OMRON

GD Series

IO-Link Master Unit (Multi-Network Compatible)

User's Manual

EtherNet/IP™ Edition

GD-ILM□□□-MLP

IO-Link Master Unit

Z514-E1-02

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Introduction

Thank you for purchasing the IO-Link Master Unit GD-ILM16C-MLP and GD-ILM16E-MLP.
This manual contains the information required when using *EtherNet/IP* as the host network.
Please read this manual and make sure you understand the functionality and performance of the product before you attempt to build a system. After reading the manual, keep it in a safe and accessible location for further reference.

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

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

Applicable Products

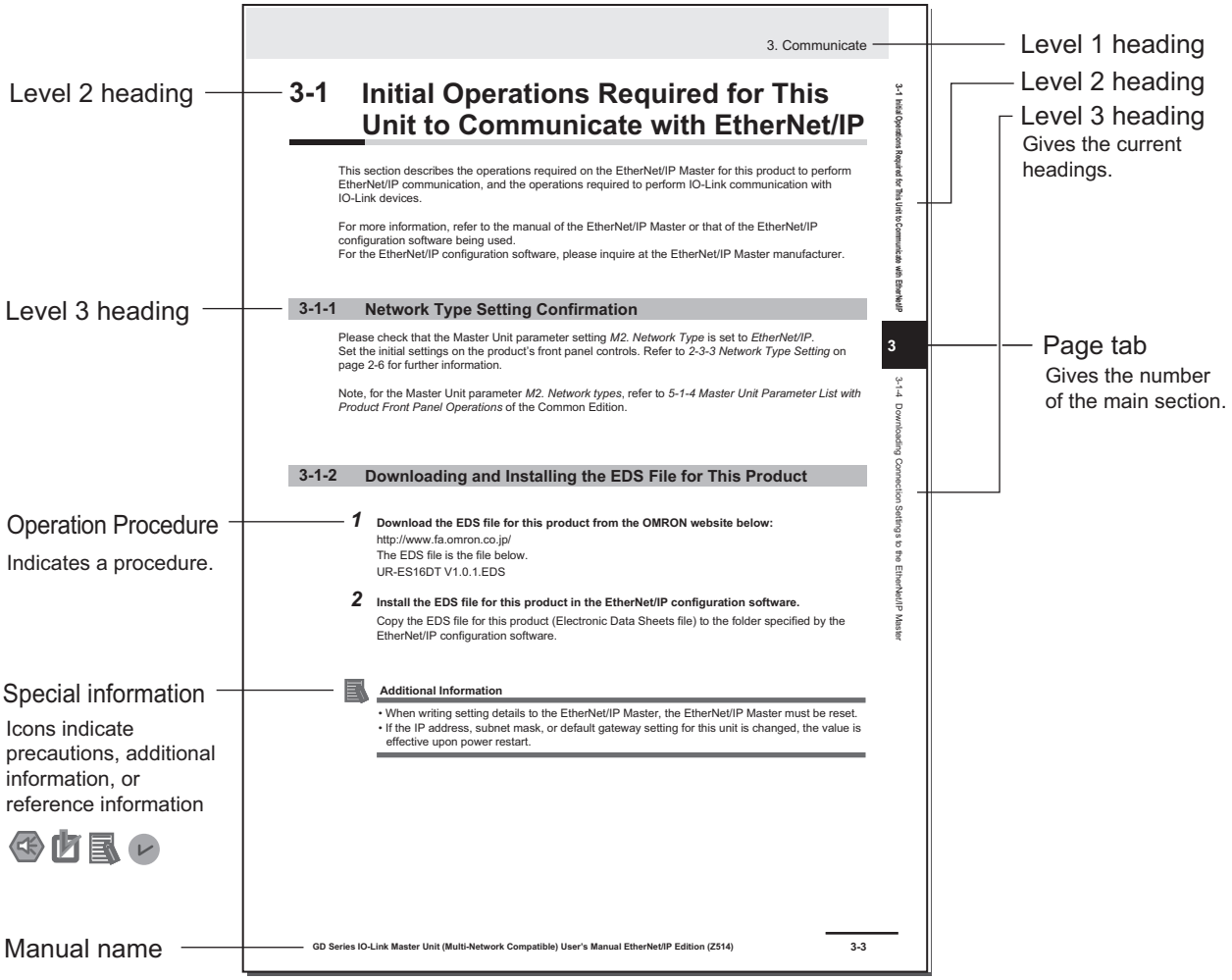
This manual covers the following product.

- GD-series IO-Link Master Unit
  - GD-ILM16C-MLP
  - GD-ILM16E-MLP

Manual Structure

Page Structure

The following page structure is used in this manual.



This illustration is provided only as a sample. It may not literally appear in this manual.

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Special information in this manual is classified as follows:

Important

This summarizes particularly important points about its performance, including the things to be observed during operation and the advice on usage.

Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.

Version Information

Information on differences in specifications and functionality for products with different unit versions and for different versions of the Support Software is given.

Notations Used in this Manual

These are the notations used in this manual.

Precautions for Correct Use

This indicates particularly important points to observe during operation.

Additional Information

This information is useful for operation.

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Terms and Conditions Agreement

Warranty, Limitations of Liability

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Refer to the *GD Series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition (Cat. No. Z512)* (hereinafter abbreviated as the *Common Edition*) for safety precautions .

Precautions for Safe Use

Refer to the *GD Series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition (Cat. No. Z512)* (hereinafter abbreviated as the *Common Edition*) for precautions for safe use.

Precautions for Correct Use

Refer to the *GD Series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition (Cat. No. Z512)* (hereinafter abbreviated as the *Common Edition*) for precautions for use.

Regulations and Standards

Refer to the *GD Series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition (Cat. No. Z512)* (hereinafter abbreviated to as the *Common Edition*) for regulations and standards.

Checking the Included Items

Refer to the *GD Series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition (Cat. No. Z512)* (hereinafter abbreviated as the *Common Edition*) for included items.

Related Manuals

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

Manual number	Manual name	Details
Z512	GD-series IO-Link Master Unit (Multi-Network Compatible) User's Manual Common Edition GD-ILM□□□-MLP (Referred to herein as the *Common Edition*.)	Describes this product's common functions and performance as well as operation. Be sure to read these documents.
Z518	GD Series Wave Inspire HUB Operation Manual	Provides necessary information for operating OMRON Support Software (Wave Inspire HUB) for the GD Series.

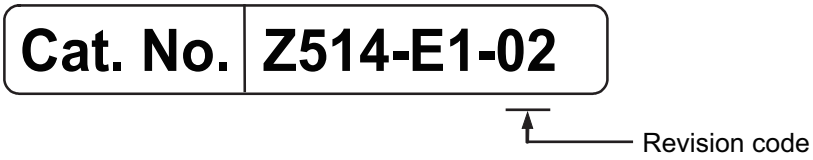
Terminology List

This explains the terminology used in this document.

Terminology	Description
EtherNet/IP	A standard network for an industrial-use Ethernet, equipped with CIP (Common Industrial Protocol) as a control protocol, mounted on an application layer of a TCP/IP protocol widely used in the Ethernet.
EtherNet/IP Master	Master station PLC, etc., for EtherNet/IP communication (operated as a scanner in cyclic communication).
EtherNet/IP configuration software	Software for preparation of EtherNet/IP network configurations. Select depending on the EtherNet/IP Master.
Cyclic communication (cyclic transmission and process I/O communication)	The EtherNet/IP Master 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. Host master side programs can be simplified.
Cyclic communication area	An area where the EtherNet/IP Master, as the originator, cyclically inputs or outputs the target. Uses EtherNet/IP configuration software to specify each connection.
Explicit message communication (Explicit message communication and ISDU communication)	When necessary, use the Explicit message communication instructions from the EtherNet/IP Master to read and write the specified data in this product or IO-Link device. When this happens, this product executes ISDU communication (of IO-Link) with the IO-Link device.
Connection	In EtherNet/IP cyclic communication, the node on one side requests establishment of a logical communication line, and when that line is established, uses the line to exchange data with a partner node. Indicates the logical communication line at that time. The device that requests establishment of a connection is called the *originator* and the device receiving the request is called the *target*.
Object	Refers to the clumpy substances that define the data or its activities held in communication specifications or each device.
Class	Expresses the object type. Defines all properties characterizing a clump of objects.
Instance	Refers to the substances inside an object (the instance is what embodies the class).
Attribute	Refers to the detailed information inside an instance.
Service codes	Refers to the access method for providing objects.
Assembly object	An object that is particularly used in cyclic communication within an object. Gathers (assembles) data inside own device, and places it on the connection.
Packet interval (RPI)	The data update cycle for each connection between the originator and target in EtherNet/IP cyclic communications. Sets the EtherNet/IP Master side for each connection. The minimum packet interval for this product is 1 ms.

Revision History

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



Revision code	Date	Revised content
01	February 2026	Original production
02	March 2026	Corrected mistakes.

1

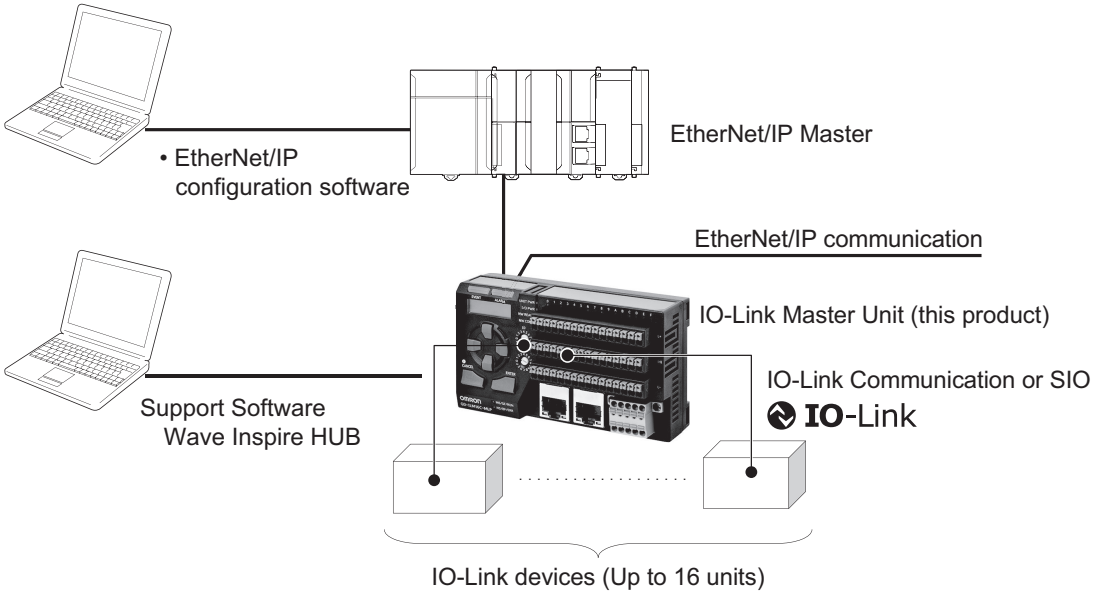
Overview

This chapter describes the overview when using *EtherNet/IP* as the host network.

1-1 Product Overview

When setting the network type to *EtherNet/IP*, this product conducts EtherNet/IP cyclic communication with the EtherNet/IP communication master, while simultaneously communicating IO-Link process data with the connected IO-Link devices.
In addition, it enables receiving of acyclic communication messages from the EtherNet/IP communication master, conversion of that to an IO-Link ISDU communication, and reading and writing of service data inside the IO-Link device when necessary.
In cyclic communication, it also enables read and write in response to a specific IO-Link device or target address in this product without using acyclic communication, through use of cyclic communication operation only.

EtherNet/IP and IO-Link System Configuration Example



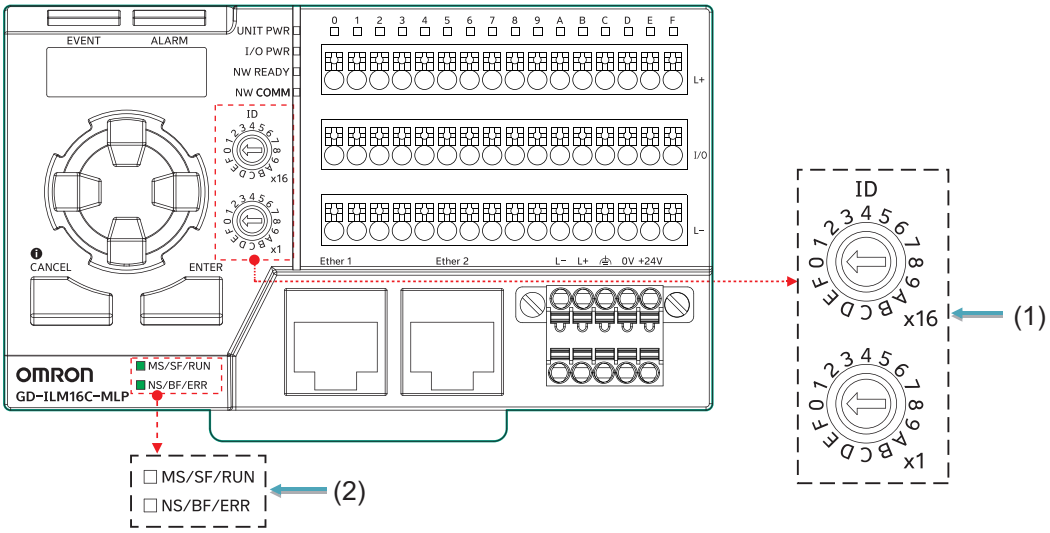
Features

- The host network type can be switched among the following depending on the setting.
  a) EtherNet/IP (default value)
  b) Ethernet & Modbus/TCP
  c) CC-Link IE Field Basic
- EtherNet/IP cyclic communication enables input/output with up to 16 IO-Link devices (up to 32 bytes input and up to 4 bytes output per device). Further, reading and writing the settings of this product or the designated index/sub-index values of IO-Link devices is possible using part of cyclic data without relying on acyclic communication (this is called extended access).
- By using the EtherNet/IP Explicit communication instructions, reading and writing the settings of this product or the designated index/sub-index values of IO-Link devices is also possible, as necessary.

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 *EtherNet/IP* as the host network, are as follows.
Refer to the Common Edition for other part names and functions.



Note The above figure is for GD-ILM16C-MLP.
The same applies to GD-ILM16E-MLP.

1. **IP address lowest digit setting switch**
   Sets the lowest digit of the IP address value (the “n” in 192.168.250.n). The top value is multiplied by 16 and added to the bottom value.
2. **MS/SF/RUN LED, NS/BF/ERR LED**
   Displays the host network status.
   For EtherNet/IP, this is as follows.

MS/SF/RUN	NS/BF/ERR	Operation status
Lit green	Lit green	Normal communication status (connection established) **Note** Also includes assembly instance conflicts.
Lit green	Flashing green	Connection not established
Flashing red	Lit red	IP address conflict condition (if Address Conflict Detection (ACD) is enabled)
Lit green	Flashing red	Exclusive Owner connection timeout
Flashing green	Off	IP address conflict condition (if Address Conflict Detection (ACD) is disabled)
Off	Off	No power supply

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 EtherNet/IP Master cyclic communication area.		-
	For default value	• Input (IO-Link device → EtherNet/IP Master): 32 bytes/device (however, port F only is 16 bytes) • Output (EtherNet/IP Master → IO-Link device): 4 bytes/device	*3-3 Cyclic Communication Details* on page 3-7
	For other than default value	The following manual or auto assignments are possible.	• Common Edition *Chapter 4: Product Functions* • *A-1 Assignment Method Other Than Process Data Default Value* on page A-2
		Manual assignment: With the following Master Unit parameters for this product, the allocation size is set to other than default values for each port. • Input: *M40. Process input data words allocation*: 0 to 16 words per port (default value: 16 words) • Output: *M41. Process output data words allocation*: 0 to 16 words per port (default value: 2 words)	
		Auto assignment: In accordance with the actual IO-Link device specifications, the above Master Unit parameter word allocation is automatically set. This depends on setting *M42. Process data words auto allocation* to *Yes* (1).	
2) Confirmation with front panel controls	Confirmation is done with product front panel operation.		Common Edition *Chapter 5 Front Panel Operations*

1-4 Setting/Monitoring Product Master Unit Parameters

This section describes how to set/monitor product Master Unit parameters.

