for the IO-Link communication are not updated (they are held).		
10	Data mapping error (by port)	An error when the process data size of the entire IO-Link master unit is as follows: - The process data size (input) for all ports has exceeded 64 bytes. - The process data size (output) for all ports has exceeded 64 bytes. In these cases, the "IO-Link COMM error" becomes 1 (ON) and "IO-Link input data enable flag" becomes 0 (OFF) for all ports in IO-Link mode.	By port	System error
9	Device mismatch (by port)	An error where the connected IO-Link device does not match the configuration information settings. In this case, "IO-Link input data enable flag" becomes 0 (OFF). In addition, the process input values for the IO-Link communication are not updated (they are held).		Unit input error
8	Reflect setting waiting (by port)	It becomes 1 (ON) when one of the following occurs on a port in IO-Link mode. - When starting in IO-Link mode, if the port setting size (input or output) differs from the size at the time of startup completion. - If the port's "Operation mode selection" has changed compared to the mode at startup completion. Note: On ports where "Reflect setting waiting" occur, all outputs of fixed-length process data (digital output 1, Error log clear flag) are held. The input and output of IO-Link process data (input and output to/from the IO-Link device) operations continue. In addition, for ports where "Reflect setting waiting" occurs, instructions cannot be made for forced input and output. Recovery is made when all the following conditions are met: - When the port setting size (input or output) matches the size at the time of startup completion. - When the port's "Operation mode selection" matches with the mode at the time of startup completion.		Operation waiting
7	Allocation error (The entire IO-Link master unit)	It becomes 1 (ON) when the IO-Link master unit is not assigned correctly to the device unit. In this case, in IO-Link mode, an output disable notification will be issued to the IO-Link device via IO-Link communication. In addition, the process input values for the IO-Link communication are not updated (they are held). The process data size of the IO-Link master unit is input 0 bytes / output 0 bytes when it starts.	Common for ports	System error
6	Manual output in progress	When the "Signal line error recovery operation setting" is ON (Manual) In digital output mode, the behavior when a signal line error occurred is maintained even after it recovers. The system is waiting for the user to turn the power off and on again.	By port	Operation waiting
5 to 0	Reserved	0 Fixed	-	-

6.2   Reading IO-Link Device Error Log

The error log of the IO-Link device (history of event codes and ISDU communication error responses) can be read from the PC software or from the upper controller.

■ Error log display on the PC software

The following error histories can be found by clicking the [Get error log] button on the "Get device error" tab in the PC software. For more information, refer to "5.4 Details of the Error Log Function".
- - "Diagnosis": Event codes in the event communication
- - "ISDU": Error responses in ISDU communication

■ Reading the IO-Link error log by message communication from the upper controller

(For EtherCAT) The error log of the IO-Link device is also stored in the diagnostic information area below in the object dictionary of the EtherCAT device unit. It can be read by port from the upper controller via SDO communication.

The existence of error log from IO-Link devices can be checked in "Error log update flag" in the process data. For more information, refer to "Reading the following "IO-Link error log" of the "IO-Link master Module Specific Diagnosis" in the object dictionary via SDO communication from the upper controller" of "5.4 Details of the Error Log Function".

Note The event codes that occur on the IO-Link master unit are as follows:

Event code	Description	Remarks
0x1000	"No Service" error occurred in ISDU communication.	-
0x1100	An ISDU communication timeout occurred.	-
0x5600	An ISDU communication checksum error occurred.	-
0x5700	The data length of ISDU communication is 0.	-
0x8033	The length of the setting value is too long.	The write data size of the device exceeds the size specified by the parameter.
0xFF22	Communication with the IO-Link device was interrupted.	An error occurs when the IO-Link device's communication line is disconnected.
0xFF23	The IDs of the storage data and connected device are different.	The error is automatically cleared when communication is restored.
0xFF24	The data storage buffer has overflowed.	The device data size exceeds the storage size of the master unit.
0xFF25	Access to storage data was rejected.	Specific to the product.
0xFF91	There has been a data storage upload request from the device.	-
0xFFF3	No device IDs to be verified are registered.	Specific to the product.
0xFFFB	The IO-Link device is not connected.	Specific to the product. The IO-Link communication is stopped at PREOPERATE during this error.
0xFFFC	Serial number verification error.	Specific to the product. The IO-Link communication is stopped at PREOPERATE during this error.
0xFFFE	The device ID of the IO-Link device is different.	Specific to the product. If the storage data ID and the device ID are different during restore.
0xFFFF	The device ID to be restored is different.	Specific to the product.

