CKD

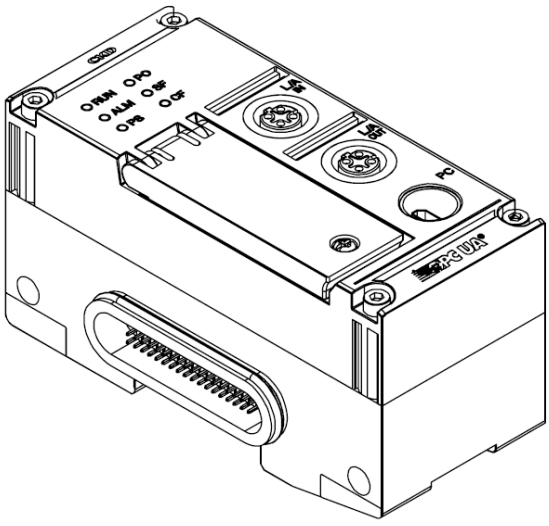
Remote I/O

RT series

OPC UA Compatible Device Unit

INSTRUCTION MANUAL

SM-B03355-A



- 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 Corporation

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.

OPC UA is a standard for industrial automation managed by the OPC Foundation.
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

Use the product in a specified manner.

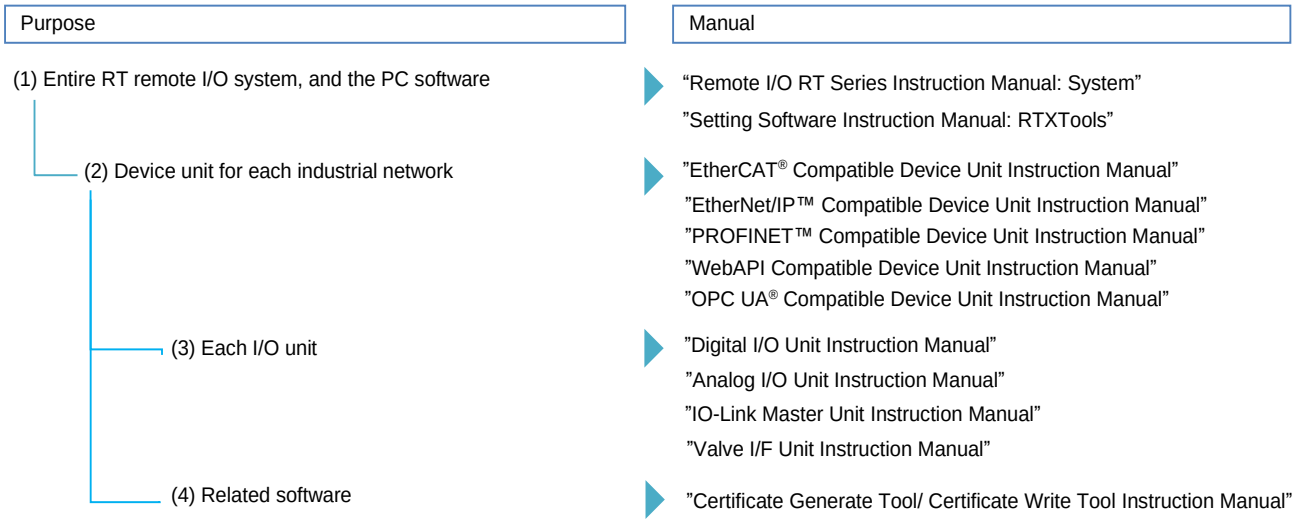
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.



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 RTXTools: setting software for RT series.
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 (this 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 (this manual)	Instruction manual for the OPC UA compatible device unit RT-XTEUN00N
SM-A46344-A	IO-Link Master Unit Instruction 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 master units 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

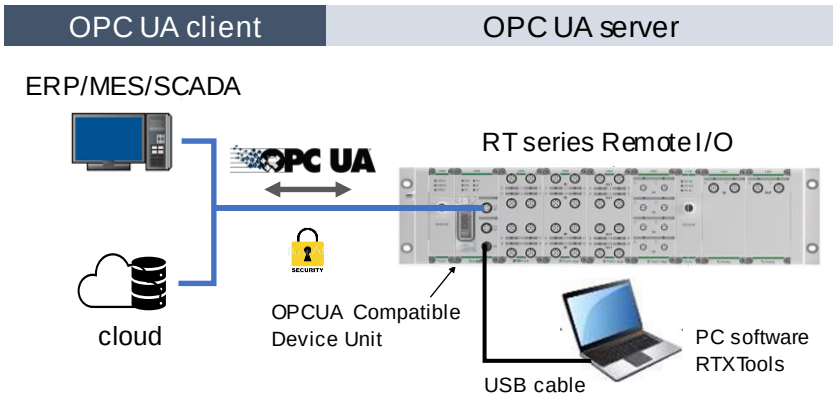
TERMS RELATED TO THE OPC UA COMPATIBLE DEVICE UNIT

Term	Definition
OPC UA server	A server that provides data from industrial equipment and devices, and sends data in response to requests from clients.
OPC UA client	A device or software that communicates with an OPC UA server to acquire and control data.
Address space	An area for identifying data and objects in the OPC UA server and managing them in a hierarchical structure.
Device certificate	A digital certificate for verifying the identity of a device in OPC UA communication, and being used to establish secure communication.
NTP server	A server that provides accurate time via a network and is used to synchronize time between devices.
Historical Access	A function that obtains past data and history.

1. PRODUCT OVERVIEW

RT Series OPC UA compatible device unit is a device unit in the Remote I/O RT Series systems, supporting OPC UA server.
The device unit acts as an interface between the OPC UA clients such as PC and each I/O unit.

By connecting the PC software (free of charge) to the device unit via USB or LAN cable, it is possible to check the information and status of the entire Remote I/O RT Series system, as well as the settings/status of each unit.

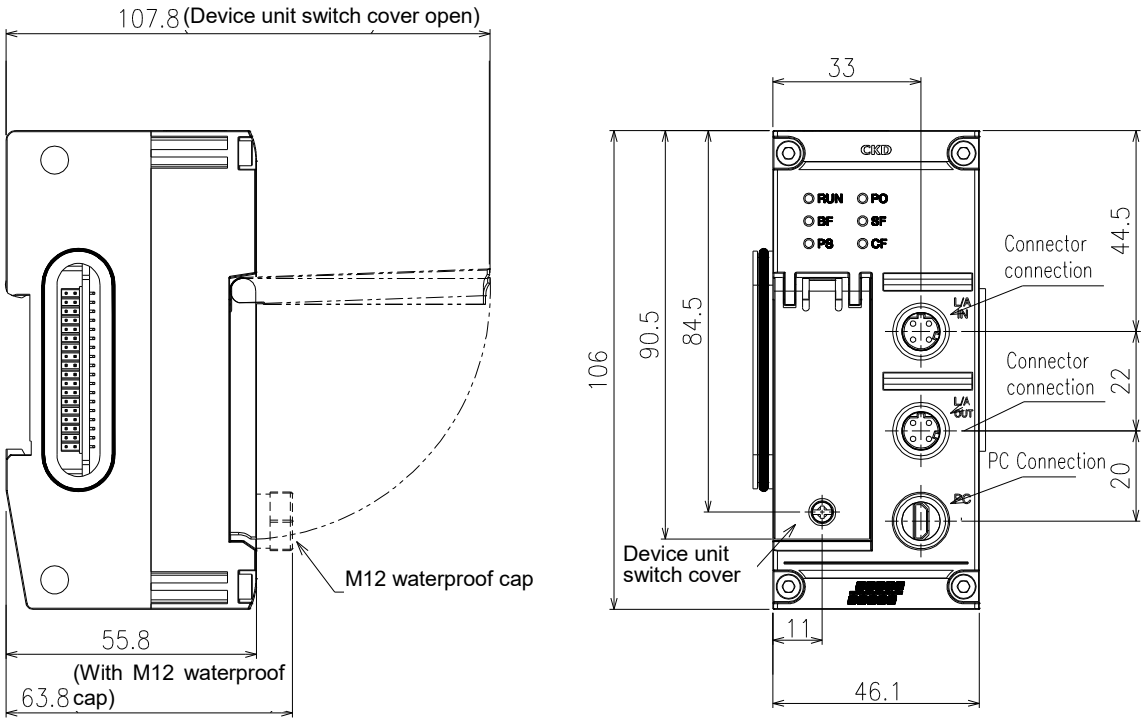


1.1 Features

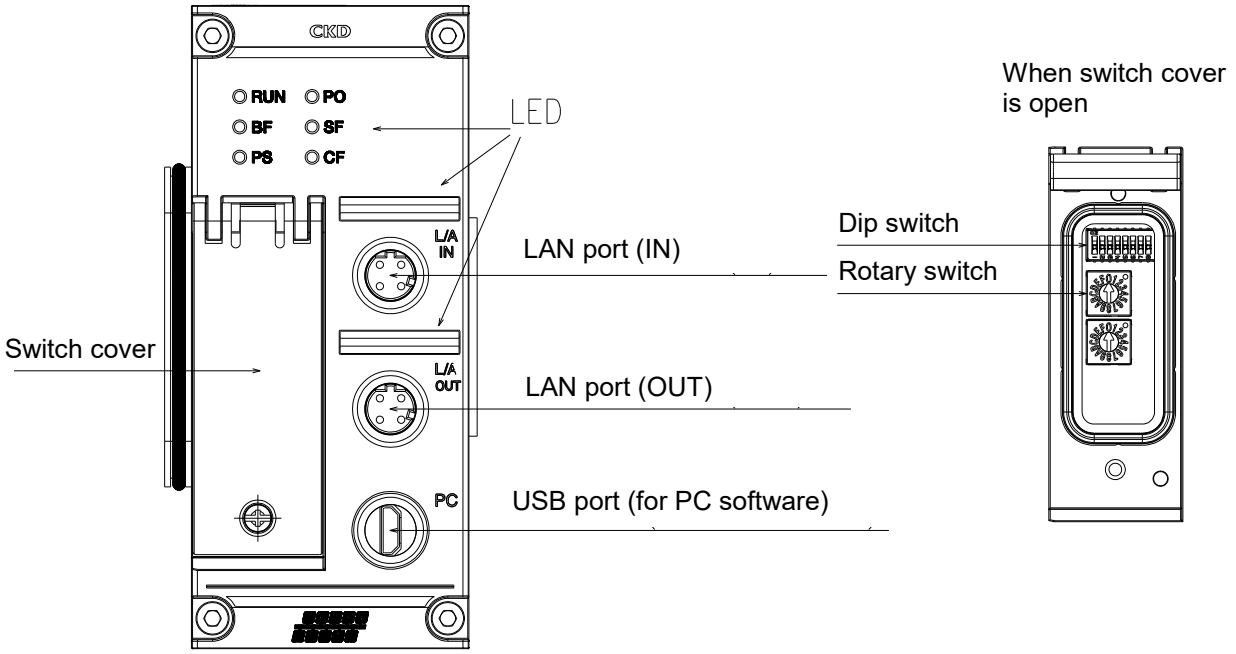
Features include the following:

- Data can be sent directly to a upper system without using a PLC.
- Supports encrypted communication using certificates
- Can be connected from up to 13 OPC UA clients.
- Diagnostic information of the connected units can be transmitted.
- Monitors the status of the internal power supply from the power supply unit (from among the power supply units on the left side toward the device unit, the closest power supply unit to itself is monitored).
- The output operation in the event of a communication error can be specified for the entire Remote I/O system.
- A device unit can log its own or connected I/O units' errors to its own non-volatile memory. In addition, it is possible to use the PC software to save the time series data to a file.

1.2 External Dimensions



1.3 Names and Functions of Each Part



■ LED

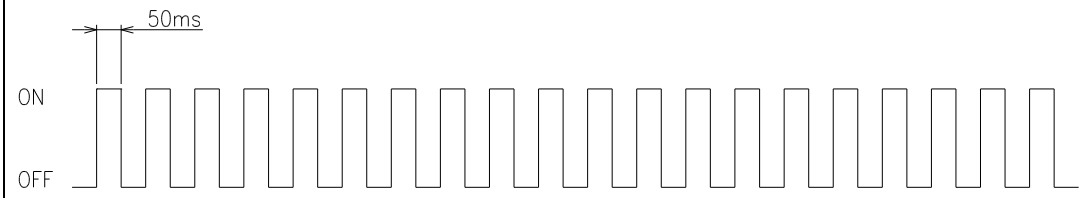
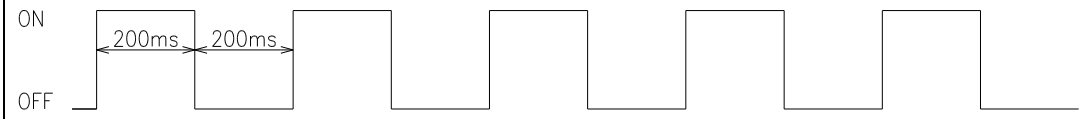
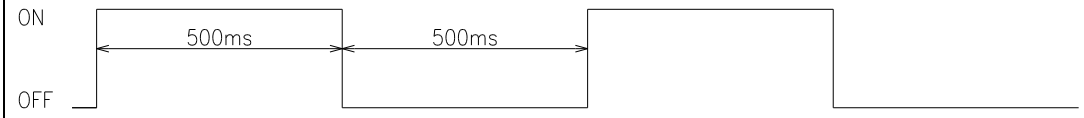
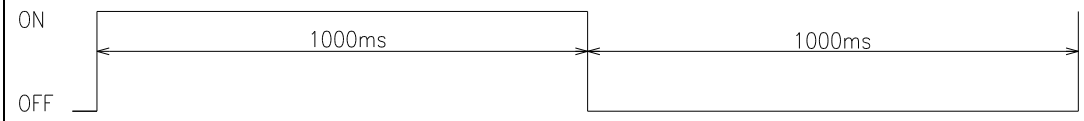
Specifications

LED	Indication
RUN	Indicates the operating status of the device unit.
ALM	Indicates an error status of the OPC UA server function.
L/A IN	Indicates the link status on the IN side of the connector.
L/A OUT	Indicates the link status on the OUT side of the connector.
PS	Indicates the 24 V power status for the unit/input.
PO	Indicates the 24 V power status for the output.
SF	Indicates the status of the entire Remote I/O system.
CF	Indicates a setting change or forced input/output.

Status list

Name	Status	Meaning
RUN	Green on	OPC UA server is in startup.
	Green blinking (slow)	Synchronizing with NTP server.
	Off	Power OFF OPC UA server has failed to startup.
ALM	Red on	OPC UA server is in stop status.
	Red blinking (fast)	Fixed-length memory allocation failure
	Red blinking (slow)	Reading certificate has failed
	Yellow on	Synchronization with the NTP server has failed.
	Green blinking (slow)	Writing process data failed
	Green on	Normal condition
	Off	Power OFF
L/A IN	Green blinking (fast)	LINK, ACTIVITY
	Green on	LINK, NO ACTIVITY
	Off	NO LINK, NO ACTIVITY
L/A OUT	Green blinking (fast)	LINK, ACTIVITY
	Green on	LINK, NO ACTIVITY
	Off	NO LINK, NO ACTIVITY
PS	Red blinking (fast)	Unit/input voltage is outside the range of 24 V ± 25%
	Yellow on	Unit/input voltage restored from voltage error Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green on	Unit/input voltage is in normal condition.
	Off	Power OFF status
PO	Red blinking (fast)	Output voltage is outside the range of 24 V ± 25%
	Yellow on	Output voltage restored from voltage error. Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green on	Output voltage is in normal condition.
	Off	Power OFF status
SF	Red blinking (fast)	Internal bus communication error Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Red blinking (slow)	Hardware error
	Red blinking (twice)	Factory setting error (serial number of device unit)
	Yellow on	Operation waiting
	Yellow blinking (fast)	Unit configuration error
	Green blinking (fast)	Initialized set memory (starts in system reset status) Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green blinking (slow)	Process data overflow
	Green on	Normal condition
	Off	Power OFF status
CF	Red blinking (slow)	WebAPI/PC concurrent access
	Yellow on	Being set to the forced I/O settings
	Green blinking (fast)	Being accessed to WebAPI
	Green blinking (slow)	Being accessed from PC
	Off	Power OFF status or no access status

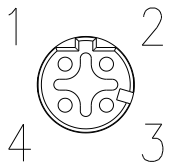
■ LED blinking statuses

Blinking status	Blinking timing
Blinking (fast)	
Blinking (slow)	
Blinking	
Blinking (1Hz)	

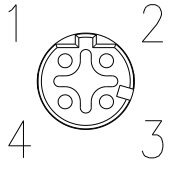
A video is available to show how the LEDs flash.
If necessary, refer to the video at the following URL.

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

■ LAN port (IN)

M12(A) 4-pin female	Pin number	Description
	1	Transmission data, plus (TD+)
	2	Reception data, plus (RD+)
	3	Transmission data, minus (TD-)
	4	Reception data, minus (RD-)

■ LAN port (OUT)

M12(A) 4-pin female	Pin number	Description
	1	Transmission data, plus (TD+)
	2	Reception data, plus (RD+)
	3	Transmission data, minus (TD-)
	4	Reception data, minus (RD-)

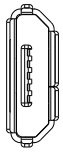
■ Waterproof cap

Always put a waterproof cap on any ports that are not in use.
The tightening torque is 0.1 ± 0.05 N･m.
In addition, proper use of waterproof caps (RT-CM12) is required to achieve protection structure IP65/IP67.
Purchase RT-CM12 separately.

■ USB port (for PC software)

⚠CAUTION

Do not leave the USB port open.
If there are no waterproof caps on the USB port, the degree of protection of the USB port is IP20. Do not allow foreign objects to get inside, and ensure that the ports are free of water, solvents, and oil during use.