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

Method	Description	Reference
1) Setting with front panel controls	Setting/monitoring is done with product front panel operation.	Common Edition *Chapter 5 Front Panel Operations*
2) Setting by Explicit communication instruction from EtherNet/IP Master	Setting/monitoring is done for the *Product Object* by Explicit communication instruction from EtherNet/IP Master.	*3-6-1 This Unit's Object (Class ID: 64 h)* on page 3-28
3) Setting via cyclic communication extended access	Specific Master Unit parameters can be read/written by cyclic communication operation alone without using the Explicit message communication (via extended access).	*3-3 Cyclic Communication Details* on page 3-7

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

This section explains how to set/monitor 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 by Explicit communication instruction from EtherNet/IP Master	Setting/monitoring is done for the *IO-Link device object connected to the Product* by Explicit communication instruction from EtherNet/IP Master.	*3-6-2 IO-Link Device Object Connected to This Unit (Class ID: 80 to 8F h)* on page 3-29
2) Setting/monitoring via cyclic communication extended access	Specific service data inside IO-Link devices can be read/written by cyclic communication operation alone without using the Explicit message communication (via extended access).	*3-3 Cyclic Communication Details* on page 3-7
3) Setting/monitoring with front panel controls	Setting/monitoring is possible with front panel controls.	Common Edition *5-1-5 Device Identification Display*

1-6 Basic Procedures

The procedures to install and configure this product and start the EtherNet/IP and IO-Link communication are shown below.

Procedure	Details	References
Prior confirmation	• Which Ethernet connection type to use in EtherNet/IP	*2-2 Ethernet Connection* on page 2-4
	• Prepare an Ethernet connection cable and Switching Hub	*Checking the Included Items* on page 16 Manual of the EtherNet/IP Master being used
	Data I/O design: • Whether to access settings with cyclic communication data operation, using cyclic communication, and without using acyclic communication (whether to use *extended access*) • What to read and write to this product or IO-Link device using acyclic communication	*3-2 Cyclic Communication Mechanism in This Unit* on page 3-5 *3-3 Cyclic Communication Details* on page 3-7 *3-4 Explicit Message Communication Mechanism in This Unit* on page 3-25 *3-5 Explicit Message Communication Details* on page 3-26
Hardware installation and wiring	Setting the product IP address (192.168.250.n) lowest digit setting (n) using the rotary switch on the front of the product	*2-1 Configuring the IP Address for This Unit* on page 2-2
Initial Settings for Front Panel Controls	Set the *Network type* setting to *EtherNet/IP*	*2-3 Initial Settings for Front Panel Controls* on page 2-6
Operation to communicate with the EtherNet/IP Master	Check that the *Network type* setting is at *EtherNet/IP*	*3-1-1 Network Type Setting Confirmation* on page 3-2
	Install the EDS file for this product	*3-1 Initial Operations Required for This Unit to Communicate with EtherNet/IP* on page 3-2 Manual of the EtherNet/IP Master being used Manual of the EtherNet/IP configuration software being used
	• Cyclic communication: Add this product to the EtherNet/IP system in the EtherNet/IP configuration software, configure the connection, and configure the cyclic communication area • Acyclic communication: Create a communication program	
	Download connection settings to the master	
This product parameter	Using front panel controls	Common Edition
	Using Explicit communication instruction from EtherNet/IP Master	*3-6-1 This Unit's Object (Class ID: 64 h)* on page 3-28
IO-Link device service data setting	Using front panel controls	Common Edition
	Using Explicit communication instruction from EtherNet/IP Master	*3-6-2 IO-Link Device Object Connected to This Unit (Class ID: 80 to 8F h)* on page 3-29
Starting communication	Start system (power ON)	
	Start EtherNet/IP communication Starting IO-Link communication	Manual of the EtherNet/IP Master being used

Procedure	Details	References
Checking operation	EtherNet/IP Master and this product/IO-Link device display check	Manual of the EtherNet/IP Master being used Common Edition Each IO-Link device manual
	Verify that the EtherNet/IP Master reads and writes data	Manual of the EtherNet/IP Master being used
	Verifying read/write data between this product and an IO-Link device	Each IO-Link device manual
	Verify that EtherNet/IP Master and this product reads/writes data via cyclic communication to/from this product	Manual of the EtherNet/IP Master being used
	Execute PLC Explicit communication instruction for reading and writing to this product or IO-Link device (when required) using acyclic communication	*3-3 Cyclic Communication Details* on page 3-7 *3-5 Explicit Message Communication Details* on page 3-26
Troubleshooting	EtherNet/IP Master and this product/IO-Link device display check, acyclic (Explicit) communication response check	*Section 5 Troubleshooting* on page 5-1

Additional Information

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

Method	Main application	References
1) Unit front operation	Startup time or Maintenance	• Common Edition
2) Acyclic communication from EtherNet/IP Master	Controlled operation	• *3-5 Explicit Message Communication Details* on page 3-26 • *A-2 List of Master Unit Parameters for This Product* on page A-9
3) Cyclic communication extended access from EtherNet/IP Master	When you want to more easily perform IO-Link device setting changes	• *3-3 Cyclic Communication Details* on page 3-7

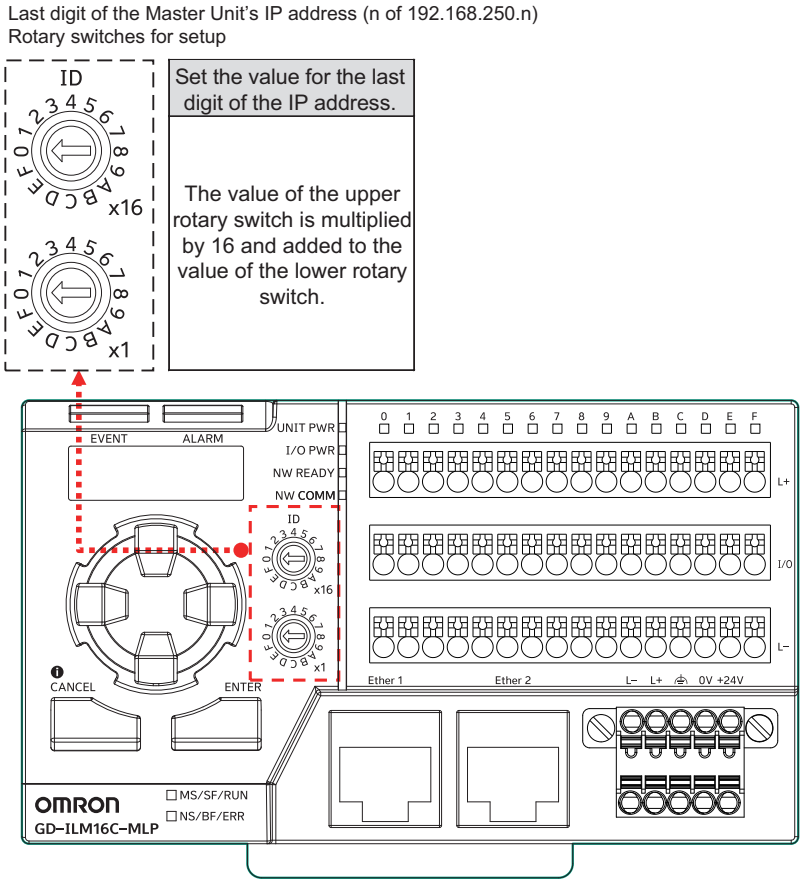
2

Initial Setting of This Product with Regard to EtherNet/IP

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

2-1 Configuring the IP Address for This Unit

Before inserting the power, use the front panel rotary switch to set the product IP address lowest digit setting (n in 192.168.250.n) as the host network EtherNet/IP node.



Note The above figure is for GD-ILM16C-MLP. The same applies to GD-ILM16E-MLP.

The top value is multiplied by 16 and added to the bottom value.
For example, when setting to 250, set the upper switch to 15 and the lower switch to 10.

The IP address in the default setting is 192.168.250.n (the n value is determined by the front panel rotary switch).
When changing to something other than 192.168.250.n, set the *M82. IP address* Master Unit parameter with product front panel controls. Note, turning the front panel rotary switch when the power is on causes an automatic move to *M82. IP address*.

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

When changing the IP address, default gateway, or subnet mask with product front panel controls, refer to *5-1-1 Overview of Display Operations* and *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition.

Static IP is the only way to set the product IP address (the IP address cannot be acquired via BOOTP or DHCP).

2-2 Ethernet Connection

Shown here is the Ethernet connection configuration when using EtherNet/IP as the host network.

2-2-1 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 a standard (1000BASE-T, 100BASE-TX, 10BASE-T).
For details, refer to the user's manual for each EtherNet/IP Master.

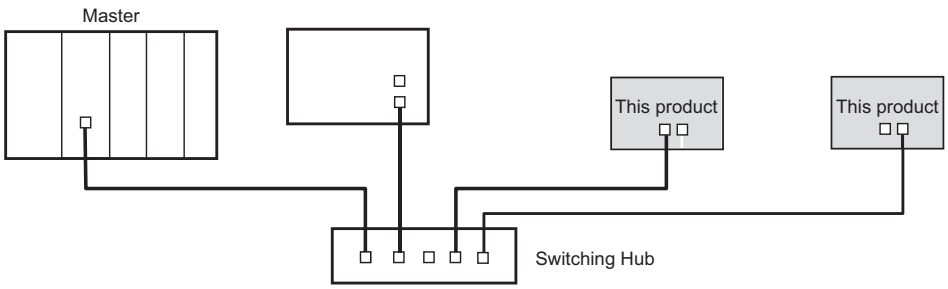
2-2-2 Ethernet Connection Status

Connect connectors/cables depending on the Ethernet connection type.
This product supports the following connection types.

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

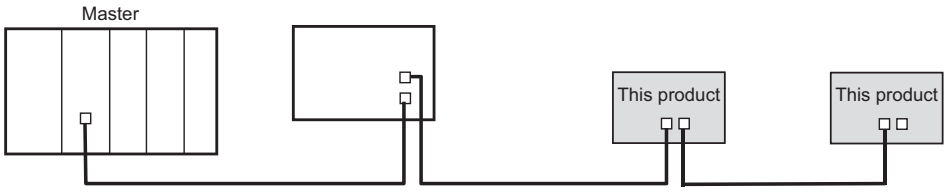
● Star Configuration

The star configuration network enables connection of various devices from a Switching Hub.
Connection to either Ether1 or Ether2 of the product is possible.



● Linear Bus Configuration

A linear bus configuration network is a connection type in which devices are daisy chained together.
This requires no Switching Hub and can result in a shorter total LAN cable length.
The upstream device (toward the master) and downstream device can be connected to either Ether1 or Ether2 on this product.



● Device Level Ring Configuration

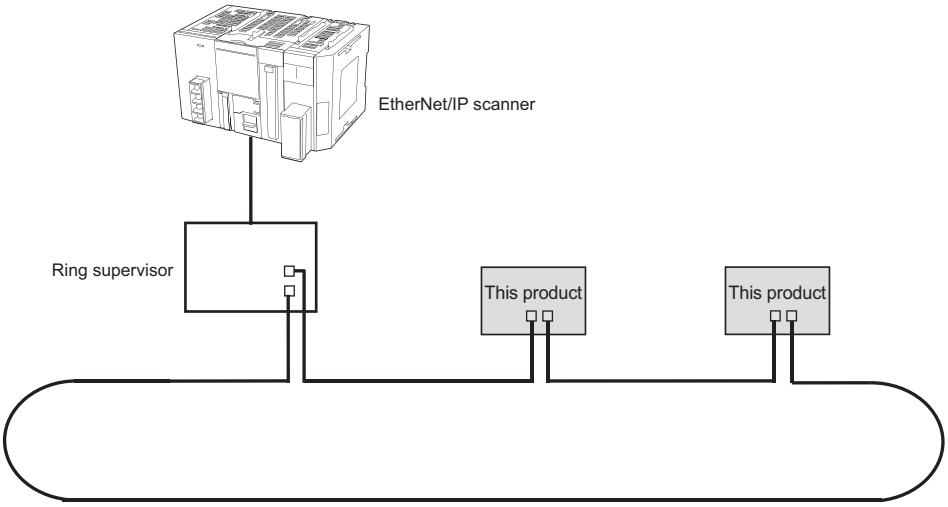
A device level ring (DLR) configuration network is a connection type that provides strong resilience to outages.

Connection to either Ether1 or Ether2 of the product is possible.

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

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

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



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

Additional Information

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

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

2-3 Initial Settings for Front Panel Controls

Shown here is the initial setting method via product front panel operation when using *EtherNet/IP* as the host network.

2-3-1 Powering Up the EtherNet/IP Master

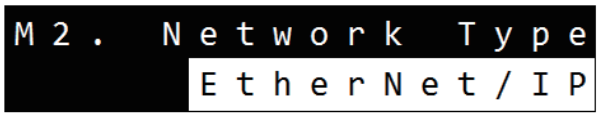
When available, apply power to the EtherNet/IP Master station in advance.
This makes it possible to check whether the master is connected correctly.

2-3-2 Language

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

2-3-3 Network Type Setting

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



The factory default network type setting is *EtherNet/IP*.
Press the **ENTER** button. Wait about 20 seconds.
When rewriting is complete, there will be an automatic reboot.

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.

Port number

Refer to *5-1 Front Panel Operations* of the Common Edition for details on the front panel operation.

3

Communicate

Describes the initial settings for EtherNet/IP communication and IO-Link communication, the configuration of the data to be handled, and communication examples.

3-1 Initial Operations Required for This Unit to Communicate with EtherNet/IP

This section describes the operations required on the EtherNet/IP Master for this product to perform EtherNet/IP communication, and the operations required to perform IO-Link communication with IO-Link devices.

For more information, refer to the manual of the EtherNet/IP Master or that of the EtherNet/IP configuration software being used.
For the EtherNet/IP configuration software, please inquire at the EtherNet/IP Master manufacturer.

3-1-1 Network Type Setting Confirmation

Please check that the Master Unit parameter setting *M2. Network Type* is set to *EtherNet/IP*.
Set the initial settings on the product's front panel controls. Refer to *2-3-3 Network Type Setting* on page 2-6 for further information.

Note, for the Master Unit parameter *M2. Network types*, refer to *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition.

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

1 Download the EDS file for this product from the OMRON website below:
http://www.fa.omron.co.jp/
The EDS file is the file below.
GD-ILM16C-MLP V1.0.0.EDS
GD-ILM16E-MLP V1.0.0.EDS

2 Install the EDS file for this product in the EtherNet/IP configuration software.
Copy the EDS file for this product (Electronic Data Sheets file) to the folder specified by the EtherNet/IP configuration software.

3-1-3 Configuring EtherNet/IP Master, and EtherNet/IP Communication with This Unit

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

Cyclic Communication

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

- **Design**

1 Determine which data in this product to use with cyclic communication
There are two types of internal data (assembly instances) for cyclic communication in this product.
Determine which data to transmit periodically (both can be used).

2 Confirm the connection I/O type to use
Confirm the connection I/O type to use.

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

Cyclic communication internal data	Assembly instance	Size	Data direction
Input	101 (65 h)	500 byte fixed	Target (This Unit) → Originator (EtherNet/IP Master)
Output	100 (64 h)	68 byte fixed	Originator (EtherNet/IP Master) → Target (This Unit)

● Configuration

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

1 Register this product on the EtherNet/IP network in the configuration software, and then enter the IP address of this product, configured in *2-1 Configuring the IP Address for This Unit* on page 2-2 (192.168.250.n (n is the value set with the front rotary switch)).

2 Create a cyclic communication area on the EtherNet/IP Master for which to assign data from this product.

3 Select the connection I/O type of this product (target).

4 Assign the assembly instance of this product to the input/output of the selected connection.

5 Select the cyclic communication area on the assigned EtherNet/IP Master.

6 Configure the RPI, timeout value, and connection type for the connection parameters.

7 To use two connections, repeat steps 3 through 6 above.

Explicit Message Communication

If you are using Explicit message communication, create a communication program on the EtherNet/IP Master.

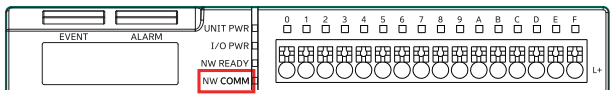
3-1-4 Downloading Connection Settings to the EtherNet/IP Master

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

Cyclic communication will automatically start.

