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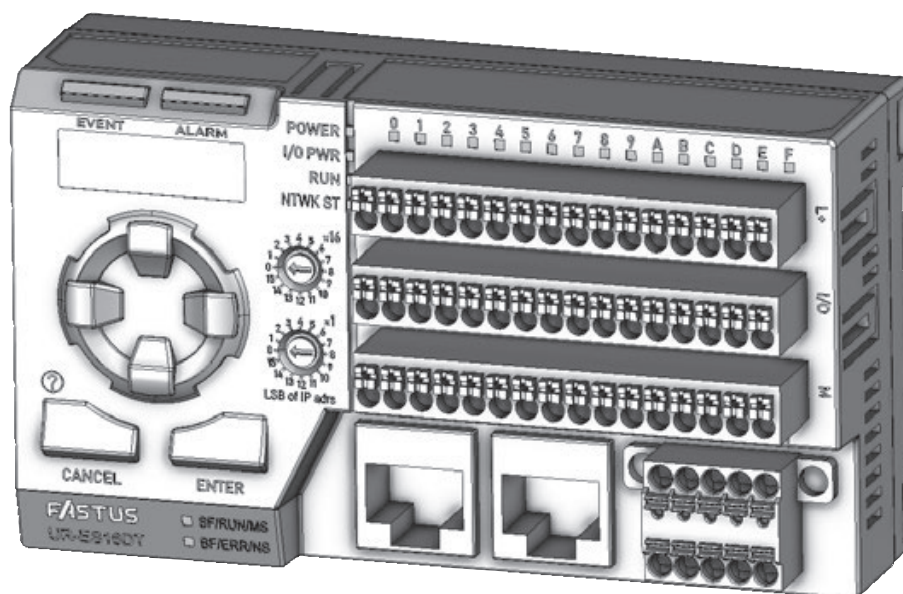
\*FASTUS is a product brand of OPTEX FA.

**IO-Link Master**

**UR-ES16DT**

# User's Manual

## CC-Link IE Field Basic Edition



**OPTEX FA CO., LTD.**

Ramco Innovations

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# Introduction

Thank you for purchasing the IO-Link Master UR-ES16DT.

This manual contains the information required when using “CC-Link IE Field Basic” as the host network. Read this manual thoroughly before using the product to ensure correct product use with full understanding of the functions and performance of the product. Also, after you have finished reading this manual, store it safely for future reference.

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# Safety Precautions

This manual uses the following symbols to display safety precautions for ensuring safe operation of the UR-ES16DT IO-Link Master (hereafter, “this product”).

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

## ■ Safety Symbols

The indications and their meanings are as follows.

|  |   |
|--|---|
|  <b>WARNING</b> | Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage. |
|  <b>CAUTION</b> | Indicates that any improper operation or handling may sometimes result in moderate or minor injury or property damage.  |

## ■ Notes

For common product functions, see Common Edition (UR-ES\_UM-XXX-XXXX) (below, the “Common Edition”).

# Related Manuals

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

## Product Common Edition

Describes common functions not related to the host network type used.

| Manual number       | Manual name  | Details  |
|---------------------|--|--|
| UR-ES_UM_E-XXX-XXXX | IO-Link Master UR-ES16DT<br>User's Manual Common Edition<br>(Referred to herein as the<br>"Common Edition.") | Describes this product's common functions and<br>performance as well as operation.<br>Be sure to read these documents. |

# Manual Structure

This manual's content is structured as follows.

|  |   |
|--|---|
| <b>1. Overview</b>   | Provides an overview of the use of "CC-Link IE Field Basic" as the host network.  |
| <b>2. Product Initial Settings Related to CC-Link IE Field Basic</b> | Describes initial setting for this product's IP address setting, communication connection, and front panel operation.   |
| <b>3. Communication</b>  | Describes the initial settings for CC-Link IE Field Basic communication and IO-Link communication, the configuration of the data to be handled, and communication examples. |
| <b>4. Specifications</b>   | Describes the specifications for CC-Link IE Field Basic with this product.  |
| <b>5. Troubleshooting</b>  | Describes methods of troubleshooting, etc. related to CC-Link IE Field Basic communication.   |
| <b>6. Appendix</b>   | Describes product master setting values as well as acyclic communication sample programs when using Module FB.  |

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# Notations Used in this Manual



These are the notations used in this manual.

## CAUTION

This indicates particularly important points to observe during operation.

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## MEMO

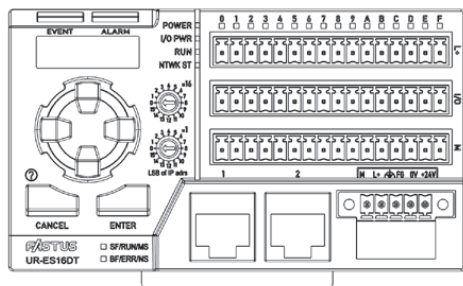
This information is useful for operation.

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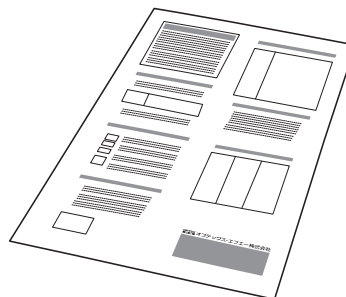
# Checking the Included Items

Before use, confirm the product packaging. If there are any defective or damaged items, please contact our customer support center (refer to the end of this manual).

## Product Packaging



• UR-ES16DT unit



• Instruction manual

- I/O terminal block: three pieces
- Power terminal block: one piece
- RJ45 connector protective cap: two pieces (attached to unit)

## Other Required Items

### Cables

This product uses the following cables.

| Type           | Specifications   |
|----------------|--|
| Ethernet cable | <p>Ethernet cables that fulfill the following specifications</p> <ul style="list-style-type: none"> <li>• Connector: RJ45 connector</li> <li>• Cable: Use an Ethernet cable of category 5 or above that complies with a standard (1000BASE-T, 100BASE-TX, 10BASE-T).</li> </ul> <p>For details, refer to the CC-Link IE Field Basic master station manual.</p> |

### Switching Hub

Use the following industrial Switching Hubs.

| Type          | Specifications   |
|---------------|--|
| Switching Hub | <p>Layer 2 switch</p> <p>For details on usable Switching Hub, refer to the CC-Link IE Field Basic master station manual and the materials on operation confirmation devices.</p> |

# Terminology List

This explains the terminology used in this document.

| Terminology  | Description   |
|--|---|
| CC-Link IE Field Basic master station                                    | Station which controls the entire CC-Link IE Field Basic network. Able to perform cyclic and acyclic communication with all stations. 1 unit exists per 1 network. For short, it is also called the “host master station”.  |
| Cyclic communication (cyclic transmission and process I/O communication) | The host master station regularly reads and writes the status/flag of this product and the process input/output data of the IO-Link device. This product executes process I/O communication (of IO-Link) with the IO-Link device.   |
| Extended access function   | This function uses cyclic communication to read and write settings for this product and IO-Link devices (including sensor units connected to UC2-IOL). Host master side programs can be simplified.   |
| Acyclic communication (socket or Modbus/TCP communication)               | Reads and writes the designated data in this product or an IO-Link device as necessary, using arbitrary socket communication from the host master station or the Module FB for Mitsubishi Electric PLC below. <ul style="list-style-type: none"><li>• For reading: UDP_READ</li><li>• For writing: UDP_WRITE</li></ul> As well, this product also supports Modbus/TCP communication. However, neither socket communication nor Modbus/TCP communication is capable of writing process data. |
| Process I/O communication  | For IO-Link communication, cyclic communication will be used for requests from the IO-Link master to IO-Link devices.   |
| ISDU communication   | For IO-Link communication, acyclic communication will be used for requests from the IO-Link master to IO-Link devices.  |
| Link scan time   | Indicates CC-Link IE Field Basic communication link scan time.  |
| GXWorks2/3   | A generic term for GXWorks3 and GX Works2.  |
| Remote output (RY)   | Information output from the CC-Link IE Field Basic master station to the slave stations in bits. Link device type.  |
| Remote input (RX)  | Information input from the slave stations to the CC-Link IE Field Basic master station in bits. Link device type.   |
| Remote register (RWr)  | Information input from the slave stations to the CC-Link IE Field Basic master station in units of 16 bits (1 word). Link device type.  |
| Remote register (RWw)  | Information output from the CC-Link IE Field Basic master station to the slave stations in units of 16 bits (1 word). Link device type.   |
| Link device  | Devices that make up the interior of a CC-Link IE Field Basic network.<br>Generic name for RX, RY, Rwr, and RWw.  |
| Socket communication   | Indicates product unique protocol communication within Ethernet socket communication. This communication designates the IP address and port number (2001 on this product) to send and receive data with UDP/IP or TCP/IP.   |
| Modbus/TCP communication   | Request messages are issued from the Modbus/TCP master, and retaining registers within this product are read and written.<br>When this happens, depending on the retaining register number, this product executes ISDU communication (of IO-Link) with the IO-Link device.  |



# 1

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## Overview

This chapter provides an overview of the use of “CC-Link IE Field Basic” as the host network.

# 1-1 Product Overview

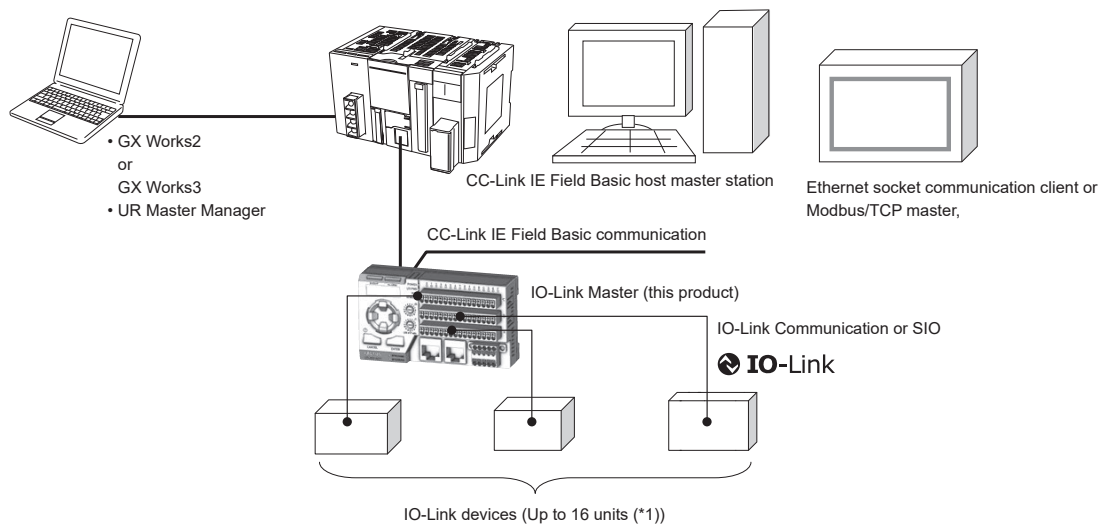
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Overview

When setting the network type to “CC-Link IE Field Basic”, this product conducts cyclic communication with the CC-Link IE Field Basic communication master as a CC-Link IE Field Basic communication slave station, while simultaneously communicating IO-Link process data with the connected IO-Link devices.

Regarding acyclic communication, it is also possible to send/receive data from the socket communication client on settings of this product or the connected IO-Link devices and to read/write IO-Link device process input. Similar processing is also possible with Modbus/TCP communication.

## ■ CC-Link IE Field Basic and IO-Link System Configuration Example



\*1: To connect a maximum of 16 IO-Link devices to this product, the following conditions are required.

Process data size for this product with all connected IO-Link devices:

Input: Max. 32 words for all channels total

Output: Max. 32 words for all channels total

## ■ Features

- The host network type can be switched among the following depending on the setting.
  - EtherNet/IP (default value)
  - EtherCAT
  - PROFINET (planned)
  - Ethernet & Modbus/TCP
  - CC-Link IE Field Basic
- With the CC-Link IE Field Basic network type, CC-Link IE Field Basic communication is possible as cyclic communication and socket or Modbus/TCP communication as acyclic communication.
- CC-Link IE Field Basic cyclic communication enables input/output with up to 16 IO-Link devices (for

default values, 2 words each input/output per device). Further, reading and writing with partial cyclic communication, without using acyclic communication, is possible for settings of this product, IO-Link device designated index/sub-index values, or “specific data” of sensor units connected to the OPTEX FA IO-Link gateway UC2-IOL (this is called extended access).

- A time stamp can also be added to the process input data. As a result, it is possible to read the time when the process input data was taken from this machine, as synchronized with the network time, with a resolution of 15.26  $\mu$ s.

Additionally, adding parity information calculated from process input data and time information, it is possible to ensure the integrity of process input data and time (data integrity: DI).

As well, the time can be read from the IO-Link device setting value, stored in this product, and then read from the host PLC.

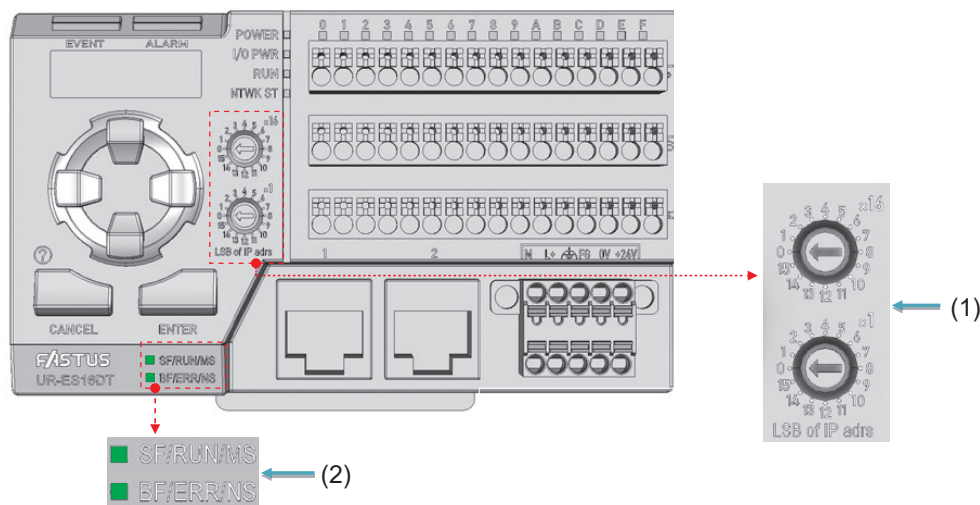
- Through socket communication or the Module FB for Mitsubishi Electric PLC, it is also possible to read and write this product's settings or IO-Link device designated index/sub-index values as necessary. IO-Link device process input can also be read (process output writing is not possible).
- Similar processing is also possible with Modbus/TCP communication.
- The front panel buttons of this product can be remotely controlled from a touch panel display, etc., using socket or Modbus/TCP communication.

# 1-2 Part Names and Functions

## 1-2-1 Part Names and Functions

The part names and functions after assembling the terminal block, when using “CC-Link IE Field Basic” as the host network, are as follows.

Refer to Common Edition for other part names and functions.



### (1) IP address lowest digit setting switch

Sets the lowest digit of the IP address value (the “n” in 192.168.0.n). The top value is multiplied by 16 and added to the bottom value.

To set other arbitrary IP addresses, refer to “2-2-4 Product IP Address Setting”.

### (2) SF/RUN/MS LED, BF/ERR/NS LED

Displays the host network status.

As below for CC-Link IE Field Basic.

**SF/RUN/MS**

Off: Network chip is not active or power is off.

Blinking: Network chip is working.

Lit: Network chip is ready.

**BF/ERR/NS**

Off: Ethernet cable is not connected or power is off.

Blinking: Ethernet cable is connected, but communication has not been established.

Lit: Ethernet communication has been established. This may also indicate that communication is ready.

# 1-3 Inputting/Outputting IO-Link Devices and Process Data

This section explains how to input/output process data of IO-Link devices connected to the product.

The input/output methods are as below.

| Method                                    | Description  | Reference   |
|---|--|---|
| 1) Input/output via cyclic communication  | IO-Link device process data is assigned to the CC-Link IE Field Basic master station link device.  | -   |
|   | For default value <ul style="list-style-type: none"> <li>• Input (IO-Link device → CC-Link IE Field Basic master station): 2 words/device</li> <li>• Output (CC-Link IE Field Basic master station → IO-Link device): 2 words/device</li> </ul>  | "3-3 Cyclic Communication (cyclic transmission/process I/O communication)"      |
|   | For other than default value <p>The following manual or auto allocations are possible.</p> <p>Manual allocation:<br/>With the following master parameters for this product, the allocation size is set to other than default values for each channel.</p> <ul style="list-style-type: none"> <li>• Input:ss "M40. Process input data words allocation": 0 to 16 words per channel (default value: 2 words)</li> <li>• Output: "M41. Process output data words allocation": 0 to 16 words per channel (default value: 2 words)</li> </ul> <p>Auto allocation:<br/>In accordance with the actual IO-Link device specifications, the above master parameter word allocation is automatically set.<br/>This depends on setting "M42. Process data words auto allocation" to "Yes" (1).</p> | Common Edition "Chapter 4: Product Functions"                                   |
| 2) Confirmation with front panel controls | Confirmation is done with product front panel operation.   | Common Edition "Chapter 5 Front Panel Controls"                                 |
| 3) Input via acyclic communication        | Socket or Modbus/TCP communication enables input only (output writing is not possible)   | 3-4-1 Socket Communication (UDP/IP or TCP/IP)<br>3-4-2 Modbus/TCP Communication |



# 1-4 Setting/Monitoring Product Master Parameters

This section describes how to set/monitor product master parameters.

As shown below, there are three setting/monitoring methods.

| Method  | Description   | Reference  |
|---|---|--|
| 1) Setting with front panel controls  | Setting is done with product front panel operation.   | Common Edition "Chapter 5 Front Panel Controls"  |
| 2) Setting via Module FB for Mitsubishi Electric PLC or client socket communication program, or by Modbus/TCP communication | Setting/monitoring is possible via Mitsubishi Electric Module FB for PLC or a client communication program, or by Modbus/TCP communication. | <ul style="list-style-type: none"><li>• "3-4-1 Socket Communication (UDP/IP or TCP/IP)"</li><li>• "App-2 Acyclic Communication Sample Programs Using Module FB"</li></ul> or <ul style="list-style-type: none"><li>• "App-3 Sample Socket Communication Program"</li></ul> |
| 3) Setting via cyclic communication extended access   | Specific master parameters can be read/written by cyclic communication operation alone (via extended access).                               | "3-3 Cyclic Communication (cyclic transmission/process I/O communication)"   |

# 1-5 Setting/Monitoring IO-Link Device Service Data

This section explains how to set service data inside IO-Link devices connected to the product.

As shown below, there are three setting/monitoring methods.

| Method   | Description   | Reference  |
|--|---|--|
| 1) Setting/monitoring via Module FB for Mitsubishi Electric PLC or client socket communication program, or by Modbus/TCP communication | Setting/monitoring is possible via Module FB for Mitsubishi Electric PLC or a client communication program, or by Modbus/TCP communication. | <ul style="list-style-type: none"><li>• “3-4-1 Socket Communication (UDP/IP or TCP/IP)”</li><li>• “3-4-2 Modbus/TCP Communication”</li></ul> |
| 2) Setting/monitoring via cyclic communication extended access   | Specific service data can be read/written by cyclic communication operation alone (via extended access).                                    | “3-3 Cyclic Communication (cyclic transmission/process I/O communication)”   |
| 3) Setting/monitoring with front panel controls  | Setting/monitoring is possible with front panel controls.   | Common Edition “5-1-5 Device Setting Value Window”   |

# 1-6 Setting/Monitoring Data from UC2-IOL Connected Sensor Unit

Setting/monitoring methods for data from the target sensor unit connected with OPTEX FA IO-Link gateway UC2-IOL are shown here.

As shown below, there are two setting/monitoring methods.

| Method   | Description  | Reference  |
|--|--|--|
| 1) Setting/monitoring via Modbus/TCP communication             | Setting/monitoring of sensor unit arbitrary data is possible via Modbus/TCP communication.                                   | "3-4-2 Modbus/TCP Communication"   |
| 2) Setting/monitoring via cyclic communication extended access | Specific data from the target sensor unit can be read/written by cyclic communication operation alone (via extended access). | "3-3 Cyclic Communication (cyclic transmission/process I/O communication)" |

# 1-7 Basic Procedures

The process from installing and setting this product through beginning CC-Link IE Field Basic and IO-Link communication is indicated below.

| Procedure                                 | Details   | References   |
|---|---|--|
| Prior confirmation                        | System configuration decision:<br><ul style="list-style-type: none"> <li>IO-Link device types and number used<br/>In particular, calculate the number of connectable IO-Link devices based on the total process data size of each IO-Link device</li> <li>(Related to the above) Determine whether to automatically allocate process data from the actual IO-Link device or manually set the number of input or output words for the IO-Link device for each channel</li> <li>Each channel I/O allocation settings</li> </ul> | 1-1 Product Overview<br>3-3 Cyclic Communication (cyclic transmission/process I/O communication)<br>Common Edition                         |
|   | Data I/O design:<br><ul style="list-style-type: none"> <li>Whether to access settings with cyclic communication data operation, using cyclic communication (whether to use "extended access")</li> <li>What to read and write to this product or IO-Link device using acyclic communication</li> </ul>  | 3-3 Cyclic Communication (cyclic transmission/process I/O communication)<br>3-4 Acyclic Communication (socket or Modbus/TCP communication) |
| ↓   | ↓   |  |
| Hardware installation and wiring          | CC-Link IE Field Basic master station mounting  | Manual for the CC-Link IE Field Basic master station used  |
| ↓   | ↓   |  |
| Initial settings for front panel controls | Set "Network type" to "CC-Link IE Field Basic"  | 2-2 Initial Settings for Front Panel Controls  |
|   | ↓   |  |
|   | Product IP address setting<br>Turn the rotary switch on the product front panel when the power is on, or set the product master parameter "M82. IP address"   | 2-2-4 Product IP Address Setting<br>Common Edition   |
| ↓   | ↓   |  |
| Initial setting via GXWorks2/3            | Register this product to the CC-Link IE Field Basic network   | Reading CSP+ Files into GXWorks2/3   |
|   | ↓   |  |
|   | In GXWorks 2/3, register this product to the CC-Link IE Field Basic network configuration   | 3-2-3 Read the CSP+ File for This Product into GXWorks2/3  |
|   | ↓   |  |
|   | Network configuration settings for CC-Link IE Field Basic between this product and the CC-Link IE Field Basic master station (product IP address setting and input/output assignment on GXWorks2/3)   | 3-2-4 Setting CC-Link IE Field Basic Master Unit Parameters  |
|   | ↓   |  |
|   | Writing configuration contents to the CC-Link IE Field Basic master station   | 3-2-6 Writing Configuration Contents to the CC-Link IE Field Basic Master Station  |
|   | ↓   |  |
|   | CC-Link IE Field Basic established (NTWK ST LED on product front panel lights up green)   | 1-2 Part Names and Functions   |

| Procedure                           |   | Details  | References  |
|-------------------------------------|---|--|---|
|                                     | ↓   | ↓  |   |
|                                     | Install the IO-Link device profile for the devices connecting to this product | (When using other companies' IO-Link devices (*1))<br>Using the IODD_Converter.exe in UR Master Manager, select “UDP (CC-Link IE Field Basic)” as the network type and transfer (install)<br><br>*1: Upon installation, the IO-Link device process data and settings can be referenced and changed with names from this product. | Common Edition  |
| ↓                                   |   | ↓  |   |
| Product parameter setting           |   | Using front panel controls   | Common Edition  |
|                                     |   | When using socket communication from the host master station, Module FB for Mitsubishi Electric PLC, or Modbus/TCP/ISDU communication  | 3-4 Acyclic Communication (socket or Modbus/TCP communication)  |
| ↓                                   |   | ↓  |   |
| IO-Link device service data setting |   | Using front panel controls   | Common Edition  |
|                                     |   | When using socket communication from the host master station, Mitsubishi Electric Module FB for PLC, or Modbus/TCP/ISDU communication  |   |
| ↓                                   |   | ↓  |   |
| Starting communication              |   | Start system (power ON)  |   |
|                                     |   | ↓  |   |
|                                     |   | CC-Link IE Field Basic starts<br>IO-Link communication starts  | Manual for the CC-Link IE Field Basic master station used   |
| ↓                                   |   | ↓  |   |
| Checking operation                  |   | Verify CC-Link IE Field Basic master station and this product/IO-Link device display   | Manual for the CC-Link IE Field Basic master station used<br>1-2 Part Names and Functions / 5-1 Troubleshooting<br>Each IO-Link device manual |
|                                     |   |  |   |
|                                     |   | Verifying read/write data between this product and an IO-Link device   | Each IO-Link device manual  |
|                                     |   | ↓  |   |
|                                     |   | Confirmation of data reading/writing via cyclic communication between the CC-Link IE Field Basic master station and this product   | 3-3 Cyclic Communication (cyclic transmission/process I/O communication)<br>Manual for the CC-Link IE Field Basic master station used         |
|                                     |   | ↓  |   |
|                                     |   | Product or IO-Link device reading/writing via acyclic (UDP or TCP socket/ISDU) communication (as necessary)<br>Executing socket communication or the PLC Module FB for Mitsubishi Electric PLC as below:<br>• For reading: UDP_READ<br>• For writing: UDP_WRITE<br>or Modbus/TCP/ISDU communication                              | 3-4 Acyclic Communication (socket or Modbus/TCP communication)  |

| Procedure       | Details   | References                |
|-----------------|---|---------------------------|
| ↓               | ↓   |                           |
| Troubleshooting | Confirmation of the CC-Link IE Field Basic master station and this product/IO-Link device display, response confirmation via acyclic (UDP or TCP socket/ISDU) communication | Chapter 5 Troubleshooting |

## ●●● MEMO ●●●

Product master parameters and connected IO-Link device settings can be changed by either of the following methods. The applications of each are as follows.

| Method  | Main application       | References   |
|---|------------------------|--|
| 1) Unit front operation                               | Startup or maintenance | • "2-2 Initial Settings for Front Panel Controls"  |
| 2) Acyclic communication from the host master station | Controlled operation   | • "3-4 Acyclic Communication (socket or Modbus/TCP communication)"<br>• "App-1 List of Product Master Parameters"<br>• "App-2 Acyclic Communication Sample Programs Using Module FB" |

### CAUTION

- If more than 32 words are used on either the input or the output in total, the excess process data will not be assigned to the host master station (and will be ignored).  
To connect a maximum of 16 IO-Link devices to this product, the following conditions are required.  
Process data size for this product with all connected IO-Link devices:  
Input: Max. 32 words for all channels total  
Output: Max. 32 words for all channels total
- To add a particular IO-Link device type for connection after installing IODD data on this product (when required), use IODD\_Converter.exe (within UR Master Manager) to install the IO-Link device. Recreate the included IODD data and install it again.
- When the IO-Link ready flag is ON, read and write process data.



---

# 2

## **Product Initial Settings Related to CC-Link IE Field Basic**

Describes initial setting for this product's IP address setting, communication connection, and front panel operation.