  * For events that occur on IO-Link devices, refer to the specifications of each IO-Link device in use.

6.3 Troubleshooting from LED Display

6.3.1 Normal LED indication but unintended operation

LED	Problem	Cause	Action
- (EtherCAT device unit only) RUN: Green on ERR: Off - CF of device unit: Off - Even number (left) LED of IO-Link master unit: Green on	In IO-Link mode, the upper controller cannot read or write the process data of the IO-Link device correctly. The process data values confirmed on the "I/O Monitor" main tab of the PC software directly connected to the remote I/O are different from the process data values confirmed on the upper controller. E.g.) If the process data (PD) of the IO-Link device on port 0 is 4 bytes, it is separated by byte on the upper controller side and stored on ports 0 to 3.	The size of the communication unit (EtherCAT's "PDO") on the upper controller's configuration tool is smaller than the actual process data (PD) size of the IO-Link device.	Check the process data (PD) size of the IO-Link device connected in IO-Link mode. Meanwhile, check the size of the communication unit (EtherCAT's "PDO") on the upper controller's configuration tool (the default is "4 bytes" for input or output). Match the size of the communication unit (EtherCAT's "PDO") on the upper controller's configuration tool to the actual process data (PD) size of the IO-Link device.

6.3.2 Troubleshooting from LED Display

■ Normal condition

IO-Link Master Unit		Problem
Even number (Left) LED	**Odd number (Right) LED**	
Green on	Off	In IO-Link communication
Yellow on	Off	Digital input 1 ON Or digital output 1 ON
Off	Yellow on	Digital input 2 ON
Off	Off	Digital input 2 OFF Or power OFF

Device unit Examples of EtherCAT response	IO-Link Master Unit	Problem	Cause	Action
	Even number (left) LED for the port in digital output mode			
ERR: Red blinking (twice)	Off	A communication error (application watchdog timeout) occurred in the device unit. In this case, the output of	The DIP switch setting SW3 on the device unit is OFF, and the "Communication error operation setting" on the IO-Link master unit is "0" (OFF).	To keep the digital output of the port in digital output mode set to other than OFF, set the "Communication error operation setting" on the IO-Link master unit to "1" (ON) or "2" (HOLD).

Device unit Examples of EtherCAT response	IO-Link Master Unit	Problem	Cause	Action
	Even number (left) LED for the port in digital output mode			
		the port in digital output mode is switched OFF.	The DIP switch setting SW3 of the device unit is ON (output settings in the event of a communication error/ priority to hardware), and the SW4 is OFF (Clear).	Review the settings of the DIP switch of the device unit and IO-Link master unit related to the output setting functions in the event of a communication error. If the digital output value needs to be retained, and the same applies to other I/O units, set DIP switch SW4 on the device unit to ON (Hold).
SF: Red blinking (fast)	Off	An internal bus error has occurred in the device unit. In this case, the output of the port in digital output mode is switched OFF.	The DIP switch setting SW3 on the device unit is OFF, and the "Communication error operation setting" on the IO-Link master unit is "0" (OFF).	To keep the digital output other than OFF, set the "Communication error operation setting" on the IO-Link master unit to "1" (ON) or "2" (HOLD).
CF: Yellow on		Ports in digital input mode or digital output mode are not updated.	PC software is forcing output.	Cancel the forced output from the PC software.