Additional Information

- When writing setting details to the EtherNet/IP Master, the EtherNet/IP Master must be reset.
- If the IP address, subnet mask, or default gateway setting for this product is changed, the value is effective upon power restart.
- If the product front panel NW COMM LED does not light up blue-green (showing normal communication) even after setting is complete, once again check the settings performed by the EtherNet/IP configuration software, and the product settings (IP address, subnet mask, default gateway).



- If communication is not possible even after all the confirmation above, refer to the manuals for each EtherNet/IP Master.

3-2 Cyclic Communication Mechanism in This Unit

During cyclic communication, a device opens a logical communication line called a *connection* with another device. Data communication begins once this is successfully opened.
The device that opens the connection is called the *originator* and other device is called the *target*.
Generally, a device that has the originator function is called a *scanner* while a device with only the target function is called an *adapter*.
This product is an *adapter*.
Note that a *scanner* can function as either an originator or target.

Additional Information

Cyclic communication in EtherNet/IP is based on objects that send and receive data within own device gathered into a single connection called an *Assembly object* in the middle of the EtherNet/IP object.
Selection of an instance ID (assembly instance ID) for the connection being used serves to enable batch sending or receiving.

3-2-1 Connections Supported by This Unit

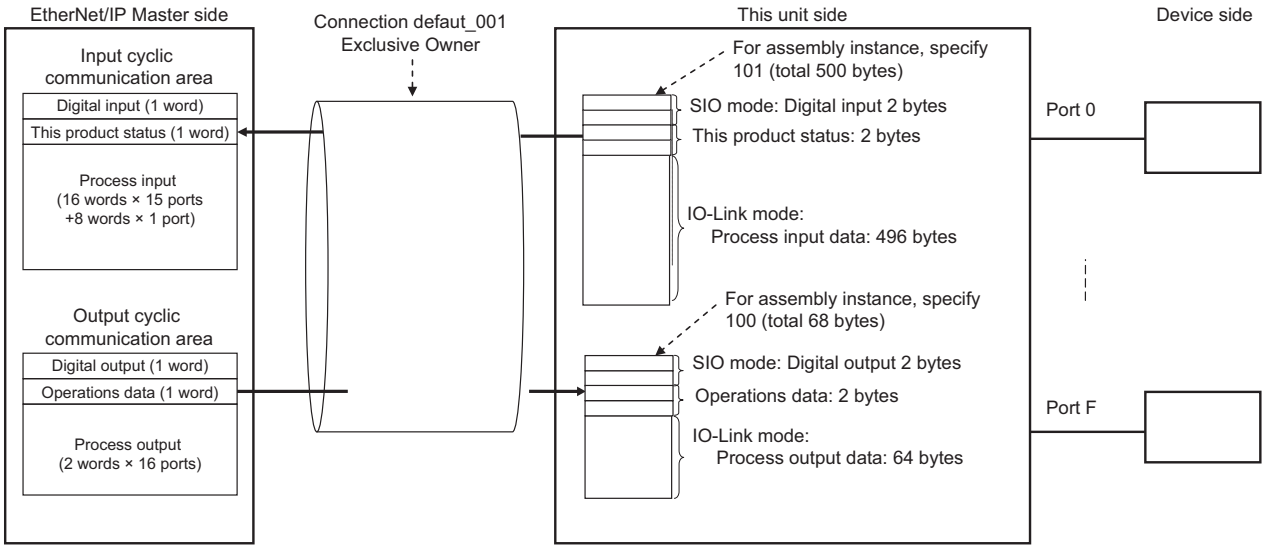
The one connection below is provided in the EDS file of this product.

Connection name	Connection I/O type
defaut_001	Exclusive Owner

Exclusive Owner is a connection I/O type that allows both the input instance (*1) and output instance (*1) to be configured.
*1. These are instances for the assembly object.

The assembly instances assigned to the above connection are as follows.

Connection name	Connection I/O type	Assembly instance already defined using EDS file	
		Input (This product → EtherNet/IP Master)	Output (EtherNet/IP Master → This product)
defaut_001	Exclusive Owner	101 (65 h): Total 500 bytes fixed Breakdown: • Digital input in SIO mode: 2 bytes • Status data: 2 bytes • Process input data in IO-Link mode: 496 bytes	100 (64 h): Total 68 bytes fixed Breakdown: • Digital output in SIO mode: 2 bytes • Operations data: 2 bytes • Process output data in IO-Link mode: 64 bytes



Additional Information

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

3-2-2 Available Connection Types

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

Assembly instance	Connection type	
	Multicast (Multi-castconnection)	Unicast (Point to Point connection)
101: Input	Can be selected	
100: Output	Cannot be used	Fixed

3-3 Cyclic Communication Details

Here is described the content of input and output due to cyclic communication between the EtherNet/IP Master and this product, and this product and the IO-Link device.

3-3-1 Overview of Cyclic Communication (Cyclic Transmission/Process I/O Communication) Assignments

This product can input and output the IO-Link device data connected to this product, to the EtherNet/IP Master cyclically.

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 enables setting values to be accessed without using Explicit message communication, for other than normal cyclic data shared type assignments.
  The following can be accessed.
  a) Any service data in any connected IO-Link device
  b) Product Master Unit setting values

Additional Information

In this product, the process data for the IO-Link device is converted into little endian format at the default value.
If the data conversion program on the host PLC is created in big-endian format, change the *M43. Process data LSB/MSB* setting from *Lower order (Little)* (default) to *Higher order (Big)*.

During Normal Assignment

● Input (This Product → EtherNet/IP Master)

Input Byte Address (Start number +)	Category	Details
+0 to +3	Digital input and status data	Digital input in SIO mode and product status are stored.
+4 to +499	Process input data	Process input data is stored in order from Port 0 to F. If the Master Unit parameter *M40. Process input data word allocation* is the default value, 32 bytes are assigned to each port. • If the port is not being used, then 00 h is stored in all 32 bytes. • If the process input data for the IO-Link device connected to the port is less than 32 bytes, then 00 h is stored in the open byte at the topmost address within the 32 bytes.

● Output (EtherNet/IP Master → This Product)

Output byte address (Start number +)	Category	Details
+0 to +3	Digital output and operations data	Digital output in SIO mode and product operations data are stored.
+4 to +67	Process output data	Process output data is stored in order from Port 0 to F. If the Master Unit parameter *M41. Process output data word allocation* is the default value, 4 bytes are assigned to each port. • If the port is not being used, then all 4 bytes are ignored. • If the process output data for the IO-Link device connected to the port is less than 4 bytes, then the open byte at the topmost address within the 4 bytes is not sent to the IO-Link device. • If the process output data for the IO-Link device connected to the port exceeds 4 bytes, then all the data for the excessive part is sent to the IO-Link device as 00 h.

Extended Access Enabled Assignment

● Input (This Product → EtherNet/IP Master)

Input byte address (Start number +)	Category	Details
+0 to +3	Digital input and status data	Digital input in SIO mode and product status are stored.
+4 to +495	Process input data	Process input data is stored in ascending port number order from Port 0 to F. If the Master Unit parameter *M40. Process input data word allocation* is the default value, 32 bytes are assigned to each port from Port 0 to E. The 16 bytes are assigned to Port F only. • If the port is not being used, then 00 h is stored in all 32 or 16 bytes. • If the process output data for the IO-Link device connected to the port is less than 32 or 16 bytes, then 00 h is stored in the open byte at the topmost address within the 32 or 16 bytes.
+496 to +499	Extended access read data	Extended access read data is stored.

● Output (EtherNet/IP Master → This Product)

Output byte address (Start number +)	Category	Details
+0 to +3	Digital output and operations data	Digital output in SIO mode and product operations data are stored.

Output byte address (Start number +)	Category	Details
+4 to +59	Process output data	Process output data is stored in ascending port number order from port 0 to D (port E and F are not assigned). If the Master Unit parameter *M41. Process output data word allocation* is the default value, 4 bytes are assigned to each port. • If the port is not being used, then all 4 bytes are ignored. • If the process output for the port is less than 4 bytes, then the open byte at the topmost address within the 4 bytes is not sent to the IO-Link device. • If the process output for the port exceeds 4 bytes, then all the data for the excessive part is sent to the IO-Link device as 00 h.
+60 to +67	Extended access specified data and extended access write data	Stores the data specified for extended access, and the data written with extended access.

The process input and process output data in the product cyclic communication is basically assumed to be both the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters being used as the above default values.

For when both the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters are other than the default values, refer to *A-1 Assignment Method Other Than Process Data Default Value* on page A-2.

Additional Information

Points of difference in assignment content between the normal assignment and extended access enabled assignment
The normal assignment and extended access enabled assignment differ as shown below.

● Input (This Product → EtherNet/IP Master)

Data type	During normal assignment (Extended access disabled)	Extended access enabled assignment
Process input data	Same (Ports 0 to E are each 32 bytes)	
	Port F: 16 bytes	Port F: 12 bytes
Digital input data	Same (Ports 0 to F are each 1 bit)	
Status data	The bits noted at right do not exist. Others are the same.	Access completed, and there is a bit showing access error.
Extended access read data	Does not exist.	Read request bit rising, for read data.

● Output (EtherNet/IP Master → This Product)

Data type	When normal assignment (Extended access disabled)	Extended access enabled assignment
Process output data	Same (Ports 0 to D: Each 4 bytes)	
	Ports E to F: Each 4 bytes	Port E to F: None
Digital output data	Same (Ports 0 to F are each 1 bit)	

Data type	When normal assignment (Extended access disabled)	Extended access enabled assignment
Operations data	The bits noted at right do not exist. Others are the same.	The bits below exist. • Bit requests write or read when rising • Bit specifies the product Master Unit parameters • Bit specifies byte order during service data writing inside IO-Link device
Extended access specified data	Does not exist.	Data specifies target selection to access, and the address. The following specifications exist. • IO-Link device port • Any service data within IO-Link device, or (product Master Unit parameter) setting value number/target number • Mode where the target selection to access is set to the set values of the connected IO-Link device or the product Master Unit parameters (in such case, the data size is also specified at the same time)
Extended access write data	Does not exist.	Write request bit rising, for write data.

The following is shown when both the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters are the default values.
Refer to *A-1 Assignment Method Other Than Process Data Default Value* on page A-2 for uses other than the default value.

3-3-2 Normal Assignment (Extended Access Disabled)

When *Extended access enable flag* (output byte address +2, bit address 0) is set to 0 (OFF: Extended access disabled), the product assignment to the master cyclic communication area is as shown below.

Input (This Product → EtherNet/IP Master): 500 Bytes

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital input (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital input (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Event flag	I/O power supply flag	Output overcurrent flag	Reserved	Latest event port			
+3	Error flag	IO-Link ready flag	Synchronization establishment flag	Reserved	Latest error port			
+4	Process input data Port 0 (32 bytes)							
…								
+35								
+36	Process input data Port 1 (32 bytes)							
…								
+67								
…	…							

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+452	Process input data Port E (32 bytes)							
…								
+483								
+484	Process input data Port F (16 bytes)							
…								
+499								

Output (EtherNet/IP Master → This Product): 68 Bytes

Output byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital output (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital output (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Clear the latest event	Reset encoder counter	Reserved					0 (Extended access disabled)
+3	Clear the latest error	Reserved						
+4	Process output data Port 0 (4 bytes)							
…								
+7								
+8	Process output data Port 1 (4 bytes)							
…								
+11								
…	…							
+64	Process output data Port F (4 bytes)							
…								
+67								

Normal Assignment (In Case the Extended Access is Not Enabled)

● Digital Input/Digital Output (SIO Mode), and Product Status/Operation Flags

- Input from this product to EtherNet/IP Master

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Input cyclic communication area for EtherNet/IP Master	Digital input in SIO mode	Digital input (Ports 0 to 7/8 to 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 (note, this function does not exist on the process output data side).	Input Byte Address +0/+1

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
	This product status	Event flag	Sets to 1 (ON) when an event is occurring in one of the connected IO-Link devices. When this flag is set to 1 (ON), access the *Event data readout by port* data through Explicit message communication. For *Latest event data readout by port*, refer to *A-2-2 Data for Access from PLC* on page A-20.	Input Byte Address +2, Bit Address 7
		I/O power supply flag	Sets to 1 (ON) when power is being supplied for I/O by the I/O power supply.	Input Byte Address +2, Bit Address 6
		Output overcurrent flag	Sets to 1 (ON) when overcurrent is generated in SIO (output).	Input Byte Address +2, Bit Address 5
		Latest event port	Port number of the latest generated event. When accessing the *Event data readout by port* through Explicit message communication, specify the port based on this value.	Input Byte Address +2, Bit Address 0 to 3
		Error flag	Sets to 1 (ON) when an error is generated in this product. When this flag is set to 1 (ON), access the *Latest error code readout by port* through Explicit message communication. For *Latest error code readout by port* data, refer to *A-2-2 Data for Access from PLC* on page A-20.	Input Byte Address +3, Bit Address 7
		IO-Link ready flag	When communication is established with all IO-Link devices, and EtherNet/IP is established with the EtherNet/IP Master, if this flag is set to 1 (ON), execute cyclic communication read or Explicit message communication write with the IO-Link device. **Note** This flag will be set to 1 (ON) even when not all ports' I/O setting assignments are in IO-Link mode.	Input Byte Address +3, Bit Address 6
		Synchronization establishment flag	Sets to 1 (ON) when I/O synchronization (setting 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 µs) with the network time.	Input Byte Address +3, Bit Address 5
		Latest error port	Port number of the latest generated error. When accessing the *Latest error code readout by port* through Explicit message communication, specify the port based on this value.	Input Byte Address +3, Bit Address 0 to 3

- Output from EtherNet/IP Master to this product

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Output cyclic communication area for EtherNet/IP Master	Digital output in SIO mode	Digital output (Ports 0 to 7/8 to F)	Digital output data in SIO mode (PNP output or NPN output).	Output Byte Address +0/+1
	Unit operation flag	Clear the latest event	When rising from 0 (OFF) to 1 (ON), clear the latest event.	Output Byte Address +2, Bit Address 7
		Reset encoder counter	For SIO device as encoder, when rising from 0 (OFF) to 1 (ON), reset the fastest counter in the product.	Output Byte Address +2, Bit Address 6
		Extended access enable flag	Specify extended access disabled (normal) assignment as the assignment method for the cyclic communication area. 0 (OFF): Extended access disabled	Output Byte Address +2, Bit Address 0
		Clear the latest error	When rising from 0 (OFF) to 1 (ON), clear the latest error.	Output Byte Address +3, Bit Address 7

● Process Data

- Input from this product to EtherNet/IP Master

Type and direction	Assignment	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Input from IO-Link devices	Input cyclic communication area for EtherNet/IP Master	Process input data Port 0 to E	Process input data in IO-Link communication mode. At default value, each port is 32 bytes.	Input Byte Address +4 to +483
		Process input data port F	Process input data in IO-Link communication mode. At default value, port F is 16 bytes.	Input Byte Address +484 to +499

- Output from EtherNet/IP Master to this product

Type and direction	Assignment	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Output to IO-Link devices	Output cyclic communication area for EtherNet/IP Master	Process output data Port 0 to F	Process output data in IO-Link communication mode. At default value, each port is 4 bytes.	Output Byte Address +4 to +67

In this product, the process data for the IO-Link device is converted into little endian format at the default value. The *Process data LSB/MSB* Master Unit parameter can be used to change this to big endian format for each port.

3-3-3 Extended Access Enabled Assignment

When *Extended access enable flag* (output byte address +2, bit address 0) is set to 1 (ON: Extended access enabled), the master cyclic communication area is as shown below.
The area in yellow below is data only when extended access is enabled.