Micro USB(B)	Pin number	Description
	1	VBUS
	2	DM
	3	DP
	4	ID
	5	GND

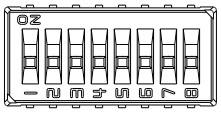
Note: For the unused USB port, always attach the waterproof cap that comes included as standard accessory (RT-CM12 when sold separately).

■ Dip switch

⚠WARNING

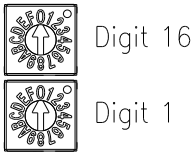
When operating each switch on the device unit, switch OFF the supplied power and set the switches with a precision screwdriver or other tool.
Not doing so can cause a failure as a result of short circuits or damage to components.

When operating a switch, make sure that only the relevant areas are in contact.
Not doing so may result in a failure.

Dip switch 8 points	SW	Name	Description
	1	WebAPI	Specifies whether the WebAPI function is enabled or disabled OFF: Disable (factory setting) ON: Enable
	2	Reserved	-
	3	Reserved	-
	4	Reserved	-
	5	Parameter initialization at startup	If ON at startup, all units will be restored to the factory settings. OFF: Do not initialize (factory setting) ON: Initialize (restores all installed units to the factory settings)
	6	Reserved	-
	7	IP address 3rd octet selection	Selects the third octet of the IP address. OFF: 192.168.0XXX (factory setting) ON:192.168.1.XXX Note: XXX is the value specified by the below rotary switches (when 1 to 254).
	8	Reserved	-

Note: The set value is read only once at startup and confirmed.

■ Rotary switch

2 rotary switches	Value	Part name	Description
	2 digits from 0 to F	IP address setting	Set the IP address of the OPC UA compatible device unit. Set 0 to 255 with [x1] and [x16] switches. 0: Use the software setting value. 1 to 254: 192.168.A.1 to 192.168.A.254 Note: A is selected as 0 or 1 with the above dip switch SW7. 255: Use the software setting value. Factory setting: 0 The value is read only once at startup and confirmed.

1.4 Unit specifications

<table>
<tr><th colspan="2">Item</th><th>Description</th></tr>
<tr><td colspan="2">Type</td><td>Device unit</td></tr>
<tr><td rowspan="7">Communication specifications</td><td>Protocol</td><td>OPC UA</td></tr>
<tr><td>Compliance standard</td><td>IEEE802.3u</td></tr>
<tr><td>Distance between nodes</td><td>Maximum of 100 m</td></tr>
<tr><td>Cable</td><td>Standard Ethernet cable (CAT5 or higher, 100BASE-TX)</td></tr>
<tr><td>Speed</td><td>100 Mbps</td></tr>
<tr><td>System</td><td>Full duplex/half duplex</td></tr>
<tr><td>Supported functions</td><td>Refer to "OPC UA Function"</td></tr>
<tr><td colspan="2">Number of connectable I/O units</td><td>1 to 17 units</td></tr>
<tr><td colspan="2">Number of hardware connectable units</td><td>The width of the entire Remote I/O system must not exceed 922.5 mm
- Input: Maximum of 504 bytes
- Output: Maximum of 504 bytes
- Total I/O: Maximum of 512 bytes</td></tr>
<tr><td colspan="2">Process data size limit</td><td>The process data that device unit can input/output to an upper master has the following size limitations. If exceeded, a "Process data overflow" occurs.
<table>
<tr><td>Item</td><td>Minimum size</td><td>Maximum size</td></tr>
<tr><td>Input</td><td>0 bytes</td><td>504 bytes</td></tr>
<tr><td>Output</td><td>0 bytes</td><td>504 bytes</td></tr>
<tr><td>Total</td><td>1 byte</td><td>512 bytes</td></tr>
</table></td></tr>
<tr><td colspan="2">Protection function</td><td>
<table>
<tr><td rowspan="2">Protection function</td><td colspan="3">Power line</td></tr>
<tr><td>Internal power</td><td>Unit/input</td><td>Output</td></tr>
<tr><td>Low voltage protection (reset function)</td><td>Yes</td><td>No</td><td>No</td></tr>
<tr><td>Overvoltage detection</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Low voltage detection</td><td>No</td><td>Yes</td><td>Yes</td></tr>
</table></td></tr>
<tr><td colspan="2">Connector</td><td>M12(D) 4-pin female x 2 (BUS IN / BUS OUT), Micro USB(B) x 1 (for PC software)</td></tr>
<tr><td colspan="2">Setting switch</td><td>Dip switch x 1: Parameter initialization at startup, WebAPI ON/OFF,
Rotary switch x 2: For device name settings</td></tr>
<tr><td colspan="2">LED</td><td>8 pcs. (RUN, ALM, L/A IN, L/A OUT, PS, PO, SF, CF)</td></tr>
<tr><td colspan="2">Working temperature range</td><td>-10°C to +55°C</td></tr>
<tr><td colspan="2">Relative humidity</td><td>30% to 85% RH</td></tr>
<tr><td colspan="2">Ambient atmosphere</td><td>No corrosive gases or heavy dust</td></tr>
<tr><td colspan="2">Installation location</td><td>Indoor use</td></tr>
<tr><td colspan="2">Altitude</td><td>Up to 2000m</td></tr>
<tr><td colspan="2">Pollution degree</td><td>3</td></tr>
<tr><td colspan="2">Degree of protection</td><td>IP65/IP67 (when connected) Note[1]</td></tr>
<tr><td colspan="2">Current consumption</td><td>Unit/input power supply: 100 mA or less (24V equivalent) Output power supply 20 mA or less (24V equivalent)</td></tr>
<tr><td colspan="2">Size (W x H x D)</td><td>46.1 × 106 × 55.8 (mm)</td></tr>
<tr><td colspan="2">Net weight</td><td>Approximately 230g (including 2 tie rods for device unit)</td></tr>
<tr><td colspan="2">Standard accessories</td><td>Tie rod for device unit x 2 (RT-TR-1), waterproof cap for USB port x 1 (RT-CM12)
Note: Waterproof caps (RT-CM12) for the L/A IN and L/A OUT ports are sold separately.</td></tr>
</table>

Note 1: IP65/IP67 is not part of the UL certification.

2. INSTRUCTIONS FOR USE

⚠CAUTION

Thoroughly read and understand the instruction manual before using the device unit.
The product may operate in an unexpected way, causing injury to people or damage to equipment.

Instructions		Reference
Prior checking	Check the Remote I/O system structure.	“Remote I/O RT Series Instruction Manual: System Construction”
	Check the power supply units' current consumption (related to the number of power supply units used).	
	Determine whether Remote I/O system diagnostic information is used (related to dip switch SW8 of the device unit).	"1.3 Names and Functions of Each Part”
	Check if a variable I/O unit (e.g. IO-Link master unit) is present among the I/O units.	“Remote I/O RT Series Instruction Manual: System Construction”
	If there are any variable I/O units (e.g.: IO-Link master unit), check the sizes of the parts of them that are variable. (E.g.: For IO-Link master units, check each output and input size of the IO-Link device that connects ports to be used as IO-Link mode.)	
	- Check the I/O size and assignment information of the Remote I/O system	
	Determine the authentication method when using the WebAPI	“8.1 Setting Method"
	Check the IP address of the NTP server to connect to.	
	Determine security policies.	“7.2 Security”
↓	↓	-
Hardware mounting, wiring, and setup	Set up PC and such to control the device unit	
	↓	-
	- Assemble the Remote I/O system. - Mount the Remote I/O system (DIN rail mounting or direct screw mounting).	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Wire the LAN cable to the device unit.	"3.2Communication Wiring"
	↓	-
	- Wire the 24 V power supply to the power supply unit.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Wire each external I/O to the I/O units. Note: For an IO-Link master unit, IO-Link devices must also be connected.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	
	Set the following switches for the device unit. - Dip switches: Whether there will be diagnostic information; operation in the event of a communication error; etc. - Rotary switches: IP address (Specify the IP address using the PC/configuration software when selecting 0 or 255)	“Remote I/O RT Series Instruction Manual: System Construction” "1.3 Names and Functions of Each Part”
↓	↓	-

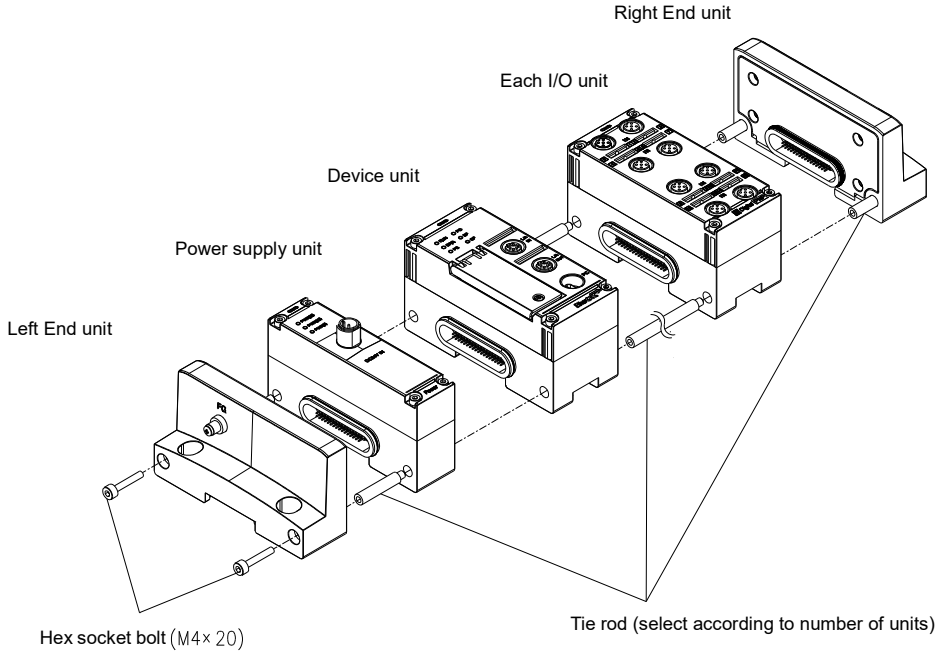
Instructions		Reference
Client and product settings	Set up a client to be connected	Instruction manuals for each client
	↓	-
	Generate a certificate and private key for the OPC UA compatible device unit	『Certificate Generate Tool User's Manual』
	Generate a certificate for an OPC UA client	Instruction manuals for each client
	↓	
	(Only if necessary) Set the following according to the client - MAC address setting of the product - IP address settings of the product - Communication encryption settings for the product - Other settings required for OPC UA communication	Instruction manuals for each client
	↓	-
	Write the certificate and private key to the product	『Certificate Write Tool User's Manual』
	(Only if necessary) Develop an OPC UA client control program.	
↓	↓	-
Checking Remote I/O system settings and status	Supply 24 V power to the power supply units 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"
	↓	-
	Device unit settings	"4. SETTINGS"
	● If setting up from the PC software	"Remote I/O RT Series Instruction Manual: System Construction"
	Connect the PC software to the device unit with a USB cable.	
	↓	
	Check the actual Remote I/O system structure with the PC software.	
	↓	
	Set up the actual Remote I/O system structure with the PC software. Note: If the I/O unit is a variable I/O unit, set the input/output size manually or from the Remote I/O RT unit.	
	● When setting with OPC UA from a created program, etc.	Instruction manuals for each development environment "7 OPC UA FUNCTION"
	From the created program, create a program that sends to the product using the OPC UA Setting node.	
	↓	-
	(If necessary) Check the output wiring, depending on the forced output setting from the PC software.	"Remote I/O RT Series Instruction Manual: System Construction"
	↓	-
	Note: Some settings require a power cycle.	-
↓	↓	-
Confirming and starting communication	Start communication from the client to the product.	Instruction manuals for each client
	↓	-
	Check the reading and writing of data to the Remote I/O system from the OPC UA client via OPC UA communication.	Instruction manuals for each client
	↓	-
	Check the reading and writing of data to the Remote I/O system via OPC UA communication.	Instruction manuals for each development environment "7 OPC UA FUNCTION"

3. INSTALLATION AND WIRING

3.1 Device Unit Installation

Connect device unit horizontally with power supply and I/O unit.

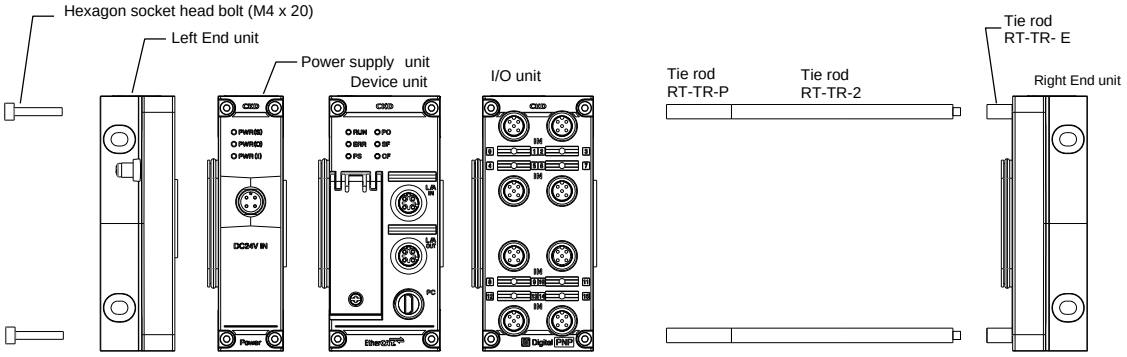
E.g.)



1 Connect the following tie rods in advance.
Select as few tie rods as possible.

Tie rod model No.	Applicable unit	Specifications
RT-TR-P	For one power supply unit	M4 x 27 mm, 2 pcs
RT-TR-1	For one device unit and one I/O unit	M4 x 46 mm, 2 pcs
RT-TR-2	For one device unit and two I/O units	M4 x 92 mm, 2 pcs
RT-TR-4	For one device unit and four I/O units	M4 x 184 mm, 2 pcs
RT-TR-8	For one device unit and eight I/O units	M4 x 368 mm, 2 pcs
RT-TR-V	For one Valve I/F unit	M4 x 32 mm, 2 pcs
RT-TR-E	For right End unit	M4 x 35 mm, 2 pcs

E.g.)



2 Connect the units together.

3 Pass the tie rods through each unit, and then push adjacent units together.

4 Tighten the left End unit with hexagon socket head bolts (M4 x 20) (tightening torque 1.2 N·m ± 0.05 N·m).

5 Check that all units are connected without any gaps.

3.2 Communication Wiring

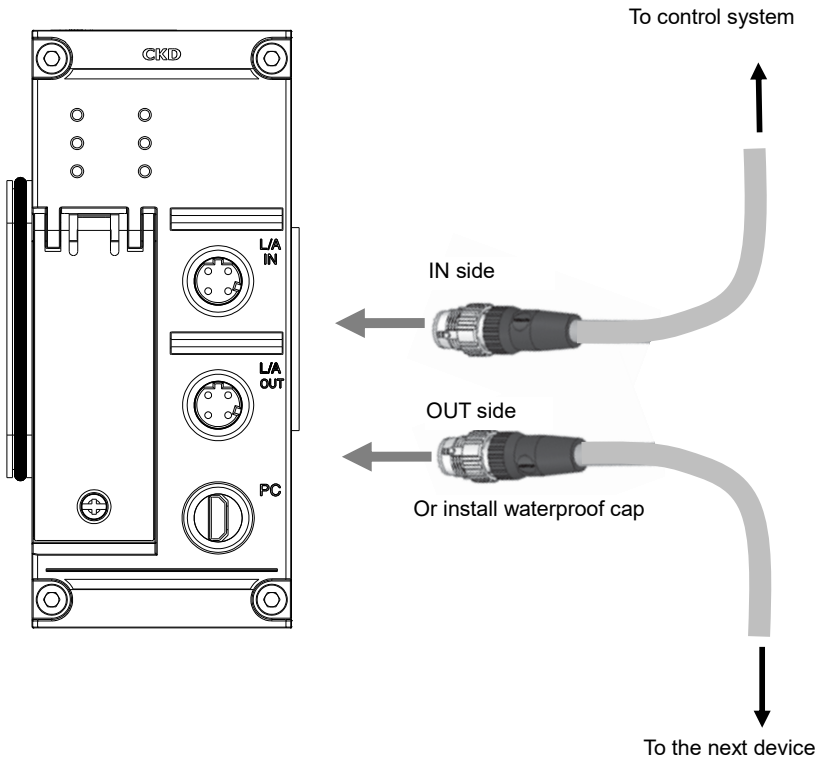
⚠WARNING

Use the specified cable for the communication cable.
Using cables other than those specified can cause communication malfunctions, and result in personal injury or damage to equipment.

Follow the steps below to connect the communication cable.

1 After confirming safety, stop communication with the product and power off all the peripheral equipment.

2 Refer to the following figure and wire the cables comply with the product and its communication specifications to the IN and OUT sides.
If no remote device is connected to the OUT side, install a waterproof cap (RT-CM12), sold separately.