■ Error condition

IO-Link Master Unit		Problem	Port diagnostic information	Cause	Action
Even number (left) LED	Odd number (right) LED				
Red on	Off	When the PC software is connected to a device unit, the "Unit Configuration" main tab is not displayed and the "Error" main tab is displayed.	-	The IO-Link master unit is disconnected from the internal bus communication The device unit has failed to automatically recognize the IO-Link master unit at start-up (There is a "Unit configuration error" (system error) on the device unit).	- Check the connection between the units. - Check that the number of I/O units connected to the device unit is less than 17.
		The unit configuration cannot be checked from the upper controller's configuration tool.			
		The IO-Link master unit cannot be controlled by the upper controller.		The IO-Link master unit is disconnected from the internal bus communication	Check whether there is a process data overflow in the device unit. If the problem persists, contact CKD.
Red blinking (fast)	-	A "memory read/write error" has occurred. In this case, the "Port error flag" will be 1 (ON) on all ports. - When in digital input mode, OFF is input. - When in digital output mode, OFF is output.	Memory read/write error (hardware error)	An error has occurred in the IO-Link master unit's internal memory.	Turn the power OFF then ON again. If the problem persists, replace the IO-Link master unit, or contact CKD.

IO-Link Master Unit		Problem	Port diagnostic information	Cause	Action
Even number (left) LED	Odd number (right) LED				
Red blinking (slow)	Off	- The port error flag for the target port is 1 (ON). - The IO-Link error flag for the target port is 1 (ON). - The IO-Link input data enable flag for the target port is 0 (OFF). - When in digital input mode, OFF is input. - When in IO-Link mode, an IO-Link COMM error occurs.	Power line error (Power failure)	An overcurrent or short circuit has been detected in the pin 1 line (unit/input 24 V (+)) when the "Power line error detection" setting is "Enable" in any of the following operation modes: - Digital input mode (PNP) - Digital input mode (NPN) - IO-Link mode	Check that the pin 1 line (24V(+) for unit and input) is not overcurrent or short-circuited.
		When in digital output mode, one of the following occurs: - The port error flag for the target port is 1 (ON). - The IO-Link error flag for the target port is 1 (ON). - The IO-Link input data enable flag for the target port is 0 (OFF). - When in digital output mode, OFF is output. - When in IO-Link mode, an IO-Link COMM error occurs.	Signal line error (unit output error)	An overcurrent or short circuit has been detected in the pin 4 line (Digital output 1) when the "Signal line error detection" setting is "Enable" in any of the following operation modes. - Digital output mode (PNP) - Digital output mode (NPN) - IO-Link mode	Check that the pin 4 line (digital output 1) is not overcurrent or short-circuited.
Yellow blinking (fast)	Off	- The IO-Link master unit settings have been initialized. The process data size of the IO-Link master unit was input 0 bytes / output 0 bytes when it started. - When in IO-Link mode, an output disable notification has been issued to the IO-Link device via the IO-Link communication. In this case, the process input values for the IO-Link communication are not updated (they are held).	Allocation error (system error)	The IO-Link master unit was not assigned correctly to the device unit. One of the following occurred at startup (occurs in all operating modes): - The IO-Link master unit settings were initialized at startup because the device unit's DIP switch SW5 (initialize parameters on startup) was ON or there was an internal misalignment between the device unit and IO-Link master unit. - A "process data overflow" occurred in the device unit, causing the device unit to allocate 0-byte input / 0-byte output process data to the IO-Link master unit.	- Check the device unit's DIP switch SW5 (initialize parameters on startup). - Check whether there is a process data overflow in the device unit. - Turn the power off and then on again. If the problem still persists even after checking the above, contact CKD.