Input (This Product → EtherNet/IP Master): 500 Bytes

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital input (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital input (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Event flag	I/O power supply flag	Output overcurrent flag	Access completed	Latest event port			
+3	Error flag	IO-Link ready flag	Synchronization establishment flag	Access error	Latest error port			
+4 … +35	Process input data Port 0 (32 bytes)							
+36 … +67	Process input data Port 1 (32 bytes)							
…	…							
+452 … +483	Process input data Port E (32 bytes)							
+484 … +495	Process input data Port F (12 bytes)							
+496 … +499	Extended access read data (4 bytes)							

Output (EtherNet/IP Master → This Product): 68 Bytes

Output byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital output (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital output (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Clear the latest event	Reset encoder counter	Reserved			Write request	Read request	1 (Extended access enabled)
+3	Clear the latest error	Reserved	Little endian access	GD-ILM16C-MLP/-ILM16E-MLP parameter specification	Port No. of IO-Link to access (0 to F)			
+4 … +7	Process output data Port 0 (4 bytes)							

Output byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+8	Process output data Port 1 (4 bytes)							
…								
+11								
…	…							
+56	Process output data Port D (4 bytes)							
…								
+59								
+60	Index number (lower byte)							
+61	Index number (higher byte)							
+62	Subindex number or target number							
+63	Reserved					Byte length or target selection to access		
+64	Extended access write data							
…								
+67								

Assignment Data Details (When Extended Access is Enabled)

● Digital Input/Digital Output (SIO Mode), and Product Status/Operation Flags

- Input from this product to EtherNet/IP Master

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Input cyclic communication area for EtherNet/IP Master	Digital input in SIO mode	Digital input (Ports 0 to 7/8 to 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.)	Input Byte Address +0/+1
	This product status	Event flag	Sets to 1 (ON) when an event is occurring in one of the connected IO-Link devices. When this flag is set to 1 (ON), access the *Event data readout by port* data through Explicit message communication. For *Latest event data readout by port*, refer to *A-2-2 Data for Access from PLC* on page A-20.	Input Byte Address +2, Bit Address 7
		I/O power supply flag	Sets to 1 (ON) when power is being supplied for I/O by the I/O power supply.	Input Byte Address +2, Bit Address 6
		Output overcurrent flag	Sets to 1 (ON) when overcurrent is generated in SIO (output).	Input Byte Address +2, Bit Address 5
		Access completed (Extended access enabled assignment only)	Turns ON when reading/writing has completed. If the read/write request bit turns OFF, this bit will turn OFF also.	Input Byte Address +2, Bit Address 4
		Latest event port	Port number of the latest generated event. When accessing the *Event data readout by port* through Explicit message communication, specify the port based on this value.	Input Byte Address +2, Bit Address 0 to 3

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
		Error flag	Sets to 1 (ON) when an error is generated in this product. When this flag is set to 1 (ON), access the *Latest error code readout by port* through Explicit message communication. For *Latest error code readout by port* data, refer to *A-2-2 Data for Access from PLC* on page A-20.	Input Byte Address +3, Bit Address 7
		IO-Link ready flag	When communication is established with all IO-Link devices, and EtherNet/IP is established with the EtherNet/IP Master, if this flag is set to 1 (ON), execute cyclic communication read or Explicit message communication write with the IO-Link device. **Note** This flag will be set to 1 (ON) even when not all ports' I/O setting assignments are in IO-Link mode.	Input Byte Address +3, Bit Address 6
		Synchronization establishment flag	Sets to 1 (ON) when I/O synchronization (setting 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 µs) with the network time.	Input Byte Address +3, Bit Address 5
		Access error (Extended access enabled assignment only)	If an error occurs when requesting reading/writing, this turns on along with the access completed bit.	Input Byte Address +3, Bit Address 4
		Latest error port	Port number of the latest generated error. When accessing the *Latest error code readout by port* through Explicit message communication, specify the port based on this value.	Input Byte Address +3, Bit Address 0 to 3

- Output from EtherNet/IP Master to this product

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Output cyclic communication area for EtherNet/IP Master	Digital output in SIO mode	Digital output (Ports 0 to 7/8 to F)	Digital output data in SIO mode (PNP output or NPN output).	Output Byte Address +0/+1
	Unit operation flag	Clear the latest event	When rising from 0 (OFF) to 1 (ON), clear the latest event.	Output Byte Address +2, Bit Address 7
		Reset encoder counter	For SIO device as encoder, when rising from 0 (OFF) to 1 (ON), reset the fastest counter in the product.	Output Byte Address +2, Bit Address 6
		Write request (Extended access enabled assignment only)	With this bit rising, the specified data write is started.	Output Byte Address +2, Bit Address 2
		Read request (Extended access enabled assignment only)	With this bit rising, the specified data read is started.	Output Byte Address +2, Bit Address 1

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
		Extended access enable flag	Specify extended access enabled assignment as the assignment method for the cyclic communication area. 1 (ON): Extended access enabled	Output Byte Address +2, Bit Address 0
		Clear the latest error	When rising from 0 (OFF) to 1 (ON), clear the latest error.	Output Byte Address +3, Bit Address 7
		Little endian access (Extended access enabled assignment only)	Specify the byte unit order for *Extended access read data* or *Extended access write data*. 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. 0 (OFF): Read and write service data (setting values, etc.) in the IO-Link device in big endian format.	Output Byte Address +3, Bit Address 5
		GD-ILM16C-MLP/-ILM16E-MLP parameter specification (Extended access enabled assignment only)	Specify whether to set the extended access destination to this product or the IO-Link device. 1 (ON): Specifies access to the product Master Unit parameters. **Note** Read and write for the product Master Unit parameters is the little endian format (fixed). 0 (OFF): Specifies access to service data (setting values, etc.) in the IO-Link device.	Output Byte Address +3, Bit Address 4
		Port No. of IO-Link to access (0 to F) (Extended access enabled assignment only)	If GD-ILM16C-MLP/-ILM16E-MLP parameter specification is set to 0 (OFF), specify the IO-Link device port number to access.	Output Byte Address +3, Bit Address 0 to 3

● Process Data / Extended Access-Related Data

- Input from this product to EtherNet/IP Master

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Input cyclic communication area for EtherNet/IP Master	Input from IO-Link devices	Process input data Port 0 to E	Process input data in IO-Link communication mode. At default value, each port is 32 bytes.	Input Byte Address +4 to +483
		Process input data Port F	Process input data in IO-Link communication mode. At default value, Port F is 12 bytes.	Input Byte Address +484 to +495
	Extended access read data		The value read during extended access. 4 bytes. If *Little endian access* is set to 1 (ON), the byte address +500 will be the lowest-order byte. • Data read from the target (this product or an IO-Link device) at time of read request is stored. • For a write request, a value of 0 will be stored when the operation is complete. • During an access error, the extended access error code will be stored. For details on extended access error codes, refer to *Extended Access Error Code List* on page 3-18.	Input Byte Address +496 to +499

- Output from EtherNet/IP Master to this product

Assignment	Category	Data name	Description	Assignment cyclic communication area address at default value (Start number +)
Output cyclic communication area for EtherNet/IP Master	Output to IO-Link devices	Process output data Port 0 to D	Process output data in IO-Link communication mode. At default value, each port is 4 bytes.	Output Byte Address +4 to +59
	Extended access specified data	Index number (lower byte)	When the byte length or target selection to access is 1 to 4 (read and write of 1 to 4 byte data), either the index number for service data in the corresponding IO-Link device (setting value, etc.), or the setting value number of the product Master Unit parameter, specifies the low-order byte.	Output Byte Address +60
		Upper byte specification for index number or setting value number	When the byte length or target selection to access is 1 to 4 (read and write of 1 to 4 byte data), either the index number for service data in the corresponding IO-Link device (setting value, etc.), or the setting value number of the product Master Unit parameter, specifies the high-order byte.	Output Byte Address +61
		Subindex number or target number	When the byte length or target selection to access is 1 to 4 (read and write of 1 to 4 byte data), the sub-index number for service data in the corresponding IO-Link device (setting value, etc.) and the target number of the product Master Unit parameter are specified.	Output Byte Address +62
		Byte length or target selection to access	Whether the target selection to access is to be set to the set values of the IO-Link device connected to a given port or to the product Master Unit parameters is specified (in such case, the data size for read and write is also specified at the same time). 0: Not used 1 to 4: Read and write of 1 to 4 byte data (the target selection to access is the connected IO-Link device or the product Master Unit parameters)	Output Byte Address +63, Bit address 0 to 3
	Extended access write data		Specify the setting value to write via extended access. 4 bytes. Value at time of write request is sent to the target (this product or an IO-Link device). If *Little endian access* is set to 1 (ON), the byte address +64 will be the lowest-order byte.	Output Byte Address +64 to +67

In this product, the process data for the IO-Link device is converted into little endian format at the default value. The *Process data LSB/MSB* Master Unit parameter can be used to change this to big endian format for each port.

● Extended Access Error Code List

The following error codes are stored in the front (+496) byte 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.

Error Code	Details
34 h	The read setting value data length is 0 (read error).
80 h	The port 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.
94 h	Cannot be executed when the storage function is BUSY.

3-3-4 Assignments for Default Values

The assignment examples below are shown as normal assignments when both the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters remain at the default values.

Example) Process data size for connected IO-Link device

This product port number	Example of process data size for connected IO-Link device	
	Process input data byte count	Process output data byte count
0	32	0
1	8	0
2	0	2
3	Not used	
4	3	0
5	0	3
6	0	8
7	Not used	
…		
F		

Process input/output data words allocation

This product port number	M40. Process input data words allocation default value	M41. Process output data words allocation default value
0	16	2
1	16	2
2	16	2
3	16	2
4	16	2
5	16	2
6	16	2
7	16	2
…	…	…
E	16	2
F	8	2

Input

Byte address	Input
+0	Digital input Ports 0 to 7
+1	Digital input Ports 8 to F
+2	Status data Low-order byte
+3	Status data High-order byte

Byte address	Input
+4	Port 0 IO-Link process input data 32 bytes
…	
+35	
+36	Port 1 IO-Link process input data 8 bytes
…	
+43	
+44	(Port 1 continued) Open (*1) 24 bytes (0 stored)
…	
+67	
+68	Port 2 Input not used 32 bytes (0 stored)
…	
+99	
+100	Port 3 Not used 32 bytes (0 stored)
…	
+131	
+132	Port 4 IO-Link process input data 3 bytes
…	
+134	
+135	(Port 4 continued) Open (*1) 29 bytes (0 stored)
…	
+163	
+164	Port 5 Input not used 32 bytes (0 stored)
…	
+195	
+196	Port 6 Input not used 32 bytes (0 stored)
…	
+227	
+228	Port 7 to F Port not used 32 bytes × 8, 16 bytes × 1 (0 stored)
…	
+503	

Output

Byte address	Output
+0	Digital output Ports 0 to 7
+1	Digital output Ports 8 to F
+2	Operations data Low-order byte
+3	Operations data High-order byte
+4	Port 0 Output not used 4 bytes
…	
+7	
+8	Port 1 Output not used 4 bytes
…	
+11	
+12	Port 2 IO-Link process output data 2 bytes
+13	

Byte address	Output
+14	(Port 2 continued) Open (*1) 2 bytes (0 sent)
+15	
+16	Port 3 Port not used 4 bytes (0 sent)
…	
+19	
+20	Port 4 Output not used 4 bytes
…	
+23	
+24	Port 5 IO-Link process output data 3 bytes
+25	
+26	
+27	(Port 5 continued) Open 1 byte (*1)
+28	Port 6 IO-Link process output data Low-order 4 bytes only are sent (Remaining high-order 4 bytes are ignored)
…	
+31	
+32	Port 7 to F Port not used 4 bytes × 9 (0 sent)
…	
+67	

*1. Open regions in used ports are unrelated to the *M43 Process data LSB/MSB* settings.

3-3-5 Assignment Data List by Objective with Extended Access Enabled

Assigned data → At such a time as this ↓		Extended access	Byte length or target selection to access	Port No. of IO-Link to access	Little endian access	GD-ILM16C-MLP/-ILM16E-MLP parameter specification	Index number or setting value number		Subindex number or target number	Connection in order from left edge of target sensor unit	Write	Read	Read and write size specification
							High-order byte	Low-order byte					
Address	Output byte Address	+2	+63	+3	+3	+3	+61	+60	+62	+61	+2		Based on byte length or target selection to access
	Bit Address	0	0 to 3	0 to 3	5	4	Specification None	Specification None	Specification None	Specification None	2	1	
When using cyclic data to perform read and write of the product Master Unit parameters		1 (ON)	1 to 4 (Specify the byte count)	Unrelated	Unrelated (Little endian fixed)	1 (ON)	Master Unit parameter setting value number		Master Unit parameter target port	Unrelated	1 (ON) or 0 (OFF) specification		Based on byte length or target selection to access (1 to 4 bytes)
When specifying index/sub-index within a specified IO-Link device, for cyclic reading and writing of data			1 to 4	Specification	1 (ON): Little endian format	0 (OFF)	Index number		Subindex number	Unrelated			Based on byte length or target selection to access (1 to 4 bytes)

3-3-6 Process Data Reading and Writing Methods

Please read the process data when the IO-Link ready flag is set to 1 (ON) and the EtherNet/IP cyclic communication is normal.

Ex.) When reading process input data from any of the port IO-Link devices

The IO-Link ready flag performs read-out as the input condition when the assigned cyclic communication area (input byte address +3, bit address 6) is set to 1 (ON) and the cyclic communication abnormality is set to 0 (OFF).

Please write the process data when the IO-Link ready flag is set to 1 (ON) and the EtherNet/IP cyclic communication is normal.

Ex.) When writing process output data from the IO-Link device
The IO-Link ready flag performs write as the input condition when the assigned cyclic communication area (input byte address +3, bit address 6) is set to 1 (ON) and the EtherNet/IP cyclic communication abnormality is set to 0 (OFF).
Because there is an abnormality in the IO-Link communication when the IO-Link Ready flag is set to 0 (OFF), handle data transfer destinations suitably.

Precautions for Correct Use

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

3-3-7 Actual Access Extension Methods

Please read and write the specific address that is specifically targeted in extended access when the IO-Link ready flag is set to 1 (ON) and the EtherNet/IP cyclic communication is normal.

When Using Extended Access to Write to the IO-Link Device Service Data

- Set extended access (output byte address +2, bit address 0)=1 (ON).
- Use Port No. of IO-Link to access (output byte address +3, bit address 0 to 3) to specify the target port.
- Use the index number (output byte address +60: Low order, +61: High order) to specify the index number, and the sub-index number (output byte address +62) to specify the sub-index number.
- If service data for the target IO-Link device is converted to little endian format, set the little endian access (output byte address +3, bit address 5) to 1 (ON).
- Set the write data to the extended access write data (output byte address +64 to 67). If the above case is converted to little endian format, the write data is stored in the little endian format. +64 is the low-order byte, and +67 is the high-order byte.
- Use the byte length or target selection to access (output byte address +63, bit address 0 to 3) to specify the write byte count (1 to 4).
- When writing, the write request bit (output byte address +2, bit address 2) is elevated from 0 (OFF) to 1 (ON).
- With access complete = 1 (ON), write is completed. However, if at the same time there is access error=1 (ON), as this means that an error has occurred, please check the extended access read data error code.

When Using Extended Access to Write to the Product Master Unit Parameters

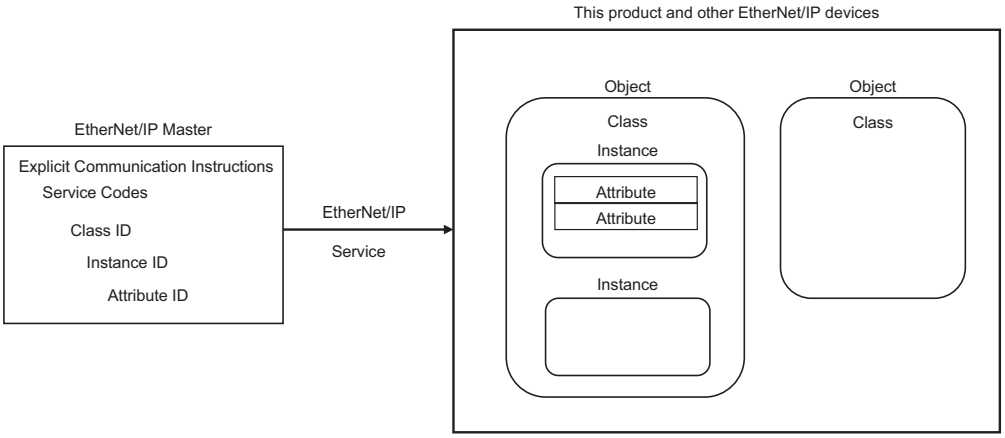
- Set extended access (output byte address +2, bit address 0)=1 (ON).
- Use GD-ILM16C-MLP/-ILM16E-MLP parameter specification (output byte address +3, bit address 4) to specify the product Master Unit parameters.
- Use the setting value number (output byte address +60: Low order, +61: High order) to specify the setting value, and the target port (output byte address +62) to specify the target number.
- Set the write data to the extended access write data (output byte address +64 to 67). Store write data in little endian format. +64 is the low-order byte, and +67 is the high-order byte.