For device unit communication wiring, purchase cables or connectors that meet the following specifications:
[Specifications] M12 plug (male), D-coding, 4-core

■ Recommended communication cable

When connecting a device unit to a control system or remote device with an RJ45 connector type

Product name	Specifications	Number of cores	Cable extraction method	Length	Manufacturer	OMRON Corporation model No.
XS5W industrial Ethernet plug cable with connectors on both sides (M12 straight to RJ45)	M12 plug (D-coding, male) - RJ45	4 cores	Straight to RJ45	0.5 m	Omron Corporation	XS5W-T421-BMC-SS
				1 m		XS5W-T421-CMC-SS
				2 m		XS5W-T421-DMC-SS
				3 m		XS5W-T421-EMC-SS
				5 m		XS5W-T421-GMC-SS
				10 m		XS5W-T421-JMC-SS

- For a wire with one open-end side

Product name	Specifications	Number of cores	Cable extraction method	Length	Manufacturer	OMRON Corporation model No.
XS5H industrial Ethernet plug cable with a connector on one side (M12 straight to open-end-cable)	M12 plug (D-coding, male) – open-end-cable	4 cores	Straight to open-end-wire	0.5 m	Omron Corporation	XS5H-T421-BM0-K
				1 m		XS5H-T421-CM0-K
				2 m		XS5H-T421-DM0-K
				3 m		XS5H-T421-EM0-K
				5 m		XS5H-T421-GM0-K
				10 m		XS5H-T421-JM0-K
				15 m		XS5H-T421-KM0-K

4. SETTINGS

⚠WARNING

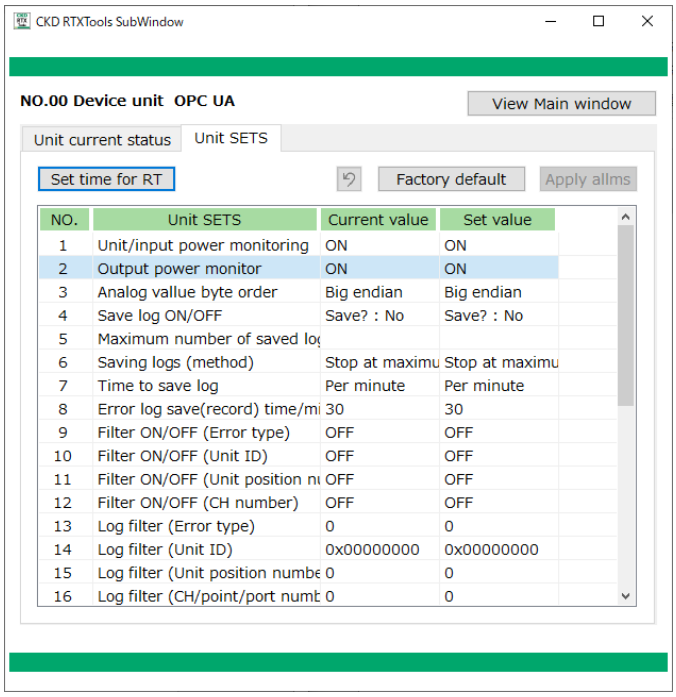
Check the settings of each unit before operating.
Setting the units incorrectly can cause malfunction, and result in personal injury or damage to equipment.

4.1 Setting Method

There are three ways to configure a OPC UA compatible device unit: using the PC software, industrial network communication and WebAPI.

4.1.1 Using the PC software

Select a OPC UA compatible device unit on the "Unit Configuration" main tab and click the [Settings] button.



4.1.2 Using industrial network communication

Set the OPC UA compatible device unit using the setting node from the OPC UA client. Refer to "7.3.3 Setting data7.3.3Setting data" for more information.

4.1.3 Using WebAPI

Specify the IP address instead of the COM port when connecting the PC software. Upon connection, the PC and OPC UA compatible device unit must be connected on the same network.
Accessing the WebAPI using customer's own applications is also possible. Refer to "8. WebAPI FUNCTION" for more information.

When using RTXTools with WebAPI, turn ON the dip switch SW1 on the device unit.

4.2 List of Settings

The items that can be set are as follows.

Setting	Description	Value	Factory setting	Settings Required
Unit/input power monitor	Set whether the device unit monitors the unit/input power from the power supply unit closest to itself on the left when facing it. In the event of an error, a "Unit/input power voltage error" will occur.	0: OFF (not monitored) 1: ON (monitored)	1: ON (monitored)	-
Output power supply monitor	Set whether the device unit monitors the power supply for the output from the power supply closest to itself on the left when facing it. In the event of an error, an "Output power voltage error" will occur.	0: OFF (not monitored) 1: ON (monitored)	1: ON (monitored)	-
analog value byte order	Sets the byte order when the device unit transmits and receives analog input or output values of the analog I/O unit in the connected I/O unit to and from the upper master.	0: Big endian 1: Little endian	0: Big endian	-
Save log ON/OFF, number of logs saved	Set whether to save logs. Set the maximum number of entries to log.	0: Do not save 1 to 255: Maximum number to save	0: Do not save	-
Saving logs (method)	Select how to save logs from the following. - Repeat (overwrite) - Stop at maximum number	0: Repeat (overwrite) 1: Stop at maximum number	1: Stop at maximum number	-
Log saving time	Select when to save logs from the following. - Save immediately when an error occurs - Save at each set value (minutes)	0: Real-time 1 to 60: Save every 1 to 60 minutes	30: Save every 30 minutes	-
	Set the save interval when the time to save logs is "save at every set value (minutes)."			-
Type of log filter	Set whether error logging filtering (logging only errors with specified conditions) is enabled. Set the type of log filter. Save logs that have passed the filtering target filter with the following bit equal to "1". Bit 7: Enable/disable log filter error type Bit 6: Enable/disable log filter unit ID Bit 5: Enable/disable log filter unit position number Bit 4: Enable/disable log filter CH/point/port number If this setting is 0x00, all logs are saved.	0x00 to 0xFF The meaning of each bit is as follows OFF: Disable ON: Enable	0x00: All disabled	-
Filter ON/OFF (Error type)	Only log errors for the specified error type. Set the error type to filter for.	0x00 to 0xFF	0x00	-
Filter ON/OFF (Unit ID)	Only log errors for the specified unit ID. Set the unit ID to filter for. However, the variable I/O unit determines a match in the top 2 bytes.	0x00000000 to 0xFFFFFFFF	0x00000000	-
Filter ON/OFF (Unit position number)	Only log errors for the unit with the specified unit position number.	0 to 17 (device unit = 0)	0	-
Filter ON/OFF	Only log errors for the specified CH/point/port	0 to 31	0	-

Setting	Description	Value	Factory setting	Settings Required
(CH/point/port number)	number. Set the CH/point/port number to filter for.			
IP address	Set the IP address of the product. Use this setting when starting up with the rotary switch set to 0.	000.000.000.000 to 255.255.255.255	192.168.1.10	
Subnet mask	Set the subnet mask of the product. Use this setting when starting up with the rotary switch set to 0.	000.000.000.000 to 255.255.255.255	255.255.255.0	
Default gateway	Set the default gateway of the device. Use this setting when starting up with the rotary switch set to 0.	000.000.000.000 to 255.255.255.255	192.168.1.1	
WebAPI access authentication	Set the authentication method when accessing WebAPI.	0: Basic authentication 1: Digest authentication 2: No authentication	2: No authentication	
WebAPI login ID	Set the login ID when accessing WebAPI.	Half-width alphanumeric characters and symbols 1 to 16 characters	admin	
WebAPI password	Set the password when accessing WebAPI.	Half-width alphanumeric characters and symbols 1 to 16 characters	pass	
NTP Server IP Address	Set the IP address of the NTP server.	000.000.000.000 to 255.255.255.255	192.168.1.100	
OPC UA Login ID1	Set the login ID for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	user1	
OPC UA Password 1	Set the password for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	pass1	
OPC UA Login ID2	Set the login ID for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	user2	
OPC UA Password 2	Set the password for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	pass2	
OPC UA Login ID3	Set the login ID for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	user3	
OPC UA Password 3	Set the password for anonymous communication.	Half-width alphanumeric characters and symbols 1 to 16 characters	pass3	

5. TROUBLESHOOTING

5.1 Unit Fault (Device unit diagnostic information)

The information can be read from the PC software or WebAPI.

5.1.1 Error codes displayed in the PC software

The CH 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).

- [Codes] on the [Errors] main tab
- [Error code] (in the error log)

5.1.2 Reading diagnostic information area via OPC UA

Refer to “7.3.4 Diagnostic information”.

5.1.3 Reading diagnostic information area via WebAPI

Refer to “8.3.7 Obtaining unit diagnostic data”.

5.2 Troubleshooting from LED Display

5.2.1 LED is normal but conduct unintended operation

LED	Problem	Cause	Action
- Device unit RUN, ALM: Green on SF: Off - Even number (left) LED of IO-Link master unit: Green on	When the I/O unit configuration includes an IO-Link master unit, the created program cannot read and write the process data of the IO-Link device correctly when in IO-Link mode. The value of the process data is different from the value checked on the I/O monitor tab of the PC software directly connected to the Remote I/O system, or the value of the PC software is incorrect. E.g.) When the process data (PD) of the IO-Link device on port 1 is 4 bytes, the data of port 2 are stored from halfway in the upper master side, or extra data are stored between them and the data on port 2.	The size or mode settings for each port on the IO-Link master unit is incorrect. Or the IO-Link device is operating at a different data size from what expected. Note: However, the actual process data size matches the process data size of the device defined in the created program.	Check the size of the process data (PD) of the IO-Link devices connected in IO-Link mode. Set the process data size or setting mode correctly for each port on the IO-Link master. If necessary, update the process data size setting of the product defined in the created program.

5.2.2 Troubleshooting from power supply unit LED Display

■ Power supply unit LED

Power supply unit			Problem	Action
PWR(S)	PWR(O)	PWR(I)		
24 V unit/input status	24 V output status	5 V internal status		
Green on	Green on	Green on	Normal condition	-
Off	Off	Off	24 V unit/input and 24 V output are not supplied correctly.	Supply 24 V unit/input and 24 V outputs correctly.
Off	Green on	Off	24 V unit/input is not correctly supplied or the power supply unit internal fuse is blown.	Check the unit/input 24 V power supply. If the problem persists, replace the power supply unit.
Green on	Off	Green on	24 V output is not correctly supplied. Or, The internal fuse of the power supply unit is blown.	Check the output 24 V power supply. If the problem persists, replace the power supply unit.
Green on	Green on	Off	The internal IC of the power supply unit has failed.	Replace the power supply unit (Note[1]).

Note 1: If replacing the power supply unit does not fix it, it may be due to a faulty I/O unit. If such is the case, contact CKD.

5.2.3 Troubleshooting from the device unit LED display

■ Power monitoring LED on the device unit

Device unit	Problem	Cause	Action
PS			
Red blinking (fast)	Unit/input power supply voltage error	When the "Unit/input power monitor" setting is "monitored", the device unit has detected that the 24 VDC unit/input voltage is outside the range of 24 VDC ± 25%.	Verify that the 24 V unit/input voltage to the power supply unit is within the range of ± 10%.
Yellow on	Unit/input voltage restored from voltage error	It is latched after recovering from a voltage error in the control/input 24 V.	Reset it using power cycle operation or PC software operation.
Off	Power OFF state	24 V for unit/input to the power supply unit is OFF or not correctly supplied.	Verify that there is 24 V for the unit/input to the power supply unit.

Device unit	Problem	Cause	Action
PO			
Red blinking (fast)	Output power voltage error	When the "Output power supply monitor" setting is "monitored", the device unit has detected that the 24 VDC output voltage is outside the range of 24 VDC ± 25%.	Verify that the 24 V output voltage to the power supply unit is within the range of -5 to +10%.
Yellow on	Output voltage restored from voltage error.	It is latched after recovering from a voltage error in the output 24 V.	Reset it using power cycle operation or PC software operation.
Off	Power OFF state	24 V output to the power supply unit is OFF or not correctly supplied.	Verify that there is 24 V output to the power supply unit.

■ Basic LED of the device unit

Normal condition

Device unit								Problem
RUN	ALM	SF	CF	PS	PO	L/A IN	L/A OUT	
OPC UA server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.	Status of the 24 V power supply for unit/input	Status of the 24 V power supply for output	Link status on the IN side of the connector	Link status on the OUT side of the connector	
Green on	Green on	Green on	Off	Green on	Green on	Green blinking (fast)	Green blinking (fast)	Normal condition

Error condition

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
Green on	Red on	Undefined	Undefined	Cannot connect from OPC UA client		Starting up the OPC UA server has failed.	Turn the unit power off and then on again. If the condition still persists even after making improvements, contact CKD.
Green on	Red blinking (fast)	Undefined	Undefined			Failed to allocate the fixed-length memory	
Green on	Red blinking (slow)	Undefined	Undefined			The certificate and private key have not been read correctly.	Write the certificate and private key to the Remote I/O RT unit. Refer to the instruction manual " SM-B04196-A Certificate Write Tool" for details.
Green on	Yellow on	Undefined	Undefined	The internal time of the device unit is in the initial status (1970/1/1/09:00:00).		Synchronization with the NTP server has failed.	Check that the IP address of the NTP server is correct.
Green on	Green blinking (slow)	Undefined	Undefined	Cannot write process data		The data value to be written is greater than the process data.	Check that the data size to be written is correct.
Off	Off	Yellow blinking (fast)	Undefined	A "Unit configuration error" has occurred.	Unit configuration error	The device unit does not automatically recognize the connected I/O units correctly when it is powered on, or it has detected a change in the number of I/O units connected during operation.	- If the Remote I/O RT unit configuration is correct, leave the configuration as is and turn the power off and on again. - If the Remote I/O RT unit configuration is not

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
							correct, turn OFF the power, change the I/O unit configuration, and then turn on the power. - Check the connection between the units.
						When using multiple power supply units, the power-up timing between the power supply units has shifted by 3 seconds or more.	Cycle the power by making the power-up timing to the multiple power supply units at the same time (within 3 seconds).
Off	Off	Off	Off	It does not work at all	-	The power is not supplied properly.	- Check that the 24V is supplied to the power supply unit. - Check that all LEDs on the power supply unit are lit.

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
Undefined	Undefined	Red blinking (fast)	Undefined	An internal bus communication error has occurred.	Internal bus communication error	There is a physical connection problem between the units, or there is a strong noise around the area.	Disconnect, reconnect, and then power on the Remote I/O system units. If it still occurs, check the connection, improve the noise condition, or implement a workaround. If the condition still persists even after making improvements, contact CKD.
Undefined	Undefined	Red blinking (slow)	Undefined	A hardware error has occurred in the device unit.	Hardware error	There is a possible hardware error.	Turn the unit power off and then on again. If the problem persists, replace the device unit.
Undefined	Undefined	Red blinking (slow)	Undefined	- Cannot read/write various memories. - Settings are	Memory read/write error	There is a possible hardware failure.	Turn the power off and on again after writing new data, or do so while the dip switch

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
				initialized. - Cannot communicate. - Automatic recognition fails. - Cannot read log data from the PC software.			SW5 is ON. If the problem persists, contact CKD.
Undefined	Undefined	Red blinking (Twice)	Undefined	Factory setting error has occurred.	Factory setting error	The serial number or MAC address of the device unit is the initial value (the serial number is always written at manufacturing). There is a possible failure.	Contact CKD.
Undefined	Undefined	Yellow on	Undefined	Process data is fixed.	-	- Disconnection detected in digital input unit or analog input unit. - The digital output unit or analog output unit is in “Manual output” status. - Valve I/F unit is in “Manual output” status - Changed the settings that changes the process data size on the variable I/O unit.	Turn the unit power off and then on again.

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA Server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
Undefined	Undefined	Green blinking (fast)	Undefined	The I/O unit setting is initialized and started.	Initialized set memory	The setting memory was initialized and started up while the device unit's dip switch SW5 (Parameter initialization at startup) was OFF. - Changed connected I/O unit (when the device unit started up, the unit ID and connection position number of the connected I/O unit did not match ones at the last start-up). - The checksum of the setting memory in the analog I/O unit and IO-Link master unit did not match the one stored in the device unit.	Check if the configuration of the I/O unit has changed. And turn the power off and on again. If the problem persists, contact CKD. Note: To clear the error, turn the power off and on again, or perform a latch reset from the PC software.
Undefined	Undefined	Green blinking (slow)	Undefined	The process data size of some I/O units is different than expected. Some I/O units have an internal bus communication error.	Process data overflow	The process data size with the upper master as a device unit exceeds the maximum size below. - Input: Maximum of 504 bytes - Output: Up to 504 bytes. - Total I/O: Maximum of 512 bytes	Make the process data size the maximum size or lower, for example by reducing the number of I/O units or changing the I/O unit type. And turn the power off and on again.
Undefined	Undefined	Undefined	Yellow on	Cannot control process data from the created program.	-	There is a unit with a forced I/O setting.	Cancel the forced I/O setting from the PC software, or turn the power off and on again.
Undefined	Undefined	Undefined	Red blinking (slow) Yellow on One of the above.	Cannot control process data from the created program.	WebAPI/PC concurrent access	At the same time, settings are also changed from the PC software LAN connected.	Check whether the settings are also changed from the PC software LAN connected.
Undefined	Undefined	Undefined	Red	Cannot	WebAPI/PC	At the same time,	Check whether the

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	ALM	SF	CF				
OPC UA Server status	OPC UA Communication status	Status of the entire Remote I/O system	Setting change or forced input/output.				
			blinking (slow) Green blinking (fast) Green blinking (slow) One of the above.	change settings by acyclic parameter communication.	concurrent access	settings are also changed from the LAN connected PC software or USB connected PC software.	settings are also changed from the LAN connected PC software or USB connected PC software.
Undefined	Undefined	Undefined	Green blinking (slow)	Cannot change settings by acyclic parameter communication.		At the same time, settings are also changed from the PC software.	Check whether the settings are also changed from the PC software.
Undefined	Undefined	Undefined	Off	Cannot be controlled from the PC software.	-	There is no access from the PC software (USB connected) for 60 seconds or more.	Check that the COM port specified is correct.
Undefined	Undefined	Undefined	Off	Cannot be controlled from the PC software or WebAPI.	-	There is no access from the PC software (LAN connected) or WebAPI for 60 seconds or more.	Check that the IP address and URL specified are correct.

Note 1: Power cycle is required when the switch settings have been changed.

■ LED in data transmission/reception status of the device unit

Device unit	Problem	Cause	Action
L/A IN L/A OUT			
Off	There is no OPC UA communication.	The Ethernet cable is not connected properly.	Check the Ethernet cable connection.

6. STARTING STEPS OF OPC UA COMMUNICATION

This section describes the operations for the OPC UA client and the product to start communication.
The steps are as follows.

1 Advance preparation
- Prepare the software
- Configure the device structure

2 Steps for communication
- Generate a certificate
- Write the certificate
- Set the Remote I/O RT (IP address, password, NTP server IP address, etc.)