IO-Link Master Unit		Problem	Port diagnostic information	Cause	Action
Even number (left) LED	Odd number (right) LED				
Yellow blinking (slow)	Off	- IO-Link input data enable flag is 0 (OFF). - IO-Link input error flag is 1 (ON).	Process data size error (system error)	An IO-Link device that exceeds the setting size of the IO-Link master unit is connected. - Actual input process data size of the IO-Link device > "Input size" setting or, - Actual output process data size of the IO-Link device > "Output size" setting	If the connected IO-Link device is correct as designed, change the "Input size" and "Output size" settings to match the size of the actual device. Then, turn the power OFF and ON again to have the IO-Link master unit detect the IO-Link device. At the same time, change the size of the communication unit (PDO) on the upper controller's configuration tool to match the actual size. * If the connected IO-Link device is not as designed, replace the IO-Link device.
			Device mismatch (unit input error) (Only when the "Device verification" settings are "Verify")	The connected IO-Link device does not match the configuration information (Note 1) settings. Note 1: The configuration information for IO-Link device consists of the following: Device ID, vendor ID, revision, and serial number	To verify the device, do one of the following: - If the connected IO-Link device is correct, change the configuration information for the IO-Link device according to the actual device. - If the connected IO-Link device is not correct, replace the IO-Link device. If a device verification is not performed, change the "Device verification" setting to "0" (disable).
Green blinking (slow)	Off	Unable to detect IO-Link devices	-	In IO-Link mode, no IO-Link device has been detected since startup. The following is occurring: No IO-Link device is connected at startup.	Check the connection to the IO-Link device.

IO-Link Master Unit		Problem	Port diagnostic information	Cause	Action
Even number (left) LED	Odd number (right) LED				
Green blinking (slow) (Continued)	Off (Continued)	- IO-Link input data enable flag is 0 (OFF). - IO-Link input error flag is 1 (ON).	IO-Link COMM error (unit input error)	In IO-Link mode, communication with IO-Link devices is not possible. One of the following has occurred: - No IO-Link device is connected. - I/O cable is broken. - The 24 V (unit/input) power supply to the power unit is not correctly supplied. - The IO-Link device is malfunctioning. - There is noise in the surrounding area. - The IO-Link master unit is malfunctioning.	- Check the IO-Link device connection. - Check whether the I/O cable is broken. - Do one of the following: - Check the 24V (unit/input) power supply to the power supply unit. -Take measures against noise. - Replace the IO-Link device. - Replace the IO-Link master unit.
		- ISDU communication is not possible.	IO-Link COMM error (unit input error)		
Green on or, Green blinking (slow)	Off	- Cannot change the input or output size settings. - The IO-Link error flag is 1 (ON) for all ports in IO-Link mode. - IO-Link input data enable flag is 0 (OFF) for all ports in IO-Link mode.	All ports in IO-Link mode: Data mapping error (system error) IO-Link COMM error (unit input error)	One of the following has occurred: - The total process output of ports in IO-Link mode is 63 bytes or more. - The total process input of ports in IO-Link mode is 59 bytes or more.	If the connected IO-Link device is correct, reset the process data size using one of the following actions: - Reset each port so that the total input/output size of the IO-Link master unit is 58/62 bytes or less. - Check that the total input/output size of the connected IO-Link device is 62/58 bytes or less, and perform "Set with device" on the PC software. At the same time, change the size of the communication unit (PDO) on the upper controller's configuration tool to match the actual size. - If the connected IO-Link device is not correct, replace the IO-Link device.
Off	Off	- The IO-Link device does not communicate via IO-Link. - Digital input or digital output cannot be controlled.	-	The desired operating mode is not selected.	Set it according to the desired operation mode.