- Use the byte length or target selection to access (output byte address +63, bit address 0 to 3) to specify the write byte count.
- When writing, the write request bit (output byte address +2, bit address 2) is elevated from 0 (OFF) to 1 (ON).
- With access complete = 1 (ON), write is completed. However, if at the same time there is access error=1 (ON), as this means that an error has occurred, please check the extended access read data error code.

3-4 Explicit Message Communication Mechanism in This Unit

In EtherNet/IP, call the clumpy substance that defines the data or its activities held in communication specifications or each device an *Object*.
In Explicit message communication, specify the following in the Explicit communication command on the EtherNet/IP Master side according to the access method to this object and the data to be accessed.

- Service Code: Code for object access method
- Class ID: Object ID
- Instance ID: Substance ID inside Object
- Attribute ID: Detailed Information ID inside Instance



For this product, access can be performed for the following.

- Service data inside IO-Link device connected to this product (setting value, etc.)
- Product Master Unit setting values

For a list of services supported by this product, refer to *3-5-1 List of Services Supported by Objects in This Unit* on page 3-26.

3-5 Explicit Message Communication Details

Function that returns a response to requests from the Explicit message communication instructions for the EtherNet/IP Master, to exchange data with the EtherNet/IP Master when necessary.
In response to the product Master Unit parameters, designate a Master Unit parameter number and target number for access.
For the details of product Master Unit parameter numbers and target numbers, refer to *A-2 List of Master Unit Parameters for This Product* on page A-9.

Further, this product can perform Explicit message communication (ISDU communication) with IO-Link devices based on Explicit message communication from the EtherNet/IP Master.
When needed, access the IO-Link devices via this product from the EtherNet/IP Master or product front panel operation. Mainly reads and writes service data such as service data, identification data or diagnosis information data within the IO-Link devices.
When the IO-Link Ready flag is ON, read and write IO-Link device service data.

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

3-5-1 List of Services Supported by Objects in This Unit

The following table lists services supported by objects in this product. Refer to *3-6 Details of Objects Supported by This Unit* on page 3-28 for further information.

Object name	Class ID	Details	Application
This product's object	64 h	This object reads and writes data from this product.	• When the setting value number in this product is specified, and the Master Unit parameters are written
IO-Link device object connected to this product	80 h to 8F h	This object reads and writes service data (setting values, etc.) inside the IO-Link device connected to this product. 80 h to 8F h corresponds to ports 0 to F.	• When using Explicit message communication to read and write service data inside IO-Link device connected to this product (setting value, etc.), from the EtherNet/IP Master
Identity object	01 h	This object provides identification information and general information on this product.	Confirm the vendor ID of this product, perform a reset operation, etc.
Message Router object	02 h	This object is located within the node and is used to distribute explicit message requests to the appropriate application objects. It has no class attributes or instance attributes.	—
Assembly object	04 h	This object binds the attributes of multiple objects. This allows data between each object to be sent and received using a single connection.	• Acyclically execute functions similar to cyclic communication • Read whether error diagnosis is enabled or disabled
Connection Manager object	06 h	This object assigns and manages internal resources associated with both cyclic communication and Explicit message communication.	—
DLR object	47 h	This object provides a status information interface for the Device Level Ring (DLR) protocol when using a ring configuration network environment. **Note** The DLR protocol is used to switch the network quickly when a communication outage occurs.	Read the network topology, network status, supervisor IP address, etc. when using the DLR function

Object name	Class ID	Details	Application
QoS object	48 h	This object manages all data and activity related to the Quality of Service (QoS) function of a device. It includes the DSCP setting in the IP header.	Configure QoS-related settings **Note** This is used for time-critical applications such as DLR.
TCP/IP Interface object	F5 h	This object writes and reads settings such as the IP address, subnet mask, and default gateway.	When configuring/monitoring TCP/IP-related settings Specifically shown below. • Enable/disable the Address Conflict Detection (ACD) function
Ethernet Link object	F6 h	This object provides parameters, error counters, and status information for the Ethernet IEEE 802.3 communication interface.	Confirm the current communication speed

3-5-2 List of Explicit Messages Seen from Objective

Explicit message elements → At such a time as this ↓	Service Codes		Class ID	Instance ID	Attribute ID	
	Read-out	Write			Low-order byte	High-order byte
When performing read and write of the product Master Unit parameters, when necessary	0E h	10 h	64 h	Master Unit parameter setting value number	Master Unit parameter target port	00 h
When specifying index/sub-index within a specified IO-Link device, for reading and writing of data when necessary			80 h to 8F h corresponds to Ports 0 to F.	Index number inside IO-Link device	Subindex number inside IO-Link device	00 h: Big endian specification 64 h: Little endian access

3-6 Details of Objects Supported by This Unit

Here are descriptions of monitoring and setting content details based on Explicit message communication from EtherNet/IP Master.

The EtherNet/IP Master can read or write the following data using Explicit message communication when necessary.
- Master Unit parameters for this product (GD-ILM16C-MLP and GD-ILM16E-MLP)
- Service data inside IO-Link device connected to this product (setting value, etc.)

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

Refer to *3-5-1 List of Services Supported by Objects in This Unit* on page 3-26 for information on supported objects.

This product contains sets of parameters called *Objects*. The EtherNet/IP Master reads from and writes to this location to monitor and set parameters.

3-6-1 This Unit's Object (Class ID: 64 h)

This object reads and writes data from this product.

Instance ID used to specify the setting value number.
Attribute ID low-order byte to specify the target number. The attribute ID high-order byte is 00 h (always read and write in little endian format).
For the details of product Master Unit parameter setting value numbers and target numbers, refer to *A-2 List of Master Unit Parameters for This Product* on page A-9.

Instance/Attribute Range

Instance ID	Attribute ID	
	Low-order byte	High-order byte
Master Unit parameter setting value number in this product 0000 h to 01FF h	00 h to FF h: Target number for Master Unit parameters within this product	00 h: Always read and write in little endian format.

Service Codes

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

3-6-2 IO-Link Device Object Connected to This Unit (Class ID: 80 to 8F h)

This object reads and writes specified service data inside the IO-Link device connected to this product. Note, when reading and writing, the byte order can be specified.

In the instance ID, specifies the index number inside the IO-Link device, or the index number of the sensor unit setting value.
In the attribute ID low-order bytes, specifies the sub-index number inside the IO-Link device. In the attribute ID high-order bytes, specifies the endian format.
Regarding the IO-Link device or each index number in the sensor unit, please refer to all materials where the endian list is recorded.

Instance/Attribute Range

Application	Instance ID	Attribute ID	
		Low-order byte	High-order byte*2
Access to normally connected IO-Link devices	Index number inside IO-Link device	00 h to 0F h: Subindex number inside IO-Link device 0 to F	00 h: Big endian specification 64 h: Little endian access

*1. Regarding the index numbers in the sensor unit setting values (some sub-index numbers), please refer to the index lists in each sensor unit.
*2. Regarding the index numbers in the sensor unit setting values (some sub-index numbers), please refer to the index lists in each sensor unit.

Service Codes

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

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

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

Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h to 09 h

Service Codes

Service code	Service name	Details
01 h	Get_Attributes_All	Read the values of all attributes.

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

Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Vendor ID	Vendor ID	Read	UINT	002F h
02 h	Device Type	Device type	Read	UINT	000C h (communication adapter)
03 h	Product Code	Product code	Read	UINT	0C0F h (for GD-ILM16C-MLP) 0C10 h (for GD-ILM16E-MLP)
04 h	Revision	Identity object revision	Read	Struct	-
	Major Revision	Major revision	Read	USINT	01 h
	Minor Revision	Minor revision	Read	USINT	01 h
05 h	Status	Device status	Read	WORD	Value varies depending on device status. Refer to *1: *Device status* for further information.
06 h	Serial Number	Serial number	Read	UDINT	Device serial number
07 h	Product Name	Product name	Read	SHORT_STRING	"GD-ILM16C-MLP or GD-ILM16E-MLP"
08 h	State	Device operation state	Read	USINT	Value varies depending on device operation state. Refer to *2: *Device operation state* for further information.
09 h	Configuration Consistency Value	Configuration value applied	Read	UINT	0000 h

*1. Device status

Bit	Name	Description
0	Owned by Master	Set to 1 (ON) when connection with master complete
1	Reserved	Always 0
2	Configured	Set to 1 (ON) when configuration complete
3	Reserved	Always 0

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

*2. Device operation state

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

Reset Service Parameters

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

Data	Parameter name	Details	Attribute
0	Reset type 0	Restart.	Write
1	Reset type 1	Return to factory settings and then restart.	Write

3-6-4 Message Router Object (Class ID: 02 h)

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

3-6-5 Assembly Object (Class ID: 04 h)

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

Instance/Attribute Range

Instance ID		Attribute ID
Output	64 h (100)	03 h, 04 h
Input	65 h (101)	

Service Codes

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

Attribute ID List

- For instance ID 64 h (100)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Output from EtherNet/IP Master to this product	Read	ARRAY of BYTE	00 h
04 h	Size	Size (bytes)	Read	UINT	0044 h (68)

- For instance ID 65 h (101)

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
03 h	Data	Input from this product to EtherNet/IP Master	Read	ARRAY of BYTE	00 h
04 h	Size	Size (bytes)	Read	UINT	01F8 h (504)

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

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

3-6-7 DLR Object (Class ID: 47 h)

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

Instance/Attribute Range

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

Service Codes

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

Attribute ID List

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

3-6-8 QoS Object (Class ID: 48 h)

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

Instance/Attribute Range

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

Service Codes

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

Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
04 h	DSCP Urgent	Differentiated Services Code Point (DSCP) value of Urgent Priority message in cyclic communication (Valid range: 0 to 63)	Read/write	USINT	55 (37 h)
05 h	DSCP Scheduled	DSCP value of Scheduled Priority message in cyclic communication (Valid range: 0 to 63)	Read/write	USINT	47 (2F h)
06 h	DSCP High	DSCP value of High Priority message in cyclic communication (Valid range: 0 to 63)	Read/write	USINT	43 (2B h)
07 h	DSCP Low	DSCP value of Low Priority message in cyclic communication (Valid range: 0 to 63)	Read/write	USINT	31 (1F h)
08 h	DSCP Explicit	DSCP value of message (Class 3 or UCMM) in Explicit message communication (Valid range: 0 to 63)	Read/write	USINT	27 (1B h)

3-6-9 TCP/IP Interface Object (Class ID: F5 h)

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

Instance/Attribute Range

Instance ID	Attribute ID
01 h	01 h to 0D h

Service Codes

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

Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Interface Status	Interface status Bit 0 to 3: 0=IP address setting not completed 1=Address applied, set by a static address 2=Setting applied by hardware (not supported by GD-ILM16C-MLP and GD-ILM16E-MLP) Bit 4: Indicates that a new TTL or Mcast Config value was set. The value will be applied upon reset. Bit 5: Indicates that a new value is pending for Interface Configuration. This bit is not switched on, as it is reset when the value is set via GD-ILM16C-MLP and GD-ILM16E-MLP. Bit 6: Indicates that an address conflict was detected in the network by the ACD function. Bit 7: Indicates that an address conflict was detected in the network by the ACD function, and that the port cannot currently be used.	Read	DWORD	00000002 h
02 h	Configuration Capability	List of functions supported by the TCPIP object Bit 0: BOOTP client (unsupported) Bit 1: DNS client (unsupported) Bit 2: DHCP client (unsupported) Bit 3: DHCP/DNS client (unsupported) Bit 4: Configurable via configuration (unsupported) Bit 5: Configurable via hardware	Read	DWORD	000000A0 h
03 h	Configuration Control	IP address configuration method Bit 0 to 3: 0=Set static IP address 1=Obtain address using BOOTP function 2=Obtain address using DHCP function Bit 4: DNS function support (unsupported)	Read/write	DWORD	00000000 h
04 h	Physical Link Object	The path to the link object in the physical layer	Read	Struct	None
	Path Size	Path size (set to 0 and cannot be changed for models with Multi Port)		UINT	0000 h
	Path	The path to the link object in the physical layer		Padded EPATH	None
05 h	Interface Cofiguration	EtherNet/IP unit settings	Read/write	Struct	-
	IP Address	IP address		UDINT	192.168.250.1
	Network Mask	Subnet mask		UDINT	255.255. 255.0
	Gateway Address	Default gateway		UDINT	0.0.0.0
	Name Server	Primary name server		UDINT	0.0.0.0
	Name Server2	Secondary name server		UDINT	0.0.0.0
	Domain Name	Domain name		STRING	""

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
06 h	Host Name	Host name	Read/write	STRING	""
07 h	Safety Network Number	Safety network	Read	6 octets	No support
08 h	TTL Value	TTL value for multicast packets (valid range: 1 to 255)	Read/write	USINT	1
09 h	Mcast Config	Multicast address settings	Read/write	Struct	
	Alloc Control	Multicast determination method 0=The multicast address and number of addresses are determined automatically (default value) 1=The multicast address and number of addresses are determined by the user		USINT	00 h
	Reserved	Reserved	-	USINT	-
	Num Mcast	Number of multicast addresses	Read/write	UINT	Assigned automatically
	Mcast Start Addr	Starting multicast address		UDINT	Assigned automatically
0A h	SelectAcd	Address Conflict Detection (ACD) function enabled/disabled 0 = Disabled 1=Enabled (default value) Specify whether to enable or disable the function that searches for IP address conflicts with other devices on the network.	Read/write	BOOL	01 h
0B h	LastConflict Detected	Information on the address conflict that was last detected	Read/write	Struct	
	AcdActivity	ACD status when a conflict is detected 0=No conflict detected (default value) 1=Conflict while generating an IPV4 address 2=Conflict during operation 3=Conflict during semi-active probe		USINT	00 h
	Remote MAC	MAC address of the device with a conflicting IP address detected by ARP		ARRAY of 6 USINTs	0
	ArpPdu	Copy of the IP address conflict information from ARP		ARRAY of 28 USINTs	0
0C h	EtherNet/IP Quick Connect	Quick Connect enabled/disabled 0 = Disabled 1 = Enabled	Read/write	BOOL	00 h
0D h	Encapsulation Inactivity Timeout	Timeout during packet generation. The TCP socket will be closed if the specified time is exceeded. 0=Function disabled Default value: 120 seconds (valid range: 1 to 3600 seconds, 0001 to 0E10 h)	Read/write	UINT	0078 h (120 seconds)

3-6-10 Ethernet Link Object (Class ID: F6 h)

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

Instance/Attribute Range

Instance ID		Attribute ID
Ether1	01 h	01 h to 0B h
Ether2	02 h	

Service Codes

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

Attribute ID List

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
01 h	Interface Speed	Interface communication speed 0=0M Speed 10=10M Speed 100=100M Speed	Read	UDINT	The set communication speed
02 h	Interface Flags	Interface status flag Bit 0: Link status Bit 1: Half-duplex (0) or full-duplex (1) Bits 2 - 4: 0: Performing auto negotiation 1: Failed to perform auto negotiation and detect speed 2: Failed to perform auto negotiation but detected speed successfully 3: Successfully performed auto negotiation 4: Auto negotiation not attempted Bit 5: Reset required to apply settings Bit 6: Hardware fault (always 0)	Read	DWORD	Value varies depending on settings
03 h	Physical Address	Device MAC address	Read	ARRAY of 6 USINTs	Device MAC address