3 Starting communication from the client to the product.
- Set UaExpert connection
- Check the connection and operation

6.1 Advance preparation

6.1.1 Preparing the software

The following software is required to perform OPC UA communication.
Download each software and install it by referring to the instruction manual.

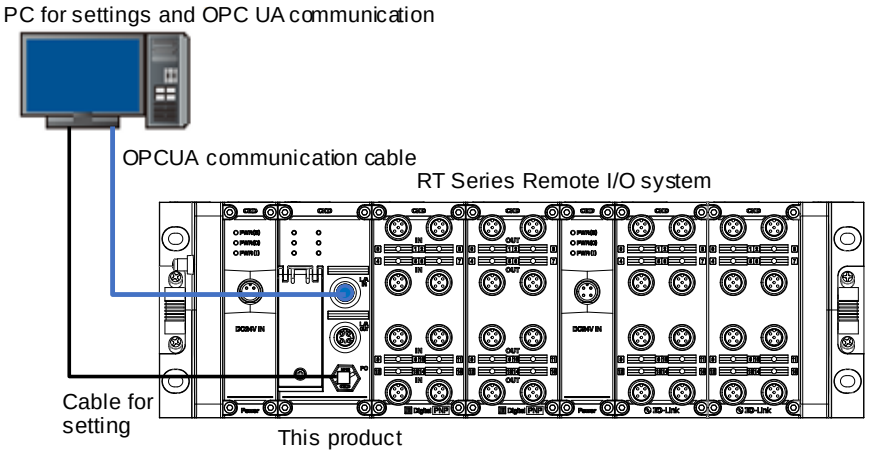
Software name	Overview	Related instruction manuals
PC software (RTXTools)	Use to set the device unit.	SM-A90084-A, RT series setting software: RTXTools Instruction Manual
Certificate Generate Tool	Use to generate a certificate for a device unit.	SM-B04196-A_Certificate Generate Tool/ Certificate Write Tool
Certificate Write Tool	Use to write a certificate for a device unit.	
Each OPC UA client software	Prepare the software by the customer.	

The "RT Series Setting Software: RTXTools Instruction Manual" and "Certificate Generate Tool/ Certificate Write Tool" can be downloaded from the following URL.

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

6.1.2 Device structure

Connect the product as follows to set the product and communicate with a client.
The structure is assumed that the product settings and communication with the client will be performed on a single PC, however, if there are each PC for client communication and settings, it is also possible to use PCs separately.



6.2 Pre-communication steps

6.2.1 Generating and writing the certificate

Generate certificate using the "Certificates Generate Tool".
Write certificates using the "Certificates Write Tool".
Refer to the instruction manual “SM-B04196-A_Certificate Generate Tool/ Certificate Write Tool” for details.

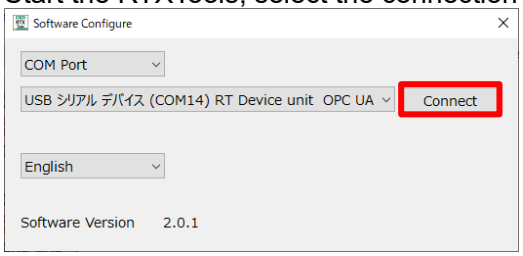
6.2.2 Setting RT

Use RTXTools to configure the following:

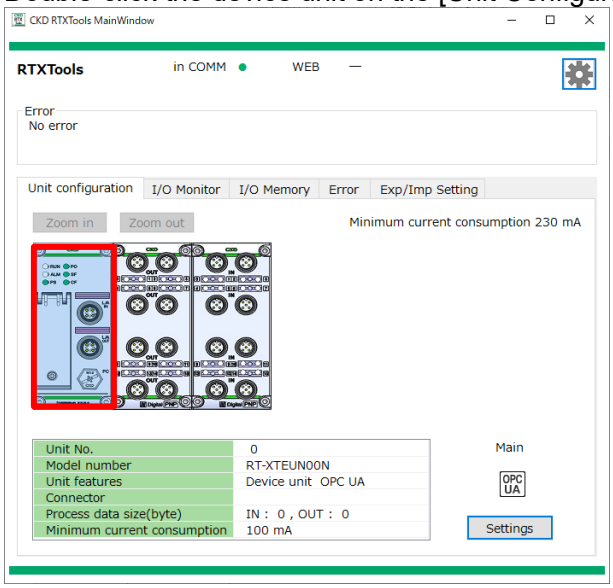
- IP address/subnet mask/default gateway
- NTP server IP address
- Login ID/password

Settings can be changed by the following steps.

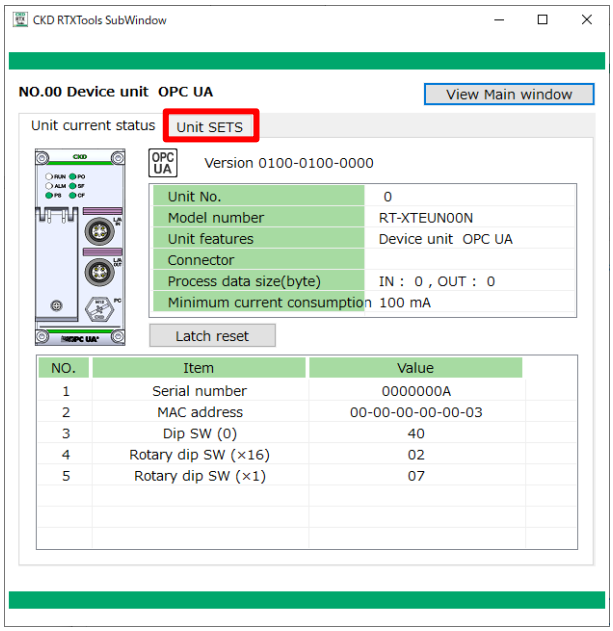
1 Connect the product to the PC RTXTools is installed via USB cable and turn the power on. Start the RTXTools, select the connection port, and click [Connect].



2 Double-click the device unit on the [Unit Configuration] tab.

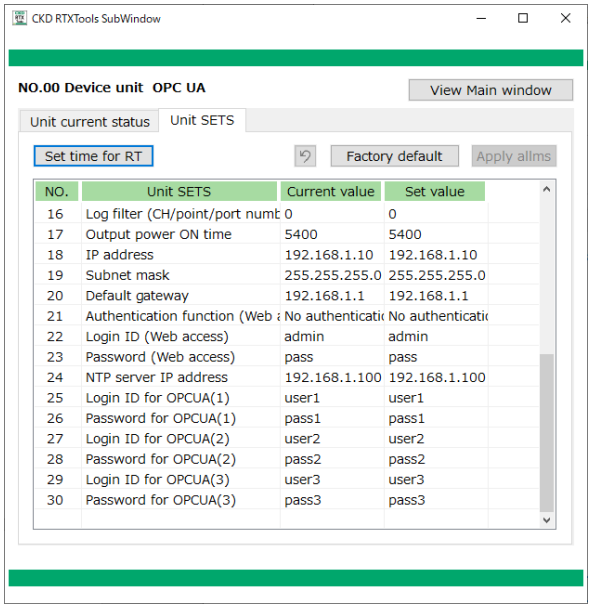


3 When the OPC UA device unite sub window is displayed, click the [Unit Settings] tab.



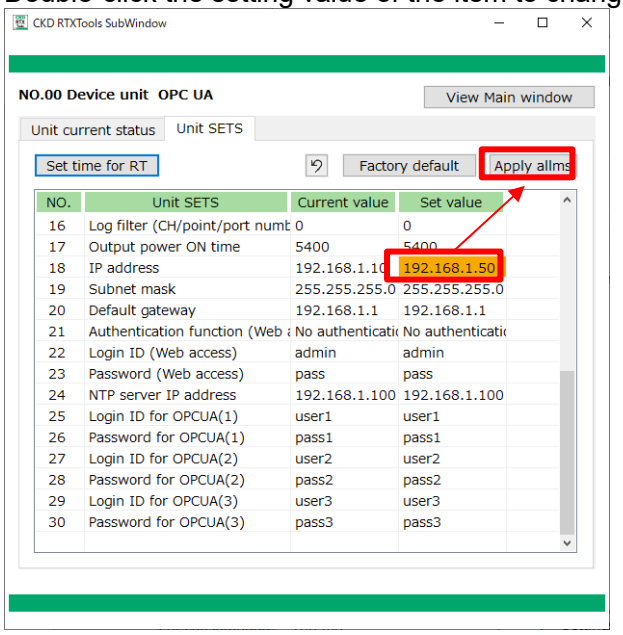
Each setting can be changed on the [Unit Settings] .

No.	Unit settings	Description
18	IP address	Set the IP address of the product.
19	Subnet mask	
20	Default gateway	
24	NTP Server IP Address	Set the IP address of the NTP server to communicate with at startup according to the operating environment.
25 to 30	OPC UA login ID/password	Set the login ID/password to be used for connecting OPC UA communication.

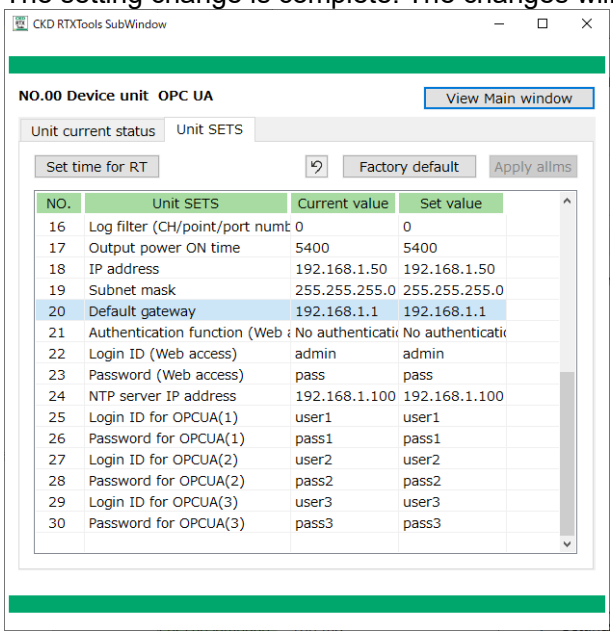


To use the IP address set in RTXTools, the rotary switch must be set to 0x00.

4 Double-click the setting value of the item to change, enter a value, and click [Apply all].



5 The setting change is complete. The changes will be reflected after a power cycle.



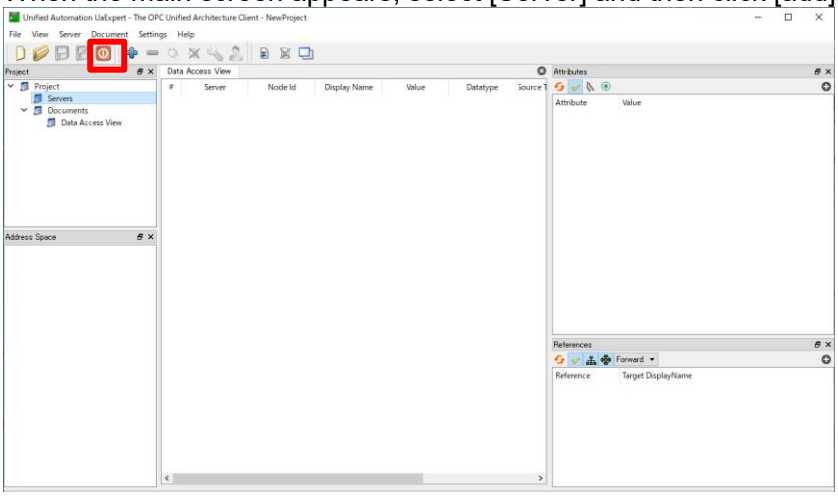
6.3 Communicating from the client to the product

Follow the instruction manual for the client software to connect the product from the client software.
This section describes the client software UaExpert from Unified Automation as an example.

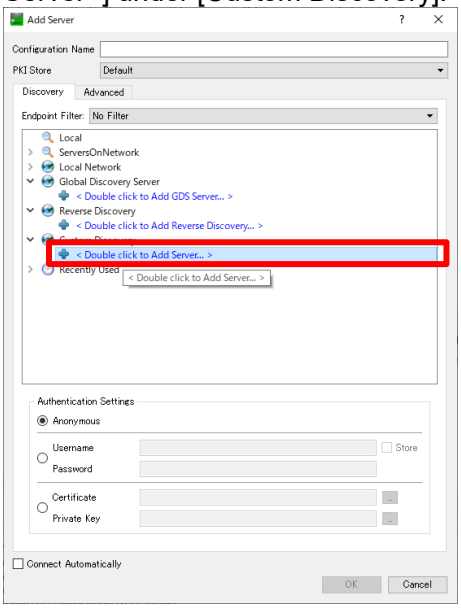
6.3.1 Setting UaExpert connection

1 Start UaExpert.

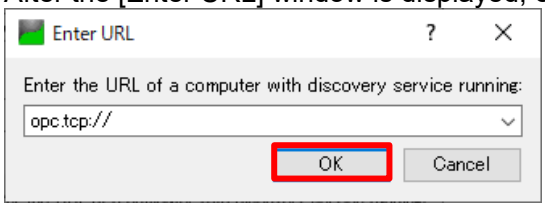
2 When the main screen appears, select [Server] and then click [add].

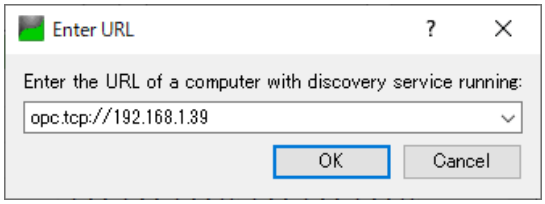


3 On the [Add Server] screen for adding an OPC UA server, double-click [<Double-click to Add Server>] under [Custom Discovery].

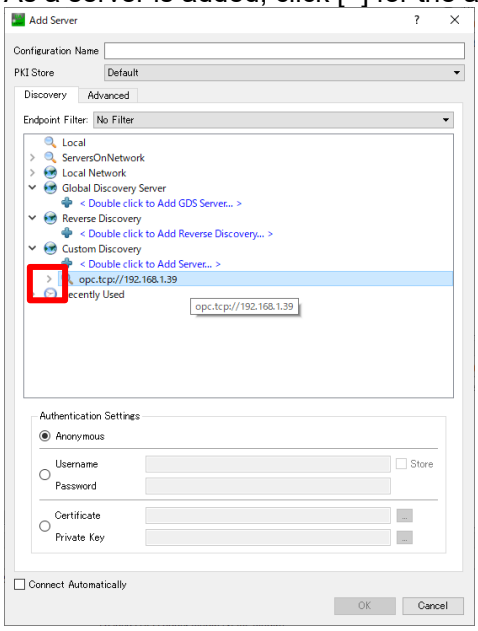


4 After the [Enter URL] window is displayed, enter the IP address of the product and click [OK].

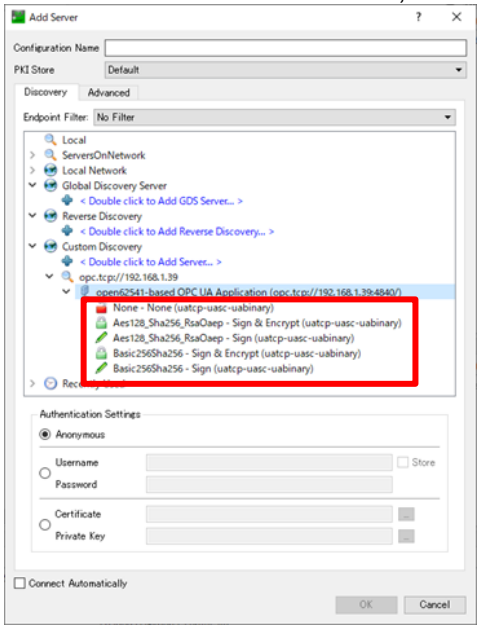




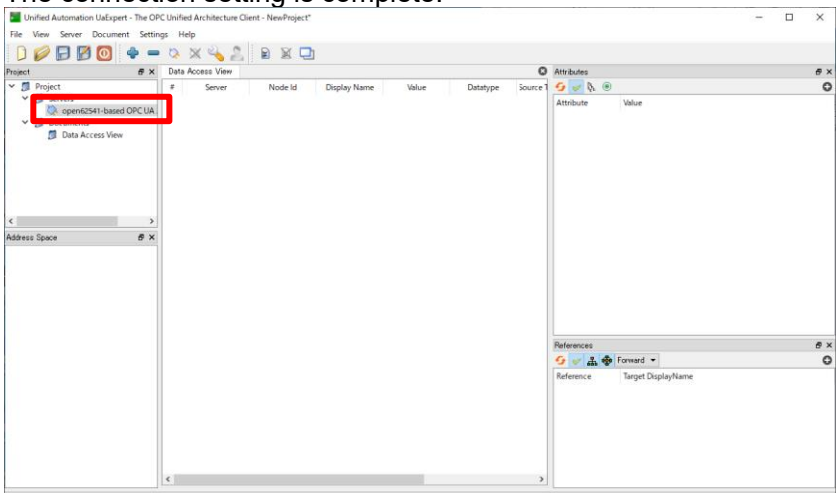
5 As a server is added, click [>] for the added server.



6 Select the security method to be used for connection.
Note: For details on each item, refer to "7.2 Security." Click [OK] after selecting them.