# 2-1 Ethernet Connection

Shown here is the Ethernet connection configuration when using CC-Link IE Field Basic as the host network.

## 2-1-1 Connector and Cable

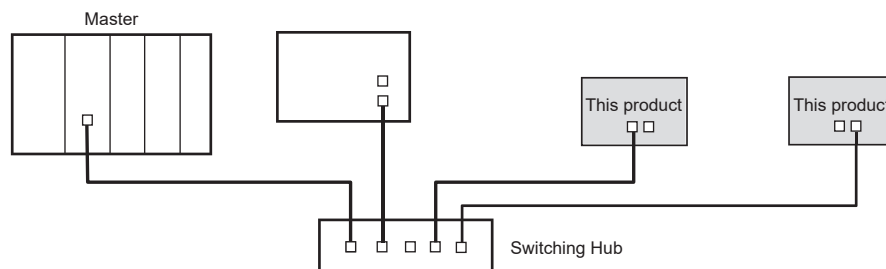
The Ethernet cable may be connected to either of the RJ45 connectors at left or right of the product.  
For the cable, use an Ethernet cable that complies with the standard (100BASE-TX).  
For details, refer to the CC-Link IE Field Basic master station manuals.

## 2-1-2 Ethernet Connection Type

Topologies capable of CC-Link IE Field Basic are star or linear bus configurations.

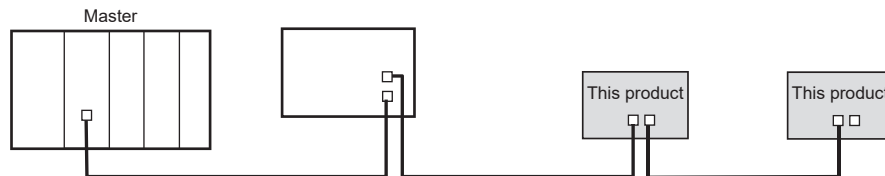
### ● Star configuration

The star configuration network enables connection of various devices from a Switching Hub.  
Connection to either Port 1 or Port 2 of the product is possible.



### ● Linear bus configuration

A linear bus configuration type network is a connection format in which devices are connected by daisy chain. It doesn't require a Switching Hub and shortens the required length of LAN cables. The upstream side (master side) / downstream side can be connected to either PORT1 or PORT2 of this product.



For details, refer to the CC-Link IE Field Basic master station manuals.



## 2-2 Initial Settings for Front Panel Controls

Shown here is the initial setting method via product front panel operation when using "CC-Link IE Field Basic" as the host network.

### 2-2-1 Powering up the CC-Link IE Field Basic Master Station

When available, apply power to the CC-Link IE Field Basic master station in advance.  
This makes it possible to check whether the master station is connected correctly.

### 2-2-2 Language

After turning the product on for the first time, select the language setting.

### 2-2-3 Network Type Setting

Continuing, the window automatically switches to the network type setting screen shown below.

```
M 2 .   N e t w o r k   T y p e
      E t h e r N e t / I P
```

The factory default network type setting is "EtherNet/IP".

When setting the host industrial network to "CC-Link IE Field Basic," change the network type setting here to "CC-Link IE Field Basic".

Regarding "M2. Network types," refer to Common Edition "5-1-4 Master Parameter List with Product Front" Panel Operation.

Press the [↑] button four times. "CC-Link IE Field Basic" will be displayed as below (scroll display).

```
M 2 .   N e t w o r k   T y p e
C C - L i n k   I E F   B a s i
```

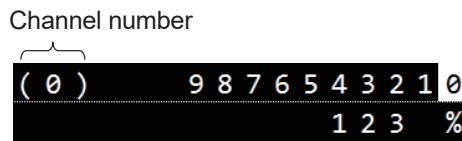
Press the [ENTER] button. The network type will switch to "CC-Link IE Field Basic". Wait about twenty seconds while the network chip firmware rewrites.

When rewriting is complete, there will be an automatic reboot.

```
KEEP POWER ON
. . . . .
```

After the reboot, the process data display window will appear (if language selection is complete).

The following process data display is an example of the start window when turning the power on after selecting the language.



Refer to Common Edition [5-1 Front panel controls] for further information about front panel operation.

## 2-2-4 Product IP Address Setting

Set the product IP address with the operation below. The value set here will also be set as the product IP address in the CC-Link IE Field Basic network configuration setting on GXWorks2/3 (see "3-2-4 Setting CC-Link IE Field Basic Master Unit Parameters").

- 1** Turn the rotary switch on the product front panel when the power is on.  
The master parameter will automatically switch to "M82. IP address."
- 2** Set the product IP address in accordance with the CC-Link IE Field Basic master station IP address (highest 3 digits): the highest 3 digits should be the same as the master station IP address and the lowest digit unique to the product.

Note: The factory default product IP address is 192.168.0.n (the n value is determined by the front panel rotary switch).

The default gateway value is 0.0.0.0. When a change is required, set the "M80. Default gateway" master parameter with product front panel controls.

The subnet mask default value is 255.255.255.0. When a change is required, set the "M81. Subnet mask" master parameter with product front panel controls.

### MEMO

- Note that with the product IP address set to the factory default, 192.168.0.n (where n depends on the front panel rotary switch), if, for example, the network address in CC-Link IE Field Basic communication is 192.168.3.□, the product will not be able to communicate with the master station.
- Static IP is the only way to set the product IP address (the IP address cannot be acquired via BOOTP or DHCP).

When changing the IP address, default gateway, or subnet mask with product front panel controls, refer to Common Edition "5-1 Front Panel Controls".

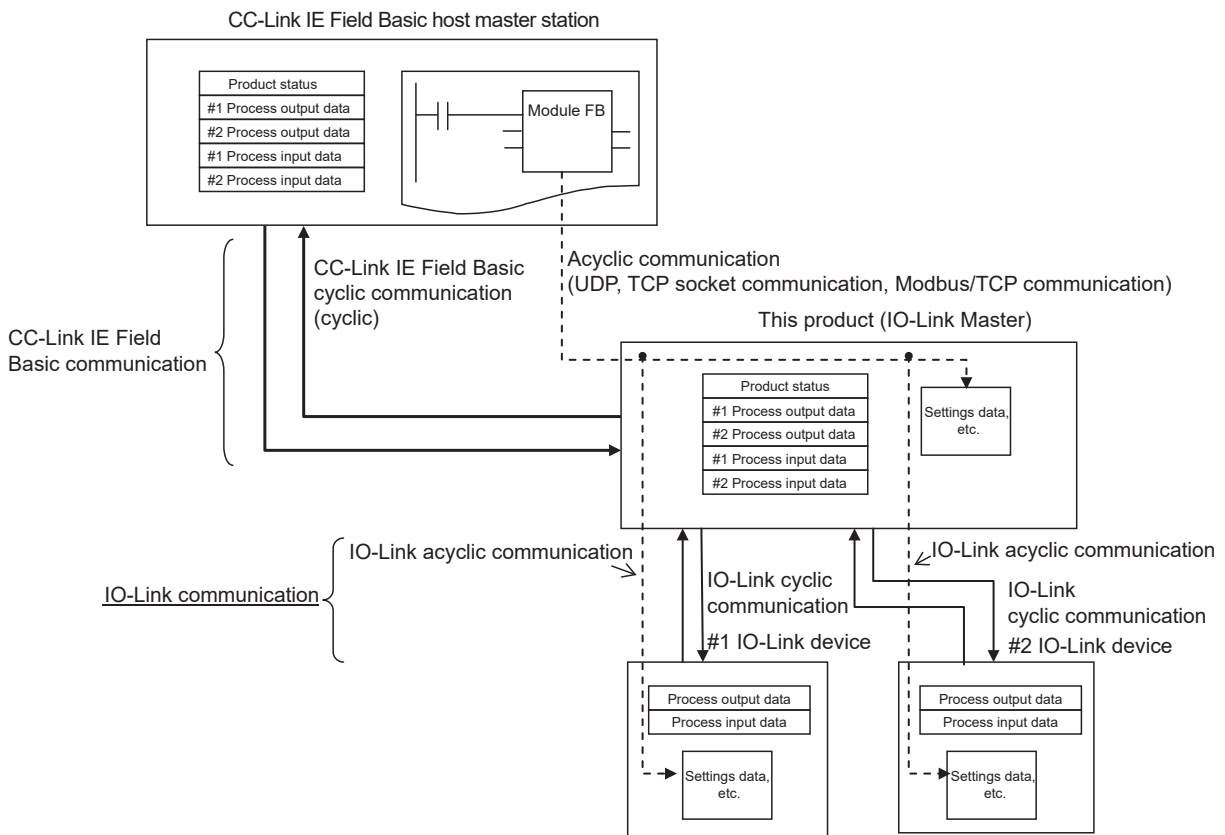
## Communication

This section describes the initial settings for CC-Link IE Field Basic communication and IO-Link communication, the configuration of the data to be handled, and communication examples.

# 3-1 Communication System Overview

This product performs IO-Link cyclic communication with the connected IO-Link devices. It collects data from these IO-Link devices and, along with its own status, conveys them through CC-Link IE Field Basic cyclic communication with the CC-Link IE Field Basic master station.

As well, the product can perform acyclic communication with its own and various connected IO-Link device service data from a Module FB for Mitsubishi Electric PLC on the CC-Link IE Field Basic master station, or from socket communication and Modbus/TCP communication programs (\*1).



\*1: Writing to process data is not possible from socket communication (including the Module FB for Mitsubishi Electric PLC) or Modbus/TCP communication.

## 3-2 Initial Setting of This Product via Software

Create initial settings for the product with software such as GXWorks2/3 or UR Master Manager.

### 3-2-1 Required Software

- Engineering tool for CC-Link IE Field Basic:  
GXWorks2 or GXWorks3 (tool used as the product's CC-Link IE Field Basic slave station)
  - For import/download from IODD file (device definition) group:  
UR Master Manager
- \*IODD files are provided from each IO-Link device manufacturer.

#### MEMO

Download UR Master Manager from the OPTEX FA website below.  
<https://www.optex-fa.com/>  
For UR Master Manager operation, see its user's manual.

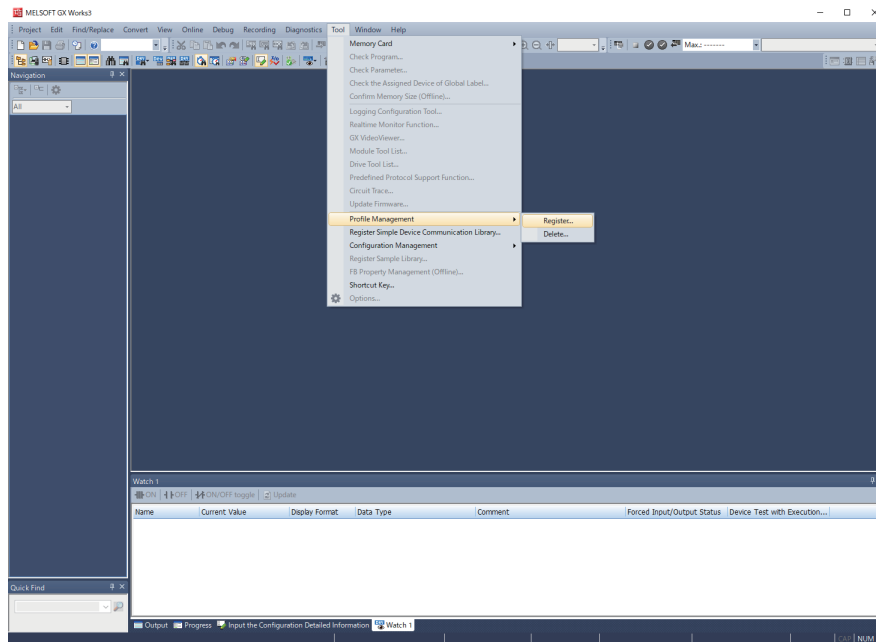
### 3-2-2 Procedure Overview

- 1 Download the CSP+ file for this product from the OPTEX FA website.
- 2 Register the CSP+ file for this product profile in GXWorks2/3.
- 3 In GXWorks 2/3, register this product to the CC-Link IE Field Basic network configuration.
- 4 Input the settings for CC-Link IE Field Basic communication between this product as the slave station and the CC-Link IE Field Basic master station (product IP address and I/O allocation (\*1)), and write to the CC-Link IE Field Basic master station.

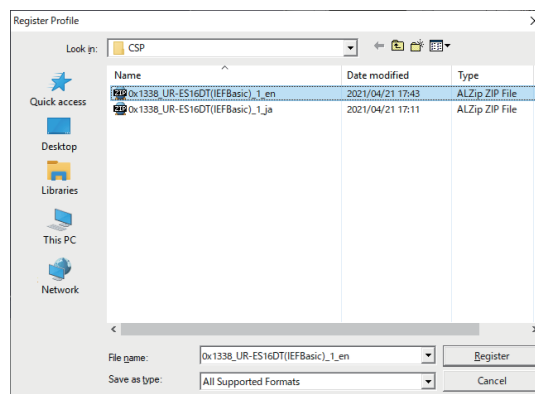
\*1: Allocate this product's remote I/O signals to the remote input (RX) and remote output (RY) of the upper CC-Link IE Field Basic master station.

### 3-2-3 Read the CSP+ File for This Product into GXWorks2/3

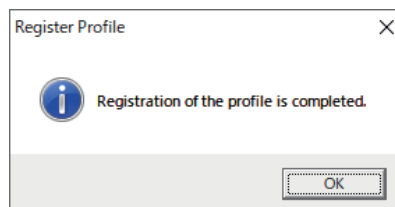
- 1 Download the CSP+ file for this product from the OPTEX FA website below.  
<https://www.optex-fa.com/>
- 2 Register the above CSP+ file for this product in GXWorks2/3. The product protocol version is "1".
  1. Launch GXWorks2/3 (GXWorks2 or GXWorks3).
  2. From [Profile Management] in the [Tool] menu, select [Register].



### 3 Select the CSP+ file prepared in advance and click the [Register] button.



The file is compressed in .zip format and can be registered without unzipping.  
Multiple files can also be selected for simultaneous registration by pressing the [Ctrl] and [Shift] keys.  
When registration completes normally, the following dialog box will be displayed.



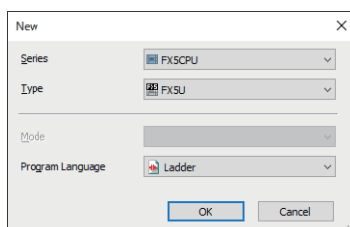
### 4 Click the [OK] button and close the window.

This completes the CSP+ file reading.

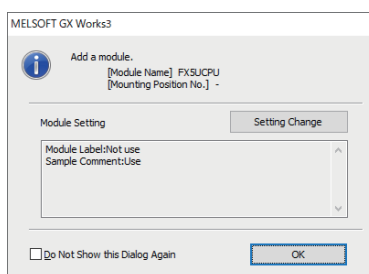
### 5 Continuing, create a new project or open an existing one in GXWorks2/3. Select [New] in the [Project] menu.

If possible, connect the PLC CPU module and computer with a USB cable and turn on the power.  
As well, after setting the product's own IP address with "M82. IP address," connect to the CC-Link IE Field Basic Master Unit with an Ethernet cable and turn on the power.

Select the [Series], [Type], and [Program Language] to use for the CPU module.



The following dialog box is displayed to confirm the addition of the CPU module (depending on the configuration, the addition may complete automatically without showing the dialog box).

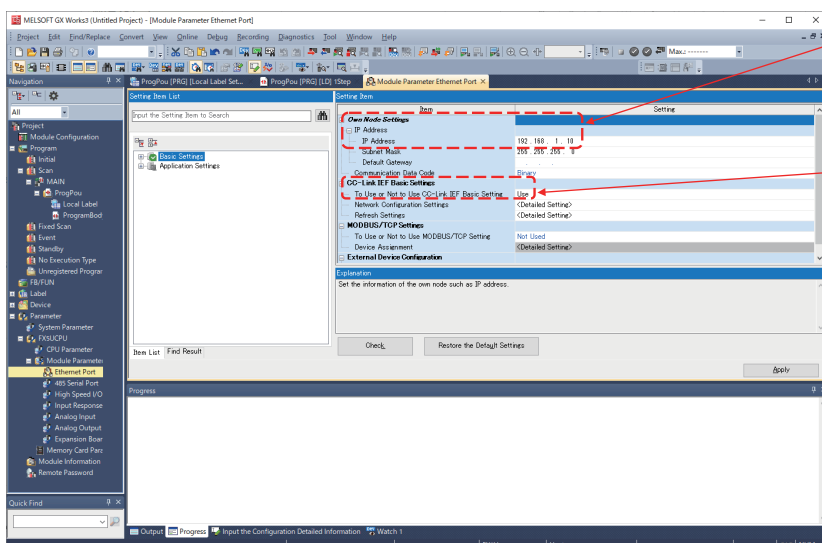


## 3-2-4 Setting CC-Link IE Field Basic Master Unit Parameters

Set the CC-Link IE Field Basic Master Unit parameters.

From the module information under Parameter in the navigation tree, double-click on the FX5U CPU module parameter Ethernet port. "Own-Node Setting" is displayed at right: set the master station IP address.

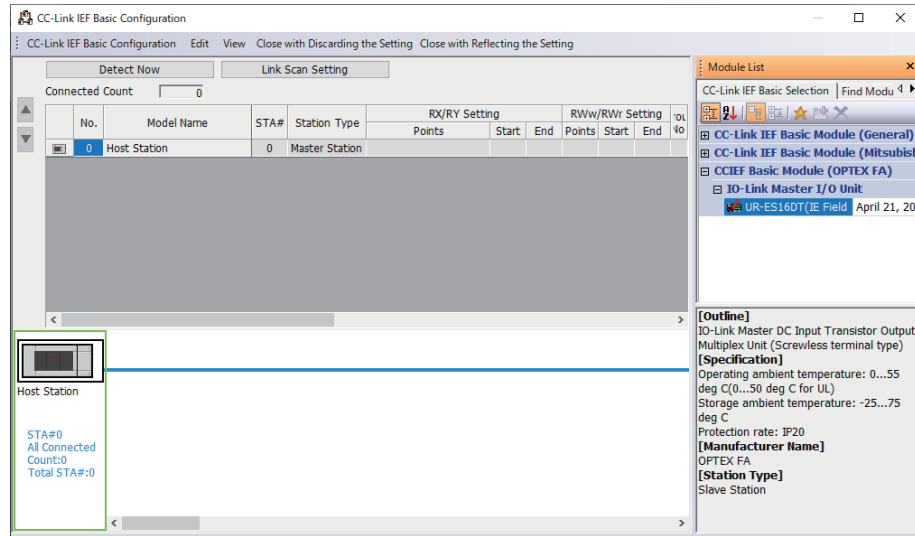
As well, "CC-Link IE Field Basic Setting" are displayed below. Change "To Use or Not to Use CC-Link IE Field Basic Setting" to "Use".



Set the CC-Link IE Field Basic master IP address.  
The value should be the same as this product's IP address up to the upper three bytes (192.168.1 here).

Change "To Use or Not to Use CC-Link IE Field Basic Setting" to "Use".  
Next, double-click [Detailed Setting] in Network Configuration Settings.

Next, double-click [Detailed Setting] in Network Configuration Settings.  
The “CC-Link IE Field Basic Configuration” screen below is displayed.



## 3-2-5 Registering the Product to the CC-Link IE Field Basic Configuration

In GXWorks 2/3, register this product to the CC-Link IE Field Basic configuration.

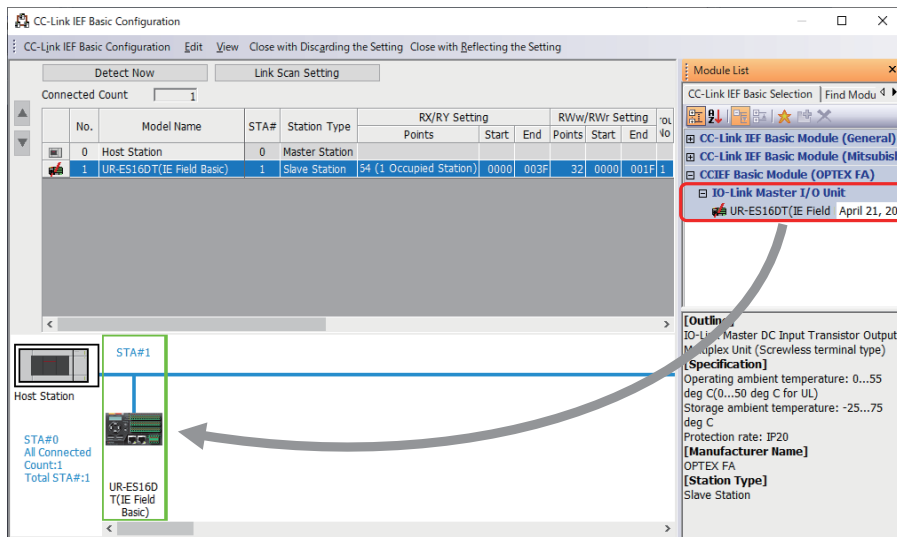
### ■ Registering the Product to the CC-Link IE Field Basic Configuration Offline.

Scroll down the list of modules at right to display “CC IE Field Basic Module (OPTEX FA)”.

Open this to find “UR-ES16DT (IE Field Basic)” under “IO-Link Master I/O Unit”. The profile version can be confirmed with this date.

Drag and drop “UR-ES16DT” into the network map at left.

This product’s number of occupied stations is 1.

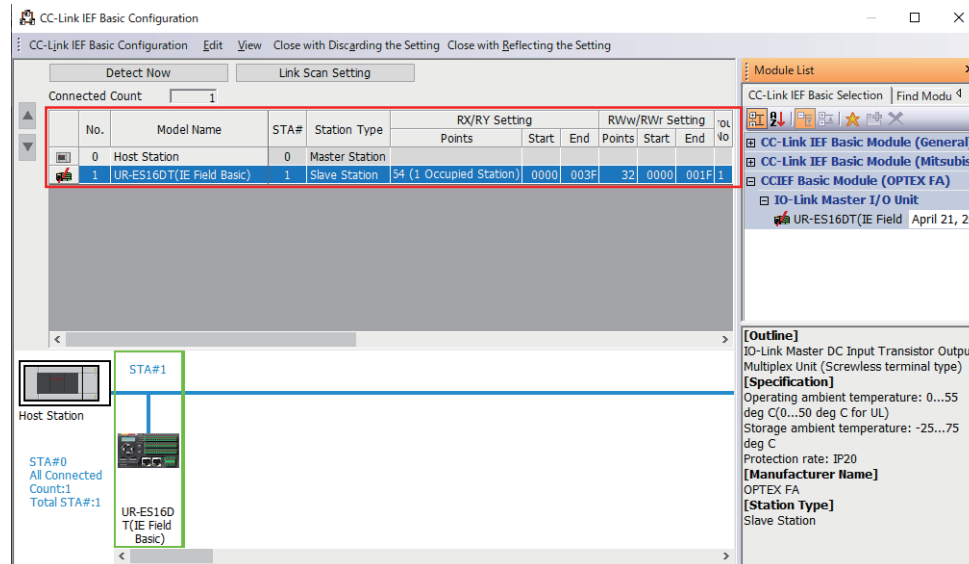




This product will be added to the network map.

## MEMO

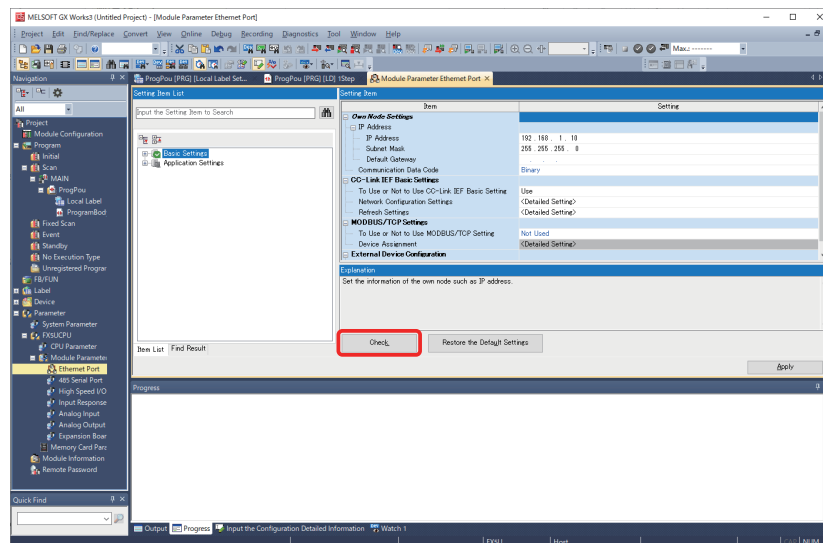
The dragged and dropped modules will also be displayed in the list of stations at top.



In the list of stations displayed at top, set the product's IP address, subnet mask, and allocation of link devices (RX, RY, RWr, RWw) to the product.

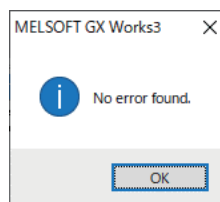
| Setting Items   | Setting Details   |
|-----------------|---|
| Station number  | The top slave station number will be displayed.   |
| IP address      | Set the product's IP number.<br>Set the same value as the master parameter "M82. IP address."   |
| Subnet mask     | Set the product's IP number.<br>Set the same value as the master parameter "M81. Subnet mask."<br>The default value is 255.255.255.0. |
| RX/Ry setting   | Set the following allocations for RX and Ry.<br>Points (*1), Start, End<br>*1: 64 points (bits) each are set automatically.           |
| RWw/RWr setting | Set the following allocations for RWw and RWr.<br>Points (*2), Start, End<br>*2: 32 points (words) each are set automatically.        |

Click [Close with Reflecting the Setting]. The Basic Setting window will return.

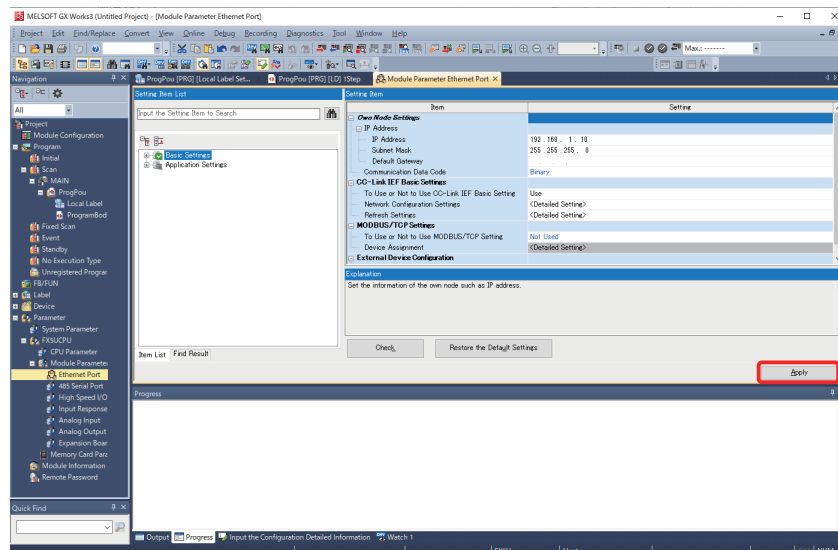


Click the [Check] button.