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
04 h	Interface Counters	Counter value related to packets received on interface	Read/ read and clear	Struct	0
	In Octets	Octets received on interface		UDINT	0
	In Ucast Packets	Unicast packets received on interface		UDINT	0
	In NUcast Packets	Packets other than unicast packet received on interface		UDINT	0
	In Discards	Inbound packets discarded after receipt		UDINT	0
	In Errors	Inbound packets including errors (not including those discarded)		UDINT	0
	In Unknown Protos	Inbound packets received via unknown protocol		UDINT	0
	Out Octets	Octets sent on interface		UDINT	0
	Out Ucast Packets	Unicast packets sent on interface		UDINT	0
	Out Nucast Packets	Packets other than unicast packet sent on interface		UDINT	0
	Out Discards	Discarded outbound packets		UDINT	0
	Out Errors	Outbound packets including errors		UDINT	0
05 h	Media Counters	Counter values related to Ethernet media	Read/ read and clear	Struct	0
	Alignment Errors	Received frames not composed of octets where the data length is an integer value		UDINT	0
	FCS Errors	Received frames that did not pass through FCS check		UDINT	0
	Single Collisions	Frames successfully sent for which a collision was predicted		UDINT	0
	Multiple Collisions	Frames successfully sent for which at least one collision was predicted		UDINT	0
	SQE Test Errors	Number of SQE test error messages generated		UDINT	0
	Deferred Transmissions	Frames where the initial transmission was delayed due to busy status		UDINT	0
	Late Collisions	Number of times where a collision was detected after the 512-bit time when sending a packet		UDINT	0
	Excessive Collisions	Frames for which sending failed due to excessive collisions		UDINT	0
	MAC Transmit Errors	Frames for which sending failed due to an internal MAC sublayer transmission error		UDINT	0
	Carrier Sense Errors	Time where assertion was not performed due to loss of carrier detection function for frame transmission		UDINT	0
	Frame Too Long	Frames received exceeding the maximum size allowed		UDINT	0
	MAC Receive Errors	Frames for which receipt failed due to an internal MAC sublayer receive error		UDINT	0

Attribute ID	Parameter name	Details	Attribute	Data	
				Data type	Default value
06 h	Interface Control	Physical layer interface settings	Read/write	Struct	0
	Control Bits	Interface management bit Bit 0: Auto negotiation status (1: Yes, 0: No (fixed setting)) Bit 1: Type of fixed setting (0: Half-duplex, 1: Full-duplex)		WORD	0001 h (auto negotiation)
	Forced Interface Speed	Interface speed 10 Mbps: 000A h (full-duplex) 100 Mbps: 0064 h Set to 0 (0000 h) for auto negotiation.		UINT	0000 h
07 h	Interface Type	Interface type Bit 0: Unknown interface type Bit 1: Device dedicated interface Bit 2: Twisted pair Bit 3: Optical fiber	Read	USINT	02 h
08 h	Interface State	Interface status Bit 0: Unknown status Bit 1: Normal Bit 2: Interface disabled Bit 3: Interface test status	Read	USINT	Value varies depending on interface status
09 h	Admin State	Administrator permissions enabled/disabled 1=Enabled (default value) 2=Disabled	Read/write	USINT	01 h
0A h	Interface Label	Label name for each interface	Read	SHORT_ STRING	Instance 1: “Ether1” Instance 2: “Ether2”
0B h	Interface Capability	Functions supported by interface	Read	Struct	
	Capability Bits	Functions supported by interface Bit 0: Reset required to apply manual settings Bit 1: Auto negotiation support Bit 2: Auto MDIX support Bit 3: Manual speed/communication method can be configured		DWORD	0000000F h
	Speed/Duplex Options	List of communication speeds/communication methods supported by interface	Read	Struct	
		Number of component elements		USINT	04 h
		Communication speed/communication method		ARRAY of Struct	
		Communication speed 1 000A h =10M Speed 0064 h =100M Speed		UINT	000A h
		Communication method 1 00 h = Half-duplex 01 h = Full-duplex		USINT	00 h
		Communication speed 2		UINT	000A h
		Communication method 2		USINT	01 h
		Communication speed 3		UINT	0064 h
		Communication method 3		USINT	00 h
		Communication speed 4		UINT	0064 h
		Communication method 4		USINT	01 h

4

Specifications

This chapter describes the specifications of this product.

4-1 Specifications

4-1-1 Communication Specifications

Item	Specifications
	GD-ILM16□-MLP
Host Network Communication Protocol	EtherNet/IP
Applicable version	EtherNet/IP adapter
Authentication version	CT21
Conforming standard	IEEE802.3u
Transmission speed	10 Mbps (10BASE-T), 100 Mbps (100BASE-TX)
Cable	Twisted pair cable (STP), Category 5/5e or higher
Ethernet Connection Type	Star configuration, linear bus configuration, device level ring configuration
Distance between nodes	Within 100 m
IP address configuration	Static IP address only
Cyclic Communication (Implicit Message)	Class1 service
Acyclic Communication (Explicit Message)	• Class3 message • UCMM
Support objects	• Identity object • Message Router object • Assembly object • Connection Manager object • DLR object • QoS object • TCP/IP Interface object • Ethernet Link object • This unit's object • IO-Link device object connected to this unit
Reset service	• Type0 • Type1
Maximum no. of connections	Class1: 5, Class3: 8, UCMM: 8
Packet interval (RPI)	1-3200 ms
Unit Allowable Communications Band Width	1000 pps
EtherNet/IP Product Internal Response Time	0.6 ms or less
Extended access function	This function uses cyclic communication to read and write settings for this product and IO-Link devices. Host master side programs can be simplified.
Other functions	• ACD (Address Conflict Detection) • DLR (Device Level Ring) • Auto Negotiation • Auto MDIX • Quick Connect

4-2 Data Processing Time

4-2-1 Process Data Response Time Calculation

The process data response time from the EtherNet/IP Master and through IO-Link is indicated as follows.

Additional Information

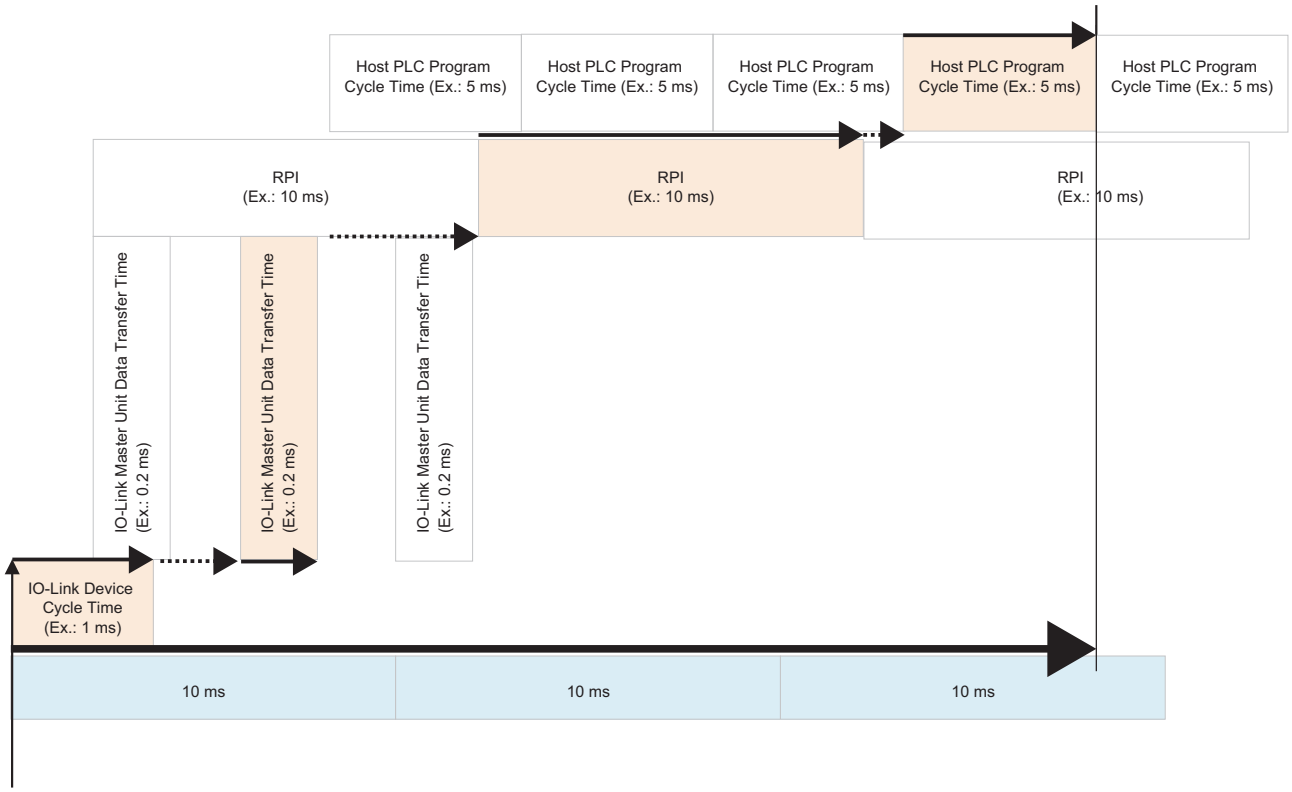
Refer to the manual of the EtherNet/IP Master for information on the RPI and the internal processing time of the EtherNet/IP Master.

EtherNet/IP and IO-Link Are Not Synchronized

● Process Input Data

(IO-Link Cycle Time) × 1 - 2 + (RPI) × 1 - 2 + (Host PLC Program Cycle Time) × 1 - 2

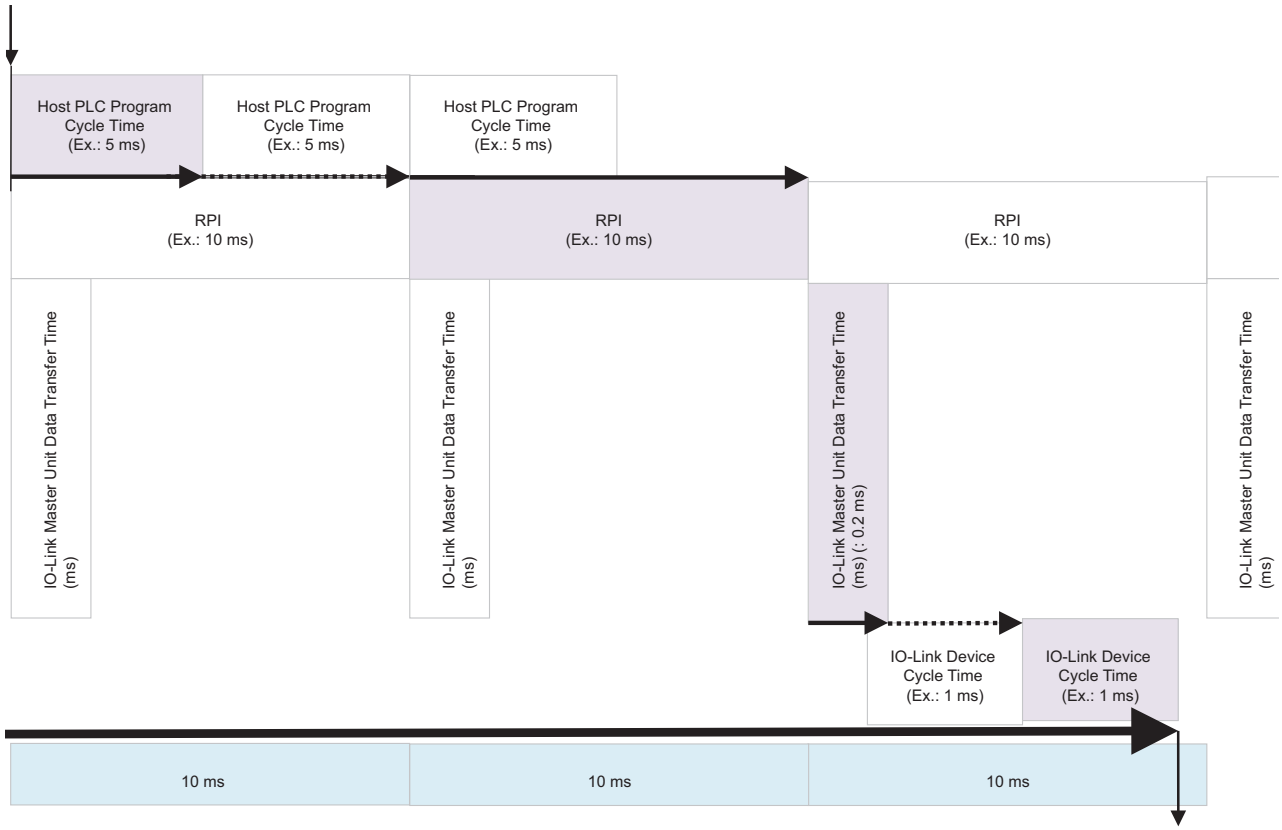
Example:



● Process Output Data

(Host PLC Program Cycle Time) + (RPI) × 1 - 2 + (IO-Link Cycle Time) × 1 - 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 cycle time in IO-Link communication can be confirmed in the *Master Unit 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 Unit parameters M21. I/O synchronization* in this product. However, it cannot be set faster than the minimum cycle time of the IO-Link device.

Example of Cycle Time for IO-Link

Conditions: Process input data bytes: 2, process output data bytes: 0, bytes read or written through Explicit message communication (ISDU communication): 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 EtherNet/IP, if the Master Unit 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 ports 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 Unit parameter *M51. IO-Link cycle time -Process value-*.)
However, in order to suppress noise generated by the communication signal. IO-Link communication delays each port 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 EtherNet/IP processing chip.
The processing time depends on the number of process data bytes for the IO-Link devices on all ports. It will be transferred at a speed of 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 of OMRON E3AS-HL photoelectric sensors (IO-Link-compatible) are connected to this product using IO-Link communication.
Note that the minimum cycle time for E3AS-HL photoelectric sensors (IO-Link-compatible) is 1.2 ms.

Conditions: This is possible with the RPI set to 1 ms.
E3AS-HL photoelectric sensor process data: *Detection value*, *amount of light received*, etc. (4 bytes in total)
The time required for output to pass from the 16 E3AS-HL photoelectric sensors, through this product, into the host PLC, and then to be program processed is as follows.
IO-Link device cycle time 1.2 ms × 2-3 + RPI 1 ms × 1-2 + Host PLC program cycle time 1 ms × 1-2 = 4.4-7.6 ms

5

Troubleshooting

Describes methods of troubleshooting related to EtherNet/IP 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	IP address conflict within the network	Address Conflict Detection (ACD) enabled *1	Make sure the IP address is not a duplicate of any other.
Off	Flashing green	IP address conflict within the network		Address Conflict Detection (ACD) disabled *1
		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 there has been no change, even after waiting 10 seconds for startup, check the IP address, subnet mask, and default gateway settings.
Flashing green	Lit green	Connection not established	Device file is incorrect	Confirm that the device file for this product is being used on the master.
			Master configuration is invalid	• Confirm that the IP address for the device is configured correctly on the master. • Make sure the network part is the same in the master and product IP addresses. Example: If the subnet mask is 255.255.255.0: Master: 192.168.250.2 Product: 192.168.250.1 The underlined part is the network part.
Flashing red	Lit green	Exclusive Owner connection timeout		• Reset the power for this product. • Reconnect the Exclusive Owner connection on the master.

*1. Based on TCP/IP Interface object (Class ID: F5 h) attribute ID: 0A h (ACD function) (Default value: Enabled).

Front LEDs (on this product)	Status	Procedure
Ether1 or Ether2		
Off	LAN cable is disconnected	Check whether the Ether1 or Ether2 LAN cables are disconnected.

Front LEDs (on this product)		Status	Details	Procedure
NW READY	NW COMM			
Lit blue-green	-	EtherNet/IP internal IC startup	The EtherNet/IP network chip is starting up.	-
Off	-		The EtherNet/IP network chip is not operating.	If the NW READY LED does not stay ON (blue-green) even though the power is ON, check the UNIT PWR LED. If the NW READY LED is unlit even though the UNIT PWR LED is lit, the power voltage may be extremely low, or the network type switching may have failed, preventing startup.
Flashing blue-green	-	Network chip firmware transferring	The EtherNet/IP network chip firmware is undergoing internal transfer.	-

Front LEDs (on this product)		Status	Details	Procedure
NW READY	NW COMM			
Lit blue-green	Lit blue-green	EtherNet/IP communication status	Communication with EtherNet/IP Master station is being performed correctly.	-
Lit blue-green	Flashing blue-green		Communication disconnection	• Confirm the EtherNet/IP Master status (refer to the manual for the EtherNet/IP Master being used). • Confirm the EtherNet/IP cable status. • Confirm the status of the Switching Hub between the EtherNet/IP Master and this product. • Confirm the following if no problems are found. a) IP address setting b) Subnet mask setting c) Default gateway setting After changing the IP address, subnet mask, or default gateway setting, restart the product power.
-	Off		Not communicating	• Confirm the following. a) Communication wiring with EtherNet/IP Master station b) Product front panel IP address lowest digit setting c) EtherNet/IP Master Status • Reset the CPU module of the host PLC.