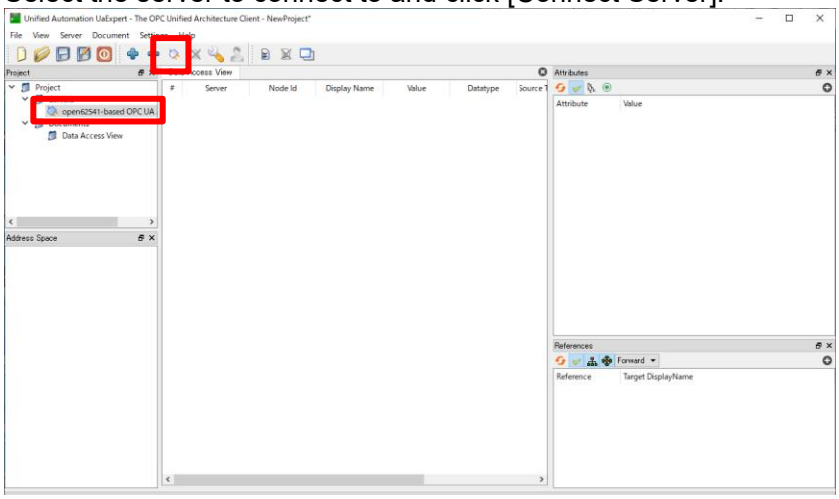
7 The server connection destination has been registered in the project.
The connection setting is complete.



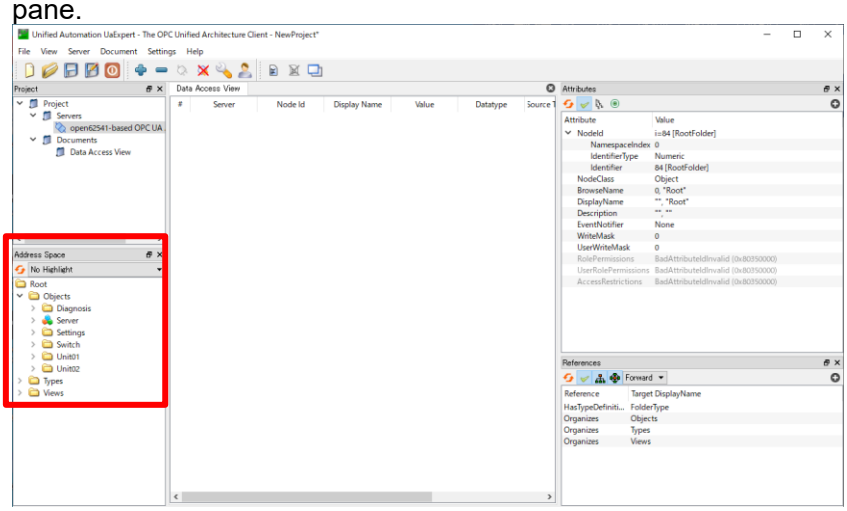
6.3.2 Checking the connection and operation

As an example, this section describes how to check the process data of the digital output unit (16 points) connected to the first unit on the manifold by communicating with a Remote RT unit.

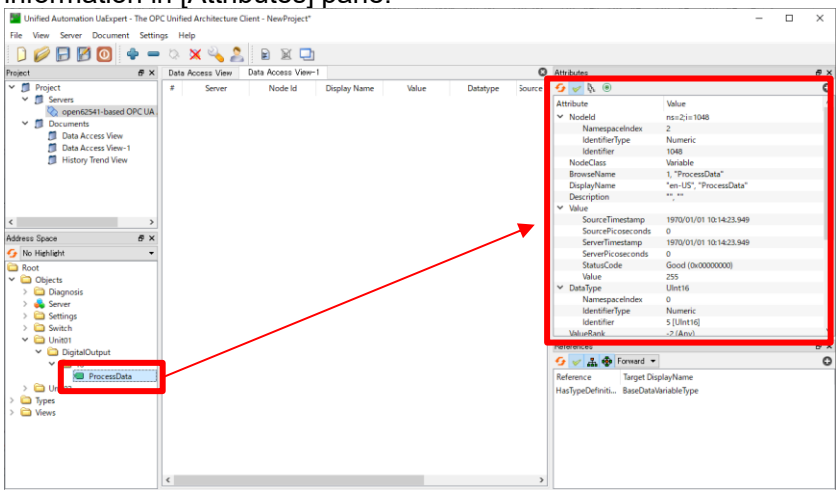
1 Select the server to connect to and click [Connect Server].



2 Once the connection is complete, the address of the product is displayed in [Address space] pane.

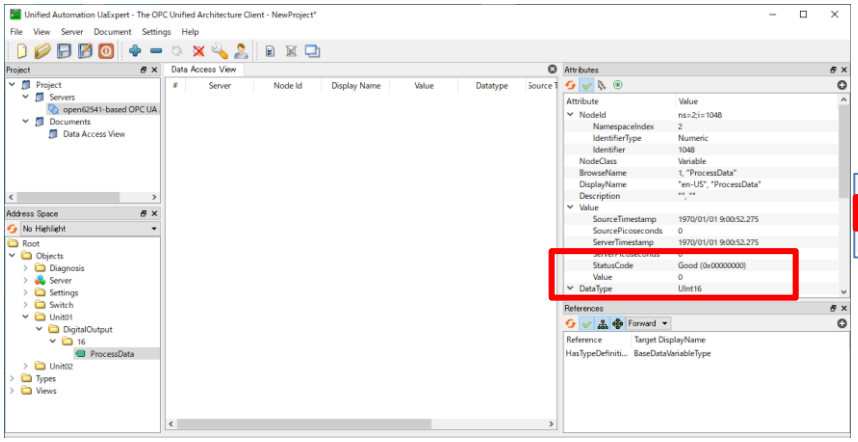


3 Double-click [Object/Unit01/DigitalOutput/16/ProcessData] in [Address Space] to display the information in [Attributes] pane.



4 The current process data of the digital output unit (16 points) connected to the first unit of the manifold can be checked in the [Value] column of [Attributes] pane.

5



Zoom-in image

7. OPC UA FUNCTION

This product supports OPC UA function.

OPC UA function is used mainly for the application below.

Note 1: RTXTools is intended to be used for confirmation before operation. Connecting with RTXTools during operation may affect communication with applications. If it occurs, stop using the WebAPI connection with RTXTools.

7.1 Time Management

This product accesses the NTP server to synchronize the time when the power is turned on.
Time synchronization is required for the following OPC UA features:

OPC UA function	Description
Security	Used to check the validity of a certificate.
Historical Access	Used to record the time when the process data changed.

Note: While the device can be used without synchronizing, the above functions will be disabled.

As a side note, NTP server synchronization is performed through the following process.

Sync status	LED status		Device's internal clock	Remarks
	RUN	ALM		
In synchronizing	Green blinking (slow)	Green on	-	-
Succeeded	Green on	Green on	NTP server time	Resync every 30 minutes
Failed (Timeout)	Green on	Yellow on	1970/1/1/09:00:00	No more synchronizing

7.2 Security

The product supports encrypted communication using certificates
Can select whether or not to use security (security policy) and the strength of that security (security mode) when communicating with a client.

The security policy and security mode are as follows:

Security policy	Description
SignAndEncrypt	Sign and encrypt messages
Sign	Sign but do not encrypt messages
None	No security

Security mode	Description
Basic256Sha256	High security
Aes128Sha256RsaOaep	Medium to high security
None	No security

7.3 Address Space

The product can view the following information by communicating with the client.

7.3.1 Process Data

The process data of the I/O units connected inside the RT manifold can be viewed.
This address is visible to clients only when the unit is connected.

The "*" in each address name corresponds to the following:

Node name	value	Remarks
Unit*	Unit 1 to Unit 17	Indicates the position number of the unit in the manifold: device unit is numbered 0 and the other units are numbered from the left.
ch*	ch0 to ch1	Indicates the number of channels in the target unit.
port*	Port0 to Port7	Indicates the port number in the target unit.

■ Digital input unit

Node Address	Objects/Unit*/DigitalInput/8/		
Node name	Access Rule	Data type	Historical Access
Process Data	R	1 byte	Enable

Digital input unit (8 points) bit assignment

Bit7	Bit6	…	…	…	…	Bit1	Bit0
Connector 7	Connector 6	…	…	…	…	Connector 1	Connector 0

Node Address	Objects/Unit*/DigitalInput/16/		
Node name	Access Rule	Data type	Historical Access
Process Data	R	2 bytes	Enable

Digital input unit (16 points) bit assignment

Bit15	Bit14	…	…	…	…	Bit1	Bit0
Connector 15	Connector 14	…	…	…	…	Connector 1	Connector 0

Node Address	Objects/Unit*/DigitalInput/32/		
Node name	Access Rule	Data type	Historical Access
Process Data	R	4 bytes	Enable

Digital input unit (32 points) bit assignment

Bit31	Bit30	…	…	…	…	Bit1	Bit0
Connector 31	Connector 30	…	…	…	…	Connector 1	Connector 0

■ Digital output unit

Node Address	Objects/Unit*/DigitalOutput/16/		
Node name	Access Rule	Data type	Historical Access
Process Data	RW	2 bytes	Enable

Digital output unit (16 points) bit assignment

Bit15	Bit14	…	…	…	…	Bit1	Bit0
Connector 15	Connector 14	…	…	…	…	Connector 1	Connector 0

Node Address	Objects/Unit*/DigitalOutput/32/		
Node name	Access Rule	Data type	Historical Access
Process Data	RW	4 bytes	Enable

Digital output unit (32 points) bit assignment

Bit31	Bit30	…	…	…	…	Bit1	Bit0
Connector 31	Connector 30	…	…	…	…	Connector 1	Connector 0

■ Analog input unit

Node Address	Objects/Unit*/AnalogInput/2/ch*/		
Node name	Access Rule	Data type	Historical Access
Process Data	R	2 bytes	Enable

■ Analog output unit

Node Address	Objects/Unit*/AnalogOutput/2/ch*/		
Node name	Access Rule	Data type	Historical Access
Process Data	RW	2 bytes	Enable

■ Valve I/F unit

Node Address	Objects/Unit*/ValveOutput/32/		
Node name	Access Rule	Data type	Historical Access
Process Data	RW	4 bytes	Enable

Valve IF unit bit assignment

Bit31	Bit30	…	…	…	…	Bit1	Bit0
Connector 31	Connector 30	…	…	…	…	Connector 1	Connector 0

■ IO-Link master unit

IO-Link mode Input process data

Node Address	Objects/Unit*/AnalogOutput/2/ch*/		
Node name	Access Rule	Data type	Historical Access
Process Data IN	R	0 to 32 bytes	Enable

IO-Link mode output process data

Node Address	Objects/Unit*/AnalogOutput/2/ch*/		
Node name	Access Rule	Data type	Historical Access
Process Data OUT	RW	0 to 32 bytes	Enable

7.3.2 System data

■ Rotary switch status

Node Address	Objects/Switch/Status/		
Node name	Access Rule	Data type	Historical Access
Rotaryx16	R	1 byte	Disable
Rotaryx1	R	1 byte	Disable

■ Dip switch status

Node Address	Objects/Switch/Status/		
Node name	Access Rule	Data type	Historical Access
Dip	R	1 byte	Disable

■ System Log

Node Address	Objects/ Diagnosis/		
Node name	Access Rule	Data type	Historical Access
RTSystemLog	R	0 to 4080 bytes	Disable

■ MAC address

Node Address	Objects/ UnitInfo/		
Node name	Access Rule	Data type	Historical Access
MAC Address	R	6 byte	Disable

■ Serial number

Node Address	Objects/ UnitInfo /		
Node name	Access Rule	Data type	Historical Access
Serial No.	R	4 byte	Disable

7.3.3 Setting data

■ Settings for individual unit

Node Address	Objects/Settings/			
Node name	Access Rule	Data type	Historical Access	Remarks
UnitNo	RW	1 byte	Disable	Specifies the unit position.
Write	RW	1bit	Disable	Specifies to read or write.
datalength	RW	1 byte	Disable	Specifies the data length.
parameterID	RW	4 bytes	Disable	Specifies the parameter ID. For details, refer to the following parameter ID tables of each units.
data	RW	0 to 256 bytes	Disable	Reads or writes data.
execute	RW	1 byte	Disable	Reads/writes the individual unit settings by writing to “Execute”. Note: The value written to “Execute” is arbitrary.
result	R	4 bytes	Disable	Indicates the succeeded/failed of the setting change

■ Settings for the device unit

Parameter ID	RW	Name	Data type	Initial value	Description
0x0CFF0100	RW	Input power monitor	BYTE	1	0: OFF (not monitored) 1: ON (monitored)
0x0DFF0100	RW	Output power monitor	BYTE	1	0: OFF (not monitored) 1: ON (monitored)
0x0EFF0100	RW	Analog byte order	BYTE	0	0: Big endian 1: Little endian
0x10FF0100	RW	Maximum number of saved logs	BYTE	0x00	0x00: Do not save 0x01 to 0xFF: Maximum number to save
0x11FF0100	RW	Saving logs (method)	BYTE	1	0: Repeat (overwrite) 1: Stop at maximum number
0x12FF0100	RW	Time to save log	BYTE	0x1E	0x00: real-time 0x1 to 3C: Save every 1 to 60 minutes
0x13FF0100	RW	Log filter	BYTE	0x00	(Refer to “4.2 List of Settings”.)
0x14FF0100	RW	Log filter details (Error code specification)	BYTE	0x00	0x00 to 0xFF
0x15FF0400	RW	Log filter details (Unit specification)	DWORD	0x00000000	0x00000000 to 0xFFFFFFFF
0x19FF0100	RW	Log filter details (Unit position specification)	BYTE	0	0x00 to 0x11
0x1AFF0100	RW	Log filter details (CH specification)	BYTE	0x00	0x00 to 0xFF
0x30FF0400	RW	IP Address	DWORD	0xC0A8010A (192.168.1.10)	0x00000000 to 0xFFFFFFFF
0x34 FF0400	RW	Sub Net Mask	DWORD	0xFFFFFF00 (255.255.255.0)	0x00000000 to 0xFFFFFFFF
0x38 FF0400	RW	Default Gate Way	DWORD	0xC0A80101	0x00000000 to 0xFFFFFFFF
0x40FF1600	RW	Login ID (Web access)	16 Byte	admin	Up to 16 characters (ASCII code)
0x50 FF1600	RW	Password (Web access)	16 Byte	pass	Up to 16 characters (ASCII code)
0x60FF0100	RW	Web Authentication	1 Byte	2	0: Basic authentication 1: Digest authentication 2: No authentication
0x6CFF0400	RW	IP Address(NTP Server)	DWORD	0xC0A80164 192.168.1.100	0x00000000 to 0xFFFFFFFF
0x70 FF1600	RW	Login ID 1 (OPC UA)	16 Byte	user1	Up to 16 characters (ASCII code)
0x80 FF1600	RW	Login Pass 1 (OPC UA)	16 Byte	pass1	Up to 16 characters (ASCII code)
0x90 FF1600	RW	Login ID 2 (OPC UA)	16 Byte	user2	Up to 16 characters (ASCII code)
0xA0 FF1600	RW	Login Pass 2 (OPC UA)	16 Byte	pass2	Up to 16 characters (ASCII code)
0xB0 FF1600	RW	Login ID 3 (OPC UA)	16 Byte	user3	Up to 16 characters (ASCII code)
0xC0 FF1600	RW	Login Pass 3 (OPC UA)	16 Byte	pass3	Up to 16 characters (ASCII code)

■ Settings for the analog input 2 CH unit

Parameter ID	RW	Name	Data type	Initial value	Description
0x10FF0100	RW	Power line error detection	BYTE	1	0: Disable 1: Enable
0x18FF0100	RW	Averaging sampling count	BYTE	0x00	0x00: Two times 0x01: Four times 0x02: Eight times 0x03: Sixteen times
0x1AFF0200	RW	Sampling period	WORD	0x0001	0x0001 (1 ms) to 0xFFFF (65535 ms)
0x20FF0400	RW	Data format	DWORD	0x01	Note 1:
0x28FF0400	RW	Input range	DWORD	0x00	Note 2:
0x40FF0400	RW	Max range error	DWORD	1	0: Disable 1: Enable
0x48FF0400	RW	Min range error	DWORD	1	0: Disable 1: Enable
0x70FF0400	RW	User set value upper limit error	DWORD	0	0: Disable 1: Enable
0x78FF0400	RW	User set value lower limit error	DWORD	0	0: Disable 1: Enable
0x80FF0800	RW	User set value upper limit error threshold	QWORD	0x0000	Note 3:
0x90FF0800	RW	User set value lower limit error threshold	QWORD	0x0000	Note 3:
0xA0FF0400	RW	Sensor power	DWORD	1	0: OFF (Do not supply) 1: ON (Supply)
0xA8FF0400	RW	Measured hysteresis	DWORD	0	0: OFF 1: ON
0xB0FF0400	RW	Enable/Disable	DWORD	1	0: Disable 1: Enable

Assigning “Power line error detection” data

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	CH1	CH0

Assigning “Data format” data

Offset(byte)	+0	+1	+2	+3
Depends on the target item	0	0	CH1	CH0

Note: “Input range”, “Max range error“, “Min range error“, “User set value upper limit error“, “User set value lower limit error“, “Sensor power“, “Measured hysteresis“, and “Enable/Disable“ are also assigned in the same way.

Assigning “User set value upper limit error threshold” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	+6	+7
28	CH3(Note1)		CH2(Note1)		CH1		CH0	

Note: “User set value lower limit error threshold” bit is the same.

Note 1: The values for the data format setting are as follows:

0x00: Offset 12 (12 bit)
0x01: Offset 16 (16 bit)
0x02: Signed magnitude A (12 bit)
0x03: Signed magnitude B (16 bit)
0x04: Signed magnitude C (16bit)
0x05: Signed magnitude D (16bit)
0x06: Signed magnitude E (16bit)
0x07: Signed 2's complement (16 bit)

Note 2: The values for the input range setting are as follows

0x00: DC -10 V to +10 V
0x01: DC -5 V to +5 V
0x02: DC 0 V to 10 V
0x03: DC 0 V to 5 V
0x04: DC 1 V to 5 V
0x0A: DC -20 mA to +20 mA
0x0B: DC 4 mA to 20 mA
0x0C: DC 0 mA to 20 mA

Note 3: Refer to “7.1.1 Analog Input” of “Analog I/O Unit Instruction Manual “ for the valid setting value for the combination of data format and input range.