If there is no problem, the following dialog box will be displayed.



Click the [OK] button. The window below will return.

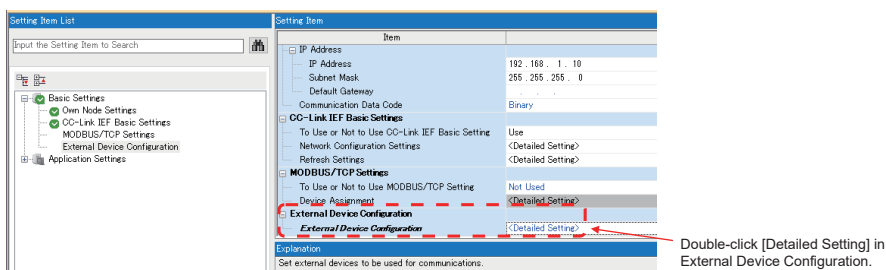


Click the [Apply] button.

If using only cyclic communication, then at this point the necessary information for CC-Link IE Field Basic network communication has all been input.

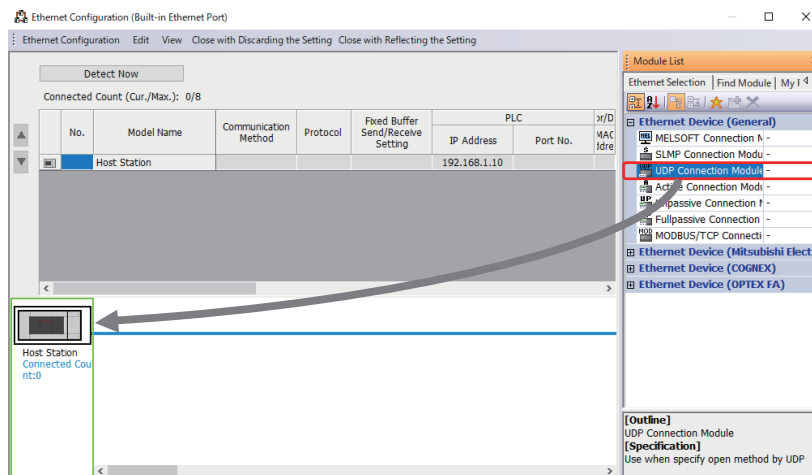
When using the Module FB or a socket communication program to read and write setting values with regard to the product, the next required step is “External Device Configuration.”

Double-click [Detailed Setting] in “External Device Configuration.”

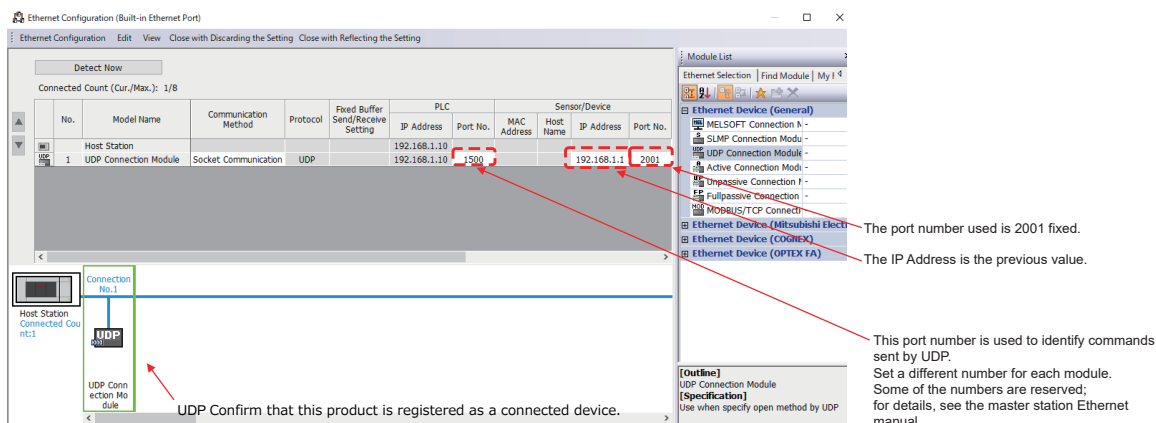


The Ethernet configuration screen below will be displayed.

Drag and drop “UDP Connection Module,” under “Ethernet Devices (General)” in the unit list at right, into the network map at left.



Set the port number to be used with UDP communication.



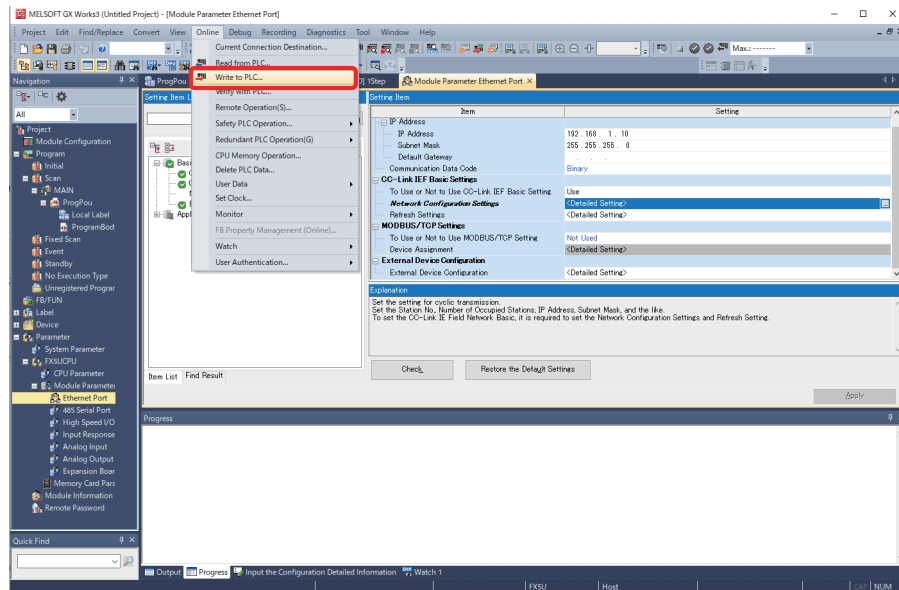
At this point, the necessary information for CC-Link IE Field Basic network communication has all been input.

However, here the settings have been made only on the computer, and the setting details also need to be written to the CC-Link IE Field Basic master station.

## 3-2-6 Writing Configuration Contents to the CC-Link IE Field Basic Master Station

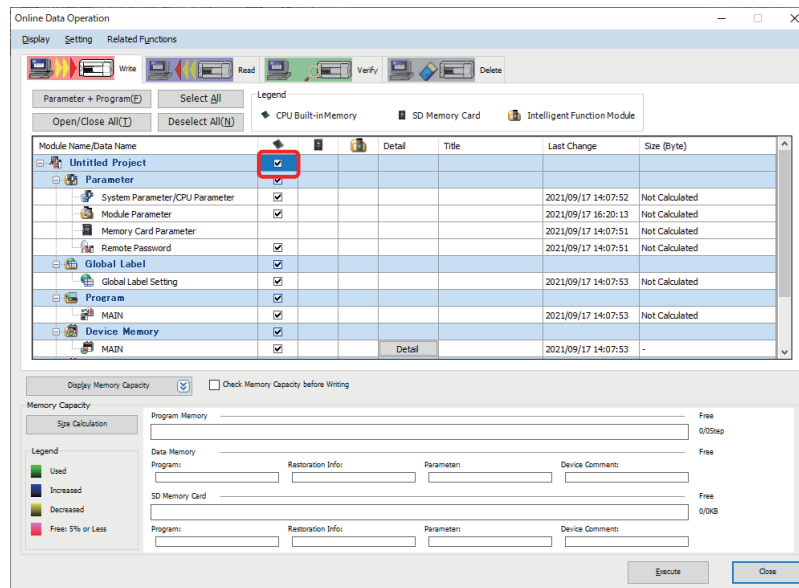
Online, write the setting details required for CC-Link IE Field Basic to the CC-Link IE Field Basic master station.

From the [Online] menu, select [Write to PLC].



Select the parameter to write.

As this is the first time, check the [Untitled Project] checkbox.

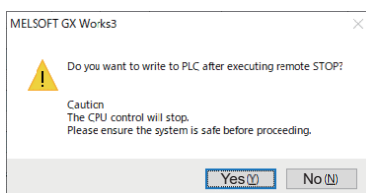


Click the [Execute] button to display the confirmation dialog box for continued writing to the PLC.

Click the [Yes] button. The confirmation dialog box for execution of writing to the PLC after remote stop will be displayed.

Click the [Yes] button. The following confirmation dialog box will be displayed.

Click the [Yes to all] button to begin writing. When complete, the following dialog box will be displayed.



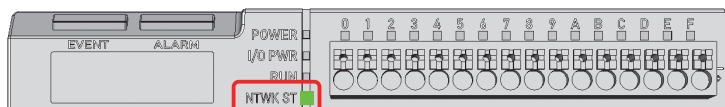
Here the CC-Link IE Field Basic settings are complete on the CC-Link IE Field Basic master station side.

Here, reset the host master station side CPU module.

Restart the CPU module and confirm that CC-Link IE Field Basic communication is established (the Ethernet SD/RD LED is blinking and the product's NTWK ST LED is lit).

### MEMO

- When writing setting details to the CC-Link IE Field Basic master station, it must be rebooted.
- If the product front panel NTWK ST LED does not light up green (showing normal communication) even after setting is complete, once again check the GXWorks2/3 settings and product settings.



- If communication is not possible even after all the confirmation above, refer to the manuals for each CC-Link IE Field Basic master station.

## 3-3 Cyclic Communication (cyclic transmission/ process I/O communication)

This product exchanges the following data regularly in CC-Link IE Field Basic with the CC-Link IE Field Basic master station link device (RX/RX/RWw/RWw).

- Digital input/digital output in SIO mode, product status/operation flags: Bit unit
- IO-Link device I/O maximum 32 bytes of process data: Word unit

### 3-3-1 Assigning the Host CC-Link IE Field Basic Master Station to Link Devices

This product assigns the “RX”, “RY”, “RWw” and “RWw” of [Setting Item] in GXWorks2/3 parameter settings [Basic Settings] - [Network Configuration Settings] from the set start numbers to the host master station link devices.

#### MEMO

Below, this manual explains how to indicate the product status/operation flag link device address with RX/RX setting start number “00”.

Ex.: Event flag: RX17, Latest Event channel: RX10-13

#### Normal Assignment and Extended Access Enabled Assignment

The unit can be switched between using either of the following two assignment methods.

- Normal assignment: Assignment method where everything is cyclic data shared type.
- Extended access enabled assignment: This assignment method allows setting values to be accessed without using acyclic communication, for normal cyclic data shared type assignments.  
The following can be accessed.
  - Any service data in any connected IO-Link device
  - Product master parameters
  - Specific data in a sensor unit connected to UC2-IOL

The assignment method (normal assignment or extended access enabled assignment) is specified using “Extended access enable flag” (RY10).

The following is shown when both the “M40. Process input data words allocation” and “M41. Process output data words allocation” master parameters are the default values.

## 3-3-2 Normal Assignment (extended access disabled)

The master station link device allocation to this product when “Extended access enable flag” (RY10) is set to 0 (OFF: Extended access disabled) is as below.

| Link device     | Word address (Start number +) | Bit address (*1)   |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|-----------------|-------------------------------|--|---------------|-----------------------------|----------|----------------------|---|---|---|------------------------|-----------------------|--------------------|----------|----------------------|---|--------------------------|---|
|                 |                               | F  | E             | D                           | C        | B                    | A | 9 | 8 | 7                      | 6                     | 5                  | 4        | 3                    | 2 | 1                        | 0 |
| RX              | 0□                            | Digital input (channel 0-F: corresponds to bit address 0-F)  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1□                            | Error  | IO-Link ready | Synchronization established | Reserved | Latest error channel |   |   |   | Event                  | I/O power supply      | Output overcurrent | Reserved | Latest event channel |   |                          |   |
| RY              | 0□                            | Digital output (channel 0-F: corresponds to bit address 0-F) |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1□                            | Clear the latest error                                       | Reserved      |                             |          |                      |   |   |   | Clear the latest event | Encoder counter reset | Reserved           |          |                      |   | Extended access disabled |   |
| RW <sub>r</sub> | 00                            | Process input data channel 0 (*2)                            |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 01                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 02                            | Process input data channel 1 (*2)                            |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 03                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | ...                           | ...  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1E                            | Process input data channel F (*2)                            |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1F                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
| RW <sub>w</sub> | 00                            | Process output data channel 0 (*2)                           |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 01                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 02                            | Process output data channel 1 (*2)                           |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 03                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | ...                           | ...  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1E                            | Process output data channel F (*2)                           |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |
|                 | 1F                            |  |               |                             |          |                      |   |   |   |                        |                       |                    |          |                      |   |                          |   |

\*1: Depending on the CC-Link IE Field Basic master product, some bit addresses are only 0 to 7. In that case, bit addresses 8 to F can be accessed with the following word (byte) address.

\*2: Process input and output data are assigned two words (four bytes) per channel at default values.

With the product master parameters “M40. Process input data words allocation” or “M41. Process output data words allocation,” it is possible to allocate nothing or to change to a different number of words.

With the product master parameter “M42. Process data words auto allocation,” automatic setting of M40/M41 above is possible from the actual IO-Link device specifications.

## Assigned Data Content (during normal allocation)

### Digital input/digital output (SIO mode) and product status/operation flags

- Input from this product to CC-Link IE Field Basic master station

| Assignment                            | Category                  | Host master station assigned link device address (Start number +) | Data name                          | Description   |
|---------------------------------------|---------------------------|---|------------------------------------|---|
| Host master station remote input (RX) | Digital input in SIO mode | RX00 to 0F  | Digital input (channel 0-F)        | Digital input data in SIO mode (PNP input or NPN input).<br>In IO-Link mode, the least-significant value of the bit data defined in process input data format is reflected (this function does not exist on the process data output side).  |
|                                       | Product status            | RX1F  | Error flag                         | Changes to 1 (ON) when an error is generated in this product.<br>When this flag is at 1 (ON), access the "Latest error code readout by channel" through acyclic communication.<br>Refer to "App-1-2 Data for Access from PLC" for "Latest error code readout by channel."   |
|                                       |                           | RX1E  | IO-Link ready flag                 | When communication is established with all IO-Link devices and cyclic communication with the CC-Link IE Field Basic master station, if this flag is at 1 (ON), execute read and write with the IO-Link devices through cyclic or acyclic communication.<br>Note: This flag will go to 1 (ON) even when not all channels' I/O setting assignments are in IO-Link mode. |
|                                       |                           | RX1D  | Synchronization establishment flag | Changes to 1 (ON) when I/O synchronization (set value number: M21) is set to any of 2/3/4/5/6 (0.4 ms/0.8 ms/1.6 ms/3.2 ms/6.4 ms cycle), while the internal timer in this product is synchronized (within +/-20 $\mu$ s) with the network time.  |
|                                       |                           | RX18 to 1C  | Latest error channel               | Channel number of the latest generated error.<br>When accessing the "Latest error code readout by channel" through acyclic communication, specify the channel based on this value.  |
|                                       |                           | RX17  | Event flag                         | Changes to 1 (ON) when an event is occurring in one of the connected IO-Link devices.<br>When this flag is at 1 (ON), access the "Event data readout by channel" data through acyclic communication.<br>Refer to "App-1-2 Data for Access from PLC" for "Latest event data readout by channel".   |
|                                       |                           | RX16  | I/O power supply flag              | Changes to 1 (ON) when power is being supplied for I/O by the I/O power supply.   |
|                                       |                           | RX15  | Output overcurrent flag            | Changes to 1 (ON) when overcurrent is generated in SIO (output).  |
|                                       |                           | RX10 to 13  | Latest event channel               | Channel number of the latest generated event.<br>When accessing the "Event data readout by channel" through acyclic communication, specify the channel based on this value.   |



- Output from CC-Link IE Field Basic master station to this product

| Assignment                             | Category                   | Host master station assigned link device address (Start number +) | Data name                       | Description   |
|--|----------------------------|---|---------------------------------|---|
| Host master station remote output (RY) | Digital output in SIO mode | RY00 to 0F  | Digital output (channel 0 to F) | Digital output data in SIO mode (PNP output or NPN output).   |
|  | Product operation flag     | RY1F  | Clear the latest error          | When starting up from 0 (OFF) to 1 (ON), the latest errors are cleared.   |
|  |                            | RY17  | Clear the latest event          | When starting up from 0 (OFF) to 1 (ON), the latest events are cleared.   |
|  |                            | RY16  | Encoder counter reset           | If a SIO device is the encoder, when starting up from 0 (OFF) to 1 (ON), the product internal high-speed counter is reset.                            |
|  |                            | RY10  | Extended access enable flag     | Specify extended access disabled (normal) assignment as the assignment method for the cyclic communication area.<br>0 (OFF): Extended access disabled |

## ● Process data

- Input from this product to CC-Link IE Field Basic master station

| Type and direction         | Assignment                                | Host master station assigned link device address (Start number +) | Data name                         | Description  |
|----------------------------|---|---|-----------------------------------|--|
| Input from IO-Link devices | Host master station remote register (RWw) | RWr00 to 1F   | Process input data Channels 0 - F | Process input data in IO-Link communication mode.<br>Two words (four bytes) per channel at default values. |

- Output from CC-Link IE Field Basic master station to this product

| Type and direction        | Assignment                                | Host master station assigned link device address (Start number +) | Data name                          | Description   |
|---------------------------|---|---|------------------------------------|---|
| Output to IO-Link devices | Host master station remote register (RWw) | RWw00 to 1F   | Process output data Channels 0 - F | Process output data in IO-Link communication mode.<br>Two words (four bytes) per channel at default values. |

IO-Link device process data is converted to little endian format with default values within the product. The “Process data LSB/MSB” master parameter can be used to change this to big endian format for each channel.

### 3-3-3 Extended Access Enabled Assignment

The master station link device allocation to this product when “Extended access enable flag” (RY10) is set to 1 (ON: Extended access enabled) is as below.

The area in yellow below is data only when extended access is enabled.

| Link device     | Word address (Start number +) | Bit address  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|-----------------|-------------------------------|--|---------------|-----------------------------|--------------------------------|---|---|---|---|----------------------------------|-----------------------|--------------------|------------------|----------------------|---------------|--------------|-------------------------|
|                 |                               | F  | E             | D                           | C                              | B   | A | 9 | 8 | 7                                | 6                     | 5                  | 4                | 3                    | 2             | 1            | 0                       |
| RX              | 0□                            | Digital input (channel 0-F: corresponds to bit address 0-F)  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1□                            | Error  | IO-Link ready | Synchronization established | Access error                   | Latest error channel                      |   |   |   | Event                            | I/O power supply      | Output overcurrent | Access completed | Latest event channel |               |              |                         |
| RY              | 0□                            | Digital output (channel 0-F: corresponds to bit address 0-F) |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1□                            | Clear the latest error                                       | Reserved      | Little endian access        | To access UR-ES16DT parameters | Applicable IO-Link channel (0 to F)       |   |   |   | Clear the latest event           | Encoder counter reset | Reserved           |                  |                      | Write request | Read request | Extended access enabled |
| RW <sub>r</sub> | 00                            | Process input data channel 0 (*1)                            |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 01                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 02                            | Process input data channel 1 (*1)                            |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 03                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | ...                           | ...  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1C                            | Process input data channel E (*1)                            |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1D                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1E                            | Extended access read data                                    |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1F                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
| RW <sub>w</sub> | 00                            | Process output data channel 0 (*1)                           |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 01                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 02                            | Process output data channel 1 (*1)                           |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 03                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | ...                           | ...  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1A                            | Process output data channel D (*1)                           |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1B                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1C                            | Index number or setting value number specification           |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 |                               | Unit No. of sensor unit connected to UC2-IOL                 |               |                             |                                |   |   |   |   | (Index number (lower byte))      |                       |                    |                  |                      |               |              |                         |
|                 | 1D                            | Reserved   |               |                             |                                | Byte length or target selection to access |   |   |   | Subindex number or target number |                       |                    |                  |                      |               |              |                         |
|                 | 1E                            | Extended access write data                                   |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |
|                 | 1F                            |  |               |                             |                                |   |   |   |   |                                  |                       |                    |                  |                      |               |              |                         |

\*1: Process input and output data are assigned two words per channel at default values.

With the product master parameters “M40. Process input data words allocation” or “M41. Process output data words allocation,” it is possible to change as below.

No allocation or different number of words

With the product master parameter “M42. Process data words auto allocation,” automatic setting of M40/M41 above is possible from the actual IO-Link device specifications.

## ■ Assignment Data Details (when extended access is enabled)

### ● Digital input/digital output (SIO mode) and product status/operation flags

- Input from this product to CC-Link IE Field Basic master station

| Assignment                            | Category                  | Host master station assigned link device address (Start number +) | Data name   | Description  |
|---------------------------------------|---------------------------|---|---|--|
| Host master station remote input (RX) | Digital input in SIO mode | RX00 to 0F  | Digital input (channel 0-F)                           | Digital input data in SIO mode (PNP input or NPN input). In IO-Link mode, the least-significant value of the bit data defined in process input data format is reflected. (This function does not exist on the process output data side.)   |
|                                       | Product status            | RX1F  | Error flag  | Changes to 1 (ON) when an error is generated in this product. When this flag is at 1 (ON), access the "Latest error code readout by channel" through acyclic communication. Refer to "App-1-2 Data for Access from PLC" for "Latest error code readout by channel" data.   |
|                                       |                           | RX1E  | IO-Link ready flag                                    | When communication is established with all IO-Link devices and cyclic communication with the CC-Link IE Field Basic master station, if this flag is at 1 (ON), execute read and write with the IO-Link devices through cyclic or acyclic communication. Note: This flag will go to 1 (ON) even when not all channels' I/O setting assignments are in IO-Link mode. |
|                                       |                           | RX1D  | Synchronization establishment flag                    | Changes to 1 (ON) when I/O synchronization (set value number: M21) is set to any of 2/3/4/5/6 (0.4 ms/0.8 ms/1.6 ms/3.2 ms/6.4 ms cycle), while the internal timer in this product is synchronized (within +/-20 $\mu$ s) with the network time.   |
|                                       |                           | RX1C  | Access error (Extended access enabled assignment)     | Changes to 1 (ON) along with the access completed bit if an error occurs when requesting reading/writing.  |
|                                       |                           | RX18 to 1B  | Latest error channel                                  | Channel number of the latest generated error. When accessing the "Latest error code readout by channel" through acyclic communication, specify the channel based on this value.  |
|                                       |                           | RX17  | Event flag  | Changes to 1 (ON) when an event is occurring in one of the connected IO-Link devices. When this flag is at 1 (ON), access the "Event data readout by channel" data through acyclic communication. Refer to "App-1-2 Data for Access from PLC" for "Latest event data readout by channel".  |
|                                       |                           | RX16  | I/O power supply flag                                 | Changes to 1 (ON) when power is being supplied for I/O by the I/O power supply.  |
|                                       |                           | RX15  | Output overcurrent flag                               | Changes to 1 (ON) when overcurrent is generated in SIO (output).   |
|                                       |                           | RX14  | Access completed (Extended access enabled assignment) | Turns ON when reading/writing has completed. If the read/write request bit is turned off, this bit will also change to 0 (OFF).  |
|                                       |                           | RX10 to 13  | Latest event channel                                  | Channel number of the latest generated event. When accessing the "Event data readout by channel" through acyclic communication, specify the channel based on this value.   |

- Output from CC-Link IE Field Basic master station to this product

| Assignment                             | Category                   | Host master station assigned link device address (Start number +) | Data name   | Description  |
|--|----------------------------|---|---|--|
| Host master station remote output (RY) | Digital output in SIO mode | RY00 to 0F  | Digital output (channel 0 to F)   | Digital output data in SIO mode (PNP output or NPN output).  |
|  | Product operation flag     | RY1F  | Clear the latest error  | When starting up from 0 (OFF) to 1 (ON), the latest errors are cleared.  |
|  |                            | RY1D  | Little endian access (Extended access enabled assignment only)                      | Specify the byte unit order for "Extended access read data" or "Extended access write data".<br>1 (ON): Read and write service data (setting values, etc.) in the IO-Link device in little endian format. Set to 1 (ON) when reading and writing general service data in the IO-Link device.<br>0 (OFF): Read and write service data (setting values, etc.) in the IO-Link device in big endian format.  |
|  |                            | RY1C  | To access UR-ES16DT parameters (Extended access enabled assignment only)            | Designate the extended access destination as either this product or an IO-Link device (including sensor units connected to UC2-IOL).<br>1 (ON): Designates access to this product's master parameters.<br>Note: Reading/writing product master parameter data is in little endian format (fixed).<br>0 (OFF): Specify to access service data (setting value, etc.) in the IO-Link device, or access "specific data" from a sensor unit connected to UC2-IOL. |
|  |                            | RY18 to RY1B  | Channel No. of IO-Link to access (0 to F) (Extended access enabled assignment only) | If "To access UR-ES16DT parameters" is 0 (OFF), specify the IO-Link device channel number to access.   |
|  |                            | RY17  | Clear the latest event  | When starting up from 0 (OFF) to 1 (ON), the latest events are cleared.  |
|  |                            | RY16  | Encoder counter reset   | If a SIO device is the encoder, when starting up from 0 (OFF) to 1 (ON), the product internal high-speed counter is reset.   |
|  |                            | RY12  | Write request (Extended access enabled assignment only)                             | When this bit starts up, the designated data writing begins.   |
|  |                            | RY11  | Read request (Extended access enabled assignment only)                              | When this bit starts up, the designated data reading begins.   |
|  |                            | RY10  | Extended access enable flag   | Specify extended access enabled assignment as the assignment method for the cyclic communication area.<br>1 (ON): Extended access enabled  |

## ● Process data/extended access-related data

- Input from this product to CC-Link IE Field Basic master station

| Assignment                                | Category                   | Host master station assigned link device address (Start number +) | Data name                         | Description   |
|---|----------------------------|---|-----------------------------------|---|
| Host master station remote register (RWr) | Input from IO-Link devices | RWr00 to RWr1D  | Process input data Channel 0 to E | Process input data in IO-Link communication mode. Two words (four bytes) per channel at default values.   |
|   | Extended access read data  | RWr1E, RWr1F  | Extended access read data         | The value read during extended access. Two words (four bytes).<br>If "Little endian access" is 1 (ON), the byte address +500 will be the lowest-order byte.<br><ul style="list-style-type: none"> <li>• Upon a read request, the data read from the target (this product, the IO-Link device, or the target sensor unit connected to UC2-IOL) is stored.</li> <li>• For a write request, a value of 0 will be stored when the operation is complete.</li> <li>• If there is an access error the extended access error code will be stored. Refer to the "Extended access error code list" later in this document for details on extended access error codes.</li> </ul> |

- Output from CC-Link IE Field Basic master station to this product

| Assignment                                | Category                       | Host master station assigned link device address (Start number +) | Data name  | Description  |
|---|--------------------------------|---|--|--|
| Host master station remote register (RWw) | Output to IO-Link devices      | RWw00 to 1B   | Process output data channel 0 - D                  | Process output data in IO-Link communication mode. Two words (four bytes) per channel at default values.   |
|   | Extended access specified data | RWw1C   | Index number or setting value number specification | When byte length or target selection to access is 1 to 4 bytes (reading/writing of 1- to 4-byte data), designate the index number of the service data (setting values, etc.) inside the target IO-Link device, the product IO-Link device setting, or designate the setting of the product master parameter setting value number.  |
|   |                                | RWw1C bit address 8 to F  | Unit No. of sensor unit connected to UC2-IOL       | If "byte length or target selection to access" is set to 0 (UC2-IOL mode), specify the connection order as 0 through F, beginning from the left edge of the target sensor unit interconnected with OPTEx FA IO-Link gateway UC2-IOL.   |
|   |                                | RWw1D bit address 8 to A  | Byte length or target selection to access          | Designate whether the read/write target is the target sensor unit connected to the OPTEx FA IO-Link gateway UC2-IOL, or a connected IO-Link device on an arbitrary channel or this product's master parameters (in that case, also designate the read/write data size at the same time).<br>0: Read and write target is the "specific data" of a target sensor unit interconnected with UC2-IOL (2-byte data)<br>1 to 4: Reading/writing 1- to 4-byte data (the read/write target is the connected IO-Link device or this product's master parameters) |
|   |                                | RWw1D bit address 0 to 7  | Subindex number or target number                   | When byte length or target selection to access is 1 to 4 bytes (reading/writing of 1- to 4-byte data), designate the subindex number of the service data (setting values, etc.) inside the target IO-Link device or the product master parameter target number.  |

| Assignment | Category                   | Host master station assigned link device address (Start number +) | Data name                  | Description   |
|------------|----------------------------|---|----------------------------|---|
|            | Extended access write data | RWw1E, RWw1F  | Extended access write data | Specify the setting value to write via extended access. The data length is two words (four bytes) maximum.<br>Upon a write request, this value will be sent to the target (this product, the IO-Link device, or the target sensor unit connected to UC2-IOL). If "Little endian access" is 1 (ON), RWw1E bit address 0 through 7 will be the lowest-order byte. |

IO-Link device process data is converted to little endian format with default values within the product.