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 EtherNet/IP	ALARM LED flashing red	Error flag ON	FFFA	EtherNet/IP communication has stopped	Confirm the Host Network (EtherNet/IP) status.

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.). This ISDU handing error may occur when the power supply to the IO-Link device is unstable. Use a power supply with sufficient capacity. This ISDU handing error may occur when the power supply to the IO-Link device is unstable. Use a power supply with sufficient capacity.
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 shutdown. 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 port for this product or replacing the IO-Link device and cable.

Code (hexadecimal)	Message	Conditions	Procedure
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 port, write with device parameter backup/restore (setting value number: M32) set to *Delete*.
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. 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 this is 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 port, ISDU communication was being used elsewhere and communication could not be performed within a time 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.

Code (hexadecimal)	Message	Conditions	Procedure
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. Backed up data will not be saved. The data being restored may have partially been transferred to the IO-Link device.	Perform the storage operation (backup or restore) again. 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). 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.
FFF0	Invalid data in setting value information	There is an invalid character in the setting value information provided by the IO-Link device, 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*. Or, 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 *Model 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 *Model name*. Or, 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. • The count is cleared if nothing is written for 450 seconds. • When writing twice with a frequency of once in less than 1 second. • When writing 20 times with a frequency of 1 in less than 10 seconds. • When writing 200 times with a frequency of once in less than 110 seconds.	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 (hexa-deci-mal)	Message	Conditions	Procedure
FFFA	Network communication has stopped	This occurs when host EtherNet/IP 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. • The IO-Link device is not connected when running storage functions (manual or automatic backup/ restore of IO-Link device) • 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* • The IO-Link device is not connected when confirming device information or reading/writing a setting value number from the device setting values window • The user switched to the device setting value window when connected to a device that does not support ISDU communication	Connect the IO-Link device properly. Or, change the setting value for device verification (setting value number: M30) to *None*. Or, set the I/O assignment settings (setting value number: M10) to a value other than *IO-Link* for any ports 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*. Or, 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*. Or, 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.

Note 1. Errors will be ignored if the same error code occurs within one second on the same port.

Note 2. Up to 20 entries will be stored across all ports 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.

A

Appendices

List the following.

- Assignment Method Other Than Process Data Default Value
- Master Unit setting value for this product when using Explicit message communication for read/write
- Example of procedure for communicating with representative EtherNet/IP Master

A-1 Assignment Method Other Than Process Data Default Value

When the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters are the default values, the process data assignment is as follows.
Input: 32 bytes per each port (when extended access is disabled, Port F only is 16 bytes; when in extended access, Port F only is 12 bytes)
Output: 4 bytes per each port (when extended access is disabled, Port 0 to F only; when in extended access, Port 0 to D only)

Here, the assignment method is shown when wanting to perform any assignment other than noted above, for any of the reasons below.

- On the EtherNet/IP Master side, when not wanting to assign an unused port, or not wanting to create a used port open area (however, open areas after packing and assignment will exist)
- When connecting an IO-Link device exceeding 4 bytes in output size

There are methods for manual configuration, and methods for auto assignment.
When not connected or when the configuration value is 0 words, it is packed and assigned. However, open areas after packing and assignment will exist in cyclic communication areas.

- Manual Configuration:
  With the following Master Unit parameters for this product, the allocation size is manually set for each port.
  Input: *M40. Process input data words allocation*: 0 to 16 words per port (default value: 16 words)
  Output: *M41. Process output data words allocation*: 0 to 16 words per port (default value: 2 words)

- Auto assignment:
  In accordance with the actual IO-Link device specifications, the above Master Unit parameter word allocation is automatically set. In ports that are not connected, 0 words are automatically set.

A-1-1 Cyclic Communication Operation Other Than Default Value

As a result of manual assignment or auto assignment, cyclic communication becomes operations as shown below.

When Normal Assignment (Extended Access Disabled)

● Input (This Product → EtherNet/IP Master)

Input byte address (Start number +)	Category	Details
+0 to +3	Digital input and status data	Digital input in SIO mode and product status are stored.

Input byte address (Start number +)	Category	Details
+4 to +499	Process input data	Process input data is packed and stored in ascending port number order from Port 0 to F. Assigned in accordance with the *M40. Process input data words allocation* configuration. • When the port setting is 0 words, it is packed and assigned. • If the process input data for the IO-Link device connected to the port is smaller than the setting size, then 00 h is stored in the open byte at the topmost address within the setting size. • If the process input data for the IO-Link device connected to the port is larger than the setting size, the process input data exceeding the setting size will be ignored (the setting size is stored).

● Output (EtherNet/IP Master → This Product)

Output byte address (Start number +)	Category	Details
+0 to +3	Digital output and operations data	Digital output in SIO mode and product operations data are stored.
+4 to +495	Process output data	Process output data is packed and stored in ascending port number order from Port 0 to F. Assigned in accordance with the *M41. Process output data words allocation* configuration. • When the port setting is 0 words, it is packed and assigned. • If the process output data for the IO-Link device connected to the port is smaller than the setting size, then the excessive part at the topmost address within the setting size is ignored (not sent from this product to the IO-Link device). • If the process output data for the IO-Link device connected to the port is larger than the setting size, “0” will be sent in the portion of the process output data exceeding the set size from this product to the IO-Link device. • If the total size of the process output data from Port 0 to F exceeds 492 bytes, then the data for the excessive part is not sent to the IO-Link device.

Extended Access Enabled Assignment

● Input (This Product → EtherNet/IP Master)

Input Byte Address (Start number +)	Category	Details
+0 to +3	Digital input and status data	Digital input in SIO mode and product status are stored.

Input Byte Address (Start number +)	Category	Details
+4 to +495	Process input data	Process input data is packed and stored in ascending port number order from Port 0 to F. Assigned in accordance with the *M40. Process input data words allocation* configuration. • When the port setting is 0 words, it is packed and assigned. • If the process input data for the IO-Link device connected to the port is smaller than the setting size, then 00 h is stored in the open byte at the topmost address within the setting size. • If the process input data for the IO-Link device connected to the port is larger than the setting size, the process input data exceeding the setting size will be ignored (the setting size is stored).
+496 to +499	Extended access read data	Extended access read data is stored.

● Output (EtherNet/IP Master → This Product)

Output Byte Address (Start number +)	Category	Details
+0 to +3	Digital output and operations data	Digital output in SIO mode and product operations data are stored.
+4 to +59	Process output data	Process output data is packed and stored in ascending port number order from Port 0 to F. Assigned in accordance with the *M41. Process output data words allocation* configuration. • When the port setting is 0 words, it is packed and assigned. • If the process output data for the IO-Link device connected to the port is smaller than the setting size, then the excessive part at the topmost address within the setting size is ignored (not sent from this product to the IO-Link device). • If the process output data for the IO-Link device connected to the port is larger than the setting size, “0” will be sent in the portion of the process output data exceeding the set size from this product to the IO-Link device. • If the total size of the process output data from Port 0 to F exceeds 56 bytes, then the data for the excessive part is not sent to the IO-Link device.
+60 to +67	Extended access specified data and extended access write data	Stores the data specified for extended access, and the data written with extended access.

A-1-2 Cyclic Communication Assignment Other Than Default Value

Normal Assignment (Extended Access Disabled)

● Input (This Product → EtherNet/IP Master): 500 Bytes

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital input (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital input (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Event flag	I/O power supply flag	Output overcurrent flag	Reserved	Latest event port			
+3	Error flag	IO-Link ready flag	Synchronization establishment flag	Reserved	Latest error port			
+4 … +499	Process input data (In response to *M40. Process input data word allocation*, setting value ports other than 0 words are packed and assigned in order of rising port number.)							

● Output (EtherNet/IP Master → This Product): 496 Bytes

Output Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital output (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital output (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Clear the latest event	Reset encoder counter	Reserved					0 (Extended access disabled)
+3	Clear the latest error	Reserved						
+4 … +495	Process output data (In response to *M41. Process output data words allocation*, setting value ports other than 0 words are packed and assigned in order of rising port number.)							

Extended Access Enabled Assignment

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

● Input (This Product → EtherNet/IP Master): 500 Bytes

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital input (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital input (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Event flag	I/O power supply flag	Output overcurrent flag	Access completed	Latest event port			

Input Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+3	Error flag	IO-Link ready flag	Synchronization establishment flag	Access error	Latest error port			
+4 … +495	Process input data (In response to *M40. Process input data word allocation*, setting value ports other than 0 words are packed and assigned in order of rising port number.)							
+496 … +499	Extended access read data (4 bytes)							

● Output (EtherNet/IP Master → This Product): 496 Bytes

Output Byte Address (Start number +)	Bit Address							
	7	6	5	4	3	2	1	0
+0	Digital output (Ports 0 to 7: Corresponds to bit address 0 to 7)							
+1	Digital output (Ports 8 to F: Corresponds to bit address 8 to F)							
+2	Clear the latest event	Reset encoder counter	Reserved			Write request	Read request	1 (Extended access enabled)
+3	Clear the latest error	Reserved	Little endian access	GD-ILM16C-MLP/-ILM16E-MLP parameter specification	Port No. of IO-Link to access (0 to F)			
+4 … +59	Process output data (In response to *M41. Process output data words allocation*, setting value ports other than 0 words are packed and assigned in order of rising port number.)							
+60	Lower byte specification for index number or setting value number							
+61	Upper byte specification for index number or setting value number							
+62	Subindex number or target number							
+63	Reserved					Byte length or target selection to access		
+64 … +67	Extended access write data							

A-1-3 Assignments for Other Than Default Values

The assignment examples below are shown as normal assignments when the *M40. Process input data words allocation* and *M41. Process output data words allocation* Master Unit parameters are at other than the default values.

Example) Process data size for connected IO-Link device

Product Port Number	Example of process data size for connected IO-Link device	
	Process input data byte count	Process output data byte count
0	32	0
1	8	0

Product Port Number	Example of process data size for connected IO-Link device	
	Process input data byte count	Process output data byte count
2	0	2
3	Not used	
4	3	0
5	0	3
6	0	8
7	Not used	
…		
F		

Example) Process output data words allocation when aligned with the product (same as auto assignment)

Port Number	M40. Process input data words allocation default value	M41. Process output data words allocation default value
0	16	0
1	4	0
2	0	1
3	0	0
4	2	0
5	0	2
6	0	4
7	0	0
…	…	…
E	0	0
F	0	0

If the setting value is 0 words, as shown below, then input and output are both packed and assigned. As a result, when creating a cyclic communication area on the EtherNet/IP Master side, please read and write the byte address after packing.

Input

Byte address	Input
+0	Digital input Ports 0 to 7
+1	Digital input Ports 8 to F
+2	Status data Low-order byte
+3	Status data High-order byte
+4	Port 0 IO-Link process input data 32 bytes
…	
+35	
+36	Port 1 IO-Link process input data 8 bytes
…	
+43	
+44	Port 4 IO-Link process input data 3 bytes
…	
+46	
+47	(Port 4 continued) Open (*1) 1 bytes (0 stored)

Byte address	Input
+48	Open (0 stored)
…	
+499	

Output

Byte address	Output
+0	Digital output Ports 0 to 7
+1	Digital output Ports 8 to F
+2	Operations data Low-order byte
+3	Operations data High-order byte
+4	Port 2 IO-Link process output data 2 bytes
…	
+7	
+8	Port 5 IO-Link process output data 3 bytes
…	
+10	
+11	(Port 5 continued) Open (*1) 1 bytes (0 sent)
+12	Port 6 IO-Link process output data 8 bytes
…	
+19	
+20	Open (0 sent)
…	
+67	

*1. Open regions in used ports are unrelated to the *M43 Process data LSB/MSB* settings.

A-2 List of Master Unit Parameters for This Product

Here, Explicit message communication is used to show the setting/monitorable product Master Unit parameters in a list.
For the setting/monitor in front panel operation, refer to *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition.

EtherNet/IP is dependent on writing/reading *This unit's object (class ID: 64 h)*.
The Master Unit parameter setting value number in this product is set by the instance ID of the corresponding object.
The target numbers is specified by the attribute ID low-order byte of the corresponding object.

The Master Unit parameters are classified as below.
- User settings
- Data for access from PLC

Note that this product's Master Unit parameters are handled as little endian (beginning from the lower byte).

Note In the right column of the table below, items that can be accessed via product front panel operation or communication from the Host Master station are marked with ●.

A-2-1 User settings

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
1 (1 h)	0	Master Unit parameters reset	RW	UINT	1	0 (default value)	None	●(M1)	●
						1	Initialize I/O assignment for all ports 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 ports in PNP input mode.		
						3	As above, initialize I/O assignment for all ports in NPN input mode.		
						4	As above, initialize I/O assignment for all ports in PNP output mode.		
						5	As above, initialize I/O assignment for all ports in NPN output mode.		
						6	As above, initialize I/O assignment for all ports 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.		
2 (2 h)	0	Network type	RW	UINT	1	Specifies the host industrial-use network type.		●(M2)	●
						2 (default value)	EtherNet/IP		
						3	Not used		
						4	Not used		
						5	Ethernet&Modbus/TCP		
						6	CC-Link IE Field Basic		
4 (4 h)	0	Display brightness	RW	UINT	1	1 to 20 (default value: 7)	Display brightness Values multiplied by 5 are equivalent to % display.	●(M4)	●

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
5 (5 h)	0	Language	RW	UINT	1	0 (default value)	English	●(M5)	●
						1	Japanese		
						2	German		
						3	Chinese (Simplified)		
						4	French		
						5	Spanish		
						6	Portuguese		
						7	Italian		
						9	Korean		
						10	Chinese (Traditional)		
6 (6 h)	0	Time zone	RW	INT	1	-96 to 96 (default value: 0)	Set the time difference (15-minute units) from the displayed network time (setting value number: M65). If the network time set from the host is the UTC standard, setting “9×4=36” for the time difference will display Japan time (JST).	●(M6)	●
8 (8 h)	0	User tag name of this IO-Link Master Unit	RW	STRING	1 to 32	Up to 32 characters	Set the product user tag name up to 32 characters.	●(M8)	●
9 (9 h)	0	I/O assignment batch settings	RW	UINT	1	0 (default value)	None	●(M9)	●
						1	Change I/O assignment settings for all ports to IO-Link mode.		
						2	Change I/O assignment for all ports to PNP input mode.		
						3	Change I/O assignment for all ports to NPN input mode.		
						4	Change I/O assignment for all ports to PNP output mode.		
						5	Change I/O assignment for all ports to NPN output mode.		
						6	Change I/O assignment for all ports to unused.		