■ Settings for the digital input unit M8 x 8 type

Parameter ID	RW	Name	Data type	Initial value	Description
0x09FF0100	RW	Power line error detection	BYTE	TRUE	FALSE: Disabled TRUE: Enabled
0x10FF0300	RW	ON count threshold (Input) point 0	3BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000
…	…	…	…	…	…
0x27FF0300	RW	ON count threshold (Input) point 7	3BYTE	Same as above	Same as above
0x70FF0300	R	On Operating Cycle point 0	3BYTE	0	0x000000 to 0xFFFFFF
…	…	…	…	…	…
0x87FF0300	R	On Operating Cycle point 7	3BYTE	Same as above	Same as above
0xE6FF0300	RW	Input filter time	3BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms
0xEBFF0200	RW	Input hold time point	WORD	0	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms

Assigning “Power line error detection” bit

Bit7	Bit6	…	…	…	…	Bit1	Bit0
Connector 7	Connector 6	…	…	…	…	Connector 1	Connector 0

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+21	+22	+23
1 or 49	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 7 counter value/threshold		

Assigning “Input filter time” bit

Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	…	Bit2	Bit1	Bit0
Setting for point 7			Setting for point 6				Setting for point 0		

Assigning “Input hold time” bit

Bit15	Bit14	…	…	…	…	Bit1	Bit0
Setting for point 7		…	…	…	…	Setting for point 0	

■ Settings for the digital input unit M12 x 8 type

Parameter ID	RW	Name	Data type	Initial value	Description
0x09FF0100	RW	Power line error detection	BYTE	TRUE	FALSE: Disabled TRUE: Enabled
0x10FF0300	RW	ON count threshold (Input) point 0	3BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000
…	…	…	…	…	…
0x3FFF0300	RW	ON count threshold (Input) point 15	3BYTE	Same as above	Same as above
0x70FF0300	R	On Operating Cycle point 0	3BYTE	0	0x000000 to 0xFFFFFF
…	…	…	…	…	…
0x9FFF0300	R	On Operating Cycle point 15	3BYTE	Same as above	Same as above
0xE6FF0600	RW	Input filter time	6BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms
0xEBFF0400	RW	Input hold time	DWORD	0	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms

Assigning “Power line error detection” bit

Bit7	Bit6	…	…	…	…	Bit1	Bit0
Connector 7	Connector 6	…	…	…	…	Connector 1	Connector 0

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
1 or 49	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Input filter time” bit

Bit47	Bit46	Bit45	Bit44	Bit43	Bit42	…	Bit2	Bit1	Bit0
Setting for point 15			Setting for point 14			…	Setting for point 0		

Assigning “Input hold time” bit

Bit31	Bit30	…	…	…	…	Bit1	Bit0
Setting for point 15		…	…	…	…	Setting for point 0	

■ Settings for the digital input unit Push-in terminal block type

Parameter ID	RW	Name	Data type	Initial value	Description	
0x09FF0200	RW	Power line error detection	2BYTE	TRUE	FALSE: Disabled TRUE: Enabled	
0x10FF0300	RW	ON count threshold (Input) point 0	3BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000	
…	…	…	…	…	…	
0x6FFF0300	RW	ON count threshold (Input) point 31	3BYTE	Same as above	Same as above	
0x70FF0300	R	On Operating Cycle point 0	3BYTE	0	0x000000 to 0xFFFFFF	
…	…	…	…	…	…	
0xCFFF0300	R	On Operating Cycle point 31	3BYTE	Same as above	Same as above	
0xE6FF0C00	RW	Input filter time	12BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms	
0xF4FF0800	RW	Input hold time	QWORD	0 to 15 points: 0 16 to 31 points: 2	0 to 15 points 0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms	16 to 31 points 2: 100 ms 3: 200 ms

Assigning “Power line error detection” bit

Bit15	Bit14	…	…	…	…	Bit1	Bit0
Block 7		…	…	…	…	Block 0	

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+94	+95	+96
2 or 98	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 31 counter value/threshold		

Assigning “Input filter time” bit

Bit95	Bit94	Bit93	Bit92	Bit91	Bit90	…	Bit2	Bit1	Bit0
Setting for point 31			Setting for point 30			…	Setting for point 0		

Assigning “Input hold time” bit

Bit63	Bit62	…	…	…	…	Bit1	Bit0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the analog output 2 CH unit

Parameter ID	RW	Name	Data type	Initial value	Description
0x10FF0100	RW	Power line error detection	BYTE	1	0: Disable 1: Enable
0x11FF0100	RW	Signal line error recovery operation	BYTE	0	0: Auto 1: Manual
0x20FF0400	RW	Data format	DWORD	0x01	Note 1:
0x28FF0400	RW	Output range	DWORD	0x02	Note 2:
0x40FF0400	RW	Max range error	DWORD	1	0: Disable 1: Enable
0x48FF0400	RW	Min range error	DWORD	1	0: Disable 1: Enable
0x70FF0400	RW	User set value upper limit error	DWORD	0	0: Disable 1: Enable
0x78FF0400	RW	User set value lower limit error	DWORD	0	0: Disable 1: Enable
0x80FF0800	RW	User set value upper limit error threshold	QWORD		Note 3:
0x90FF0800	RW	User set value lower limit error threshold	QWORD		Note 3:
0xA0FF0400	RW	Load power	DWORD	1	0: OFF 1: ON
0xD0FF0800	RW	Customized output value at communication error	QWORD	0x0000	0x0000 to 0xFFFF
0xE0FF0400	RW	Communication error operation	DWORD	0x02	0x00: OFF 0x01: User 0x02: HOLD

Assigning “Power line error detection” data

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	CH1	CH0

Assigning “Data format” data

Offset(byte)	+0	+1	+2	+3
Depends on the target item	0	0	CH1	CH0

Note: “Output range“, “Max range error“, “Min range error“, “User set value upper limit error“, “User set value lower limit error“, “Load power“, “Communication error operation“ are also assigned in the same way.

Assigning “User set value upper limit error threshold” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	+6	+7
28	CH3(Note1)		CH2(Note1)		CH1		CH0	

Note: “User set value lower limit error threshold” is the same.

Note 1: The values for the data format setting are as follows:

0x00: Offset 12 (12 bit)
0x01: Offset 16 (16 bit)
0x02: Signed magnitude A (12 bit)
0x03: Signed magnitude B (16 bit)
0x04: Signed magnitude C (16bit)
0x06: Signed magnitude E (16bit)
0x07: Signed 2's complement (16 bit)

Note 2: The values for the output range setting are as follows.

0x02: DC 0 V to 10 V
0x03: DC 0 V to 5 V
0x04: DC 1 V to 5 V
0x0B: DC 4 mA to 20 mA
0x0C: DC 0 mA to 20 mA

Note 3: Refer to “7.1.2 Analog Output” of “Analog I/O Unit Instruction Manual “ for the valid setting value for the combination of data format and output range.

■ Settings for the digital output unit M12 x 8 type

Parameter ID	RW	Name	Data type	Initial value	Description
0x09FF0200	RW	Signal line error detection	WORD	TRUE	FALSE: Disabled TRUE: Enabled
0x0BFF0200	RW	Signal line error recovery operation	WORD	0	0: Auto 1: Manual
0x10FF0300	RW	ON count threshold (Output) point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
…	…	…	…	…	…
0x3DFF0300	RW	ON count threshold (Output) point 15	3BYTE	Same as above	Same as above
0x7DFF0300	R	On Operating Cycle point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF
…	…	…	…	…	…
0x9DFF0300	R	On Operating Cycle point 15	3BYTE	Same as above	Same as above
0xDC FF0400	RW	Communication error operation point	DWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD

Assigning “Signal line error detection” bit

Bit15	Bit14	…	Bit1	Bit0
Point 15	Point 14	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit15	Bit14	…	Bit1	Bit0
Point 15	Point 14	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit31	Bit30	…	…	…	…	Bit1	Bit0
Setting for point 15		…	…	…	…	Setting for point 0	

■ Settings for the digital output unit Push-in terminal block type

Parameter ID	RW	Name	Data type	Initial value	Description
0x0CFF0400	RW	Signal line error detection	DWORD	TRUE	FALSE: Disabled TRUE: Enabled
0x10FF0300	RW	ON count threshold (Output) point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
…	…	…	…	…	…
0x6D0300	RW	ON count threshold (Output) point 15	3BYTE	Same as above	Same as above
0x700300	R	On Operating Cycle point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF
…	…	…	…	…	…
0xCD0300	R	On Operating Cycle point 15	3BYTE	Same as above	Same as above
0xD4FF0400	RW	Signal line error recovery operation	DWORD	0	0: Auto 1: Manual
0xD8FF0800	RW	Communication error operation point	QWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD

Assigning “Signal line error detection” bit

Bit31	Bit30	…	Bit1	Bit0
Point 31	Point 30	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit31	Bit30	…	Bit1	Bit0
Point 31	Point 30	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit63	Bit62	…	…	…	…	Bit1	Bit0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the valve I/F unit 32-point unit

Parameter ID	RW	Name	Data type	Initial value	Description
0x0CFF0400	RW	Signal line error detection	DWORD	TRUE	FALSE: Disabled TRUE: Enabled
0x10FF0300	RW	ON count threshold (Output) point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
…	…	…	…	…	…
0x6DFF0300	RW	ON count threshold (Output) point 15	3BYTE	Same as above	Same as above
0x70FF0300	R	On Operating Cycle point 0	3BYTE	0x00000	0x000000 to 0xFFFFFF
…	…	…	…	…	…
0xCDFF0300	R	On Operating Cycle point 15	3BYTE	Same as above	Same as above
0xD4FF0400	RW	Signal line error recovery operation	DWORD	0	0: Auto 1: Manual
0xD8FF0800	RW	Communication error operation point	QWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD

Assigning “Signal line error detection” bit

Bit31	Bit30	…	Bit1	Bit0
Point 31	Point 30	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit31	Bit30	…	Bit1	Bit0
Point 31	Point 30	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit63	Bit62	…	…	…	…	Bit1	Bit0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the IO-Link master unit

Parameter ID	RW	Name	Data type	Initial value	Description
0x06FF0300	RW	Device ID port 0	3BYTE	0x000000	0x000000 to 0xFFFFFF
0x09FF0200	RW	Vendor ID port 0	WORD	0x0000	0x0000 to 0xFFFF
0x0BFF0100	RW	Revision port 0	BYTE	0x00	0x00 to 0xFF
0x0CFF0200	RW	Input size port 0	WORD	0x04	0x00 to 0x20
0x0EFF0200	RW	Output size port 0	WORD	0x04	0x00 to 0x20
0x10FF1000	RW	Serial number port 0	16BYTE	0x00 (null)	ASCII code of up to 16 characters
0x20FF0200	RW	Connector 0 operation settings	WORD	0x0F01	0x0000 to 0xFFFF (Note 1)
0x22FF0100	RW	Cycle time port 0	BYTE	0x00	0x00: Auto 0x0A to 0xFF: Manual setting
0x23FF0100	RW	Input filter time port 0	BYTE	0x00	0x00: 0.1 ms 0x01: 1 ms 0x02: 5 ms 0x03: 10 ms 0x04: 20 ms
0x24FF0100	RW	Input hold time port 0	BYTE	0x00	0x00: 1 ms 0x01: 15 ms 0x02: 100 ms 0x03: 200 ms
0x25	-	Same as port 0 setting	-	-	For Port 1
0x44	-	Same as port 0 setting	-	-	For Port 2
0x63	-	Same as port 0 setting	-	-	For Port 3
0x82	-	Same as port 0 setting	-	-	For Port 4
0xA1	-	Same as port 0 setting	-	-	For Port 5
0xC0	-	Same as port 0 setting	-	-	For Port 6
0xDF	-	Same as port 0 setting	-	-	For Port 7

Assigning “Revision” bit

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Major Revision (0x0 to 0xF)				Minor Revision (0x0 to 0xF)			

Assigning “Connector 0 operation settings” bit

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Reserved	Reserved	Reserved	Signal line error recovery operation	Signal line error detection	Power line error detection	Operation in the event of a communication error	

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

The values for the above operation settings by port are as follows.

Operation setting name by port	Value	Factory setting
Selecting operation mode	0(000): Disabled mode 1(001): IO-Link mode 2(010): Digital input mode (PNP) 3(011): Digital input mode (NPN) 4(100): Digital output mode (PNP) 5(101): Digital output mode (NPN)	1(001): IO-Link mode
Device verification	0: Do not verify 1: 3-type verification 2: 4-type verification	0: Do not verify
Restore settings	0: Do not restore 1: Restore the data	0: Do not restore
Backup settings	0: Do not back up 1: Back up the data	0: Do not back up
Port-to-port sync	0: Do not sync 1: Synchronize the data	0: Do not sync
Operation in the event of a communication error	0(00): OFF 1(01): ON 2(10): HOLD	2: HOLD
Power line error detection	0: Disable 1: Enable	1: Enable
Signal line error detection	0: Disable 1: Enable	1: Enable

■ IO-Link device specific diagnostic information

Node Address	Objects/Diagnosis/IOLink/Unit*/		
Node name	Access Rule	Data type	Historical Access
port*	R	26 bytes	Disable

7.3.4 Diagnostic information

■ Remote RT System diagnostic information

Node Address	Objects/Unit*/IOLink/port*			
Node name	Access Rule	Data type	Historical Access	Remarks
RT	R	1 byte	Disable	-System error -Hardware error -Operation waiting -Power failure -Unit output error -Unit input error

Assigning "system diagnostic information" bit

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
System error	Hardware error	Operation waiting	Reserved	Power failure	Reserved	Unit output error	Unit input error

■ Unit diagnostic information

Node Address	Objects/Diagnosis/Unit*/		
Node name	Access Rule	Data type	Historical Access
Unit	R	2 bytes	Disable

Note: Refer to the Instruction Manual for each unit for the definition of the diagnostic information.

■ CH/point/port diagnostic information

Node Address	Objects/Diagnosis/Unit*/		
Node name	Access Rule	Data type	Historical Access
ch*	R	2 bytes	Disable
port*	R	2 bytes	Disable

Note: Refer to the Instruction Manual for each unit for the definition of the diagnostic information.

■ IO-Link port diagnostic information

Node Address	Objects/Unit*/IOLink/port*			
Node name	Access Rule	Data type	Historical Access	Remarks
ProcessData Info	R(W) Note	1 byte	Enable	Input - Digital Input 1 Input - Digital Input 2 Input - Port error flag Input - IO Link communication error flag Input - Event flag Input - IO-Link input data enable flag Output - Digital Output 1 Output - Event flag clear

Note: Only enable for "Output - Digital Output 1" and "Output - Event flag clear"

Assigning "IO-Link device specific diagnostic information" bit

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input - Digital Input 1	Input - Digital Input 2	Input - Port error flag	Input - Event flag	Input - IO Link communication error flag	Input - IO-Link input data enable flag	Output - Digital Output 1	Output - Event flag clear

7.3.5 IO-Link device specific parameter

■ IO-Link device specific parameter

Node Address	Objects/Unit*/IOLink/port*			
Node name	Access Rule	Data type	Historical Access	Remarks
UnitNo	RW	1 byte	Disable	Specifies the unit position
port	RW	1 byte	Disable	Specifies the port number
write	RW	1 bit	Disable	Selects Read/Write
index	RW	2 bytes	Disable	Specifies the index
subindex	RW	1 byte	Disable	Specifies the sub index
data	RW	232 bytes	Disable	Reads/Writes data
execute	RW	1 byte	Disable	Reads/write by writing to “Execute”. Note: The value written to “Execute” is arbitrary.
result	R	4 bytes	Disable	Indicates the succeeded/failed of the setting change

7.4 Historical Access

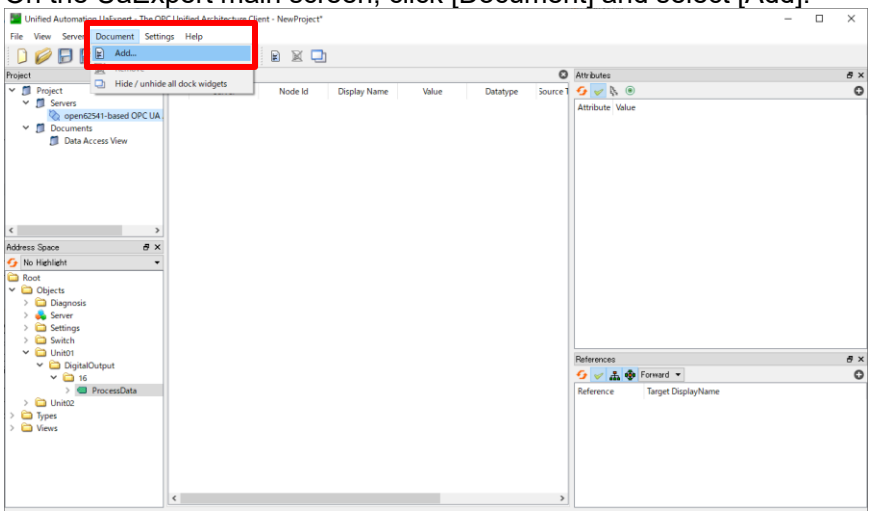
Part of the address space of the product supports the Historical Access function.
The process data is checked for changes at regular intervals, and the changed value and time will be saved if there is a change. The checking interval and number of saves of the change are all in common, as shown in the table below.