The "Process data LSB/MSB" master parameter can be used to change this to big endian format for each channel.

## ● Extended access error code list

The following error codes are stored in the front byte (RWw1E bits 0 through 7) of the extended access read data when an access error occurs during extended access.

| Error code | Details   |
|------------|---|
| 11 h       | The specified index number does not exist in the IO-Link device for which reading was attempted.  |
| 23 h       | Failed to write setting value (attempted to write a read-only setting value).                     |
| 30 h       | Outside the range of setting value write data.  |
| 33 h       | The set value data for which writing was attempted is too long.                                   |
| 34 h       | The read setting value data length is 0 (read error).   |
| 80 h       | The channel number to be accessed is out of range.  |
| 81 h       | The IO-Link device for which set value writing was attempted is not connected.                    |
| 82 h       | The IO-Link device for which set value writing was attempted does not support ISDU communication. |
| 90 h       | IODD installation data format error.  |
| 91 h       | IODD installation checksum error.   |
| 92 h       | IODD installation address error.  |
| 93 h       | IODD installation address discontinuous error.  |
| 94 h       | Cannot be executed when the storage function is BUSY.   |

### 3-3-4 Process Data Words Allocation Example

Below are allocation to this product, allocation to the host master station link device (in this case, a word unit remote register is used for the example), and an actual allocation device example with an IO-Link device connected to this product.

| Product channel | IO-Link device process data size example |                     | Result of product auto allocation execution |                     | Host master station remote register                    |  | Host master station actual device example |  |
|-----------------|--|---------------------|---|---------------------|--|--|---|--|
|                 | Process input data                       | Process output data | Process input data                          | Process output data | RWr<br>(address hexadecimal)<br>Ex.: RWr/RWr start: 00 | RWw<br>(address hexadecimal)<br>Ex.: RWw/RWr start: 00 | Ex.:<br>W100 up<br>(address hexadecimal)  | Ex.:<br>W200 up<br>(address hexadecimal) |
|                 | byte count                               | byte count          | word count                                  | word count          |  |  |   |  |
| 0               | 2  | 0                   | 1   | 0                   | RWr00  | -  | W100                                      | -  |
| 1               | 2  | 0                   | 1   | 0                   | RWr01  | -  | W101                                      | -  |
| 2               | 0  | 2                   | 0   | 1                   | -  | RWw00  | -   | W200                                     |
| 3               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| 4               | 4  | 0                   | 2   | 0                   | RWr02 - 03   | -  | W102 - 103                                | -  |
| 5               | 3  | 0                   | 2   | 0                   | RWr04 - 05   | -  | W104 - 105                                | -  |
| 6               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| 7               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| 8               | 16                                       | 0                   | 8   | 0                   | RWr06 - 0D   | -  | W106 - 10D                                | -  |
| 9               | 0  | 1                   | 0   | 1                   | -  | RWw01  | -   | W201                                     |
| A               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| B               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| C               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| D               | 4  | 0                   | 2   | 0                   | RWr0E - 0F   | -  | W10E - 10F                                | -  |
| E               | Not used                                 |                     | 0   | 0                   |  |  |   |  |
| F               | Not used                                 |                     | 0   | 0                   |  |  |   |  |

#### CAUTION

- When either input or output exceeds a total of 32 words (64 bytes), the process data exceeding the total will not be assigned to the host master station (it will be ignored).

To connect a maximum of 16 IO-Link devices to this product, the following conditions are required.

Product process data size with the connected IO-Link device group:

Input: Total of 32 words (64 bytes) over all channels

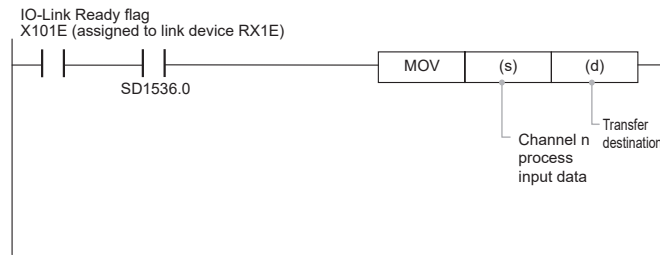
Output: Total of 32 words (64 bytes) over all channels

### 3-3-5 Process Data Reading and Writing Methods

When the IO-Link Ready flag is ON and the CC-Link IE Field Basic data link is normal, read process data.

Ex.: Reading process input data from an IO-Link device on a given channel

With input conditions of link device assigned the IO-Link Ready flag (for instance X101E) ON and SD1536 (cyclic transmission status of each station; when product station number = 1 (among stations 1 to 16)) ON, read out.

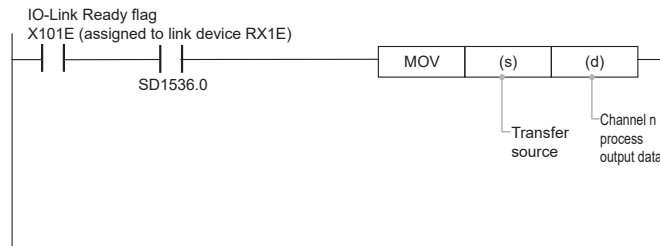


When the IO-Link Ready flag is ON and the CC-Link IE Field Basic data link is normal, write process data.

Ex.: Writing process output data from an IO-Link device on a given channel

With input conditions of link device assigned the IO-Link Ready flag (for instance X101E) ON and SD1536 (cyclic transmission status of each station; when product station number = 1 (among stations 1 to 16)) ON, write.

Because there is a communication abnormality when the IO-Link Ready flag is 0 (OFF), handle data transfer destinations suitably.



#### CAUTION

When the IO-Link Ready flag is 1 (ON), read and write process data.



### 3-3-6 Assignment Data List by Objective with Extended Access Enabled

3

Communication

| Assigned data   | Extended access | Byte length or target selection to access | Channel No. of IO-Link to access | Little endian access             | To access UR-ES16DT parameters | Index number or setting value number                                    | Subindex number or target number | Connection order from left end of target sensor unit | Write                         | Read | Read/write size designation   |
|---|-----------------|---|----------------------------------|----------------------------------|--------------------------------|---|----------------------------------|--|-------------------------------|------|---|
| Link device address   | RY10            | RWw1D bit address 8 to A                  | RY18 to RY1B                     | RY1D                             | RY1C                           | RWw1C   | RWw1D bit address 0 to 7         | RWw1C bit address 8 to F                             | RY12                          | RY11 | Depends on byte length or target selection to access                |
| In this situation   |                 |   |                                  |                                  |                                |   |                                  |  |                               |      |   |
| To read/write product master parameters to/from cyclic data                         | 1(ON)           | 1 to 4 (designate byte length)            | Irrelevant                       | Irrelevant (little endian fixed) | 1(ON)                          | IO-Link device setting or product master parameter setting value number | Master parameter target channel  | Irrelevant   | 1 (ON) or 0 (OFF) designation |      | Depends on byte length or target selection to access (1 to 4 bytes) |
| To designate designated IO-Link device index/subindex and read/write data to cyclic |                 | 1 to 4                                    | Designation                      | 1 (ON): Little endian format     | 0(OFF)                         | Index number  | Subindex number                  | Irrelevant   |                               |      | Depends on byte length or target selection to access (1 to 4 bytes) |
| To read/write "specific data" in a sensor unit connected to UC2-IOL to cyclic       |                 | 0   |                                  |                                  |                                | Irrelevant  |                                  | Designation  |                               |      | No designation (2-byte fixed)                                       |

#### MEMO

An example of the "specific data" in sensor units connected to UC2-IOL, as an extended access target, is below (as of June 2021).

- For Digital Fiber Amplifier D3RF Series  
Index number 110 (6E h): Lower threshold (Far) setting for output 1
- For White Light LED Digital Fiber Amplifier D3WF Series  
Index number 110 (6E h): Lower threshold (Far) setting for output 1
- For CDA Series displacement sensor-amplifier unit  
When the connected sensor is CD22 or TD1, set 108 (6Ch): near threshold and 109 (6Dh): far threshold

#### MEMO

When the read/write target is a sensor unit connected to UC2-IOL, the user must know what channel UC2-IOL is connected to and what sensor unit is connected in what position.

## 3-3-7 Actual Access Extension Methods

When the IO-Link Ready flag is at 1 (ON) and the CC-Link IE Field Basic data link is normal, read/write the specific address of the specific target via extended access.

### ■ To Write to IO-Link Device Service Data Via Extended Access

- Set extended access (RY10) = 1 (ON).
- Designate the target channel with target IO-Link channel designation (RY18 to RY1B).
- Designate the index number with the index number (RWw1C) and the subindex with the subindex number (output RWw1D, bit address 0 to 7).
- Designate the target IO-Link device service data in little endian format, and set the little endian access (RY1D) to 1 (ON).
- Set the data to be written to extended access write data (RWw1E, RWw1F). When setting little endian access (RY1D) to 1 (ON) as above, write data will be stored in little endian format. RWw1E bits 0 to 7 are the lowest-order bytes and RWw1F bits 8 to F are the highest-order bytes.
- Designate the byte length (1 to 4) to write with the byte length or target selection to access (RWw1D bit address 8 to A).
- When writing, the write request bit (RY12) will change from 0 (OFF) to 1 (ON) as it starts up.
- When access completed = 1 (ON), writing is complete. However, when access error = 1 (ON) at the same time, an error has occurred. Check the extended access read data (RWw1E bit address 0 to 7) error code list.

### ■ To Write to Target Sensor Unit Connected to OPTEX FA IO-Link Gateway UC2-IOL Via Extended Access

- Set extended access (RY10) = 1 (ON).
- Designate the channel in which UC2-IOL is connected to this product with target IO-Link channel designation (RY18 to RY1B).
- Designate the connection order of target sensor units connected to UC2-IOL from the left end, using target sensor unit designation (RWw1C, bit address 8 to F). For example, when designating the leftmost unit, 0 is stored.  
  
Note: The target “specified data” within the target sensor unit includes, if the sensor unit is, for example, the Digital Fiber Amplifier D3RF Series, the index number 110 (6E h) output 1 lower threshold (Far) setting, etc.
- Set the data to be written to extended access write data (RWw1E, RWw1F). When converting to little endian format as below, write data will be stored in little endian format. RWw1E bits 0 to 7 are the low-order bytes and RWw1E bits 8 to F are the high-order bytes.
- UC2-IOL data is in big endian format, so when converting to little endian format, set the little endian access (RY1D) to 1 (ON).
- Store “0” and designate UC2-IOL as the read/write target with the byte length or target selection to access (RWw1D bit address 8 to A).
- When writing, the write request bit (RY12) will change from 0 (OFF) to 1 (ON) as it starts up.

## ■ To Write to Product Master Parameters Via Extended Access

- Set extended access (RY10) = 1 (ON).
- Designate product master parameters with UR-ES16DT (RY1C).
- Designate the setting value number with the setting value number (RWw1C) and the target number with the target channel (RWw1D, bit address 0 to 7).
- Set the data to be written to extended access write data (RWw1E, RWw1F). Store write data as little endian format. RWw1E bits 0 to 7 are the lowest-order bytes and RWw1F bits 8 to F are the highest-order bytes.
- Designate the byte length to write with the byte length or target selection to access (RWw1D bit address 8 to A).
- When writing, the write request bit (RY12) will change from 0 (OFF) to 1 (ON) as it starts up.
- When access completed = 1 (ON), writing is complete. However, when access error = 1 (ON) at the same time, an error has occurred. Check the extended access read data error code list.

## 3-4 Acyclic Communication (socket or Modbus/TCP communication)

This product supports socket communication (UDP/IP or TCP/IP) or Modbus/TCP communication with regard to acyclic communication.

Thereby, reading/writing of product master parameters and IO-Link device internal service data is possible, as well as reading of process data. However, neither socket communication nor Modbus/TCP communication is capable of writing process data.

Further, this product can perform acyclic communication (ISDU communication) with IO-Link devices based on socket communication or Modbus/TCP communication from the host.

### 3-4-1 Socket Communication (UDP/IP or TCP/IP)

When the product network type is set to “CC-Link IE Field Basic,” access is possible via socket communication (UDP/IP or TCP/IP) from the client to the product.

Access methods include from a Module FB for Mitsubishi Electric PLC or via creation of a socket communication program.

#### ■ Using a Module FB for Mitsubishi Electric PLC

OPTEX FA offers a Module FB for Mitsubishi Electric PLCs. The interior is a socket communication program. The use thereof enables setting/reading of IO-Link devices connected to the product or of product master parameters via a Mitsubishi Electric PLC (iQ-F Series).

- FB to read parameter: UDP\_READ
- Module FB for writing: UDP\_WRITE

Image of UDP\_READ in use

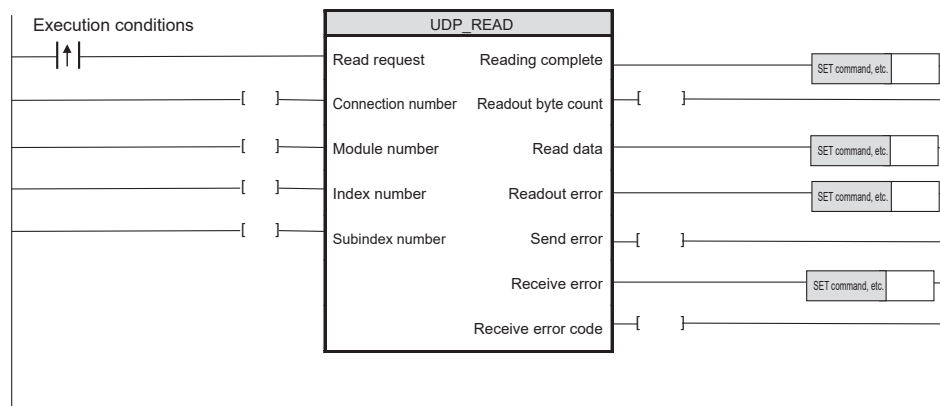
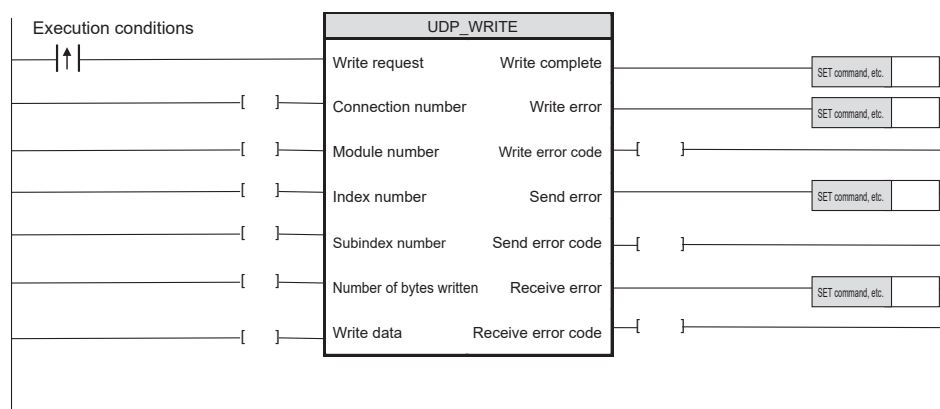


Image of UDP\_WRITE in use



Download the above Module FB as needed from the OPTEX FA website below.

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

Conditions for the use of a Mitsubishi Electric PLC are as follows.

- Module:  
CPU module: iQ-F Series (FX5, FX5U, etc.)  
Ethernet connection: CPU module built-in Ethernet port
- Engineering tool: GXWorks3

Refer to “App-1 List of Product Master Parameters” for product master parameters.

Refer to each IO-Link device index list for their index numbers and subindex numbers.

## ■ Socket Communication Program

After port open processing, the client sends or receives the following data to the product. When data transmission is complete, the port is closed.

Data configuration for data transmission between the client and this product is as below.

Transmitted data

| Byte length | Data meaning              | Data value  | Description  |
|-------------|---------------------------|-------------|--|
| +0          | Command                   | 53 h        | Data access request  |
| +1          | Transfer data designation | Bit 0       | Reading process input data/digital input data/allocated status data (*1)<br>Reads out a total of fixed 32 words for all used channels + 1 word digital input + 1 word allocated status data as a batch.  |
|             |                           | Bit 2       | Setting value access   |
|             |                           | Bit 3       | Execute by writing setting value access  |
|             |                           | Bit 4       | Background access mode<br>(When reading/writing data to/from slow IO-Link devices, execution will take place without stopping socket communication from elsewhere.)<br>Also, the normal response code in this mode when bit 2 (setting value access) is 1 will be 62 h (reading) or 42 h (writing). When bit 2 (setting value access) is 0, confirm the response to the command sent immediately before. |
|             |                           | Bit 5       | Background access mode forced cancel   |
|             |                           | Bits 7 to 6 | Reserved (0)   |

| Byte length      | Data meaning  | Data value   | Description   |
|------------------|---|--------------|---|
| +2               | Module designation  | 80 h to 8F h | IO-Link device channel 0 to 15  |
|                  |   | C0 h to CF h | Data length 4 bytes or less for IO-Link devices channels 0 to 15 will be handled as little endian |
|                  |   | FF h         | Product master parameters   |
| +3               | Index number or master parameter number (low-order byte)  |              | Setting value access index number (low-order byte) or master parameter number (low-order)         |
| +4               | Index number or master parameter number (high-order byte) |              | Setting value access index number (high-order byte) or master parameter number (high-order)       |
| +5               | Subindex number   |              | Setting value access subindex number  |
| +6               | Write data  |              | Reading setting value byte length * (2 bytes) or writing setting value (1 to 500 bytes) continue. |
| +7               | “   |              |   |
| (below likewise) |   |              |   |

\*1: Allocated status data

Allocated status data is composed of the following bits.

| Bit     | Data Name               |
|---------|-------------------------|
| 15      | Error flag              |
| 14      | IO-Link ready flag      |
| 8 to 11 | Latest error channel    |
| 7       | Event flag              |
| 6       | I/O power supply flag   |
| 5       | Output overcurrent flag |
| 0 to 3  | Latest event channel    |

For data content, refer to {Product status data reading} in “4-1 Product Functions” of Common Edition.

\*When the setting value byte length for reading is set to 0, the response will correspond to the actual setting value length. In that case, the maximum readable byte length is 500 bytes.

\*When the transfer data designation is 10 h, there is no need to send the reading setting value byte length.

## ● Received data

| Byte length      | Data meaning                    | Data value | Description  |
|------------------|---------------------------------|------------|--|
| +0               | Response code                   | 41 h       | Setting value writing normal response  |
|                  |                                 | 4E h       | No data designation response   |
|                  |                                 | 61 h       | Setting value reading normal response  |
|                  |                                 | 62 h       | Setting value reading data in preparation in background access mode  |
|                  |                                 | 42 h       | Setting value writing processing in background access mode   |
|                  |                                 | 51 h       | Background access mode cancel complete   |
|                  |                                 | 45 h       | Setting value writing abnormal response  |
|                  |                                 | 46 h       | Setting value writing abnormal response (extended error code)  |
|                  |                                 | 65 h       | Setting value reading abnormal response  |
|                  |                                 | 66 h       | Setting value reading abnormal response (extended error code)  |
| +1               | Error code                      | 00 h       | Normal   |
|                  |                                 | 02 h       | Received socket data is too short  |
|                  |                                 | 03 h       | Timeout generated in setting value access  |
|                  |                                 | 04 h       | An unexpected response has returned in setting value access  |
|                  |                                 | 05 h       | Module designation value is out of range   |
|                  |                                 | 06 h       | Readout byte count is too long (over 500 bytes)  |
|                  |                                 | 07 h       | Additional access request made during data access<br>*After making a background access request, be sure to set the send data +1 transfer data designation to 10 h and complete reading or writing, or to 20 h and interrupt. |
|                  |                                 | 08 h       | Background access has not been executed even once  |
|                  | Extended error code             |            |  |
| +2               | Read data or next response code |            | Read data is a setting value (1 to 500 bytes).<br>Ex.: Normal response when transfer data designation is 07 h 70 h, 00 h, process input data 68 bytes, 50 h, 00 h, 61 h, 00 h, setting value read data                       |
| +3               | "                               |            |  |
| (below likewise) |                                 |            |  |

## ■ Example of Data Transmission

Below is an example of data transmission to/from this product using socket communication.

### ● Ex.: Master parameter reading

Reads the product's master parameter number 8.

- Send data string (master parameter reading)

| Byte order | Data value | Description  |
|------------|------------|--|
| +0         | 53 h       | Command  |
| +1         | 04 h       | Bit 3 = read designation (0), bit 2 = setting value access |
| +2         | FF h       | Module designation = product master parameters             |
| +3         | 08 h       | Master parameter number (decimal 8) low order              |
| +4         | 00 h       | Master parameter number (decimal 8) high order             |

| Byte order | Data value | Description   |
|------------|------------|---|
| +5         | 00 h       | Subindex number (decimal 0)   |
| +6         | 00 h       | Reading setting value byte length (decimal 0) low order<br>Note: For 0, only the actual data count is read. |
| +7         | 00 h       | Reading setting value byte length (decimal 0) high order  |

- Response data string

| Byte order | Data value | Description  |
|------------|------------|--|
| +0         | 61 h       | Setting value reading normal response              |
| +1         | 00 h       | Normal response code                               |
|            | 30 h       | Read data (beginning of character string "012345") |
|            | 31 h       | Read data (2nd byte of character string "012345")  |
|            | 32 h       | Read data (3rd byte of character string "012345")  |
|            | 33 h       | Read data (4th byte of character string "012345")  |
|            | 34 h       | Read data (5th byte of character string "012345")  |
|            | 35 h       | Read data (6th byte of character string "012345")  |

## 3-4-2 Modbus/TCP Communication

When the product network type is set to "CC-Link IE Field Basic," access is possible via Modbus/TCP communication from the Modbus/TCP master to the product.

The register numbers below can be accessed.

| Register number | Category                           | Details  |
|-----------------|------------------------------------|--|
| 00000 to 00067  | Product operation-related          | This area is for operation of this product from UI devices such as HMI (display)/SCADA.<br>It includes the display indicator character string readout, button operation read/write, display screen switching, and operation lock.  |
| 00068 to 00070  | Network time-related               | The time counted within this product.  |
| 00071 to 00087  | Status-related                     | This includes content related to allocated status data, errors, and events.  |
| 00088           | Operations                         | Operations such as error clearing are conducted.   |
| 00089 to 00345  | Digital/process data input-related | SIO digital input and IO-Link process input data (32 bytes/channel).<br>Note: The content below is for readout only.<br>00346: Digital data output<br>00347 to 00602: Process data output  |
| 00603 to 03871  | Index access library-related       | This is a library area for ISDU communication with IO-Link devices (including sensor units connected to UC2-IOL).<br>In order to designate an arbitrary index/subindex and read/write to/from connected IO-Link devices (including sensor units connected to UC2-IOL), this area registers channel number/index number designations, etc. (up to 128 items) to a library (called the index access library) and gives operation instructions. |



| Register number | Category  | Details  |
|-----------------|---|--|
| 03872 to 04123  | Registered register number library-related  | This area registers product non-sequential register numbers in a library (called the registered register number library) in advance and batch-reads designation sizes beginning with one of these numbers.<br>Available only when reading from the Modbus/TCP master (possible only with function codes 03 h or 17 h). Not used for writing.<br>One area registers frequently designated arbitrary register numbers (up to 125 items) as a library, another designates readout size, and a third contains execution data for the registered register number library. |
| 04124 to 04126  | Index access library/ registered register number library backup operation-related | This area conducts backup (save) operation of the index access library (0070 to 03871) and registered register number library (3872 to 3997) data to product non-volatile memory.<br>When the power is next turned on, rewriting to the index access library or registered register number library on the user's part is not required.   |
| 05500 to 06565  | Master parameter-related  | This area reads and writes product master parameters.  |

For details of the product holding register designated during Modbus/TCP communication, refer to 3-2-2 “Detailed list of register numbers” in the Ethernet & Modbus/TCP Edition.

### 3-4-3 Event Communication

If there is an extreme pressure drop, etc., with an IO-Link device on a given channel, the product spontaneously receives the event code and event type sent from the IO-Link device and saves it in product memory.

At this time, the event flag (allocated to host master station RX17) turns ON, and the channel number where the event took place is stored in “Latest Event channel” (allocated to host master station RX10 to 13).

On this condition, from the Module FB for Mitsubishi Electric PLC or a client socket communication program, it is possible to access the master parameter “event data readout” and read out the event code and event type.

Thereby, the following IO-Link device phenomena can be grasped on the host master station side when they occur.