IO-Link Master Unit		Problem	Port diagnostic information	Cause	Action
Even number (left) LED	Odd number (right) LED				
Off	Yellow blinking (fast)	- Forced I/O settings cannot be made. - When in IO-Link mode, the input is held and the output is disabled.	Reflect setting waiting (User operation waiting)	The port setting size (input or output size) or operation mode selection has changed since startup was completed.	- Reset the port setting size (input or output size) to the setting at startup. - Turn the power off and then on again to reflect the settings.
-	Off	The "Clear data storage" operation cannot be performed.	-	The mode in operation is other than IO-Link mode.	Make sure that it is in IO-Link mode. (Data storage is automatically cleared when started up in any mode other than IO-Link mode.)
-	Off	Unable to obtain error log.	-	- No event or ISDU communication response errors have occurred. - It is not in IO-Link mode.	Make sure that it is in IO-Link mode. (The error log is automatically cleared when started up in any mode other than IO-Link mode.)
-	Off	Unable to obtain error log. (Do not obtain expected events and ISDU communication response errors.)	-	- It has been overwritten by a new event or ISDU communication response error. - It has already been read. - The power was turned off and on again after an event or ISDU communication response error.	- Check if there are more than six errors. Check the following: - Whether it has already been read. - Whether the power was turned off and on again after an event or ISDU communication response error.
-	Off	Configuration information cannot be written.	-	- It is not in IO-Link mode.	Make sure that it is in IO-Link mode.
				IO-Link device detection failed.	Try to detect the IO-Link device again.
-	Off	When in digital output mode, signal line error recovery was performed. However, the digital output remains OFF (not updated).	The behavior maintained after signal line error recovery (user operation waiting)	In digital output mode, when the "Signal line error recovery operation setting" is "ON" (Manual), the behavior at the time of the error is maintained even after the signal line recovers (user operation waiting).	Turn the power off and on again.

7. APPENDIX1: LIST OF OPERATIONS IN THE EVENT OF AN ERROR IN THIS PRODUCT

This section lists the operations performed by the IO-Link master unit in the event of a fault and when recovering from one.

7.1 Errors Not Related to IO-Link Communication

7.1.1 Communication error

■ On occurrence

Upper communication error

Device unit			IO-Link master unit operation		
DIP switch setting SW3 (output settings in the event of a communication error/priority to hardware)		DIP switch setting SW4 (hold/clear)	In IO-Link mode	In digital input mode	In digital output mode
ON	Set for all units at once	ON	Hold all outputs	- Output: Issues an output disable notification. - Input: There are no special behaviors. (Input values as a remote I/O can continue to be obtained/updated even in the event of an upper communication error)	There are no special behaviors. (Input values as a remote I/O can continue to be obtained/updated even in the event of an upper communication error)	Holds the last output.
		OFF	Clear all outputs			Outputs OFF.
OFF	Set individually for each unit	-				Depends on the "Communication error operation setting" of the IO-Link master unit (specifying OFF/ON/HOLD).

Internal bus communication error

Device unit			IO-Link master unit operation		
DIP switch setting SW3 (output settings in the event of a communication error/priority to hardware)		DIP switch setting SW4 (hold/clear)	In IO-Link mode	In digital input mode	In digital output mode
ON	Set for all units at once	ON	Hold all outputs	- Issues an output disable notification to the IO-Link device. - Holds process input values from the IO-Link device.	Uses the last input value as is.	Holds the last output.
		OFF	Clear all outputs			Outputs OFF.
OFF	Set individually for each unit	-				Depends on the "Communication error operation setting" of the IO-Link master unit (specifying OFF/ON/HOLD).

■ On recovery

Upper communication error

Device unit				IO-Link master unit operation		
DIP switch setting SW3 (output settings in the event of a communication error/priority to hardware)		DIP switch setting SW4 (hold/clear)		In IO-Link mode	In digital input mode	In digital output mode
ON	Set for all units at once	ON	Hold all outputs	Recovers automatically.	Recovers automatically.	Recovers automatically.
		OFF	Clear all outputs			
OFF	Set individually for each unit	-				

Internal bus communication error

Device unit				IO-Link master unit operation		
DIP switch setting SW3 (output settings in the event of a communication error/priority to hardware)		DIP switch setting SW4 (hold/clear)		In IO-Link mode	In digital input mode	In digital output mode
ON	Set for all units at once	ON	Hold all outputs	Does not recover.	Does not recover.	Does not recover.
		OFF	Clear all outputs			
OFF	Set individually for each unit	-				