Checking interval (ms)	100
Number of historical saves (times)	10

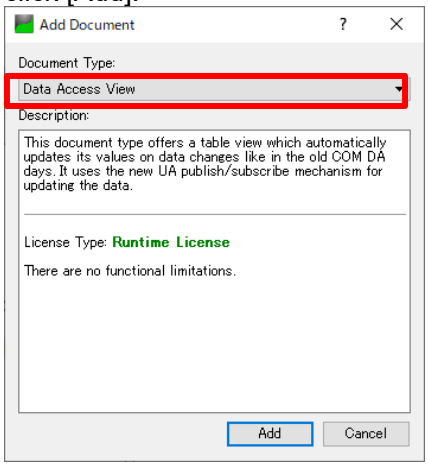
Refer to “7.3 Address Space” for supported addresses.

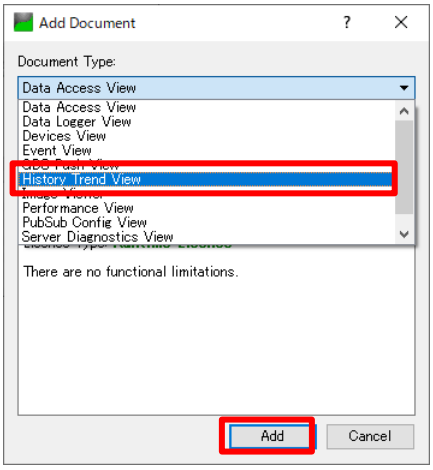
7.4.1 Steps for confirmation

1 On the UaExpert main screen, click [Document] and select [Add].

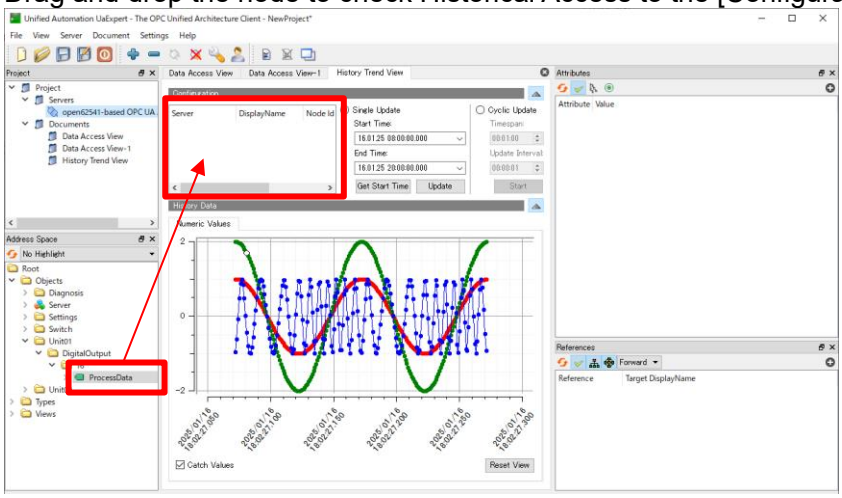


2 Open the “Document Type” tab of the “Add Document” window, select [History Trend View], and click [Add].

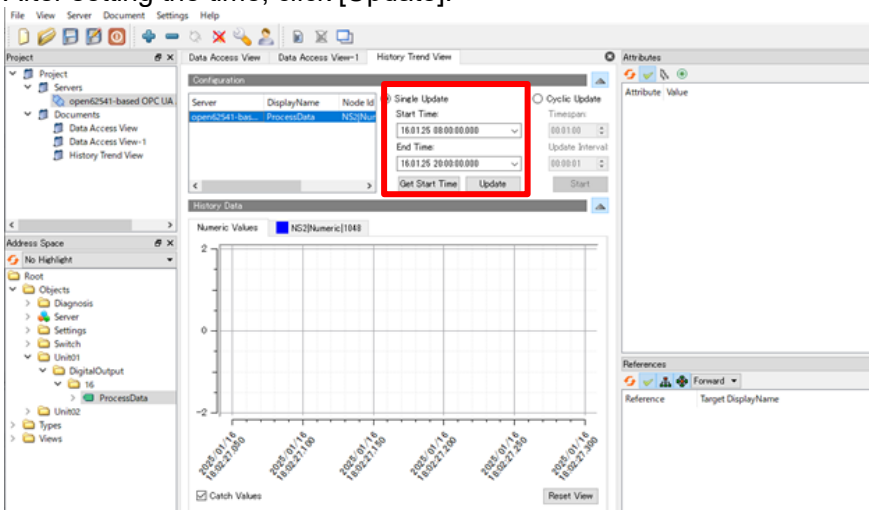




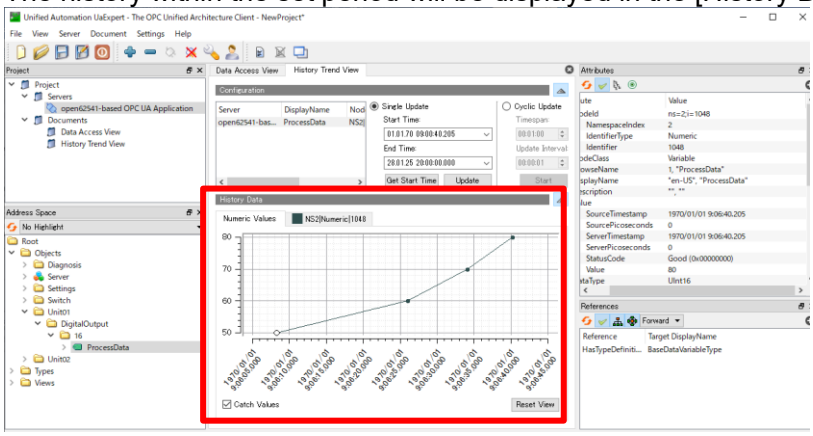
3 Drag and drop the node to check Historical Access to the [Configuration] pane.



4 Click the dropped item and enter the start time in [Start Time] and the end time in [End Time] for the data to check the history.
Additionally, by clicking [Get Start Time], the last time the value changed will be entered in [Start Time].
After setting the time, click [Update].



5 The history within the set period will be displayed in the [History Data] pane.



8. WebAPI FUNCTION

This product has WebAPI function. Turn ON the dip switch SW1 and power on the product to enable the WebAPI function.

WebAPI function is used mainly for the application below.
・RTXTools LAN connection
・ Periodic data collection from system monitoring applications, etc.
・Data collection or setting changes from user-specific applications, etc.

8.1 Setting Method

Although the WebAPI function is initially freely accessible by anyone, access to the WebAPI can be restricted by authentication. It is recommended to set up user ID and password following the steps below.

1. Connect the product to the PC using a USB cable.
2. Start RTXTools and click the appearance of the product (display of the device unit).
3. Set "Authentication Function" to "Digest Authentication".
4. Change the "Login ID (Web access)".
5. Change the "Password (Web access)".
6. Click the [Apply] button to reflect the settings to the product.

Note: This setting will reflect in real-time.

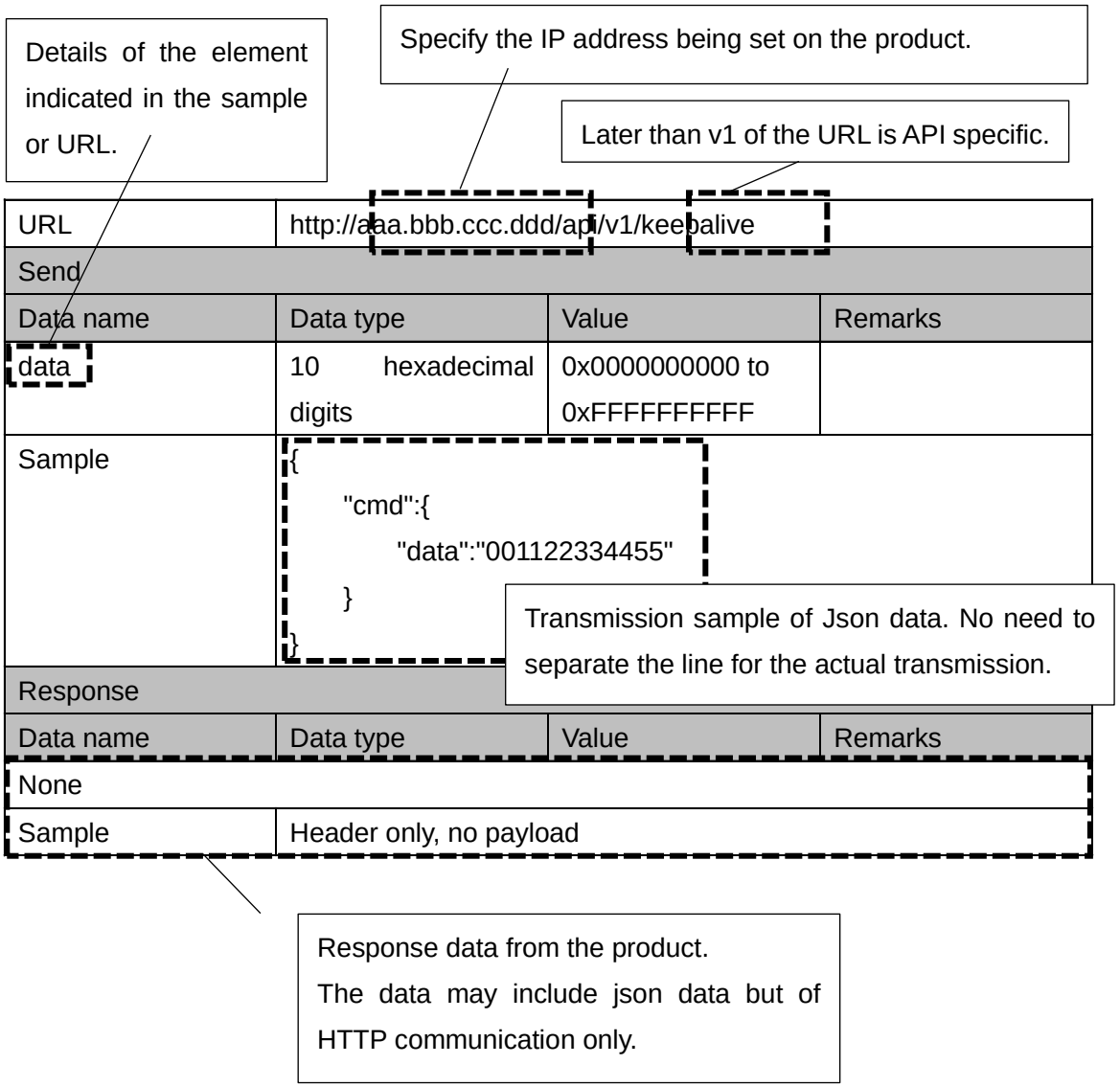
8.2 Access Method

Some WebAPIs can acquire data using general web browsers. Follow the steps below to acquire the data.

1. Enable the WebAPI function by turning ON the dip switch SW1.
2. Change the login ID and password appropriately.
3. Start a web browser.
4. Check the IP address of the product (the IP address set in “2. INSTRUCTIONS FOR USE”).
5. Access the URL using a web browser with "http://192.168.1.10/api/v1/dipsw".
   (Note: Replace "192.168.1.10" with the IP address checked in instruction 4.)
6. Check that the dip switch and rotary switch statuses are responded in the JSON format. (Note: In case of no response, check that the WebAPI is enabled and that the entered URL is correct.)

8.3 Description of Each API

Each API is described in the following format:



8.3.1 Keepalive

It is used to maintain a connect status with the product. Sends once every 30 seconds.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/keepalive</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>10 hexadecimal digits</td><td>Send the current time of the PC in the format below.
(1 byte = 2 digits)
<table><tr><td>Byte</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>Description</td><td>Date</td><td></td><td>Hours</td><td>Minutes</td><td>Seconds</td></tr></table>Date: 0x0000 to 0xFFFF
(January 1, 2000-June 6, 2179)
Hours: 0x00 to 0x17 (0 to 23)
Minutes: 0x00 to 0x3B (0 to 59)
Seconds: 0x00 to 0x3B (0 to 59)</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":"FFFF000000"
}
}</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>No</td><td colspan="3"></td></tr>
<tr><td>Sample</td><td colspan="3">Header response only, no payload</td></tr>
</table>

8.3.2 Obtaining device unit switch status

It obtains the status of the setting switches (dip switches, rotary switches) of the device unit.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/dipsw</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>No</td><td colspan="3"></td></tr>
<tr><td>Sample</td><td colspan="3">Header only, no payload</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>8 hexadecimal digits
(4 x 1 byte 2 digits)</td><td>1st byte: Dip switch status.
SW number is 1 in the highest bit and 8 is the lowest bit
2nd byte: Value of rotary switch (x16)
3rd byte: Value of rotary switch (x1)
4th byte: 0x00 fixed</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":"00000000"
}
}</td></tr>
</table>

8.3.3 Obtaining version

It obtains the software and hardware versions of the unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/cmd/version/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample			
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as above unit position
data	12 hexadecimal digits (4 digits x 3 types)	Refer to sample column and remarks column	When the product is the target AAAA: Hardware version BBBB: Software version CCCC: Option number When the product is not the target AAAA: Microcomputer version 1 BBBB: Microcomputer version 2 CCCC: Microcomputer version 3

Sample	{
	"cmd":{
	"unit":"00",
	"data":"AAAABBBBCCCC"
	}
	}		

8.3.4 Setting date and time

It adjusts the internal time of the product to the specified time. It is only held while the power is ON.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/datetime</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>12 hexadecimal digits</td><td>Sends the date and time in the format below. (1 byte = 2 digits)
<table><tr><td>byte</td><td colspan="2">5 4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>Description</td><td colspan="2">Date</td><td>Hours</td><td>Minutes</td><td>Seconds</td><td>Milliseconds</td></tr></table>Date: 0x0000 to 0xFFFF
(January 1, 2000-June 6, 2179)
Hours: 0x00 to 0x17 (0 to 23)
Minutes: 0x00 to 0x3B (0 to 59)
Seconds: 0x00 to 0x3B (0 to 59)
Milliseconds: 0x00 to 0x63(0 to 99) *1=10 msec</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":FFFF00000000
}
}</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>12 hexadecimal digits</td><td>Returns the set date and time.
The format is the same as described above.</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":" FFFF00000000"
}
}</td></tr>
</table>

8.3.5 Latch reset

It releases the latch of the LED lighting status at the time specified by the user.

URL	http://aaa.bbb.ccc.ddd/api/v1/latchreset		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	None When status code is 200, release is complete		

8.3.6 Obtaining Remote IO system diagnostic data

It obtains diagnostic data for the Remote IO system. This diagnostic data is identical to the diagnostic data contained in the process data. Refer to ”7.3.4 Diagnostic information”.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	2 hexadecimal digits	Diagnostic information	

Sample	{
	"cmd":{
	"data":"00"
	}
	}		

8.3.7 Obtaining unit diagnostic data

It obtains diagnostic information for the specified unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
data	4 hexadecimal digits	0x0000 to 0xFFFF	Diagnostic information for the target unit. Refer to the Instruction Manual for each unit.

Sample	{
	"cmd":{
	"unit":"00",
	"data":"0000"
	}
	}		

8.3.8 Obtaining point/CH/port diagnostic data

It obtains diagnostic information by point/CH/port for the specified unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag/[unit]/ch		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
data	4 hexadecimal digits x points/CHs/ports	-	Diagnostic information for each point/CH/port. The child elements of data are listed, separated by commas, in descending order.

Sample	<pre>{
	"cmd":{
	"unit":00,
	"data":[
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000"
	]
	}
	}</pre>		

8.3.9 Obtaining unit order/number/type

It acquires the order and number/type of units connect to the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/order		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	10 hexadecimal digits x number of units	Refer to Remarks column	Numbers and unit IDs containing the product are listed in comma-separated in the order from the left to the right. The first two characters represent the order in 1 byte, and the remaining eight characters represent the unit ID. For unit IDs, refer to “9.2 Unit ID List”.

Sample	{
	"cmd":{
	"data":[
	"0007010000",
	"012C080200",
	"022C080200",
	"03D3000000"
	]
	}
	}		

8.3.10 Obtaining unit setting data

It obtains the setting data for each unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/config/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0 x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
len	4 hexadecimal digits	Refer to Remarks column	Expresses the length of the received data in bytes, half the length of “data” string below.
pos	4 hexadecimal digits	-	Represents the management position within the product. It is described in the table below.
data	N hexadecimal digits	-	A string representing the settings data. It expresses 1 byte as a 2-character hexadecimal number.

Sample	{
	"cmd":{
	"unit":"00",
	"len":"00FF",
	"pos":"0000",
	"data":"00000000000000…(omitted)"
	}
	}		

The list of the settings data for each unit is shown below. Refer to the Instruction Manual of the unit for details.

The product (device unit)

Position	Length (bytes)	Name	Overview
pos+0x0C	**1**	Unit/input power monitor	Refer to 4.2 Settings list.
pos+0x0D	**1**	Output power supply monitor	
pos+0x0E	**1**	analog value byte order	
pos+0x10	**1**	Save log ON/OFF and number of saved logs	
pos+0x11	**1**	Saving logs (method)	
pos+0x12	**1**	Log saving time	
pos+0x13	**1**	Type of log filter	
pos+0x14	**1**	Filter ON/OFF (Error type)	
pos+0x15	**4**	Filter ON/OFF (Unit ID)	
pos+0x19	**1**	Filter ON/OFF (Unit position number)	
pos+0x1A	**1**	Filter ON/OFF (CH/point/port number)	
pos+0x30	**4**	IP address	
pos+0x34	**4**	Subnet mask	
pos+0x38	**4**	Default gateway	
pos+0x40	**16**	WebAPI login ID	
pos+0x50	**16**	WebAPI password	
pos+0x60	**1**	WebAPI access authentication	

Digital input unit

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of the power line error detection. Error detection is set per connector.
pos+0x08+x3n (n = point number of the target)	**3 (Per point)**	Input Off_On cycle threshold	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xDE	**1**	Input filter time	Sets the input filter time.
pos+0xEC	**1**	Input hold time	Sets the input hold time.