Errors (ex.: breakdowns, short-circuits) and maintenance information (ex.: maintenance predictive period complete)

Refer to each IO-Link device index list for their event codes.

## 3-5 Specific Communication Examples (including sample programs)

### 3-5-1 Example of Cyclic Communication

Below is an example of combining IO-Link communication and SIO for cyclic communication.

#### ■ Example Combining IO-Link Communication and SIO

Process input data (4 bytes) from the channel 0 IO-Link device is read from the lower direction (default value).

Process output data (4 bytes) to the channel 1 IO-Link device is written from the upper direction.

Reads bit input data from the channel 2 SIO device (NPN type presence sensor).

Host master side refresh settings

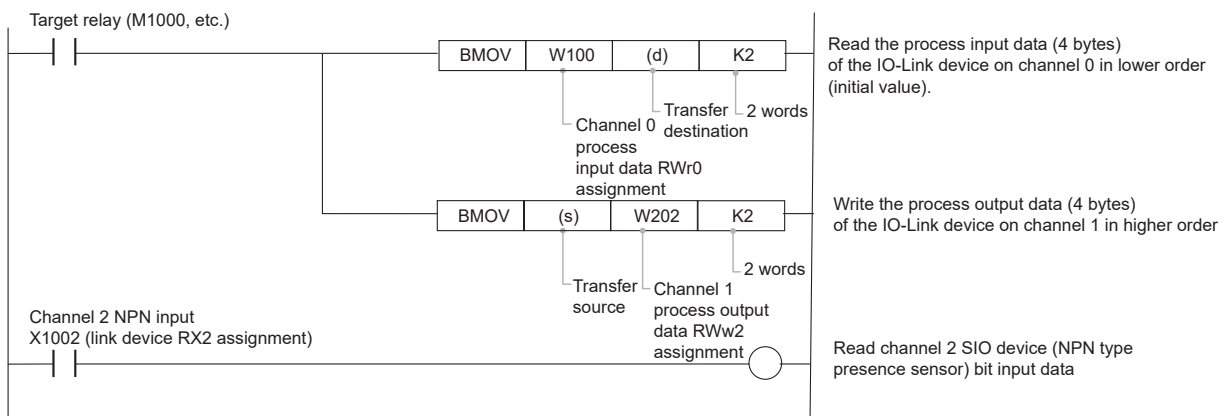
| Link side   |        |       |      |   | CPU side          |             |        |       |       |
|-------------|--------|-------|------|---|-------------------|-------------|--------|-------|-------|
| Device name | Points | Start | End  |   | Target            | Device name | Points | Start | End   |
| RX          | 64     | 00000 | 003F | ↔ | Designated device | X           | 32     | 01000 | 01077 |
| RY          | 64     | 00000 | 003F | ↔ | Designated device | Y           | 32     | 01000 | 01077 |
| RWr         | 32     | 00000 | 001F | ↔ | Designated device | W           | 32     | 00100 | 0011F |
| RWw         | 32     | 00000 | 001F | ↔ | Designated device | W           | 32     | 00200 | 0021F |

Product CC-Link IE Field Basic station number: Ex.: 1

Product master settings:

- I/O assignment function setting (set value number: M10)
  - Channel 0: IO-Link, channel 1: IO-Link, channel 2: NPN input
- Process data LSB/MSB (setting value number: M43):
  - Channel 1: Big endian

Master side program example:



## 3-5-2 Example of Acyclic Communication

This is an example of using acyclic communication to read and write IO-Link device service data.  
Use an OPTEX FA Module FB for Mitsubishi Electric PLC or create a socket communication program.  
Refer to “App-1 List of Product Master Parameters” for product master parameters.  
Refer to each IO-Link device index list for their service data.

### ■ Using a Module FB for Mitsubishi Electric PLC

The following Modules FB for Mitsubishi Electric PLCs iQ-F Series are available.

UDP\_READ (reading)

UDP\_WRITE (writing)

Setting of IO-Link devices connected to the product and product master parameters is possible.  
Refer to “App-2 Acyclic Communication Sample Programs Using Module FB” for further information.

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#### ●●● MEMO ●●●

Download the above Module FB from the OPTEX FA website below.  
<https://www.optex-fa.com/>

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### ■ Socket Communication Program Creation

See “3-4-1 Socket Communication (UDP/IP or TCP/IP)” and “App-3 Sample Socket Communication Program”.



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# 4

## **Specifications**

This chapter describes the specifications of this product.

# 4-1 Specifications

## 4-1-1 Communication Specifications

| Item                                |                                    | Specifications  |
|-------------------------------------|------------------------------------|---|
| Host network communication protocol |                                    | CC-Link IE Field Basic communication, socket communication (UDP/IP, TCP/IP), or Modbus/TCP  |
| Conforming standard                 |                                    | IEEE802.3u  |
| Transmission speed                  |                                    | 100 Mbps(100BASE-TX)  |
| Cable                               |                                    | Twisted pair cable (STP)<br>Category 5, 5e or higher  |
| Ethernet connection type            |                                    | Star configuration, linear bus configuration  |
| Cyclic communication                | Method                             | CC-Link IE Field Basic cyclic transmission  |
|                                     | By station type                    | Slave station   |
|                                     | Number of occupied stations        | 1 station   |
|                                     | Distance between nodes             | Within 100 m  |
|                                     | IP address setting                 | Static IP address   |
|                                     | Product standard response time     | 0.6 ms  |
|                                     | Extended access function           | This function uses cyclic communication to read and write settings for this product and IO-Link devices (including sensor units connected to UC2-IOL). Host master side programs can be simplified.   |
|                                     | Port number                        | <ul style="list-style-type: none"> <li>• Cyclic data transmission: 61450 (UDP)</li> <li>• Node connection: 61451 (UDP)</li> </ul>   |
| Acyclic communication               | Method                             | Socket communication (UDP/IP or TCP/IP) or Modbus/TCP communication   |
|                                     | Access target                      | Both socket communication and Modbus/TCP: Reading and writing of setting values is possible, as well as reading of process data (writing to process data is not applicable).<br>* Socket communication setting values background access mode is possible. |
|                                     | Number of simultaneous connections | <ul style="list-style-type: none"> <li>• Socket communication (UDP/IP: 4, TCP/IP: 1)</li> <li>• Modbus/TCP communication: 2</li> </ul>  |
|                                     | IP address setting                 | Static IP address   |
|                                     | Port number                        | <ul style="list-style-type: none"> <li>• Socket communication: 2001 (both TCP and UDP)</li> <li>• Modbus/TCP communication: 502</li> </ul>  |

## 4-2 Data Processing Time

### 4-2-1 Process Data Response Time Calculation

The process data response time from the CC-Link IE Field Basic master and through IO-Link is indicated as follows.

#### MEMO

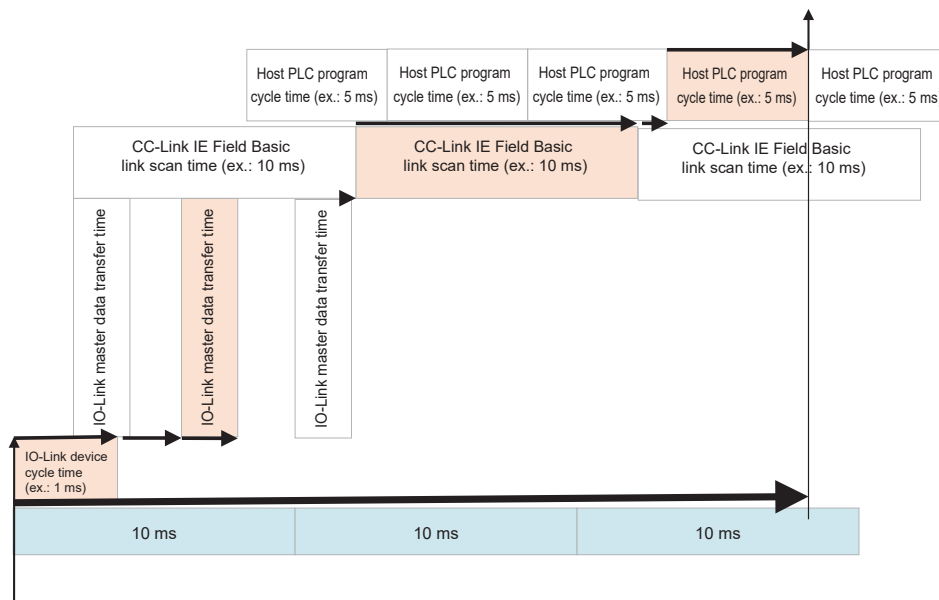
Product standard response time is 0.6 ms. As necessary, divide slave stations into fast-response and slow-response groups. Based on the standard response time of other slave stations in the same group, calculate the link scan time. With regard to the CC-Link IE Field Basic link scan time calculation, refer to the manual of the CC-Link IE Field Basic master.

#### When CC-Link IE Field Basic and IO-Link Are Not Synchronized

##### Process input data

$(\text{IO-Link cycle time}) \times (1 \text{ to } 2) + (\text{CC-Link IE Field Basic link scan time}) \times (1 \text{ to } 2) + (\text{host PLC program cycle time}) \times (1 \text{ to } 2)$

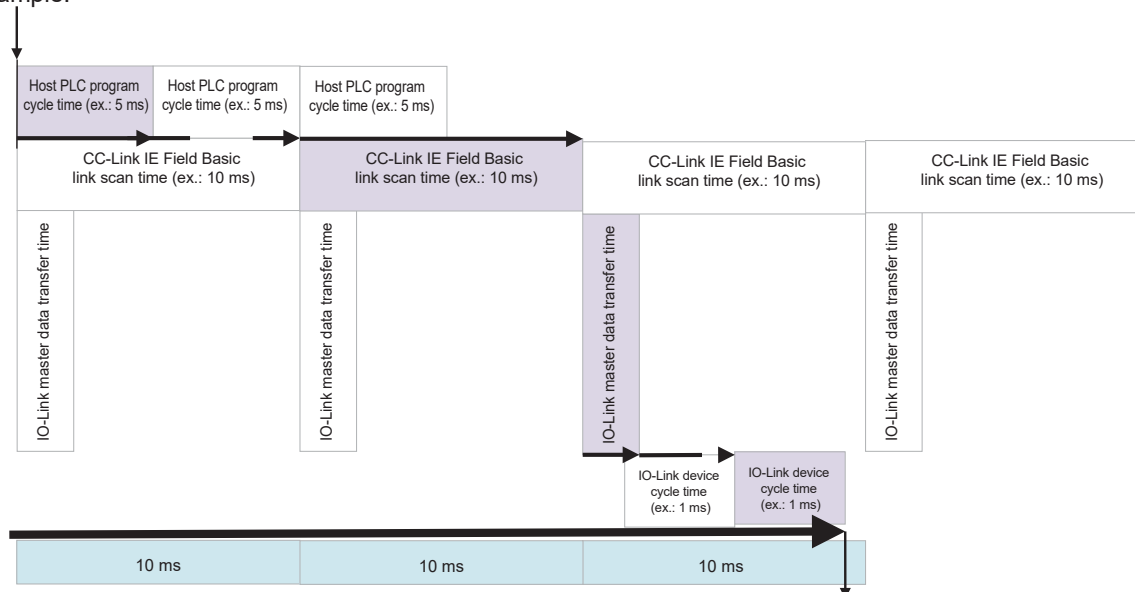
Example:



## ● Process output data

(host PLC program cycle time) + (CC-Link IE Field Basic link scan time) × (1 to 2) + (IO-Link cycle time) × (1 to 2)

Example:



## ■ IO-Link Communication Response Time

The minimum cycle time for IO-Link devices is defined by individual device.

- Minimum cycle time of "0": The fastest cycle time supported by this product will be used.
- Minimum cycle time specified: This product will communicate with the IO-Link device at the specified cycle time.

The actual IO-Link communication cycle time can be confirmed in the "Master parameters (M51. IO-Link cycle time process value)" for this product.

Note: This product performs IO-Link communication using hardware logic rather than software, so the fastest time is 0.3 ms.

The cycle time can be specified on this product. This is set in "master parameters M50. Specified cycle time" in this product. However, it cannot be set faster than the minimum cycle time of the IO-Link device.

## ■ Sample Cycle Time for IO-Link

Conditions: Process input data bytes: 2, process output data bytes: 0, on-request data bytes: 1

Minimum 0.35 ms: Add the command, checksum and reserve bytes, and then multiply by 0.05 ms.

COM3: 0.4 ms (time under 0.1 ms rounded up)

COM2: 2.4 ms

COM1: 19.2 ms

## ■ Synchronization Function Between IO-Link Communication and Digital I/O

For CC-Link IE Field Basic, if the master parameter "M21. I/O synchronization" is set to "Synchronous timer 0.8/1.6/3.2/6.4 ms" in this product, the internal timer of this product will be used to synchronize IO-Link communication or digital I/O transfer between multiple channels set to the same setting value at a cycle of 0.8/1.6/3.2/6.4 ms. (This can also be confirmed in master parameter "M51. IO-Link cycle time process value").

However, in order to suppress noise generated by the communication signal. IO-Link communication delays each channel 0.56 μs instead of sending at the exact same time.

## ■ Internal Data Transfer Processing Time for This Product

IO-Link device process input data is first rearranged through software in this product, and then transferred to the CC-Link IE Field Basic processing chip.

The processing time depends on the number of process data bytes for the IO-Link devices on all channels. Transfer takes place at approximately 0.1 to 0.4 ms.

### 4-2-2 I/O Response Time Example

In the following example, the I/O response time is calculated for a system where 16 OPTEX FA Z4 Series miniature photoelectric sensors (IO-Link-compatible) are connected to this product using IO-Link communication.

Note that the minimum cycle time for Z4 Series sensors (IO-Link-compatible) is 0.5 ms.

Conditions: Possible with the CC-Link IE Field Basic link scan time set to 3 ms.

Z4 Series photoelectric sensor process data: Averaged received light level (bit 15 - 1) + output (bit 0) (default value)

The time required for output to pass from the 16 Z4 Series sensors, through this product, into the host PLC, and then to be programmed is as follows.

IO-Link device cycle time  $0.5 \text{ ms} \times (1 \text{ to } 2)$  + CC-Link IE Field Basic link scan time  $3 \text{ ms} \times (1 \text{ to } 2)$  + host PLC program cycle time  $1 \text{ ms} \times (1 \text{ to } 2) = 4.5 \text{ to } 9.0 \text{ ms}$





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# 5

## Troubleshooting

Describes methods of troubleshooting related to CC-Link IE Field Basic communication.

# 5-1 Troubleshooting

## 5-1-1 Troubleshooting Based on LEDs

| Front LEDs (on this product) |                | Status                                    | Details                                | Procedure   |
|------------------------------|----------------|---|--|---|
| NS                           | MS             |   |  |   |
| Lit red                      | Flashing red   | Duplicate IP addresses within the network |  | Make sure the IP address is not a duplicate of any other.   |
| Off                          | Flashing green | Ethernet cable is not connected           |  | Confirm that the Ethernet cable is connected.   |
|                              |                | IP address is not set correctly           |  | Confirm the product IP address setting.   |
|                              |                | Network starting up (about 7 seconds)     |  | If the subnet mask is not 255.255.255.0 and the default gateway is not 0.0.0.0, change to these settings.   |
| Flashing green               | Lit green      | Connection not established                | Network configuration setting is wrong | Check whether the network configuration setting is correct on GXWorks2/3.   |
|                              |                |   | IP address setting is invalid          | <ul style="list-style-type: none"><li>• Check whether the device IP address is correctly set on the master side.</li><li>• Make sure the network part is the same in the master and product IP addresses.</li></ul> Example: If the subnet mask is 255.255.255.0:<br>Master: 192.168.0.2<br>Product: 192.168.0.1 the underlined part is the network part. |

| Front LEDs (on this product) | Status                    | Procedure   |
|------------------------------|---------------------------|---|
| L/A or L/A2                  |                           |   |
| Off                          | LAN cable is disconnected | Check whether the L/A1 or L/A2 LAN cables are disconnected. |

| Front LEDs (on this product) |                | Status                                      | Details   | Procedure  |
|------------------------------|----------------|---|---|--|
| RUN                          | NTWK ST        |   |   |  |
| Lit green                    | -              | IC inside CC-Link IE Field Basic startup    | The CC-Link IE Field Basic network chip is starting up.                           | -  |
| Off                          | -              |   | The CC-Link IE Field Basic network chip is not operating.                         | If the RUN LED does not stay ON (green) even though the power is ON, check the POWER LED. If the RUN LED is unlit even though the POWER LED is lit, the power voltage may be extremely low, or the network type switching may have failed, preventing startup.   |
| Flashing green               | -              | Network chip firmware transferring          | The CC-Link IE Field Basic network chip firmware is undergoing internal transfer. | -  |
| Lit green                    | Lit green      | CC-Link IE Field Basic communication status | Communication with the CC-Link IE Field Basic master station is normal.           | -  |
| Lit green                    | Flashing green |   | Communication disconnection   | <ul style="list-style-type: none"> <li>• Confirm the CC-Link IE Field Basic master status (for details, refer to the manual of the CC-Link IE Field Basic master station in use).</li> <li>• Confirm the status of the CC-Link IE Field Basic cable.</li> <li>• Confirm the status of the Switching Hub between the CC-Link IE Field Basic master and this product.</li> <li>• Confirm the following if no problems are found. <ul style="list-style-type: none"> <li>• IP address setting</li> <li>• Subnet mask setting</li> <li>• Default gateway setting</li> </ul> </li> </ul> After changing the IP address, subnet mask, or default gateway setting, restart the product power. |
| -                            | Off            |   | Not communicating   | <ul style="list-style-type: none"> <li>• Confirm the following. <ul style="list-style-type: none"> <li>• Communication wiring with the CC-Link IE Field Basic master station</li> <li>• Product front panel IP address lowest digit setting</li> <li>• CC-Link IE Field Basic master status</li> </ul> </li> <li>• Reset the CPU module of the host PLC.</li> </ul>  |

## 5-1-2 Troubleshooting Based on Symptoms

| Phenomenon   | Front LEDs (on this product) | Cyclic communication flag | Error code (hexadecimal) | Probable cause                                   | Procedure  |
|--|------------------------------|---------------------------|--------------------------|--|--|
| Data sent to/ received from an IO-Link device via IO-Link communication cannot be read/ written properly by CC-Link IE Field Basic | ALARM LED flashing red       | Error flag ON             | FFFA                     | CC-Link IE Field Basic communication has stopped | Confirm the status of the host network (CC-Link IE Field Basic). |

## 5-1-3 Error Code List

| Code (hexadecimal) | Message   | Conditions  | Procedure   |
|--------------------|---|---|---|
| 1000               | No Service generated in ISDU communication                              | This occurs when the start code of the ISDU communication response used to access the setting value for the IO-Link device is "0" (No Service).   | A setting value that is not supported by the IO-Link device is being accessed in this case. Confirm what you are trying to access (index number, etc.).   |
| 1001               | IO-Link communication has stopped                                       | This occurs when communication is established with an IO-Link device but then is disconnected. This error does not occur if the I/O power supply is shut down. The error is also automatically cleared if IO-Link communication is restored.                                      | Check the wiring between the IO-Link device and this product. Check the I/O power supply. Confirm whether the issue is resolved after changing the connection to another channel for this product or replacing the IO-Link device and cable.  |
| 1100               | Timeout generated in ISDU communication                                 | When using ISDU communication to access an IO-Link device setting value, no ISDU communication response is received even after five seconds have passed.  | Confirm what you are trying to access on the IO-Link device (index number, write data, etc.).   |
| 5600               | Checksum error generated in ISDU communication                          | When using ISDU communication to access an IO-Link device setting value, a mismatch occurs when calculating the checksum of the ISDU communication response.  | This could be caused by noise between the IO-Link device and this product. Resolve this through such means as using a separate conduit for the power line, or maintaining distance between the C/Q wires of other IO-Link devices (do not bundle wires together). Confirm that the cable between the IO-Link device and this product is not too long (over 20 m). |
| 5700               | Unregulated ISDU communication data length                              | This occurs when the data length of the ISDU communication response is either "0" or too long, when using ISDU communication to access an IO-Link device setting value.   |   |
| 6001               | Revision ID verification error  | The revision ID registered in this product does not match the revision ID of the connected IO-Link device. Process data is not transferred and setting values are not accessed.   | Change the setting value for device verification (setting value number: M30) to "None".   |
| 8033               | Setting value is too long   | This occurs when the data length is too long, when using ISDU communication to access an IO-Link device setting value.  | Write data using the data length specified for the IO-Link device.  |
| FF23               | Storage data does not match the connected device vendor ID or device ID | This occurs when the value of the vendor ID or device ID of the connected IO-Link device differs from the stored storage data, when device verification (setting value number: M30) is set to "None" and storage data exists (however, this only occurs when power is turned ON). | If an IO-Link device with a vendor ID or device ID that differs from the storage data is connected, connect the correct IO-Link device. If it is safe to delete the storage data stored on this product by channel, write with device parameter backup/restore (setting value number: M32) set to "Delete".   |

| Code (hexadecimal) | Message   | Conditions  | Procedure   |
|--------------------|---|---|---|
| FF24               | Storage buffer overload                               | This occurs when setting value data is too long and cannot be stored, when backing up setting values from an IO-Link device.<br>The data length stored during backup will be "16 bytes + index 18 (model name) length + number of setting values to backup × 4 + total data length of setting values to backup". This can be stored as long as it is 4,032 bytes or less. | Backup cannot be performed for the connected IO-Link device because the storage data is too large.  |
| FF25               | Storage data access was refused                       | This occurs when access to storage data is locked on the IO-Link device.  | If required, release the lock setting (index number 12) on the IO-Link device.  |
| FFEA               | Duplicate IP addresses                                | A module with a duplicate IP address was connected.   | Confirm the IP address of the connected module.   |
| FFEB               | Timeout generated in conflict with ISDU communication | While attempting to perform ISDU communication on the same IO-Link channel, ISDU communication was being used elsewhere and communication could not be performed within 330 times the cycle time.   | Storage takes some time, so wait a short while and try ISDU communication again (access by index number to IO-Link device).   |
| FFEC               | EEPROM write protection signal abnormality            | The write protection signal is always permitted for the EEPROM used for saving setting values, etc.   | This will not cause any immediate issues with operation. However, this indicates a hardware error and the hardware will need to be replaced.  |
| FFED               | Failure in EEPROM writing                             | Setting value, storage data and operation time writing failed.  | There is something wrong with the connection to the EEPROM, or the EEPROM has reached its maximum number of writes. It can be rewritten 1,000,000 times.  |
| FFEE               | IO-Link trace has stopped automatically               | This is a notification indicating that IO-Link tracing has stopped due to an error occurring or the buffer being full.  | Read the IO-Link trace data and confirm communication information.  |
| FFEF               | Storage was interrupted                               | An error response was received from the IO-Link device while backing up to or restoring from storage, and the storage stopped operating.<br>Backed up data will not be saved.<br>The data being restored may have partially been transferred to the IO-Link device.   | Perform the storage operation (backup or restore) again.<br>If this occurs again, it may be due to noise. If so, resolve this through such means as using a separate conduit for the power line, or maintaining distance between the C/Q wires of other IO-Link devices (do not bundle wires together). Confirm that the cable between the IO-Link device and this product is not too long (over 20 m).<br>If this still occurs, it may be caused by the firmware of the IO-Link device or this product. If so, update or replace the firmware of the IO-Link device or this product. |

| Code (hexadecimal) | Message   | Conditions   | Procedure  |
|--------------------|---|--|--|
| FFF0               | Invalid data in setting value information   | There is an invalid character in the setting value information provided by the IO-Link device or in installed IODD data information, or a value exceeding the permitted value was specified.   | This is caused by the firmware of the IO-Link device or this product. Update or replace the firmware of the IO-Link device or this product.  |
| FFF1               | Writing firmware data is abnormal   | An attempt to write invalid data was made when updating the firmware.  | There is something wrong with the data for the firmware being written. Reacquire the file and try again.   |
| FFF3               | The revision ID of the IO-Link device to verify is not registered in this product | This occurs when the revision ID registered to this product is "00 h", when device verification (setting value number: M30) is set to a value other than "None".   | Change the setting value for device verification (setting value number: M30) to "None". Alternately, register the revision ID of the IO-Link device to verify.   |
| FFF4               | IO-Link device model name is different  | This occurs when the model name (index number 18 [product name] character string) of the registered IO-Link device differs from the model name of the device that is actually connected, when device verification (setting value number: M30) is set to "Type name". Cyclic communication is not performed with the applicable IO-Link device.   | Change the setting value for device verification (setting value number: M30) to a value other than "Type name". Alternately, connect the correct IO-Link device.   |
| FFF5               | Unsupported setting value version   | The version of the setting value data restored to setting value memory is new, and it may not be possible to recognize some of it.   | Update the firmware of this product.   |
| FFF6               | Internal temperature is too high  | This occurs when the temperature of the main CPU exceeds 85°C. The error occurs every 10 minutes.  | Lower the operating temperature of this product, install a cooling fan, or lower the output load current (for example, by using a separate relay).   |
| FFF7               | EEPROM write frequency is too high  | The setting value write count occurs under the following conditions. <ul style="list-style-type: none"> <li>• The count is cleared if nothing is written for 450 seconds.</li> <li>• When writing twice with a frequency of once in less than 1 second.</li> <li>• When writing 20 times with a frequency of once in less than 10 seconds.</li> <li>• When writing 200 times with a frequency of once in less than 110 seconds.</li> </ul> | Confirm whether setting value write operations are being performed frequently from the host PLC. Confirm whether IO-Link device setting values are frequently rewritten, with automatic device parameter backup (setting value number: M31) set to "Backup" or "Both". |
| FFF8               | Software version does not match   | There is version incompatibility with the main firmware, host network communication firmware or IO-Link communication logic, and some functions may not operate normally.  | Update the FPGA data of this product and the network chip firmware.  |
| FFF9               | Network chip is not operating   | This occurs when there is no communication between the main CPU and the chip that is performing host network processing.   | The network chip may have failed, or power may have turned OFF while the network chip firmware was being updated.  |

| Code (hexadecimal) | Message                                       | Conditions   | Procedure   |
|--------------------|---|--|---|
| FFFA               | Network communication has stopped             | This occurs when host CC-Link IE Field Basic communication is established but then disconnected. The error will be automatically cleared when the status is restored.  | Check whether the Ethernet cable is disconnected, the host PLC has been reset, or the power has turned OFF. Confirm the host PLC parameters. This product may stop being recognized on the network if host PLC network settings are changed.  |
| FFFB               | IO-Link device is not connected               | This occurs when the IO-Link device is not connected under the following conditions. <ul style="list-style-type: none"> <li>• The IO-Link device is not connected when running storage functions (manual or automatic backup/restore of IO-Link device)</li> <li>• Ten seconds elapse without the IO-Link device connecting after the I/O power supply is turned ON, when device verification (setting value number: M30) is set to a value other than "None"</li> <li>• The IO-Link device is not connected when confirming device information or reading/writing a setting value number from the device setting values window</li> <li>• The user switched to the device setting value window when connected to a device that does not support ISDU communication</li> </ul> | Connect the IO-Link device properly. Alternately, change the setting value for device verification (setting value number: M30) to "None". Alternately, set the I/O assignment settings (setting value number: M10) to a value other than "IO-Link" for any channels not connected to an IO-Link device. |
| FFFC               | Serial number verification error              | This occurs when the registered serial number differs from the serial number of the connected IO-Link device, when device verification (setting value number: M30) is set to "Serial number". Cyclic communication is not performed with the applicable IO-Link device.  | Change the setting value for device verification (setting value number: M30) to a value other than "Serial number". Alternately, connect the correct IO-Link device.  |
| FFFD               | No backup data                                | This occurs when storage data is not saved in this product, when restoring storage data to an IO-Link device.  | A backup must be performed in order to perform a restore. Select "Backup" in device parameter backup/restore (setting value number: M32) and perform a backup.  |
| FFFE               | IO-Link device type ID is different           | This occurs when the registered vendor ID or device ID differs from the value of the connected IO-Link device, when device verification (setting value number: M30) is set to a value other than "None". Cyclic communication is not performed with the applicable IO-Link device.   | Change the setting value for device verification (setting value number: M30) to "None". Alternately, connect the correct IO-Link device.  |
| FFFF               | Type ID of the device to restore is different | This occurs when the vendor ID or device ID differs when storage data is restored (manual restore or automatic restore) to an IO-Link device.  | Connect the correct IO-Link device.   |

\*Errors will be ignored if the same error code occurs within one second on the same channel.