Device unit				IO-Link master unit operation		
DIP switch setting SW3 (output settings in the event of a communication error/priority to hardware)		DIP switch setting SW4 (hold/clear)		In IO-Link mode	In digital input mode	In digital output mode
ON	Set for all units at once	ON	Hold all outputs	Does not recover.	Does not recover.	Does not recover.
		OFF	Clear all outputs			
OFF	Set individually for each unit	-				

7.1.2 Power line error (in IO-Link mode, in digital input mode)

■ On occurrence

IO-Link master unit settings	IO-Link master unit operation	
Power line error detection settings	In IO-Link mode	In digital input mode
Enable	Triggers an IO-Link COMM error.	Turn off the input.
Disable		

■ On recovery

IO-Link master unit settings	IO-Link master unit operation	
Power line error detection settings	In IO-Link mode	In digital input mode
Enable	Recovers automatically.	Recovers automatically.
Disable		

7.1.3 Signal line error (in digital output mode)

■ On occurrence

IO-Link master unit settings	IO-Link master unit operation
Signal line error detection settings (In digital output mode)	In digital output mode
Enable	Outputs OFF (depending on the protection function).
Disable	

■ On recovery

IO-Link master unit settings	IO-Link master unit operation
Signal line error detection settings (In digital output mode)	In digital output mode
Enable	Depends on the "Signal line error recovery operation setting" (Auto/Manual specification).
Disable	

7.1.4 Memory read/write error

■ On occurrence

IO-Link master unit operation		
In IO-Link mode	In digital input mode	In digital output mode
Process input value: Turns off. Process output value: Turns off.	Turns off all connector inputs.	Turns off all connector outputs.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	In digital input mode	In digital output mode
Recovers automatically.	Recovers automatically.	Does not recover.

7.2   IO-Link Communication Related Errors

7.2.1 IO-Link COMM error

■ On occurrence

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Process input value: Held Process output value: Communication with the IO-Link device has stopped and the output instruction itself does not exist.	Not relevant.	Not relevant.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Process input value: Recovers automatically. Process output value: Recovers automatically.	Not relevant.	Not relevant.

7.2.2 Process data size error

■ On occurrence

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Process input value: Held Process output value: Issues an output disable notification to the IO-Link device.	Not relevant.	Not relevant.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Process input value: Recovers automatically. Process output value: Recovers automatically.	Not relevant.	Not relevant.

7.2.3 Device mismatch

■ On occurrence

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Process input value: Held Process output value: Communication with the IO-Link device has stopped and the output instruction itself does not exist.	Not relevant.	Not relevant.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Recovers automatically.	Not relevant.	Not relevant.

7.2.4 Reflect setting waiting

■ On occurrence

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
- Forced I/O settings will be disabled. - IO-Link communication and process data input/ output will continue.	Not relevant.	Digital output 1 of the fixed length process data will be held. The error log clear flag will not be held.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Recovers automatically.	Not relevant.	Not relevant.

7.2.5 Allocation error

■ On occurrence

IO-Link master unit operation			Operation of the entire IO-Link master unit
In IO-Link mode	**In digital input mode**	**In digital output mode**	
Process input value: Held Process output value: Issues an output disable notification to the IO-Link device.	Fixed at OFF.	Fixed at OFF.	When a process data overflow occurs, the IO-Link master unit starts with the process data size: input 0 bytes/ output 0 bytes. If the set values are initialized at startup, the unit starts with the process data size: input 6 bytes/ output 2 bytes.

■ On recovery

IO-Link master unit operation		
In IO-Link mode	**In digital input mode**	**In digital output mode**
Does not recover.	Does not recover.	Does not recover.

2025-09-10

8. APPENDIX2: DEVICE ID MODIFICATION

This section describes how to change the device ID using the IO-Link master unit.