Digital output unit

Position	Length (bytes)	Name	Overview
pos+0x01	**2**	Signal line error detection	Sets enables/disables of the signal line error detection. Error detection is set per connector.
pos+0x03	**2**	Signal line error recovery operation	Sets whether the behavior at the time of occurrence is maintained or the condition is returned to normal after the last data update, when a signal line error is recovered. Error recovery operation is set for each connector. When the behavior at the time of occurrence.is to be maintained, wait for the user to operate power cycle.
pos+0x08+x3n (n = point number of the target)	**1**	Output Off_On cycle threshold	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xD4	**4**	Operation in the event of a communication error	When the dip switch settings SW3 on the device unit is OFF (set individually), the digital output operation at the communication (upper or internal bus communication) error is set on the digital output unit side.

Analog input unit

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of the power line error detection.
pos+0x09	**1**	Averaging sampling count	Sets the average number of filters for analog input.
pos+0x0B	**2**	Sampling period	Sets the sampling period for analog input.
pos+0x11	**4**	Data format	Sets the conversion method to the process data for analog input.
pos+0x19	**4**	Input range	Selects the analog input signal of the analog input unit from the following. 0：-10 VDC to +10 VDC 1：-5 VDC to +5 VDC 2：0 VDC to 10 VDC 3：0 VDC to 5 VDC 4：1 VDC to 5 VDC 10：-20 mA DC to +20 mA 11：4 mA DC to 20 mA 12：0 mA DC to 20 mA DC
pos+0x31	**4**	Max range error	Sets whether or not to use the max range error for analog input.
pos+0x39	**4**	Min range error	Sets whether or not to use the min range error for analog input.
pos+0x61	**4**	User set value upper limit error	Sets whether or not to use the user set value upper limit error for analog input.
pos+0x69	**4**	User set value lower limit error	Sets whether or not to use the user set value lower limit error for analog input.
pos+0x71	**8**	User set value upper limit error threshold	Sets the threshold value of user set value upper limit error for analog input.

pos+0x81	**8**	User set value lower limit error threshold	Sets the threshold value of user set value lower limit error for analog input.
pos+0x91	**4**	Input power ON/OFF	Sets whether or not the external device is supplied with power for input when the analog input is used.
pos+0x99	**4**	Measured hysteresis	Sets whether or not the measurement values are hysteresis treated.
pos+0xa1	**4**	Enable/Disable CH	It is possible to set without using the target CH.

Analog output unit

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of the power line error detection.
pos+0x02	**1**	Power line error recovery operation	Sets whether to maintain the same behavior as during the power line error when it has been recovered from, or return to normal from the most recent data update after recovery.
pos+0x11	**4**	Data format	Sets the conversion method to the process data for analog output.
pos+0x19	**4**	Output range	Selects the analog output signal of the analog output unit from the following. 2：0 VDC to 10 VDC 3：0 VDC to 5 VDC 4：1 VDC to 5 VDC 11：4 mA DC to 20 mA 12：0 mA DC to 20 mA DC
pos+0x31	**4**	Max range error	Sets whether or not to use the max range error for analog output.
pos+0x39	**4**	Min range error	Sets whether or not to use the min range error for analog output.
pos+0x61	**4**	User set value upper limit error	Sets whether or not to use the user set value upper limit error for analog output.
pos+0x69	**4**	User set value lower limit error	Sets whether or not to use the user set value lower limit error for analog output.
pos+0x71	**8**	User set value upper limit error threshold	Sets the user set value upper limit error threshold for analog output.
pos+0x81	**8**	User set value lower limit error threshold	Sets the user set value lower limit error threshold for analog output.
pos+0x91	**4**	Output power ON/OFF	Sets whether or not the external device is supplied with output power when the analog output is used.
pos+0xa1	**4**	Enable/Disable CH	It is possible to set without using the target CH as a unit.
pos+0xc1	**8**	Customized output value at communication error	Sets the value to be output when “Communication error operation” is “User settings”.
pos+0xd1	**4**	Communication error operation	If the device unit's dip switch settings SW3 (output settings in the event of a communication error / priority to hardware) is OFF, the output operation in the event of a communication (upper communication or internal bus communication) error is set on the Analog output unit side.

IO-Link master unit

Position	Length (bytes)	Name	Overview
pos+0x01	**31**	**Port 0 settings**	Settings for each port. Refer to the following table for details.
pos+0x20	**31**	**Port 1 settings**	
pos+0x3F	**31**	**Port 2 settings**	
pos+0x5E	**31**	**Port 3 settings**	
pos+0x7D	**31**	**Port 4 settings**	
pos+0x9C	**31**	**Port 5 settings**	
pos+0xBB	**31**	**port 6 settings**	
pos+0xDA	**31**	**Port 7 settings**	

Setting details of each port of the IO-Link master unit (specify the relative position in relation to the "position" in the table above)

Relative position	Length (bytes)	Name	Overview
+0x00	**3**	Device ID	Device type of the connected IO-Link device.
+0x03	**2**	Vendor ID	Vendor ID of the connected IO-Link device.
+0x05	**1**	Revision	Revision of the connected IO-Link device.
+0x06	**2**	Input size settings	Sets the size (bytes) of the input process data of the connected IO-Link device.
+0x08	**2**	Output size settings	Sets the size (bytes) of the output process data of the connected IO-Link device.
+0x0A	**16**	Serial number	Serial number of the connected IO-Link device.
+0x1A	**2**	Selecting operation mode	Selects which operation mode is to be used for each port on the IO-Link master unit.
+0x1C	**1**	Communication cycle time settings	Set the IO-Link communication cycle.
+0x1D	**1**	Input filter time settings	Sets the input filter time.
+0x1E	**1**	Input hold time settings	Sets the input hold time.

8.3.11 Unit setting data settings

It changes the setting data for each unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/config/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
len	4 hexadecimal digits	Refer to Remarks column	Expresses the length of the data to be sent in bytes, half of the length of “data” string below. Only those parts that need to be changed can be sent.
pos	4 hexadecimal digits	-	Represents the management position within the product. It is described in "8.3.10 Obtaining unit settings data". Only those parts that need to be changed can be sent.
data	N hexadecimal digits	-	A string representing the settings data. It expresses 1 byte as a 2-character hexadecimal number. Only those parts that need to be changed can be sent.

Sample	{
	"cmd":{
	"len":"0000",
	"pos":"0000",
	"data":"00000000000000"
	}
	}		

Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

8.3.12 Obtaining log data

It reads the log data stored inside the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/log/[pos]/[req]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[pos]	4 hexadecimal digits	0 and over	The location of the log desire to start acquiring. 0 is the most recent. Specified in the URL. When POS is 1 and REQ is 5, it will result in "5 records are acquired from one log older than the most recent".
[req]	2 hexadecimal digits	0 to 255	The number of logs desire to acquire. 0 to 255. Obtain all results with 0.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
pos	4 hexadecimal digits	0 and over	Same as described above
req	2 hexadecimal digits	0 to 255	Same as described above
num	2 hexadecimal digits	0 to 255	The number of logs that could be acquired.
data	32 hexadecimal digits x num	Refer to Remarks column	16 bytes of data per element Refer to the table below for details

Sample	<pre>{
	"cmd":{
	"pos":"0000",
	"req":"0000",
	"num":"0000",
	"data":[
	"00000…00000000000",
	"00000...00000000000"
	]
	}
	}</pre>		

Name	Size (bytes)	Description
Date	2	Number of days since January 1, 2000, as 0 (up to June 6, 2179)
Hours	1	Hours when the device unit received the error information. The milliseconds are in 10 ms units.
Minutes	1	
Seconds	1	
Milliseconds	1	
Error code	2	16-bit data determined per unit. Refer to the Instruction Manual for each unit.
Unit ID	4	Refer to "9.2 Unit ID List".
Unit position	1	0x00: this product. 0x01-0x11: the position of the other units excluding the product counted from the left to the right.
Point/CH number	1	The number of point/CH where the error occurred. If the point/CH is not identified because of a unit level error etc., 255 is used.
Reserve	2	Always 0

8.3.13 Clearing log data

It deletes the log data stored inside the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/log/clear		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

8.3.14 Obtaining the forced input unit

It acquires the unit using the forced input function.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/enabled/in/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	Decimal array	The unit number of the unit in forced input is entered.	

Sample	{
	"cmd":{
	"data":[1,2,3]
	}
	}		

8.3.15 Obtaining the forced output unit

It acquires the unit using the forced output function.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/enabled/out/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	Decimal array	The unit number of the unit in forced output is entered.	

Sample	{
	"cmd":{
	"data":[1,2,3]
	}
	}		

8.3.16 Obtaining forced input

It acquires information on the forced input instructions for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/monitor/in/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	N hexadecimal digits	Refer to Remarks column	The data that has been overwritten is entered to the process data for the specified unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Indicates the position that is being overwritten for the process data of the specified unit. The bit that is overwritten is 1, and the bit that is not overwritten is 0. The length of the data is the same as the process data of the specified unit.

Sample	{
	"cmd":{
	"unit":"01",
	"data":"0000",
	"data2":"0000"
	}
	}		

8.3.17 Obtaining forced output

It acquires information on the forced output instructions for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/monitor/out/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	N hexadecimal digits	Refer to Remarks column	The data that has been overwritten is entered to the process data for the specified unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Indicates the position that is being overwritten for the process data of the specified unit. The bit that is overwritten is 1, and the bit that is not overwritten is 0. The length of the data is the same as the process data of the specified unit.

Sample	{
	"cmd":{
	"unit":"01",
	"data":"0000",
	"data2":"0000"
	}
	}		

8.3.18 Forced input setting

It indicates whether the forced input function is enabled or disabled for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/control/in/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
res	String	“ON” or “OFF”	If specify "ON", it disables the forced entry instructions for the target unit.
data	N hexadecimal digits	Refer to Remarks column	Instructs the data to be overwritten on the process data of the specified unit. The data is specified as two hexadecimal characters per 1 byte. The length of the data is matched to the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Instructs the bit of the data to be overwritten on the process data of the specified unit. Specify 1 for the bit to overwrite and 0 for the bit not to overwrite. The length of the data is matched to the process data of the specified unit.
Sample	{ "cmd":{ "res":"ON" "data":"0000", "data2":"0000" } }		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

8.3.19 Forced output settings

It indicates whether the forced output function is enabled or disabled for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/control/out/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
res	String	“ON” “ON” or “OFF”	If specify "ON", it disables the forced entry instructions for the target unit.
data	N hexadecimal digits	Refer to Remarks column	Instructs the data to be overwritten on the process data of the specified unit. The data is specified as two hexadecimal characters per 1 byte. The length of the data is matched to the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Instructs the bit of the data to be overwritten on the process data of the specified unit. Specify 1 for the bit to overwrite and 0 for the bit not to overwrite. The length of the data is matched to the process data of the specified unit.

Sample	{
	"cmd":{
	"res":"ON"
	"data":"0000",
	"data2":"0000"
	}
	}		

Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

8.3.20 Obtaining process data

It acquires the process data covered by the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/procdata/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No data to send			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	N hexadecimal digits	Refer to Remarks column	It is the data being transmitted from the PLC to the device unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.
data2	N hexadecimal digits	Refer to Remarks column	It is the data being transmitted from the device unit to the PLC. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.

Sample	{
	"cmd":{
	"data":"00000000",
	"data2":"0000"
	}
	}		

8.3.21 Obtaining unit current value

It acquires the data that each unit is handling via its internal bus.

URL	http://aaa.bbb.ccc.ddd/api/v1/procdata/[unit]		
Transmission specifications			
name	type	value	memo
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Specifies in the URL.
Sample	No		
Response specifications			
name	type	value	memo
data	Hexadecimal	Refer to Remarks column	It is the data that each unit is handling via its internal bus. When a device unit (unit=0x00) is specified, it represents the output data to instruct each unit. When any other unit is specified, it represents the input data sent from each unit to the device unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.

Sample	{
	"cmd":{
	"data":"00000000"
	}
	}		

8.4 HTTP Response Status Code

The product supports the following status codes.

Number	Meaning	Conditions
200	OK	When the request was succeeded.
400	Bad Request	When the syntax of the request is disabled
401	Unauthorized	When the request requires authentication
404	Not Found	When the requested resource (URL) does not exist
405	Method Not Allowed	When a request is made with an unauthorized method
408	Request Timeout	When response cannot be made within a predefined time
413	Payload too Large	When the payload of the request is long
414	URI too Large	When the URI is long
500	Internal server Error	When any operation that is not defined by the product has occurred
501	Not Implemented	When accessed by anything other than GET, HEAD, or POST
505	HTTP Version Not Supported	When a request is made with an unsupported HTTP version

When the response is made with the above status code, it responds including JSON data as follows.

Response Sample	{
	"status": {
	"code":401,
	"title": "401 Not Authorized"
	}
	}

9. APPENDIX DIAGNOSTIC INFORMATION LIST FOR THE PRODUCT

This section lists the operations performed by the OPC UA compatible device unit in the event of an error and when recovering from one.

9.1 Device Unit Diagnostic Information

The lists of diagnostic information are as follows.

Error name	When	LED	LED status	State and countermeasures
Memory read/write error	On occurrence	SF (Device)	Red blinking (slow)	No OPC UA communication. No automatic recognition.
Memory read/write error	On recovery	SF (Device)	Green on	May recover by a power cycle. If the problem still persists, contact CKD.
Factory setting error	On occurrence	SF (Device)	Red blinking (twice)	(No specific behavior.)
Factory setting error	On recovery	SF (Device)	Green on	Factory setting is written and restored after turning the power off and on again. Contact CKD.
Unit configuration error	On occurrence	LED of all units	Red on	Automatic recognition failed. If the LEDs do not light up red, the assignment size of the variable I/O unit is recognized as 0. The SF LED on the device unit blinks yellow (fast).
		SF (Device)	Yellow blinking (fast)	Does not start OPC UA communication if it occurs at power-up. Stops OPC UA communication if it occurs during OPC UA communication.
Unit configuration error	On recovery	SF (Device)	Green on	May recover by reviewing the unit configuration and connections between units.
Process data overflow	On occurrence	SF (Device)	Green blinking (slow)	OPC UA communication does not start.
Process data overflow	On recovery	SF (Device)	Green on	Will recover by reviewing the unit configuration and making the process data size 512 bytes or less in the total IN/OUT.
Unit/input power voltage error	On occurrence	PS (Device)	Red blinking (fast)	The behavior of each unit becomes unstable or the power turns OFF. It will recover when the supply voltage is within normal range.
Unit/input power voltage error	On recovery	PS (Device)	Yellow on	After "latch reset" using the PC software, the PS LED on the device unit will be Green on (normal status).
Output power voltage error	On occurrence	PO (Device)	Red blinking (fast)	It will recover when the supply voltage is within normal range.
Output power voltage error	On occurrence	Output unit, except IO-Link master unit	Yellow on	It will recover when the supply voltage is within normal range.
Output power voltage error	On recovery	PO (Device)	Yellow on	After "latch reset" using the PC software, the PO LED on the device unit will be Green on (normal status).

Internal bus communication error	On occurrence	SF (Device)	Red blinking (fast)	(No specific behavior.) Communication is unstable due to electromagnetic waves or other influences.
Internal bus communication error	On recovery	SF (Device)	Green on	May recover by reviewing the connections between the units or eliminating external influences.
Initialized set memory	On occurrence	SF (Device)	Green blinking (fast)	OPC UA communication does not start. Each I/O unit may operate unintentionally.
Initialized set memory	On recovery	SF (Device)	Green on	Will recover by turning the power off and on again. It starts with the settings initialized.
Hardware error	On occurrence	SF (Device)	Red blinking (slow)	(No specific behavior.) Contact CKD.
Hardware error	On recovery	SF (Device)	Red blinking (slow)	If there are no other errors, the SF LED on the device unit will be Green on

9.2 Unit ID List

The list of unit IDs is as follows.

Unit ID	Model No.	Type	Main function	Connector	Point/CH/port	Polarity
07000000	RT-XTECN00N	Device unit	EtherCAT	-	-	-
07010000	RT-XTENN00N	Device unit	EtherNet/IP	-	-	-
07060000	RT-XTEPN00N	Device unit	PROFINET	-	-	-
07070000	RT-XTEAN00N	Device unit	WebAPI	-	-	-
07080000	RT-XTEUN00N	Device unit	OPC UA	-	-	-
2B280100	RT-XADGB08A	Input	Digital	M8	8 points	PNP
2B2C0100	RT-XADGB08B	Input	Digital	M8	8 points	NPN
2C080200	RT-XADGA16A	Input	Digital	M12	16 points	PNP
2C0C0200	RT-XADGA16B	Input	Digital	M12	16 points	NPN
2D680400	RT-XADGC32A	Input	Digital	Terminal block	32 points	PNP
2D6C0400	RT-XADGC32B	Input	Digital	Terminal block	32 points	NPN
2C100002	RT-XBDGA16A	Output	Digital	M12	16 points	PNP
2C140002	RT-XBDGA16B	Output	Digital	M12	16 points	NPN
2D700004	RT-XBDGC32A	Output	Digital	Terminal block	32 points	PNP
2D740004	RT-XBDGC32B	Output	Digital	Terminal block	32 points	NPN
51080400	RT-XAAGA02N	Input	Analog	M12	2CH	-
51100004	RT-XBAGA02N	Output	Analog	M12	2CH	-
D300xxyy(Note 1)	RT-XLMSA08N	IO-Link	Master	M12	8 ports	-
6D020004	RT-XVVCN32A (Note 2)	Valve IF	TVG	-	32 points	PNP
6D820004	RT-XVVCN32B (Note 2)	Valve IF	TVG	-	32 points	NPN

Note 1: xxyy varies depending on the unit settings. (Initial value: 2622)

Note 2: The valve IF unit model number is the number displayed on the PC software. The model number as a valve manifold is TVG□P-TB-□-KA1□.

10. WARRANTY PROVISIONS

10.1 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 equipment 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.

10.2 Warranty Period

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