\*Up to 20 entries will be stored across all channels in the buffer used to store error information. Error information will begin being discarded beginning with the oldest entry when the number of entries exceeds 20.

## Appendix

Listed below.

- Product master parameters when reading/writing with socket communication
- Acyclic communication sample programs using Module FB



# App-1 List of Product Master Parameters

This list shows product master parameters which can be set/monitored with Modbus/TCP communication or socket communication.

- For Modbus/TCP communication, it is done via writing/reading register numbers 05500 to 06565.
- For socket communication, it is done by designating bit 2/3 with transfer data designation (setting value access/writing or reading), FF h with module designation (product master parameters), master parameter number and target number, and reading/writing.

Refer to “5-1-4 Master parameter list with product front panel operation” in Common Edition for details on setting/monitoring with front panel operation.

The master parameters are classified as below.

- User settings
- Data for access from PLC

Note that this product’s master parameters are handled as little endian (beginning from the low-order byte).

## App-1-1 User Settings

In socket communication, designate a master parameter number and target number from the table below.

Note: In the right column of the table below, items that can be accessed via product front panel operation, Modbus/TCP operation, or socket communication are marked with ●.

| Master parameter numbers | Target numbers      | Data name               | R/W | Value             |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|---------------------|-------------------------|-----|-------------------|---|---|--|----------------------|
| 1(1 h)                   | 0<br>(This product) | Master parameters reset | RW  | 0 (default value) | None  | ●(M1)   | ●(06500)                                   | ●                    |
|                          |                     |                         |     | 1                 | Initialize I/O assignment for all channels in IO-Link mode. (Storage data, display language, network type, and network No. will not be initialized) |   |  |                      |
|                          |                     |                         |     | 2                 | As above, initialize I/O assignment for all channels in PNP input mode.   |   |  |                      |
|                          |                     |                         |     | 3                 | As above, initialize I/O assignment for all channels in NPN input mode.   |   |  |                      |
|                          |                     |                         |     | 4                 | As above, initialize I/O assignment for all channels in PNP output mode.  |   |  |                      |
|                          |                     |                         |     | 5                 | As above, initialize I/O assignment for all channels in NPN output mode.  |   |  |                      |
|                          |                     |                         |     | 6                 | As above, initialize I/O assignment for all channels as unused.   |   |  |                      |
|                          |                     |                         |     | 7                 | Delete the installed IODD data.   |   |  |                      |
|                          |                     |                         |     | 8                 | Initialize including network setting and language as well. I/O assignment is unused. IODD data is not deleted.                                      |   |  |                      |

| Master parameter numbers | Target numbers                             | Data name                     | R/W | Value                                       |  | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|-------------------------------|-----|---|--|---|--|----------------------|
| 2(2 h)                   | 0<br>(This product)                        | Network type                  | RW  | Designate the host industrial network type. |  | ●(M2)   | ●(06250)                                   | ●                    |
|                          |  |                               |     | 2 (default value)                           | EtherNet/IP  |   |  |                      |
|                          |  |                               |     | 3   | EtherCAT   |   |  |                      |
|                          |  |                               |     | 4 (planned)                                 | PROFINET (planned)   |   |  |                      |
|                          |  |                               |     | 5   | Ethernet & Modbus/TCP  |   |  |                      |
|                          |  |                               |     | 6   | CC-Link IE Field Basic   |   |  |                      |
| 4(4 h)                   | 0<br>(This product)                        | Display brightness            | RW  | 1 to 20<br>(Default value: 7)               | Display brightness<br>Values multiplied by 5 are equivalent to % display.  | ●(M4)   | ●(05900)                                   | ●                    |
| 5(5 h)                   | 0<br>(This product)                        | Language                      | RW  | 0 (default value)                           | English  | ●(M5)   | ●(05901)                                   | ●                    |
|                          |  |                               |     | 1   | Japanese   |   |  |                      |
|                          |  |                               |     | 2   | German   |   |  |                      |
|                          |  |                               |     | 3   | Chinese (Simplified)   |   |  |                      |
|                          |  |                               |     | 4   | French   |   |  |                      |
|                          |  |                               |     | 5   | Spanish  |   |  |                      |
|                          |  |                               |     | 6   | Portuguese   |   |  |                      |
|                          |  |                               |     | 7   | Italian  |   |  |                      |
|                          |  |                               |     | 9   | Korean   |   |  |                      |
|                          |  |                               |     | 10  | Chinese (Traditional)  |   |  |                      |
| 6(6 h)                   | 0<br>(This product)                        | Time zone                     | RW  | -96 to 96<br>(default value: 0)             | Set the displayed network time (setting value number: M65) to the time difference (15-minute units). If UTC is the standard used for the network time set by the host, setting the time difference to 9 x 4 = 36 will display Japanese time (JST). | ●(M6)   | ●(05902)                                   | ●                    |
| 8(8 h)                   | 0<br>(This product)                        | User tag name                 | RW  | Up to 32 characters                         | Set the product user tag name up to 32 characters.   | ●(M8)   | ● (05800 to 05815)                         | ●                    |
| 9(9 h)                   | 0<br>(This product)                        | I/O assignment batch settings | RW  | 0 (default value)                           | None   | ●(M9)   | ●(06501)                                   | ●                    |
|                          |  |                               |     | 1   | Change I/O assignment settings for all channels to IO-Link mode.   |   |  |                      |
|                          |  |                               |     | 2   | Change I/O assignment for all channels to PNP input mode.  |   |  |                      |
|                          |  |                               |     | 3   | Change I/O assignment for all channels to NPN input mode.  |   |  |                      |
|                          |  |                               |     | 4   | Change I/O assignment for all channels to PNP output mode.   |   |  |                      |
|                          |  |                               |     | 5   | Change I/O assignment for all channels to NPN output mode.   |   |  |                      |
|                          |  |                               |     | 6   | Change I/O assignment for all channels to unused.  |   |  |                      |
| 10(A h)                  | 0 to 15<br>(Corresponds to channel number) | I/O assignment settings       | RW  | 0   | IO-Link mode   | ●(M10)  | ● (05500 to 05515)                         | ●                    |
|                          |  |                               |     | 1   | PNP input mode: Internal pull-down resistance is enabled.  |   |  |                      |
|                          |  |                               |     | 2   | NPN input mode: Internal pull-up resistance is enabled.  |   |  |                      |
|                          |  |                               |     | 3   | PNP output mode  |   |  |                      |
|                          |  |                               |     | 4   | NPN output mode  |   |  |                      |
|                          |  |                               |     | 5 (default value)                           | Not used   |   |  |                      |

| Master parameter numbers | Target numbers                             | Data name                                      | R/W | Value             |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|--|-----|-------------------|---|---|--|----------------------|
| 11(B h)                  | 0 to 15<br>(Corresponds to channel number) | Input filter time                              | RW  | 0 (default value) | None  | ●(M11)  | ● (05516 to 05531)                         | ●                    |
|                          |  |  |     | 1                 | 0.1 ms  |   |  |                      |
|                          |  |  |     | 2                 | 1 ms  |   |  |                      |
|                          |  |  |     | 3                 | 5 ms  |   |  |                      |
|                          |  |  |     | 4                 | 10 ms   |   |  |                      |
|                          |  |  |     | 5                 | 20 ms   |   |  |                      |
| 12(C h)                  | 0 to 15<br>(Corresponds to channel number) | Input hold time                                | RW  | 0 (default value) | None  | ●(M12)  | ● (05532 to 05547)                         | ●                    |
|                          |  |  |     | 1                 | 1 ms  |   |  |                      |
|                          |  |  |     | 2                 | 15 ms   |   |  |                      |
|                          |  |  |     | 3                 | 100 ms  |   |  |                      |
| 13(D h)                  | 0 to 15<br>(Corresponds to channel number) | IO-Link communication and network error output | RW  | 0 (default value) | Clear   | ●(M13)  | ● (05548 to 05563)                         | ●                    |
|                          |  |  |     | 1                 | Input hold  |   |  |                      |
|                          |  |  |     | 2                 | Output hold   |   |  |                      |
|                          |  |  |     | 3                 | All Hold  |   |  |                      |
| 14(E h)                  | 0<br>(This product)                        | UC2 direct output start channel                | RW  | 0 (default value) | The UC2 direct output function is not used.   | ●(M14)  | ●(05906)                                   | ●                    |
|                          |  |  |     | 1 to 16           | The sensor unit output signals received from the OPTEx FA IO-Link gateway UC2-IOL are directly output from the product PNP/NPN output.<br>Specified values 1 through 16 correspond to channel numbers 0 through F on which to “start” output.   |   |  |                      |
| 15(F h)                  | 0<br>(This product)                        | Encoder input selection                        | RW  | 0 (default value) | Do not use encoder input.   | ●(M15)  | ●(05903)                                   | ●                    |
|                          |  |  |     | 1 to 14           | Connect phase A, phase B, and phase Z of the encoder to the following channels (SIO mode digital input).<br>Phase A: Any channel from 0 to D (corresponds to 1 to 14)<br>Phase B: Any channel from 1 to E (corresponds to 1 to 14)<br>Phase Z: Any channel from 2 to F (corresponds to 1 to 14) |   |  |                      |
|                          |  |  |     | 15, 16            | Reserved. Do not set.   |   |  |                      |
|                          |  |  |     | 17 to 31          | Connect phase A and phase B of the encoder to the following channels (SIO mode digital input).<br>Phase A: Any channel from 0 to E (corresponds to 17 to 31)<br>Phase B: Any channel from 1 to F (corresponds to 17 to 31)<br>Phase Z: No assignment  |   |  |                      |
|                          |  |  |     | 32                | Reserved. Do not set.   |   |  |                      |
|                          |  |  |     | 33 to 48          | Phase A: Any channel from 0 to F (33 to 48 supported)<br>Phase B, phase Z: No assignment  |   |  |                      |

| Master parameter numbers | Target numbers                             | Data name           | R/W | Value                               |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|---------------------|-----|-------------------------------------|---|---|--|----------------------|
| 21(15 h)                 | 0 to 15<br>(Corresponds to channel number) | I/O synchronization | RW  | 0 (default value)                   | Asynchronous IO-Link communication uses individual devices' fastest times. The digital I/O status is also continually updated.  | ● (M21)   | ● (05564 to 05579)                         | ●                    |
|                          |  |                     |     | 2                                   | Using the product's internal timer, at an 0.4 ms cycle, synchronize IO-Link communication or digital I/O transfer between multiple channels with the same setting (I/O synchronization).  |   |  |                      |
|                          |  |                     |     | 3                                   | As above, synchronization at 0.8 ms cycle   |   |  |                      |
|                          |  |                     |     | 4                                   | As above, synchronization at 1.6 ms cycle   |   |  |                      |
|                          |  |                     |     | 5                                   | As above, synchronization at 3.2 ms cycle   |   |  |                      |
|                          |  |                     |     | 6                                   | As above, synchronization at 6.4 ms cycle   |   |  |                      |
|                          |  |                     |     | 7 to 1003                           | Specify the IO-Link communication cycle time at 0.4 ms to 100.0 ms.   |   |  |                      |
| 29(1D h)                 | 0 to 15<br>(Corresponds to channel number) | Device ID           | RW  | 0x0 - 0xFFFFF (Default value: 0x 0) | This is the device ID used for verification with IO-Link devices. Refer to "M29. Device ID" in "5-1-4 Master parameter list with product front panel operation" in Common Edition for details.  | ● (M29)   | ● (05830 to 05893)                         | ●                    |
| 30(1E h)                 | 0 to 15<br>(Corresponds to channel number) | Device verification | RW  | 0 (default value)                   | None<br>Note: Even for "None," if storage data is already saved in the product, when turning on the power (unit and I/O power), the IO-Link device type ID and storage data type ID will be verified. An error (FF23 h) will occur if the type ID does not match. The revision ID is not verified.  | ● (M30)   | ● (05580 to 05595)                         | ●                    |
|                          |  |                     |     | 1                                   | Type ID (vendor ID and device ID) verification<br>If the registered type ID and connected device type ID are different, an error (FFFE h: type ID verification error) is generated and the process data with the relevant IO-Link device is treated as invalid. As well, if IO-Link communication is not established within 10 seconds of turning on the I/O power, an error (FFFB h: IO-Link device not connected) is generated. At the same time, the revision ID is also verified. |   |  |                      |
|                          |  |                     |     | 2                                   | Type ID + serial number verification<br>Even if the type IDs (vendor ID and device ID) match, if the serial number is different, an error (FFFC h: serial number verify error) is generated, and the process data with the relevant IO-Link device is invalidated. Other operations are the same as set value 1.  |   |  |                      |
|                          |  |                     |     | 3                                   | Type ID + device model name verification<br>Even if the type IDs (vendor ID and device ID) match, if the device model name is different, an error (FFF4 h: model name verification error) is generated, and the process data with the relevant IO-Link device is invalidated. Other operations are the same as set value 1.   |   |  |                      |

| Master parameter numbers | Target numbers                             | Data name                           | R/W | Value                         |  | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|-------------------------------------|-----|-------------------------------|--|---|--|----------------------|
| 31(1F h)                 | 0 to 15<br>(Corresponds to channel number) | Automatic device parameter backup   | RW  | 0 (default value)             | None   | ● (M31)   | ● (05596 to 05611)                         | ●                    |
|                          |  |                                     |     | 1                             | Auto backup<br>When IO-Link device set values are changed, they are automatically backed up in this product.<br>If IO-Link device setting values are changed from this product, the backup operation will automatically start 10 seconds after the last change.<br>Note: When a device with a different vendor ID or device ID is connected, backup is executed at every startup, so reset "Device verification" (set value number: M30) to correct the verification error (FFFE h) as soon as possible. |   |  |                      |
|                          |  |                                     |     | 2                             | Auto restoration<br>At startup, if the IO-Link device set value is different from the one stored in the product, it will be automatically restored (set value downloaded from the product to the IO-Link device).<br>In this case, note that even if the IO-Link device set value is changed, it will be overwritten at the next startup with the data saved in this product.  |   |  |                      |
|                          |  |                                     |     | 3                             | Perform auto backup and auto restoration as above together<br>The storage data stored on this product will always match the IO-Link device setting values.<br>In other words, IO-Link device setting values are backed up to this product whenever they are changed.<br>If any setting values are different from the IO-Link device during startup, the setting values stored in this product will be restored.  |   |  |                      |
| 32(20 h)                 | 0 to 15<br>(Corresponds to channel number) | Device parameter backup/restore     | RW  | 0 (default value)             | None   | ● (M32)   | ● (06550 to 06565)                         | ●                    |
|                          |  |                                     |     | 1                             | Execute backup (uploading set values from devices to this product) manually  |   |  |                      |
|                          |  |                                     |     | 2                             | Execute restoration (downloading set values from the product to devices) manually  |   |  |                      |
|                          |  |                                     |     | 3                             | Delete backup data saved in the product manually   |   |  |                      |
| 33(21 h)                 | 0 to 15<br>(Corresponds to channel number) | Conditions for applying IODD data   | RW  | 0                             | Device   | ● (M33)   | ● (05612 to 05627)                         | ●                    |
|                          |  |                                     |     | 1 (default value)             | IODD   |   |  |                      |
| 40(28 h)                 | 0 to 15<br>(Corresponds to channel number) | Process input data words allocation | RW  | 0 to 16<br>(Default value: 2) | Process input data words allocated to the input cyclic communication area<br>When the setting value is 0 words, it will be allocated from the end.   | ● (M40)   | ● (05628 to 05643)                         | ●                    |

| Master parameter numbers | Target numbers                             | Data name                              | R/W | Value                         |  |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|--|-----|-------------------------------|--|---|---|--|----------------------|
| 41(29 h)                 | 0 to 15<br>(Corresponds to channel number) | Process output data words allocation   | RW  | 0 to 16<br>(Default value: 2) | Process output data words allocated to the output cyclic communication area. When the setting value is 0 words, it will be allocated from the end. |   | ●(M41)  | ● (05644 to 05659)                         | ●                    |
| 42(2A h)                 | 0<br>(This product)                        | Process data words auto allocation     | RW  | 0 (default value)             | None   |   | ●(M42)  | ●  | ●                    |
|                          |  |  |     | 1                             | Auto allocation  |   |   |  |                      |
| 43(2B h)                 | 0 to 15<br>(Corresponds to channel number) | Process data LSB/MSB                   | RW  | 0 (default value)             | Little endian  |   | ●(M43)  | ● (05660 to 05675)                         | ●                    |
|                          |  |  |     | 1                             | Big endian   |   |   |  |                      |
| 44(2C h)                 | 0<br>(This product)                        | Time stamp                             | RW  | 0 (default value)             | No   | Refer to “M44. Time stamp” in “5-1-4 Master parameter list with product front panel operation” in Common Edition for details. | ●(M44)  | ●(05904)                                   | ●                    |
|                          |  |  |     | 1                             | Serial   |   |   |  |                      |
|                          |  |  |     | 2                             | Common Era   |   |   |  |                      |
|                          |  |  |     | 3                             | Serial + Parity  |   |   |  |                      |
|                          |  |  |     | 4                             | Common Era + Parity  |   |   |  |                      |
| 51(33 h)                 | 0 to 15<br>(Corresponds to channel number) | IO-Link cycle time                     | R   | 1 to 1000                     | 0.1 ms increments  |   | ●(M51)  | ● (06100 to 06115)                         | ●                    |
| 52(34 h)                 | 0 to 15<br>(Corresponds to channel number) | IO-Link transmission rate              | R   | 0                             | Not communicating  |   | ●(M52)  | ● (06116 to 06131)                         | ●                    |
|                          |  |  |     | 1                             | COM1   |   |   |  |                      |
|                          |  |  |     | 2                             | COM2   |   |   |  |                      |
|                          |  |  |     | 3                             | COM3   |   |   |  |                      |
| 53(35 h)                 | 0 to 15<br>(Corresponds to channel number) | Number of IO-Link communication errors | R   | 0 to 255                      | To clear, write 1 in set value 114 h offset +0.  |   | ●(M53)  | ● (06132 to 06147)                         | ●                    |
| 54(36 h)                 | 0 to 15<br>(Corresponds to channel number) | Number of IO-Link ISDU checksum errors | R   | 0 to 255                      | To clear, write 1 in set value 114 h offset +0.  |   | ●(M54)  | ● (06148 to 06163)                         | ●                    |
| 55(37 h)                 | 0 to 15<br>(Corresponds to channel number) | IO-Link transmission rate error        | R   | -1000 to 1000                 | IO-Link transmission rate error (0.1% unit, signed)  |   | ●(M55)  | ● (06164 to 06179)                         | ●                    |
| 56(38 h)                 | 0 to 15<br>(Corresponds to channel number) | IO-Link signal width error             | R   | -1000 to 1000                 | IO-Link transmission signal width error (0.1% unit, signed)  |   | ●(M56)  | ● (06180 to 06195)                         | ●                    |

| Master parameter numbers | Target numbers                             | Data name                                     | R/W | Value  |  |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|--|---|-----|--|--|---|---|--|----------------------|
| 57(39 h)                 | 0 to 15<br>(Corresponds to channel number) | IO-Link communication mode                    | R   | 0 to 7                                       | 0: NOCOM<br>1: STARTUP<br>2: PREOPERATE<br>3: OPERATE<br>5: STARTUP (Rev.1.0)<br>6: PREOPERATE (Rev.1.0)<br>7: OPERATE (Rev.1.0)   | Refer to "M57. IO-Link communication mode" in "5-1-4 Master parameter list with product front panel operation" in Common Edition for details. | ●(M57)  | ● (06196 to 06211)                         | ●                    |
| 58(3A h)                 | 0 to 15<br>(Corresponds to channel number) | Storage backup time                           | R   | 00:00:00<br>00/01/01 to 23:59:59<br>99/12/31 | The storage data backup time is displayed as below.<br>Time and date (ex.: 18:59:00 20/02/29)  |   | ●(M58)  | ● (06320 to 06463)                         | ●                    |
| 60(3C h)                 | 0<br>(This product)                        | System program version of IO-Link master unit | R   | P.PPNNLLFF                                   | Displays the data version of the program, etc.<br>P.PP: Firmware, NN: Network chip, LL: Logic, FF: Font<br>4 bytes in decimal.   |   | ●(M60)  | ● (06300, 06301)                           | ●                    |
| 61(3D h)                 | 0<br>(This product)                        | Total operation hours of IO-Link master unit  | R   | 0 to 2097151<br>(239 years)                  | Product cumulative operating time information (unit: hours)  |   | ●(M61)  | ● (06302, 06303)                           | ●                    |
| 62(3E h)                 | 0<br>(This product)                        | Display drive time                            | R   | 0 to 262143<br>(30 years)                    | Product display operating time information (unit: hours)   |   | ●(M62)  | ● (06304, 06305)                           | ●                    |
| 63(3F h)                 | 0<br>(This product)                        | I/O power supply voltage                      | R   | 0 to 308                                     | Voltage supplied to product I/O power supply (unit: 0.1 V)   |   | ●(M63)  | ●(06251)                                   | ●                    |
| 64(40 h)                 | 0<br>(This product)                        | Internal temperature                          | R   | -2739 to 10457                               | Product internal temperature (unit: 0.1°C)   |   | ●(M64)  | ●(06252)                                   | ●                    |
| 65(41 h)                 | 0<br>(This product)                        | Network time                                  | R   | 00:00:00<br>00/01/01 to 23:59:59<br>99/12/31 | Time and date (ex.: 18:59:00 20/2/29)<br>Returned as a character string.   |   | ●(M65)  | ● (00068 to 00070: hexadecimal value)      | ●                    |
| 67(43 h)                 | 0<br>(This product)                        | Network timeout time                          | R/W | 0 to 30000                                   | When the network type is "Ethernet & Modbus/TCP," if Ethernet communication stops and the designated time passes, a network communication error (FFFA h) will be generated.<br>The designated time can be designated in 10ms intervals from 0 to 30,000 (300 seconds).<br>The default value is 0. If set to 0, even if Ethernet communication stops, it will be considered an internal data refresh on a cycle of roughly 10 ms, and no error will be generated. An error will, however, be generated even then if the Ethernet cable is disconnected. |   | ●(M67)  | ●(05905)                                   | ●                    |
| 80 (50 h)                | 0<br>(This product)                        | Default gateway                               | R/W | 0.0.0.0 to 255.255.255.255                   | Set any special designations. If there are none, leave the default values as they are.<br>The default value is 0.0.0.0.  |   | ●(M80)  | ● (06306, 06307)                           | ●                    |

| Master parameter numbers | Target numbers   | Data name   | R/W | Value                      |   | Front panel controls (Master parameter numbers) | Modbus/TCP communication (register number) | Socket communication |
|--------------------------|------------------|-------------|-----|----------------------------|---|---|--|----------------------|
| 81 (51 h)                | 0 (This product) | Subnet mask | R/W | 0.0.0.0 to 255.255.255.255 | Set any special designations. If there are none, leave the default values as they are. The default value is 255.255.255.0.  | ● (M81)   | ● (06308, 06309)                           | ●                    |
| 82 (52 h)                | 0 (This product) | IP address  | R/W | 0.0.0.0 to 255.255.255.255 | Set the product's IP number to an arbitrary value. Set only when setting to other than the default value of 192.168.0.xxx (xxx is the value set with the rotary switch). Turn the rotary switch on the product front panel when the power is on to move automatically to this "M82. IP address" setting screen. | ● (M82)   | ● (06310, 06311)                           | ●                    |

## App-1-2 Data for Access from PLC

In socket communication, designate a master parameter number and target number from the table below.