⚠ CAUTION

Check the target device and the device ID to change.
    Make sure to check the target device and the device ID to change. Specifying an incorrect device ID may cause malfunction, which may result in injury or damage to equipment. Make sure to change device ID carefully and perform thorough testing if necessary.

Check the input/output status with the upper controller before changing the device ID.
    Before changing the device ID, make sure to check the input/output status with the upper controller. Changing the device ID may alter the process data assignment, which may result in unintended input/output operations.

In the IO-Link Master Unit settings, the "Input Size" and "Output Size" settings to value equal to or greater than the process data size (PD) of the connected IO-Link device.
    If the size set is smaller than the process data (PD) size of the connected IO-Link device, a "process data size error" occurs.

Adjust the settings so that the process data size of the connected IO-Link device is an even number.
    If the "Input Size" and/or "Output Size" settings are an odd byte, add the setting value by 1 byte so that the "Input Size" and the "Output Size" settings are an even byte. If the data size is an odd byte, it may become an unintended I/O status.

8.1   Device ID Modification

The device ID of a connected IO-Link device can be changed. (However, this is only possible if the device supports device ID rewriting.)

Perform the following operations using PC software or message communication from the upper controller (see Note).

1   Change the "Device ID" setting of the IO-Link master unit.
     Change the "Device ID" to the desired ID.

2   Change the "Device verification" setting of the IO-Link master unit.
     Change the "Device verification" to either "3 types verification" or "4 types verification".

3   Turn the power off and on again.

Note: The operation method varies depending on the upper controller being used. For details, refer to the instruction manual for the
   upper controller unit being used.

✎   Changing the device ID may affect the process data size of the connected IO-Link device. If the set "Input size" or "Output size" is smaller than the changed process data (PD) size, a "process data size error" will occur. Adjust the setting value so that it is equal to or grater than the PD size.
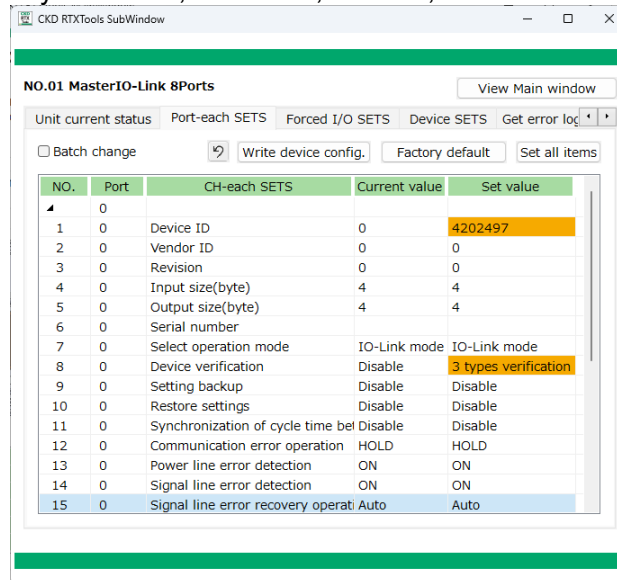

✎   "Reflect setting waiting" occurs when the process data assignment is affected by changing the device ID.
    To reflect the setting change, power the remote I/O system off and on again.
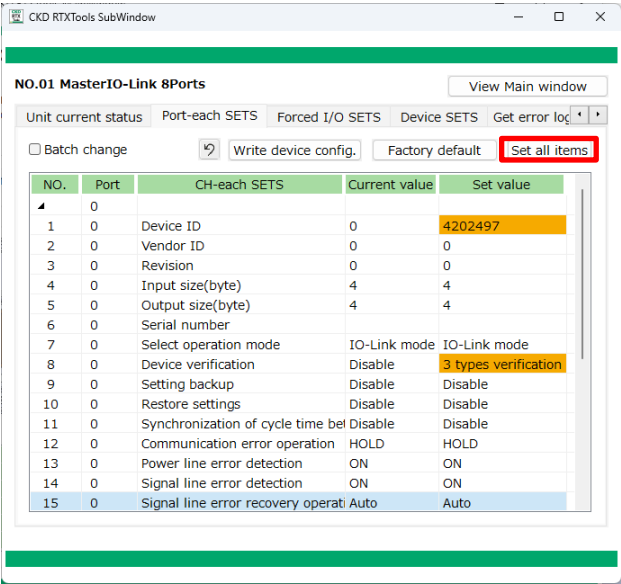
■ **E.g.) Changing the Device ID with PC Software**