Note: In the right column of the table below, items that can be accessed via product front panel operation or socket communication are marked with ●. For Modbus/TCP communication, as reference, the register number of the equivalent function is shown.

| Master parameter numbers | Target numbers                          | Data name                            | R/W | Offset   | Value   | Front panel controls      | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|---|--------------------------------------|-----|----------|---|---------------------------|----------------------|---|
| 100 h                    | 0 to 15 (Corresponds to channel number) | Latest error code readout by channel | R   | +0       | Error code lower  | ? -4. Event/error display | ●                    | See 00073 to 00075  |
|                          |   |                                      |     | +1       | Error code upper  |                           |                      |   |
|                          |   |                                      |     | +2       | Lower designated index number causing error   |                           |                      |   |
|                          |   |                                      |     | +3       | Upper designated index number causing error   |                           |                      |   |
|                          |   |                                      |     | +4       | Designated index number causing error   |                           |                      |   |
|                          |   |                                      |     | +5 to 26 | Error time and date text string (in order of generation)<br>See the form below.<br>HH:MM:SS YY:MN:DD<br>(HH: hour, MM: minute, SS: second, YY: year last two digits, MN: month, DD: day)<br>Ex.: Generated at 18:59:00 on February 19, 2020: 18:59:00 20/02/19<br>Note: When 100-μs unit data is added, HH:MM:SS:ssss<br>YY:MN:DD<br>(ssss: seconds in 100-μs units). |                           |                      |   |



| Master parameter numbers | Target numbers                             | Data name                     | R/W | Offset     | Value   | Front panel controls                | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|--|-------------------------------|-----|------------|---|-------------------------------------|----------------------|---|
| 101 h                    | 0 to 15<br>(Corresponds to channel number) | Event data readout by channel | R   | +0         | Event flag  | ? -4.<br>Event/<br>error<br>display | ●                    | See 00076 to 00087  |
|                          |  |                               |     | +1         | Event byte order 1 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +2         | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +3         | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +4         | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +5         | Event byte order 2 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +6         | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +7         | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +8         | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +9         | Event byte order 3 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +10        | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +11        | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +12        | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +13        | Event byte order 4 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +14        | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +15        | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +16        | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +17        | Event byte order 5 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +18        | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +19        | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +20        | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +21        | Event byte order 6 type (*1)  |                                     |                      |   |
|                          |  |                               |     | +22        | Event Code Lower  |                                     |                      |   |
|                          |  |                               |     | +23        | Event Code Upper  |                                     |                      |   |
|                          |  |                               |     | +24        | 00 h (fixed)  |                                     |                      |   |
|                          |  |                               |     | +25 to 150 | The text string for generation times of event byte order 1 to 6 will be displayed (in order) after the event.<br>Example 1:<br>Event byte order 1 only generated at 19:15:32 on June 24, 2020:<br>(1) 19:15:32 20/06/24<br>Example 2:<br>Event byte order 1 to 6 all generated at different times:<br>(1) 19:15:32 20/06/24 (2) 19:10:18 20/6/24 (3) 18:25:32 20/06/24 (4) 19:05:48 20/6/24 (5) 19:15:32 20/06/24 (6) 19:10:18 20/6/2 |                                     |                      |   |

| Master parameter numbers | Target numbers      | Data name  | R/W | Offset | Value   | Front panel controls                | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|---------------------|--|-----|--------|---|-------------------------------------|----------------------|---|
| 102 h                    | 0                   | Set value readout time from IO-Link devices (binary data)      | R   | +0     | 15.265 $\mu$ s unit data lower  | -                                   | ●                    | None  |
|                          |                     |  |     | +1     | 15.265 $\mu$ s unit data upper  |                                     |                      |   |
|                          |                     |  |     | +2     | Set 0 as January 1, 1970, 00:00:00, counting data every second<br>Lowest-order  |                                     |                      |   |
|                          |                     |  |     | +3     | As above 2nd byte   |                                     |                      |   |
|                          |                     |  |     | +4     | As above 3rd byte   |                                     |                      |   |
|                          |                     |  |     | +5     | Same as above, highest-order  |                                     |                      |   |
|                          |                     |  |     | +6     | Lower parity information with readout set values as word units with exclusive disjunction (XOR) at 35 AC h                  |                                     |                      |   |
|                          |                     |  |     | +7     | Same as above, high-order   |                                     |                      |   |
|                          | 1                   | Set value readout time from IO-Link devices (common era data)  | R   | +0     | 15.265 $\mu$ s unit data lower  |                                     |                      |   |
|                          |                     |  |     | +1     | 15.265 $\mu$ s unit data upper  |                                     |                      |   |
|                          |                     |  |     | +2     | s   |                                     |                      |   |
|                          |                     |  |     | +3     | min   |                                     |                      |   |
|                          |                     |  |     | +4     | hr  |                                     |                      |   |
|                          |                     |  |     | +5     | day   |                                     |                      |   |
|                          |                     |  |     | +6     | month   |                                     |                      |   |
|                          |                     |  |     | +7     | year  |                                     |                      |   |
|                          |                     |  |     | +8     | Lower parity information with readout set values as word units with exclusive disjunction (XOR) at 0 x35AC                  |                                     |                      |   |
|                          |                     |  |     | +9     | Same as above, high-order   |                                     |                      |   |
|                          | 2                   | Set value readout time from IO-Link devices (text string data) | R   |        | A 27-character text string will be displayed.<br>Ex.: 2020/2/29 18:59:0.1234 parity 8B61 h<br>→ 18:59:00.1234 20/02/29 8B61 |                                     |                      |   |
| 103 h                    | 0<br>(This product) | Event/error message readout                                    | R   |        | Executing readout switches the display to the event/error display window.   | ? -4.<br>Event/<br>error<br>display | ●                    | None  |
|                          |                     |  |     | +0     | Applicable channel (0 - 15)   |                                     |                      |   |
|                          |                     |  |     | +1     | Designated index number causing error/event qualifier   |                                     |                      |   |
|                          |                     |  |     | +2     | Index number in error<br>Low-order  |                                     |                      |   |
|                          |                     |  |     | +3     | Index number in error<br>High-order   |                                     |                      |   |
|                          |                     |  |     | +4     | Error code lower  |                                     |                      |   |
|                          |                     |  |     | +5     | Error code upper  |                                     |                      |   |
|                          |                     |  |     | +6     | Message text string   |                                     |                      |   |
|                          |                     |  |     | +7     | (continues)   |                                     |                      |   |

| Master parameter numbers | Target numbers      | Data name                             | R/W | Offset     | Value  | Front panel controls         | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|---------------------|---------------------------------------|-----|------------|--|------------------------------|----------------------|---|
| 104 h                    | 0<br>(This product) | Button operation                      | R   | +0         | Returns the status of the currently pressed button. Value is the same as below.  | -                            | ●                    | 00064   |
|                          |                     |                                       | W   | -          | Writes the decimal below.<br>1: Right button operation<br>2: Left button operation<br>4: [↑] button operation<br>8: [↓] button operation<br>16: [CANCEL] button operation<br>32: [ENTER] button operation<br><br>Remotely operates the product buttons. Operation is the same as pressing once, not holding.<br><br>Note: Even if buttons are remotely operated here, the display off timer will not be cleared. |                              |                      |   |
| 105 h                    | 0                   | Event/error clear                     | R   | -          | Executes operation equivalent to pressing the ENTER, Down, and Up buttons on the event/error menu.<br>Executes with readout  | ? -4.<br>Event/error display | ●                    | None  |
|                          | 1                   | Go to next event                      |     |            |  |                              |                      |   |
|                          | 2                   | Return to previous event              |     |            |  |                              |                      |   |
| 106 h                    | 0<br>(This product) | Operation lock                        | RW  | -          | Bit 0: Master parameter write lock   | -                            | ●                    | 00067   |
|                          |                     |                                       |     |            | Bit 1: Device set value write lock   |                              |                      |   |
|                          |                     |                                       |     |            | Bit 2: /Event/error clear operation lock   |                              |                      |   |
|                          |                     |                                       |     |            | Bit 3: All button operation lock   |                              |                      |   |
| 107 h                    | 0                   | Readout display text string (1st row) | R   | +0 to +499 | Text string on display<br>Character codes:<br>Japanese: Shift-JIS<br>Simplified Chinese: GB2312<br>Traditional Chinese: Big-5<br>Korean: EUC-kr  | -                            | ●                    | 00000 to 00031  |
|                          | 1                   | Readout display text string (2nd row) | R   |            |  |                              | ●                    | 00032 to 00063  |

| Master parameter numbers | Target numbers                          | Data name  | R/W | Offset    | Value  | Front panel controls | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|---|--|-----|-----------|--|----------------------|----------------------|---|
| 108 h                    | 1                                       | Right button operation response                      | R   | -         | <p>Operation response when remotely operating product buttons by designated target numbers is stored under the following decimals. Responses are as below.</p> <p>1: Referencing set values<br/>10 - 19: Digit position of set values being edited (equivalent to digits 1-10)<br/>100 up: Digit position in text string being edited<br/>Values up to 255 are 1-byte responses; values from 256 up are 2-byte responses.<br/>Even if buttons are remotely operated here, the display off timer will not be cleared.<br/>When specifying over 192 values, only 192 will be received. The readout values at that point are channel numbers.</p> | -                    | ●                    | 00064   |
|                          | 2                                       | Left button operation response                       |     |           |  |                      |                      |   |
|                          | 4                                       | Up button operation response                         |     |           |  |                      |                      |   |
|                          | 8                                       | Down button operation response                       |     |           |  |                      |                      |   |
|                          | 16                                      | CANCEL button operation response                     |     |           |  |                      |                      |   |
|                          | 32                                      | ENTER button operation response                      |     |           |  |                      |                      |   |
|                          | 192                                     | Process data information update operation response   |     |           |  |                      |                      |   |
| 109 h                    | 0 (This product)                        | Readout of channel numbers displayed                 | R   | +0        | When the IO-Link device numbers specified in writing are out of range, an out-of-range error will be generated without switching. The readout will return the current channel numbers.   | -                    | ●                    | 00065   |
| 10A h                    | 0 (This product)                        | Find Me requests                                     | RW  | +0        | <p>0: Cancel a Find Me request to the product</p> <p>1: Send a Find Me request to the product During Find Me, the event/error display will blink and the display will show "I am here." Press any button to clear Find Me.</p>   | -                    | ●                    | 00088 Bit 0   |
| 10D h                    | 0 to 15 (Corresponds to channel number) | Model name thumb value registration for verification | R   | +0 to +1  | Write the model name as a text string to calculate and store the thumb value. The readout value will be a 16-bit thumb value.  | -                    | ●                    | None  |
|                          |   |  | W   | +0 to +63 |  |                      |                      |   |
| 10E h                    | 0 to 15 (Corresponds to channel number) | Vendor ID and device ID registered for verification  | RW  | +0 to +1  | Registered IO-Link device vendor ID  | -                    | ●                    | None  |
|                          |   |  |     | +2 to +4  | Registered IO-Link device ID   |                      |                      |   |
|                          |   |  |     | +5        | 0  |                      |                      |   |
|                          |   |  |     | +6        | <p>Registered IO-Link device revision ID</p> <p>Value 10 h indicates that the revision ID is 1.0.<br/>Value 11 h indicates that the revision ID is 1.1.</p>  |                      |                      |   |

| Master parameter numbers | Target numbers                             | Data name   | R/W | Offset     | Value   | Front panel controls | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|--|---|-----|------------|---|----------------------|----------------------|---|
| 10F h                    | 0 to 15<br>(Corresponds to channel number) | Write serial number to be registered  | W   | +0 to +15  | Writes the serial number used for verification with IO-Link devices.  | -                    | ●                    | None  |
| 110 h                    | 0 to 15<br>(Corresponds to channel number) | Readout of vendor ID/ device ID of storage data backed up in this product and registered vendor ID/ device ID and serial number | R   | +0 to +1   | Vendor ID in product backup data<br>Note: In the case of a vendor ID mismatch, it will be invalid and 0 will be read out. | -                    | ●                    | None  |
|                          |  |   |     | +2 to +4   | Device ID in product backup data<br>Note: In the case of a device ID mismatch, it will be invalid and 0 will be read out. |                      |                      |   |
|                          |  |   |     | +5         | 0   |                      |                      |   |
|                          |  |   |     | +6 to +7   | Storage backup execution times since power on   |                      |                      |   |
|                          |  |   |     | +8 to +9   | Storage restoration execution times since power on  |                      |                      |   |
|                          |  |   |     | +10 to +26 | Text string of date and time of backup  |                      |                      |   |
| 111 h                    | 0<br>(This product)                        | Diagnostic information  | R   | +0         | Main memory (EEPROM) checksum error count   | -                    | ●                    | None  |
|                          |  |   |     | +1         | Sub memory (flash) checksum error count   |                      |                      |   |
|                          |  |   |     | +2         | Always 0.   |                      |                      |   |
|                          |  |   |     | +3         | Bit 0-5: Result of pressing switch alone in past  |                      |                      |   |
|                          |  |   |     | +4 to 5    | Display device drive power supply voltage (0.1 V unit)  |                      |                      |   |
|                          |  |   |     | +6         | Acyclic communication timeout count   |                      |                      |   |
|                          |  |   |     | +7         | Main memory (EEPROM) write frequency Updated every 450 seconds, with an alarm generated at over 200.                      |                      |                      |   |
|                          |  |   |     | +8         | Maximum value of the internal temperature measured inside the product. (unit: °C)   |                      |                      |   |
|                          |  |   |     | +9         | Set value version number (0)  |                      |                      |   |
|                          |  |   |     | +10        | Network communication error count   |                      |                      |   |
|                          |  |   |     | +11        | Storage function state number (normally 0, changes when storage-related functions operate)                                |                      |                      |   |
|                          |  |   |     | +12 to +13 | Reserved (always 0)   |                      |                      |   |
| 112 h                    | 0<br>(This product)                        | Output overcurrent status   | R   | +0 to +1   | Current output overcurrent status. Bits 0-15 are equivalent to I/O channels 0-9 and A-F.                                  | -                    | ●                    | 00072   |
|                          |  |   |     | +2 to +17  | Output overcurrent count for channels 0 to F. Counted up to 255.  |                      |                      |   |
|                          |  |   | W   | +0         | Write 1 to clear all channels' output overcurrent count.<br>Write 2 to 17 to clear channels 0 to F separately.            |                      |                      |   |

| Master parameter numbers | Target numbers                             | Data name   | R/W | Offset   | Value  | Front panel controls | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|--|---|-----|----------|--|----------------------|----------------------|---|
| 113 h                    | 0 to 15<br>(Corresponds to channel number) | Read vendor ID and device ID of IO-Link device currently connected. | R   | +0 to +1 | Vendor ID  | -                    | ●                    | None  |
|                          |  |   |     | +2 to +4 | Device ID  |                      |                      |   |
|                          |  |   |     | +5       | Always 0.  |                      |                      |   |
|                          |  |   |     | +6       | Revision ID  |                      |                      |   |
|                          |  |   |     | +7       | Always 0.  |                      |                      |   |
|                          |  |   |     | +8 to +9 | Function ID  |                      |                      |   |
| 114 h                    | 0 to 15<br>(Corresponds to channel number) | IO-Link device diagnostic information                               | R   | +0       | Number of IO-Link communication errors.  | -                    | ●                    | None  |
|                          |  |   | R   | +1       | IO-Link ISDU sum error count   |                      |                      |   |
|                          |  |   | R   | +2 to +3 | IO-Link transmission rate error (0.1% unit, signed)  |                      |                      |   |
|                          |  |   | R   | +4 to +5 | IO-Link transmission signal width error (0.1% unit, signed)  |                      |                      |   |
|                          |  |   | R   | +6 to +7 | Actual cycle time for IO-Link communication (0.1 ms units)   |                      |                      |   |
|                          |  |   | R   | +8       | IO-Link transmission rate (0: not communicating, 1: COM1, 2: COM2, 3: COM3)  |                      |                      |   |
|                          |  |   | R   | +9       | Process input data byte count  |                      |                      |   |
|                          |  |   | R   | +10      | Process output data byte count   |                      |                      |   |
|                          |  |   | R   | +11      | IO-Link communication status (0: NOCOM, 1: STARTUP, 2: PREOPERATE, 3: OPERATE, 4-7: Same as 0-3 with IO-Link Revision 1.0)   |                      |                      |   |
|                          |  |   | R   | +12      | IO-Link device on-request data byte count  |                      |                      |   |
|                          |  |   | R   | +13      | Process input data disabled (0: Enabled, 1: Disabled)  |                      |                      |   |
|                          | 0  | Clear IO-Link communication error count                             | W   | +0       | Write 1 to clear all channels' IO-Link communication error count. Write 2 to 17 to clear channels 0 to F separately.   |                      |                      |   |
|                          | 1  | Clear IO-Link ISDU checksum error count                             |     | +0       | Write 1 to clear all channels' ISDU checksum error count. Write 2 to 17 to clear channels 0 to F separately.   |                      |                      |   |
| 1FA h                    | 0 to 7<br>(Supports 8 type IDs)            | Readout of vendor IDs and device IDs of installed IODD information  | R   | -        | Returns 8 vendor IDs and device IDs each.<br>Returns 4 digits of vendor IDs and 6 digits of device IDs as hexadecimal text strings.<br>Format: VVVV-DDDDDD, ..., VVVV-DDDDDD<br>Note: Of the part not registered, the - will be stored.<br>Up to 64 types of IODD data can be installed. Target number 0 corresponds to the 1st through 8th, target number 1 to the 9th through 16th, and so on until target number 7 and the 56th through 64th. | -                    | ●                    | None  |

| Master parameter numbers | Target numbers      | Data name                                     | R/W | Offset     | Value  | Front panel controls | Socket communication | Reference: Modbus/TCP communication or equivalent register number |
|--------------------------|---------------------|---|-----|------------|--|----------------------|----------------------|---|
| 1FE h                    | 0 to 31             | Readout of IO-Link communication trace data   | R   | +0 to +127 | From the position where the channel number was specified, 128 bytes of trace send/receive data will return as a hexadecimal text string. When it is read out, the trace ends.<br>The specified channel number 31 is the most recent trace data, 30 is the previous one, and 0 is the oldest data.<br>A ">" is inserted at the start of the send data and a ":" at the start of the receive data. | -                    | ●                    | None  |
|                          | 0                   | Start of IO-Link communication trace          | W   | +0         | Bits 3-0: IO-Link device channel number<br>Saves the specified IO-Link device send/receive data to buffer memory (4096 bytes).<br>Bit 5: Set to 1 to stop the trace when an IO-Link communication error is generated.<br>Bit 6: Set to 1 to stop the trace when an ISDU communication negative response is generated.<br>Bit 7: Set to 1 to stop the trace when the buffer is full.              | -                    | ●                    | None  |
|                          |                     |   |     | +1         | Bit 0: Set to 1 to add a line break instead of ">" at the start of send data.  |                      |                      |   |
| 1FF h                    | 0<br>(This product) | Readout of MAC register number and serial No. | R   | +0 to +5   | 6-byte MAC register number data  | -                    | ●                    | None  |
|                          |                     |   |     | +6         | I/O voltage measurement calibrated value   |                      |                      |   |
|                          |                     |   |     | +7         | Internal temperature measurement calibrated value  |                      |                      |   |
|                          |                     |   |     | +8 to 23   | Product serial number (16 characters)  |                      |                      |   |

\*1: Event type details (from IO-Link specifications)

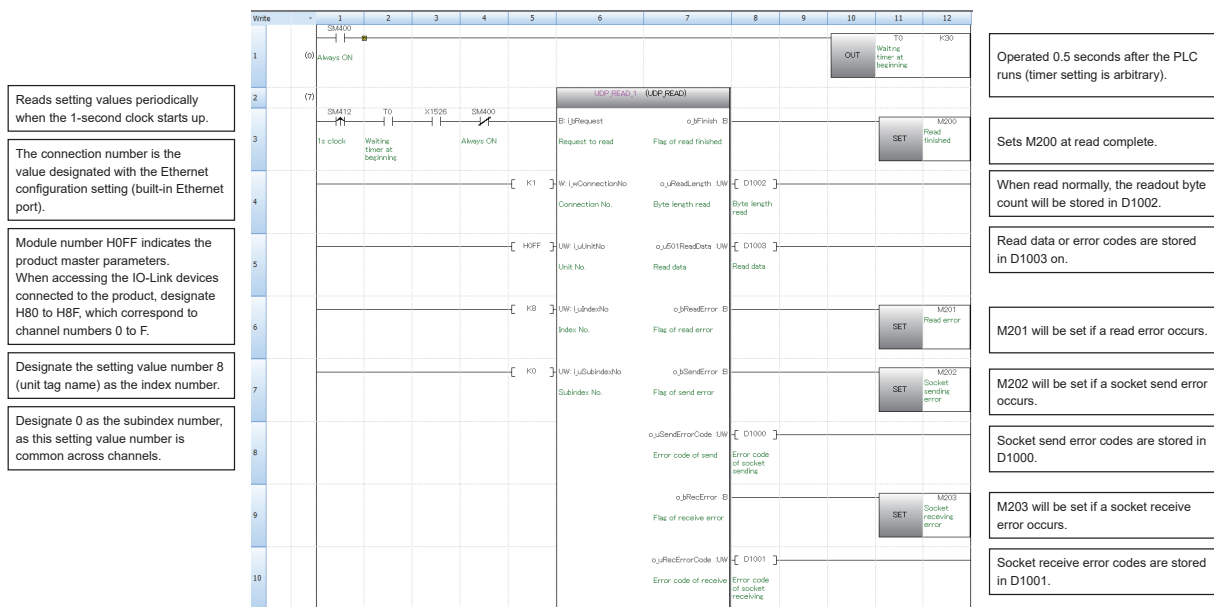
|          |                         |  |
|----------|-------------------------|--|
| Bits 7-6 | Event generation type   | 0: Reservation, 1: Single, 2: Generated, 3: Cleared            |
| Bits 5-4 | Event type              | 0: Reservation, 1: Notification, 2: Warning, 3: Error          |
| Bit 3    | Event generation source | 0: Device, 1: Master   |
| Bits 2-0 | Event cause             | 0: Unclear, 1-3: Reservation, 4: Application, 5-7: Reservation |

# App-2 Acyclic Communication Sample Programs Using Module FB

This is a sample program using an OPTEX FA Module FB for Mitsubishi Electric PLCs.

## App-2-1 Usage Example of FB to Read Parameter (UDP\_READ)

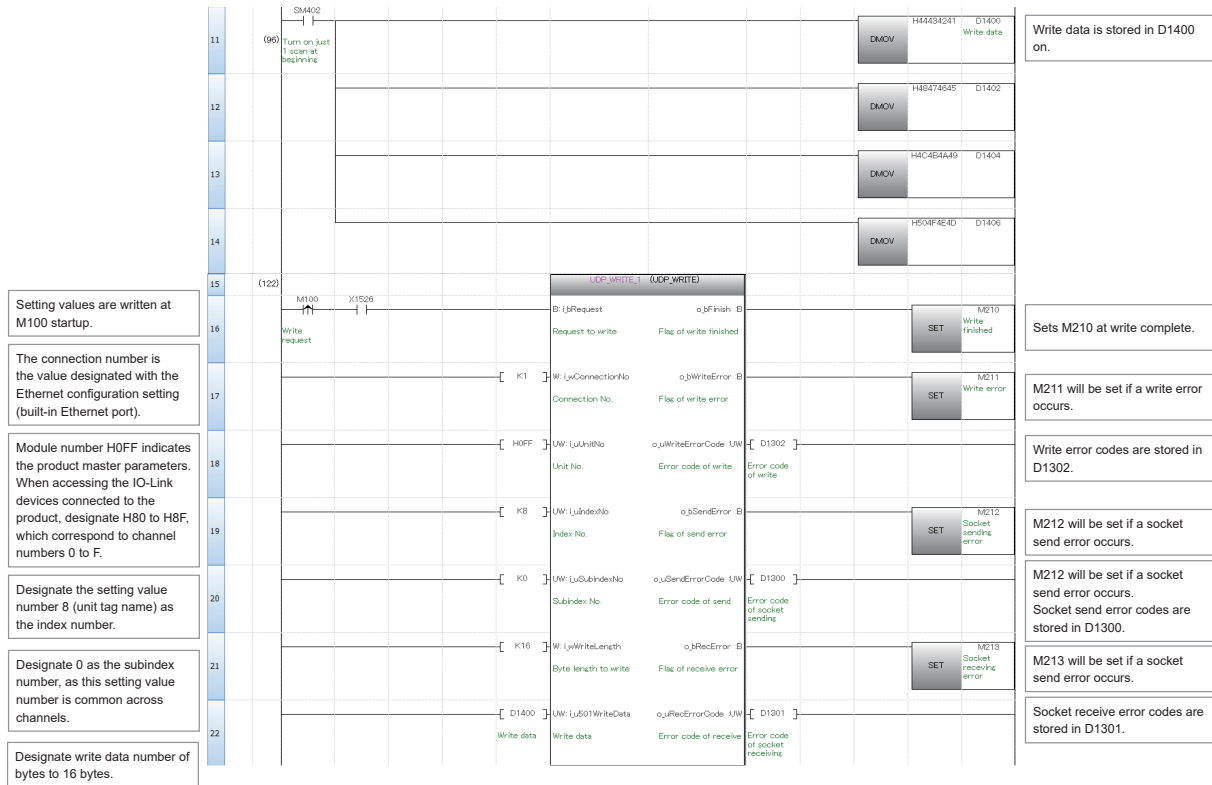
Ex.: Every 1 second, the product's master parameter unit tag name (M8) is read.





## App-2-2 Usage Example of Module FB for Writing (UDP\_WRITE)

Ex.: When conditions are met, the product's master parameter unit tag name (M8) writes a given value.



# App-2-3 FB to Read Parameter (UDP\_READ)

## Content

### Label List

|    | Label Name       | Data Type                                  | Class      | Japanese/日本語(Display Target) |
|----|------------------|--|------------|------------------------------|
| 1  | i_bRequest       | Bit  | VAR_INPUT  | Request to read              |
| 2  | i_wConnectionNo  | Word [Signed]                              | VAR_INPUT  | Connection No.               |
| 3  | i_uUnitNo        | Word [Unsigned]/Bit String [16-bit]        | VAR_INPUT  | Unit No.                     |
| 4  | i_uIndexNo       | Word [Unsigned]/Bit String [16-bit]        | VAR_INPUT  | Index No.                    |
| 5  | i_uSubindexNo    | Word [Unsigned]/Bit String [16-bit]        | VAR_INPUT  | Subindex No.                 |
| 6  | o_bFinish        | Bit  | VAR_OUTPUT | Flag of read finished        |
| 7  | o_uReadLength    | Word [Unsigned]/Bit String [16-bit]        | VAR_OUTPUT | Byte length read             |
| 8  | o_u501 ReadData  | Word [Unsigned]/Bit String [16-bit](0.500) | VAR_OUTPUT | Read data                    |
| 9  | o_bReadError     | Bit  | VAR_OUTPUT | Flag of read error           |
| 10 | o_bSendError     | Bit  | VAR_OUTPUT | Flag of send error           |
| 11 | o_uSendErrorCode | Word [Unsigned]/Bit String [16-bit]        | VAR_OUTPUT | Error code of send           |
| 12 | o_bRecError      | Bit  | VAR_OUTPUT | Flag of receive error        |
| 13 | o_uRecErrorCode  | Word [Unsigned]/Bit String [16-bit]        | VAR_OUTPUT | Error code of receive        |
| 14 | m_u2SendControl  | Word [Unsigned]/Bit String [16-bit](0.1)   | VAR        | Control data of send         |
| 15 | m_u5SendData     | Word [Unsigned]/Bit String [16-bit](0.4)   | VAR        | Send data                    |
| 16 | m_b2SendFlag     | Bit(0.1)                                   | VAR        | Flag of send finished        |
| 17 | m_bReceiving     | Bit  | VAR        | Flag of under receiving      |
| 18 | m_w2RecControl   | Word [Signed](0.1)                         | VAR        | Control data of receive      |
| 19 | m_w501 RecData   | Word [Signed](0.500)                       | VAR        | Receive data                 |
| 20 | m_b2RecFlag      | Bit(0.1)                                   | VAR        | Flag of receive finished     |
| 21 | m_uTemp          | Word [Unsigned]/Bit String [16-bit]        | VAR        | Temporary data               |
| 22 | m_bSendReq       | Bit  | VAR        | Request to send              |
| 23 | m_bReadError     | Bit  | VAR        | Flag of read error           |
| 24 | m_wReadLength    | Word [Signed]                              | VAR        | Byte length read             |

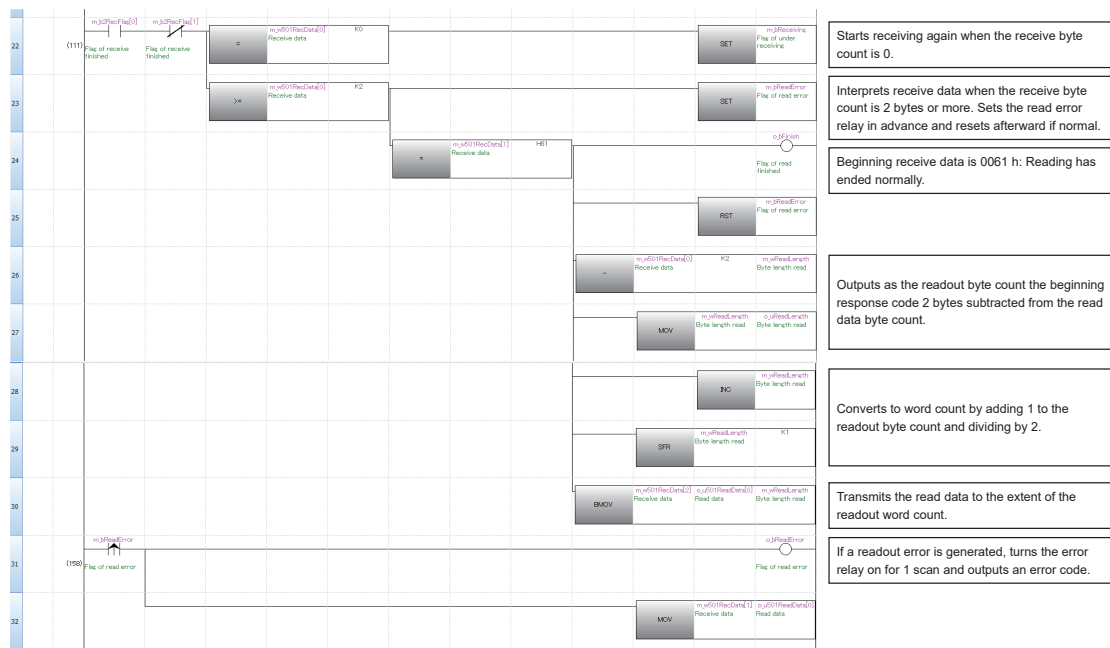
### Supplementary description

| Label name        | Value        | Description  |
|-------------------|--------------|--|
| Connection number |              | The number when opening the Ethernet port provided on the Mitsubishi Electric PLC CPU module via socket communication.<br>The connection No. displayed on the UDP connection module with the GXWorks3 Ethernet configuration screen. |
| Module number     |              | Specifies the read target.   |
|                   | 80 h to 8F h | Channels 0 to F IO-Link devices.   |
|                   | C0 h to CF h | Channels 0 to F IO-Link devices. Specifies 4 bytes or less of read data as little-endian.  |
|                   | FF h         | Product master parameters.   |
| Index number      |              | IO-Link device internal index number or product master parameter setting value number.   |
| Subindex number   |              | IO-Link device internal subindex number or product master parameter target number.   |

# Module FB Internal Program



- Specifies the word point count for socket sending.
- In accordance with Ethernet socket communication protocol, command 53 h and transfer data designation 04 h are stored.
- Shifts index number low-order byte to high-order byte.
- Stores the value designating the module (module number) in the low-order byte with OR.
- Shifts index number high-order byte to low-order byte.
- Shifts the subindex number to the high-order byte and connects it to the index number high-order byte to form 1-word data.
- Specifies the readout byte count as 0 and returns a response with the actual readout byte count.
- Sets the relay for socket sending.
- Executes socket sending to the designated connection number IP address.
- Resets the send request relay as of sending.
- Turns the error output relay on for 1 scan in the case of an error in the socket sending results.
- Outputs a socket send error code.
- Sets the relay for socket receiving if there is no socket sending error.
- Starts socket receiving when the receiving relay starts up.
- Resets the receiving relay when receiving begins.
- Turns the error output relay on for 1 scan in the case of an error in the socket receiving results.
- Outputs a socket receive error code.



# App-2-4 Module FB for Writing (UDP\_WRITE) Content

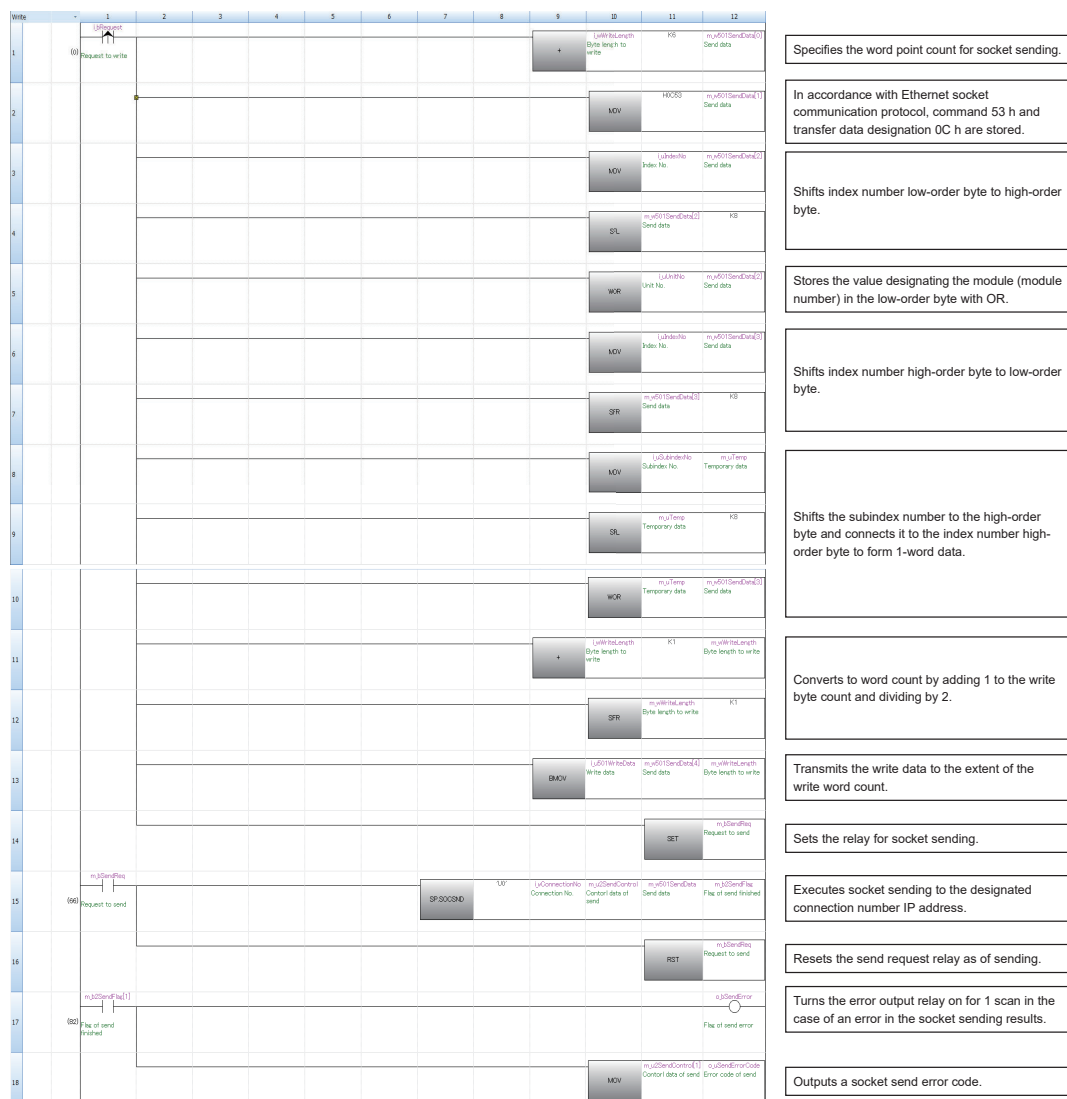
## Label List

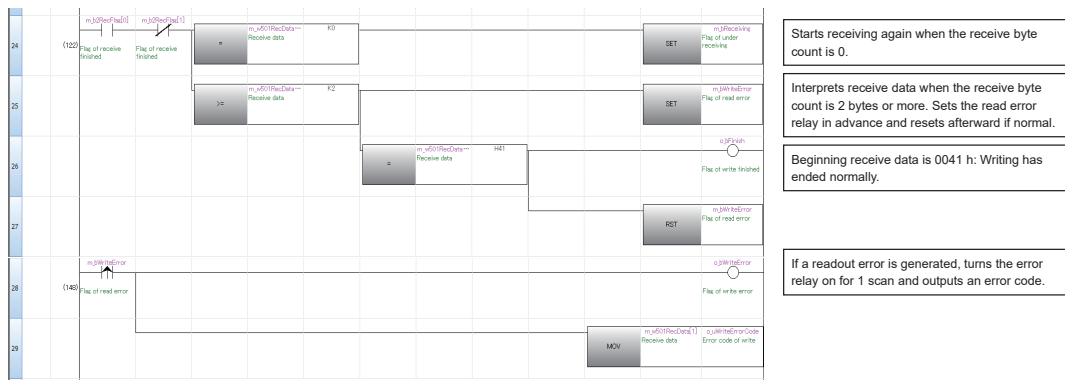
|    | Label Name        | Data Type                                 | Class      | Japanese/日本語(Display Target) |
|----|-------------------|---|------------|------------------------------|
| 1  | i_bRequest        | Bit                                       | VAR_INPUT  | Request to write             |
| 2  | i_wConnectionNo   | Word [Signed]                             | VAR_INPUT  | Connection No.               |
| 3  | i_uUnitNo         | Word [Unsigned]/Bt String [16-bt]         | VAR_INPUT  | Unit No.                     |
| 4  | i_uIndexNo        | Word [Unsigned]/Bt String [16-bt]         | VAR_INPUT  | Index No.                    |
| 5  | i_uSubindexNo     | Word [Unsigned]/Bt String [16-bt]         | VAR_INPUT  | Subindex No.                 |
| 6  | i_wWriteLength    | Word [Signed]                             | VAR_INPUT  | Byte length to write         |
| 7  | i_u501WriteData   | Word [Unsigned]/Bt String [16-bt](0..500) | VAR_INPUT  | Write data                   |
| 8  | o_bFinish         | Bit                                       | VAR_OUTPUT | Flag of write finished       |
| 9  | o_bWriteError     | Bit                                       | VAR_OUTPUT | Flag of write error          |
| 10 | o_uWriteErrorCode | Word [Unsigned]/Bt String [16-bt]         | VAR_OUTPUT | Error code of write          |
| 11 | o_bSendError      | Bit                                       | VAR_OUTPUT | Flag of send error           |
| 12 | o_uSendErrorCode  | Word [Unsigned]/Bt String [16-bt]         | VAR_OUTPUT | Error code of send           |
| 13 | o_bRecError       | Bit                                       | VAR_OUTPUT | Flag of receive error        |
| 14 | o_uRecErrorCode   | Word [Unsigned]/Bt String [16-bt]         | VAR_OUTPUT | Error code of receive        |
| 15 | m_u2SendControl   | Word [Unsigned]/Bt String [16-bt](0..1)   | VAR        | Control data of send         |
| 16 | m_w501SendData    | Word [Signed](0..500)                     | VAR        | Send data                    |
| 17 | m_b2SendFlag      | Bit(0..1)                                 | VAR        | Flag of send finished        |
| 18 | m_bReceiving      | Bit                                       | VAR        | Flag of under receiving      |
| 19 | m_w2RecControl    | Word [Signed](0..1)                       | VAR        | Control data of receive      |
| 20 | m_w501RecData     | Word [Signed](0..500)                     | VAR        | Receive data                 |
| 21 | m_b2RecFlag       | Bit(0..1)                                 | VAR        | Flag of receive finished     |
| 22 | m_uTemp           | Word [Unsigned]/Bt String [16-bt]         | VAR        | Temporary data               |
| 23 | m_bSendReq        | Bit                                       | VAR        | Request to send              |
| 24 | m_bWriteError     | Bit                                       | VAR        | Flag of read error           |
| 25 | m_wWriteLength    | Word [Signed]                             | VAR        | Byte length to write         |

## Supplementary description

| Label name        | Value        | Description  |
|-------------------|--------------|--|
| Connection number |              | The number when opening the Ethernet port provided on the Mitsubishi Electric PLC CPU module via socket communication.<br>The connection No. displayed on the UDP connection module with the GXWorks3 Ethernet configuration screen. |
| Module number     |              | Specifies the write target.  |
|                   | 80 h to 8F h | Channels 0 to F IO-Link devices.   |
|                   | C0 h to CF h | Channels 0 to F IO-Link devices. Specifies 4 bytes or less of write data as little-endian.   |
|                   | FF h         | Product master parameters.   |
| Index number      |              | IO-Link device internal index number or product master parameter setting value number.   |
| Subindex number   |              | IO-Link device internal subindex number or product master parameter target number.   |

# Module FB Internal Program





# App-3 Sample Socket Communication Program

This is a sample socket communication program.

```
// UR-ES Series CC-Link IE Field Basic Visual Studio for C++ Sample Program
//
// UR_ES_IEFB_sample.cpp: Defines the console application entry point.
//

#include "stdafx.h"

// added include file
#include <winsock2.h>
#include <ws2tcpip.h>

// configuration property → linker → input → add ws2_32.lib; to added dependent files.
// Project character set uses a multi-byte set, not Unicode.
```

## Definitions

```
// Definitions
// #define TCPIP           // Undesignated: UDP, designated: TCP/IP

#define PARAM_LEN        400 // setting value maximum data length
#define RESPCODE_LEN     2   // response code length

// definition of module being accessed
#define UNIT_MAIN        0xFF // define UR-ES unit
#define UNIT_IOL_CH0     0x80 // channel 0 IO-Link device
#define UNIT_IOL_CH1     0x81 // channel 1 IO-Link device
#define UNIT_IOL_CH2     0x82 // channel 2 IO-Link device
#define UNIT_IOL_CH3     0x83 // channel 3 IO-Link device
#define UNIT_IOL_CH4     0x84 // channel 4 IO-Link device
#define UNIT_IOL_CH5     0x85 // channel 5 IO-Link device
#define UNIT_IOL_CH6     0x86 // channel 6 IO-Link device
#define UNIT_IOL_CH7     0x87 // channel 7 IO-Link device
#define UNIT_IOL_CH8     0x88 // channel 8 IO-Link device
#define UNIT_IOL_CH9     0x89 // channel 9 IO-Link device
#define UNIT_IOL_CHA     0x8A // channel A IO-Link device
#define UNIT_IOL_CHB     0x8B // channel B IO-Link device
#define UNIT_IOL_CHC     0x8C // channel C IO-Link device
#define UNIT_IOL_CHD     0x8D // channel D IO-Link device
#define UNIT_IOL_CHE     0x8E // channel E IO-Link device
#define UNIT_IOL_CHF     0x8F // channel F IO-Link device
```



```

// definition of transfer data
#define PARAM_READ    4                // setting value read
#define PARAM_WRITE   (PARAM_READ + 8) // setting value write

// Response code
#define RESP_PWRITE    0x41            // setting value write
#define RESP_WBUSY    0x42            // setting value write busy status
#define RESP_NODATA    0x4E            // no data
#define RESP_PREAD     0x61            // setting value read
#define RESP_PBUSY     0x62            // setting value read busy status

// Ethernet/TCP protocol definition
typedef struct {
    BYTE command;                // command
    BYTE xferData;               // transfer data designation
    BYTE unit;                   // unit designation
    BYTE indexL;                 // low-order index number
    BYTE indexH;                 // high-order index number
    BYTE subindex;               // subindex number
    BYTE readLenL;               // readout byte count low-order
    BYTE readLenH;               // readout byte count high-order
} txDataNoWrite;                // no write

typedef struct {
    BYTE command;                // command
    BYTE xferData;               // transfer data designation
    BYTE unit;                   // unit designation
    BYTE indexL;                 // low-order index number
    BYTE indexH;                 // high-order index number
    BYTE subindex;               // subindex number
    BYTE writeData[PARAM_LEN];   // setting value write data
} txDataPwrite;                 // write setting values only

```

```

// send buffer union
union txBlock {
    txDataPwrite pWrite;           // setting value write
    txDataNoWrite noWrite;         // read only
};

typedef struct {
    BYTE respCode;                 // response code (RESP_NODATA, RESP_PWRITE)
    BYTE errCode;                  // error code (extended error code)
} rxDataNoRead;                   // no read

typedef struct {
    BYTE respCode;                 // response code (RESP_PREAD)
    BYTE errCode;                  // error code (extended error code)
    BYTE readData[PARAM_LEN];     // setting value read data
} rxDataPread;                    // read setting values only

// receive buffer union
union rxBlock {
    rxDataPread pRead;             // setting value read only
    rxDataNoRead noRead;          // setting value write only
};

// global variable
struct sockaddr_in dstAddr;

//-----
// socket send/receive
// dstSocket : connection socket ID
// txBuffer : send buffer
// rxBuffer: receive buffer
// txLength : send data length
// rxLength : receive data length
// return : receive data length
// -1: send error
// -2: receive error
//-----
int sendRecSocket(int dstSocket, char *txBuffer, char *rxBuffer, int txLength, int rxLength)
{
    // socket send
#ifdef TCPIP
    if (send(dstSocket, txBuffer, txLength, 0) == 0) return -1;
#else
    if (sendto(dstSocket, txBuffer, txLength, 0, (struct sockaddr *)&dstAddr, sizeof(dstAddr)) == 0) return -1;
#endif

    // socket receive
    int recByte;
    recByte = recv(dstSocket, rxBuffer, rxLength, 0);
    if (recByte < 2) return -2;

    return recByte;
}

```

```
//-----
// receive data console display
// message : response type character string
// recByte : receive data length
// respCode : response code
// respExp : expected response code
// errCode : error code
// buffer : buffer to display
// length : data length to display
// return : Nothing
//-----

void dispRxData(char *message, int recByte, BYTE respCode, BYTE respExp, BYTE errCode, BYTE *buffer, int length)
{
    int i;

    if (recByte == -1) {
        printf("A socket send error has occurred. %n");
    }
    else if (recByte == -2) {
        printf("A socket receive error has occurred. %n");
    }
    else if (respCode != respExp || errCode != 0) {
        printf("The %s response code (0x%02X) is abnormal. %n", message, respCode);
        printf("The error code is 0x%02X. %n", errCode);
    }
    else {
        printf("The %s response code (0x%02X) is normal. %n", message, respCode);
        if (length > 0) {
            // display received data in hexadecimal
            printf("Read data: ");
            for (i = 0; i < length; i++) {
                printf("%02X ", buffer[i]);
            }
            printf("%n");
        }
    }
}
}
```

## ■ Main Processing

```
//-----  
// Main function  
//-----  
int main()  
{  
    // Socket initialization  
    WSADATA wsdData;  
    if (WSAStartup(MAKEWORD(2, 0), &wsdData)) {  
        printf("Socket initialization failed %n");  
        return 2;  
    }  
  
    // Set destination IP address  
    char destination[32];  
    BYTE ipAdrs3rd = 1; // 3rd byte  
    BYTE ipAdrs4th = 31; // 4th byte  
    sprintf_s(destination, 32, "192.168.%d.%d%0", ipAdrs3rd, ipAdrs4th);  
  
    // designate port number (2001 fixed for UR-ES Ethernet/TCP)  
    int port = 2001;  
  
    // set socket structure  
    memset(&dstAddr, 0, sizeof(dstAddr));  
    dstAddr.sin_port = htons(port);  
    dstAddr.sin_family = AF_INET;  
    InetPton(AF_INET, destination, &dstAddr.sin_addr.s_addr);  
  
    // generate socket  
    int dstSocket;  
#ifdef TCPIP  
    // TCP/IP connection  
    dstSocket = socket(AF_INET, SOCK_STREAM, 0);  
  
    // connect to socket  
    if (connect(dstSocket, (struct sockaddr *) &dstAddr, sizeof(dstAddr))) {  
        printf("Could not connect to %s %n", destination);  
        return 1;  
    }  
    printf("Connected to %s %n", destination);  
#else  
    // UDP connection  
    dstSocket = socket(AF_INET, SOCK_DGRAM, 0);  
#endif  
  
    // Obtained send/receive buffer  
    union txBlock txBuffer = { 0 };  
    union rxBlock rxBuffer = { 0 };  
    int recByte;
```

## Sample Program 1: Setting Value Reading

```
//-----
// Sample 1: Setting value reading
//-----
// Use a data structure suited to the transfer data designation
// Send: No write data, so txBuffer.noWrite
// Receive: Setting value read data, so rxBuffer.pRead
printf("Sample 1\n");
txBuffer.noWrite.command = 0x53;
txBuffer.noWrite.xferData = PARAM_READ;
txBuffer.noWrite.unit = 0xFF;           // target UR-ES unit setting values
txBuffer.noWrite.indexH = 0x00;
txBuffer.noWrite.indexL = 0x08;        // read index number = 8
txBuffer.noWrite.subindex = 0x00;
txBuffer.noWrite.readLenL = 0;         // designate 0 for read data length and response will be actual data length
txBuffer.noWrite.readLenH = 0;

// socket send/receive
recByte = sendRecSocket(
    dstSocket,           // socket ID
    (char *)&txBuffer,   // send buffer
    (char *)&rxBuffer,   // receive buffer
    sizeof(txDataNoWrite), // send data length
    sizeof(rxDataPread)   // receive data length
);
dispRxData(
    "Setting value read", // character string to be displayed
    recByte,              // receive data length
    rxBuffer.pRead.respCode, // setting value reading response code
    RESP_PREAD,           // expected response code
    rxBuffer.pRead.errCode, // setting value read error code
    (BYTE *)&rxBuffer.pRead.readData, // display data address
    recByte - RESP_CODE_LEN // data length to be displayed (deleting 1 response code portion)
);
```

## ■ Sample Program 2: Setting Value Writing

```
//-----
// Sample 2: Setting value writing
//-----
// Use a data structure suited to the transfer data designation
// Send: Setting value write data, so txBuffer.pWrite
// Receive: Setting value write response, so rxBuffer.noRead
printf("Sample 2\n");
txBuffer.pWrite.command = 0x53;
txBuffer.pWrite.xferData = PARAM_WRITE;

txBuffer.pWrite.unit = 0xFF;           // target UR-ES unit setting values
txBuffer.pWrite.indexH = 0x00;
txBuffer.pWrite.indexL = 0x08;        // read index number = 8
txBuffer.pWrite.subindex = 0x00;
txBuffer.pWrite.writeData[0] = 'a';   // write data
txBuffer.pWrite.writeData[1] = 'b';
txBuffer.pWrite.writeData[2] = 'c';
txBuffer.pWrite.writeData[3] = 'd';
txBuffer.pWrite.writeData[4] = 'e';
int pWriteLen = 5;                    // setting value write byte length

// socket send/receive
recByte = sendRecvSocket(
    dstSocket,                         // socket ID
    (char *)&txBuffer,                 // send buffer
    (char *)&rxBuffer,                 // receive buffer
    sizeof(txDataNoWrite) + pWriteLen, // send data length
    sizeof(rxDataNoRead)               // receive data length
);
dispRxData(
    "Setting value write",             // character string to be displayed
    recByte,                           // receive data length
    rxBuffer.noRead.respCode,          // setting value writing response code
    RESP_PWRITE,                       // expected response code
    rxBuffer.noRead.errCode,           // setting value writing error code
    (BYTE *)&rxBuffer.noRead.errCode, // display data address (dummy)
    0                                  // data length to display
);

// socket close
closesocket(dstSocket);
WSACleanup();

return 0;
}
```

## ■ Sample Program 3: Setting Value Background Reading

```
//-----
// Sample 3: Setting value background reading
//-----
// Use a data structure suited to the transfer data designation
// Send: No write data, so txBuffer.noWrite
// Receive: Setting value read data, so rxBuffer.pRead
printf("Sample 3\n");
txBuffer.noWrite.command = 0x53;
txBuffer.noWrite.xferData = BACK_READ;

txBuffer.noWrite.unit = 0xFF;           // target UR-ES unit setting values
txBuffer.noWrite.indexH = 0x00;
txBuffer.noWrite.indexL = 0x41;        // read index number = 65
txBuffer.noWrite.subindex = 0x00;
txBuffer.noWrite.readLenL = 0;         // designate 0 for read data length and response will be actual data length
txBuffer.noWrite.readLenH = 0;

do {
    // socket send/receive
    recByte = sendRecvSocket(
        dstSocket,                      // socket ID
        (char *)&txBuffer,              // send buffer
        (char *)&rxBuffer,              // receive buffer
        sizeof(txDataNoWrite),          // send data length
        sizeof(rxDataPread)             // receive data length
    );
    dispRxData(
        "Setting value read",            // character string to be displayed
        recByte,                        // receive data length
        rxBuffer.pRead.respCode,         // setting value reading response code
        RESP_PREAD,                     // expected response code
        rxBuffer.pRead.errCode,          // setting value read error code
        (BYTE *)&rxBuffer.pRead.readData, // display data address
        recByte - RESP_CODE_LEN          // data length to be displayed (deleting 1 response code portion)
    );

    // Change to background access status confirmation
    txBuffer.noWrite.xferData = BACK_STATUS;
} while (rxBuffer.pRead.respCode == RESP_PBUSY);
```

## ■ Sample Program 4: Setting value background writing

```
//-----
// Sample 4: Setting value background writing
//-----
// Use a data structure suited to the transfer data designation
// Send: No write data, so txBuffer.pWrite
// Receive: Setting value read data, so rxBuffer.noRead
printf("Sample 4\n");
txBuffer.noWrite.command = 0x53;
txBuffer.noWrite.xferData = BACK_WRITE;

txBuffer.noWrite.unit = 0xFF;           // target UR-ES unit setting values
txBuffer.noWrite.indexH = 0x00;
txBuffer.pWrite.indexL = 0x08;         // read index number = 8
txBuffer.pWrite.subindex = 0x00;
txBuffer.pWrite.writeData[0] = 'A';    // write data
txBuffer.pWrite.writeData[1] = 'B';
txBuffer.pWrite.writeData[2] = 'C';
txBuffer.pWrite.writeData[3] = 'D';
txBuffer.pWrite.writeData[4] = 'E';
txBuffer.pWrite.writeData[5] = 'F';
pWriteLen = 6;                        // setting value write byte length

do {
    // socket send/receive
    recByte = sendRecvSocket(
        dstSocket,                     // socket ID
        (char *)&txBuffer,            // send buffer
        (char *)&rxBuffer,            // receive buffer
        sizeof(txDataNoWrite) + pWriteLen, // send data length
        sizeof(rxDataNoRead)           // receive data length
    );
    dispRxData(
        "Setting value write",          // character string to be displayed
        recByte,                       // receive data length
        rxBuffer.noRead.respCode,       // setting value writing response code
        RESP_PWRITE,                   // expected response code
        rxBuffer.noRead.errCode,        // setting value writing error code
        (BYTE *)&rxBuffer.noRead.errCode, // display data address (dummy)
        0                              // data length to display
    );
} while (rxBuffer.pRead.respCode == RESP_WBUSY);

// socket close
closesocket(dstSocket);
WSACleanup();

return 0;
}
```



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**Attention: Not to be Used for Personnel Protection.**

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

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



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The information in this user's manual is correct as of December 2022

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