1   Select IO-Link master unit on the ″Unit Configuration″ main tab and click the [Settings] button.
2   Select the "Port-each SETS" tab
3   Enter the Device ID.
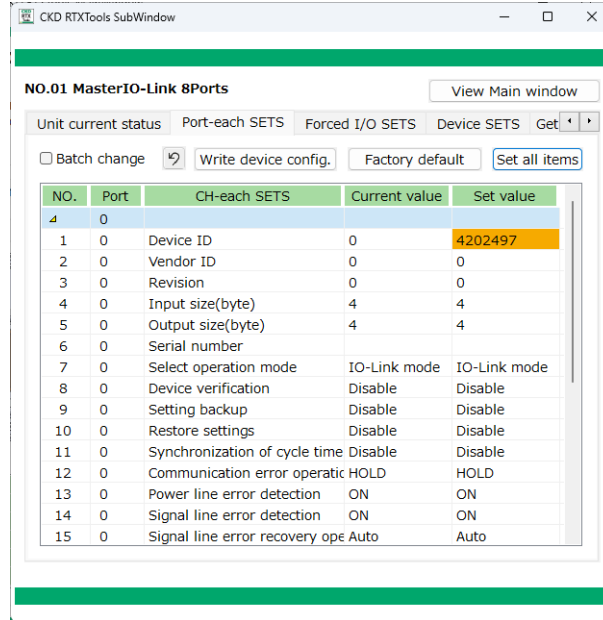
4   Set the device verification as either ″3 types verification″ or ″4 types verification″.
  • 3 types verification: Verify device ID, vendor ID, and revision.
  • 4 types verification: Verify device ID, vendor ID, revision, and serial number

5   Click the [Set All Items] button.

NO.	Port	CH-each SETS	Current value	Set value
◢	0			
1	0	Device ID	0	4202497
2	0	Vendor ID	0	0
3	0	Revision	0	0
4	0	Input size(byte)	4	4
5	0	Output size(byte)	4	4
6	0	Serial number		
7	0	Select operation mode	IO-Link mode	IO-Link mode
8	0	Device verification	Disable	3 types verification
9	0	Setting backup	Disable	Disable
10	0	Restore settings	Disable	Disable
11	0	Synchronization of cycle time bel	Disable	Disable
12	0	Communication error operation	HOLD	HOLD
13	0	Power line error detection	ON	ON
14	0	Signal line error detection	ON	ON
15	0	Signal line error recovery operati	Auto	Auto

6   Turn the power off and on again.

If using the IODD loading function of the PC software, follow the steps below.

1   Register the IODD file corresponding to the changed device ID in the PC software.

2   If "Process data size error" or "Reflect setting waiting" has occurred, review the process data size and cycle the power.

3   Run "Scan for devices" again.

The IO-Link master unit does not generate an error and the change will still be applied even if an incorrect device ID is set. Specifying an incorrect device ID may result in malfunction, such as failure to reflect the device ID change. Carefully read the instruction manual of the device to be used, and check the valid range of the device ID.
If the device ID change is not reflected, a "Device Mismatch" will occur. Review the "Device ID" and "Device Verification" settings for the device or IO-Link master unit.

9. WARRANTY PROVISIONS

9.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.

However, following failures are excluded from this warranty:
- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts. [Note1]
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

Note 1: For details on the durability and consumable parts, contact your nearest CKD sales office.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

9.2 Warranty Period

The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.