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
10 (Ah)	0 to 15	I/O assignment settings	RW	UINT	1	0	IO-Link Mode	●(M10)	●
						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		
11 (Bh)	0 to 15	Input filter time	RW	UINT	1	0 (default value)	None	●(M11)	●
						1	0.1 ms		
						2	1 ms		
						3	5 ms		
						4	10 ms		
						5	20 ms		
12 (Ch)	0 to 15	Input hold time	RW	UINT	1	0 (default value)	None	●(M12)	●
						1	1 ms		
						2	15 ms		
						3	100 ms		
13 (Dh)	0 to 15	IO-Link communication and network error handling	RW	UINT	1	0 (default value)	Clear	●(M13)	●
						1	Input hold		
						2	Output hold		
						3	All Hold		
16 (10h)	0 to 15	Bit assignment of Process input data	RW	INT	1	-1	Turns ON RX0□ for the corresponding port when the IO-Link device's process input data is valid.		●
						0 to 254	Specifies which bit from the first bit of the process input data defined as boolean (bit) data in the IO-Link device's process input data information to use as the input ON/OFF information. Data formats other than Boolean, such as Integer, cannot be specified. If the IO-Link device does not provide an index (0x0E) for the process input data format, you must install the IODD for the corresponding IO-Link device.		●

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
17 (11 h)	0 to 15	Input port to output	RW	UINT	1	0	Turns ON or OFF the PNP/NPN output based on the bit information of the process output data.		●
						1 to 16	Turns ON or OFF the PNP/NPN output based on the input bit information for “the specified port number + 1”. Use this when the IO-Link device’s process input data bit information needs to be output as-is to the outside.		●
18 (12 h)	0 to 15	Pulse input	RW	UINT	1	None	Does not use the counter function.	●(M18)	●
						ABZ	Uses all of phase A, phase B, and phase Z of the incremental encoder. The rotation count is incremented or decremented at the rising edge of the Z phase, with the count value cleared. The count value is incremented at both the rising edge and falling edge of the input pulse.		
						AB	Uses only phase A and phase B of the incremental encoder. The count value is incremented at both the rising edge and falling edge of the input pulse.		
						Single	The count value is incremented at both the rising edge and falling edge of the input pulse.		
						Frequency	Measures the frequency of the single-phase pulse input in units of 1 Hz every second.		
						High response	This is used when a high-speed response is required. It measures the frequency of the AB-phase or single-phase pulse input at the rising edge of each input cycle.		
19 (13 h)	0 to 15	Input inversion	RW	UINT	1	None	Passes the input status of the specified port as-is to the inside.	●(M19)	●
						Reverse	Passes the input status of the specified port to the inside after reversing it.		

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
21 (15 h)	0 to 15	I/O synchronization	RW	UINT	2	0 (default value)	Asynchronous IO-Link communication uses individual devices' fastest times. The digital I/O status is also continually updated.	●(M21)	●
						2	Using the product's internal timer, at an 0.4 ms cycle, synchronize IO-Link communication or digital I/O transfer between multiple ports 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.		
22 (16 h)	0 to 15	Lowest frequency	RW	UINT	1	27.2 Hz	Measures the lowest frequency with a cycle of 16 rising edges of the pulse input. This ensures stable measured values with improved frequency measurement resolution, although the measurable lowest frequency is 27.2 Hz.	●(M22)	●
						13.6 Hz	Measures the lowest frequency with a cycle of 8 rising edges of the pulse input.		
						6.8 Hz	Measures the lowest frequency with a cycle of 4 rising edges of the pulse input.		
						3.4 Hz	Measures the lowest frequency with a cycle of 2 rising edges of the pulse input.		
						1.7 Hz	Measures the lowest frequency with a cycle of 1 rising edges of the pulse input.		
29 (1D h)	0 to 15	Device ID	RW	UINT	3	0x0 - 0xFFFFFF (default value: 0x0)	This is the device ID used for verification with IO-Link devices. Refer to *M29. Device ID* in *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition for details.	●(M29)	●

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
30 (1E h)	0 to 15	Device verification	RW	UINT	1	0 (default value)	None **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)	●
						1	Type ID (vendor ID and device ID) verification 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 and serial number verification 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 and device model name verification 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 Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
31 (1F h)	0 to 15	Automatic device parameter backup	RW	UINT	1	0 (default value)	None	●(M31)	●
						1	Auto backup When IO-Link device set values are changed, they are automatically backed up in this product. If IO-Link device setting values are changed from this product, the backup operation will automatically start 10 seconds after the last change. **Note** When a device with a different vendor ID or device ID is connected, backup is executed at every start-up, so reset *Device verification* (set value number: M30) to correct the verification error (FFFE h) as soon as possible.		
						2	Auto restoration 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). In this case, note that even if the IO-Link device set value is changed, it will be overwritten at the next start-up with the data saved in this product.		
						3	Perform auto backup and auto restoration as above together The storage data stored on this product will always match the IO-Link device setting values. In other words, IO-Link device setting values are backed up to this product whenever they are changed. If any setting values are different from the IO-Link device during startup, the setting values stored in this product will be restored.		
						4	Saves a backup of the IO-Link device settings as storage data without generating an error even if the device ID of the connected IO-Link device differs from the device ID stored in this product. **Note** Note that connecting an incorrect IO-Link device accidentally allows the backup of the IO-Link device's settings to overwrite the existing storage data.		

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value			Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
32 (20 h)	0 to 15	Device parameter backup/ restore	RW	UINT	1	0 (default value)	None		●(M32)	●
						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	IODD Install Data Prioritized	RW	UINT	1	0	Device Prioritized		●(M33)	●
						1 (default value)	IODD data Prioritized			
40 (28 h)	0 to 15	Process input data words allocation	RW	UINT	1	0 to 16 (default value: 16)	Process input data words allocated to input cyclic communication area If the setting value is 0 words, it is packed and assigned.		●(M40)	●
41 (29 h)	0 to 15	Process output data words allocation	RW	UINT	1	0 to 16 (default value: 2)	Process output data words allocated to output cyclic communication area If the setting value is 0 words, it is packed and assigned.		●(M41)	●
42 (2A h)	0	Process data words auto allocation	RW	UINT	1	0 (default value)	None		●(M42)	●
						1	Auto allocation			
43 (2B h)	0 to 15	Process data LSB/MSB	RW	UINT	1	0 (default value)	Lower order (Little)		●(M43)	●
						1	Higher order (Big)			
						2	Higher order (Little)			
						3	Swap bytes			
44 (2C h)	0	Time stamp	RW	UINT	1	0 (default value)	No	Refer to *M44. Time stamp* in *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition for details.	●(M44)	●
						1	Serial			
						2	Common Era BCD			
						3	Serial + Parity			
						4	Common Era + Parity			

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
51 (33 h)	0 to 15	IO-Link cycle time	R	UINT	2	1 to 1000	0.1 ms increments	●(M51)	●
52 (34 h)	0 to 15	IO-Link transmission rate	R	UINT	1	0	Not communicating	●(M52)	●
						1	COM1		
						2	COM2		
						3	COM3		
53 (35 h)	0 to 15	Number of IO-Link communication errors	R	UINT	1	0 to 255	To clear, write 1 in set value 114 h offset +0.	●(M53)	●
54 (36 h)	0 to 15	IO-Link ISDU checksum errors	R	UINT	1	0 to 255	To clear, write 1 in set value 114 h offset +0.	●(M54)	●
55 (37 h)	0 to 15	IO-Link transmission rate error	R	INT	2	-1000 to 1000	IO-Link transmission rate error (0.1% unit, signed)	●(M55)	●
56 (38 h)	0 to 15	IO-Link signal width error	R	INT	2	-1000 to 1000	IO-Link transmission signal width error (0.1% unit, signed)	●(M56)	●
57 (39 h)	0 to 15	IO-Link communication mode	R	UINT	1	0 to 7	0: NOCOM 1: STARTUP 2: PREOPERATE 3: OPERATE 5: STARTUP (Rev.1.0) 6: PREOPERATE (Rev.1.0) 7: OPERATE (Rev.1.0) Refer to *M57. Communication mode* in *5-1-4 Master Unit Parameter List with Product Front Panel Operations* of the Common Edition for details.	●(M57)	●
58 (3A h)	0 to 15	Storage backup time	R	STRING	17	00:00:00_00/01/01 to 23:59:59_99/12/31	The storage data backup time is displayed as below. Example: December 31, 2022, 18:59:00 **18:59:00_22/12/31**	●(M58)	●

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
60 (3C h)	0	System program version of IO-Link Master Unit	R	UINT	4	P.PPNNLLFF	Display the data version of the program, etc. P.PP: Firmware, NN: Network chip, LL: Logic, FF: Font 4 bytes in decimal.	●(M60)	●
61 (3D h)	0	Total operation hours of IO-Link Master Unit	R	UINT	2	0 to 2097151 (239 years)	Product cumulative operating time information (unit: hours)	●(M61)	●
62 (3E h)	0	Display drive time	R	UINT	2	0 to 262143 (30 years)	Product display operating time information (unit: hours)	●(M62)	●
63 (3F h)	0	I/O power supply voltage	R	UINT	2	0 to 308	Voltage supplied to product I/O power supply (unit: 0.1 V)	●(M63)	●
64 (40 h)	0	Internal temperature	R	UINT	2	-2739 to 10457	Product internal temperature (unit: 0.1°C)	●(M64)	●
65 (41 h)	0	Network time	R	STRING	22	00:00:00.0000_00/01/01 to 23:59:59.0000_99/12/31	Time and date Example: December 31, 2022, 18:59:00.0000 **18:59:00.0000_22/12/31**	●(M65)	●
66 (42 h)	0	Network communication cycle	R	UINT	2	0 to 1500	Returns the host network communication cycle in 0.01 ms units. It will be forced to operate at a 150 ms cycle if the host network is disconnected.	●(M66)	●
80 (50 h)	0	Default gateway	R/W	UINT	4	0.0.0.0 to 255.255.255.255	If there are particular specifications, perform configuration. If there are not, then leave at the default value. The default value is 0.0.0.0.	●(M80)	●
81 (51 h)	0	Subnet mask	R/W	UINT	4	0.0.0.0 to 255.255.255.255	If there are particular specifications, perform configuration. If there are not, then leave at the default value. The default value is 255.255.255.0.	●(M81)	●

Master Unit parameter numbers DEC (HEX)	Target numbers 0 to 15: corresponds to channel number, 0: This product	Data name	R/W	Format	Length in bytes	Value		Front panel controls (Master Unit parameter numbers)	Communication from EtherNet/IP Master
82 (52 h)	0	IP address	R/W	UINT	4	0.0.0.0 to 255.255.255.255	Configure the Product IP address to any arbitrary value. Configure only when setting to other than the default value 192.168.250.xxx (xxx is the value set by rotary switch). Note, turning this product's front panel rotary switch when the power is on causes an automatic move to this *M82. IP address* setting screen.	●(M82)	●

A-2-2 Data for Access from PLC

Master Unit parameter numbers	Target numbers	Data name	R/W	Offset	Value	Front panel controls	Communication from EtherNet/IP Master
100 h	0 to 15 (Corresponds to port number)	Latest error code readout by port	R	+0	Error code lower		●
				+1	Error code upper		
				+2	Lower designated index number causing error		
				+3	Upper designated index number causing error		
				+4	Designated subindex number causing error		
				+5 to 26	Error time and date text string (in order of generation) See the form below. HH:MM:SS YY:MN:DD (HH: hour, MM: minute, SS: second, YY: year last two digits, MN: month, DD: day) Ex.: Generated at 18:59:00 on February 19, 2020: 18:59:00 20/02/19 **Note** When 100-µs unit data is added, HH:MM:SS:ssss YY:MN:DD (ssss: second in 100-µs unit).		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
101 h	0 to 15 (Corresponds to port number)	Event data readout by port	R	+0	Event flag		●
				+1	Event #1 type*1		
				+2	Event Code Upper		
				+3	Event Code Lower		
				+4	0		
				+5	Event #2 type*1		
				+6	Event Code Upper		
				+7	Event Code Lower		
				+8	0		
				+9	Event #3 type*1		
				+10	Event Code Upper		
				+11	Event Code Lower		
				+12	0		
				+13	Event #4 type*1		
				+14	Event Code Upper		
				+15	Event Code Lower		
				+16	0		
				+17	Event #5 type*1		
				+18	Event Code Upper		
				+19	Event Code Lower		
				+20	0		
				+21	Event #6 type*1		
				+22	Event Code Upper		
				+23	Event Code Lower		
				+24	0		
				+25 to 150	The text string for generation times of events #1 to #6 will be displayed (in order) after the event #. Ex. 1: Event #1 only generated at 19:15:32 on June 24, 2020: (1) 19:15:32 20/06/24 Ex. 2: Events #1 to #6 all generated at different times: (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 20/6/24		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
102 h	0	Set value readout time from IO-Link devices (binary data)	R	+0	15.265 µs unit data lower	-	●
				+1	15.265 µs unit data upper		
				+2	Set 0 as January 1, 1970, 00:00:00, counting data every second, least-significant		
				+3	As above 2nd byte		
				+4	As above 3rd byte		
				+5	Same as above, most-significant		
				+6	Lower parity information with readout set values as word units with exclusive disjunction (XOR) at 35AC h		
				+7	Same as above, upper		
	1	Set value readout time from IO-Link devices (CE BCD data)	R	+0	15.265 µs unit data lower		
				+1	15.265 µs 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 0x35AC		
				+9	Same as above, upper		
	2	Set value readout time from IO-Link devices (text string data)	R	-	A 27-character text string will be displayed. Ex.: 2020/2/29 18:59:0.1234 parity 8B61 h → 18:59:00.1234 20/02/29 8B61		
103 h	0 (This product)	Event/error message readout	R	-	Executing readout switches the display to the event/error display window.		●
				+0	Corresponding port (0 to 15)		
				+1	Designated subindex number causing error/event qualifier		
				+2	Lower index number in error		
				+3	Upper index number in error		
				+4	Error code lower		
				+5	Error code upper		
				+6	Message text string		
				+7	(continues)		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value		Front panel controls	Communication from EtherNet/IP Master
104 h	0 (This product)	Button operation	R	+0	Returns the status of the currently pressed button. Value is the same as below.		-	●
			W	-	Writes the decimal below. 1: Right button operation 2: Left button operation 4: ↑ button operation 8: ↓ button operation 16: **CANCEL** button operation 32: **ENTER** button operation	Remotely operates the product buttons. Operation is the same as pressing once, not holding. **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. Executes with readout.			●
	1	Go to next event						
	2	Return to previous event						
106 h	0 (This product)	Operation lock	RW	-	Bit 0: Master Unit parameter write lock	**Note** Start up while pressing the **CANCEL** button to release the lock temporarily.	-	●
					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 Character codes: Japanese: Shift-JIS Simplified Chinese: GB2312 Traditional Chinese: Big-5 Korean: EUC-kr		-	●
	1	Readout display text string (2nd row)	R					
108 h	1	Right button operation response	R	-	Each operation response when remotely operating product buttons is stored under the following decimals. Responses are as below. 1: Referencing set values 10 to 19: Digit position of set values being edited (equivalent to digits 1 to 10) 100 up: Digit position in text string being edited Values up to 255 are 1-byte responses; values from 256 up are 2-byte responses. Even if buttons are remotely operated here, the display off timer will not be cleared. When specifying over 192 values, only 192 will be received. The readout values at that point are port numbers.		-	●
	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						

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
109 h	0 (This product)	Readout of port 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 port numbers.	-	●
10A h	0 (This product)	Find Me requests	RW	+0	0: Cancel a Find Me request to the product 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.	-	●
10D h	0 to 15 (Corresponds to port 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.	-	●
			W	+0 to +63			
10E h	0 to 15 (Corresponds to port number)	Vendor ID and device ID registered for verification	RW	+0 to +1	Registered IO-Link device vendor ID	-	●
				+2 to +4	Registered IO-Link device ID		
				+5	0		
				+6	Registered IO-Link device revision ID Value 10 h indicates that the revision ID is 1.0. Value 11 h indicates that the revision ID is 1.1.		
10F h	0 to 15 (Corresponds to port number)	Write serial number to be registered	W	+0 to +15	Writes the serial number used for verification with IO-Link devices.	-	●
110 h	0 to 15 (Corresponds to port 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. **Note** In the case of a vendor ID mismatch, it will be invalid and 0 will be read out.	-	●
				+2 to +4	Device ID in product backup data. **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		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
111 h	0 (This product)	Diagnostic information	R	+0	Main memory (EEPROM) checksum error count	-	●
				+1	Sub memory (flash) checksum error count		
				+2	Always 0.		
				+3	Bit 0 to 5: Result of pressing switch alone in past		
				+4 to +5	Display device drive power supply voltage (0.1 V unit)		
				+6	Explicit Communication Time-Out 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	Interlock status (Always 0)		
112 h	0 (This product)	Output overcurrent condition	R	+0 to +1	Current output overcurrent condition. Bits 0 to 15 are equivalent to I/O ports 0 to 9 and A to F.	-	●
				+2 to +17	Output overcurrent count for Ports 0 to F. Counted up to 255.		
			W	+0	Write 1 to clear all ports' output overcurrent count. Write 2 to 17 to clear Ports 0 to F separately.		
113 h	0 to 15 (Corresponds to port number)	Read vendor ID and device ID of IO-Link device currently connected.	R	+0 to +1	Vendor ID	-	●
				+2 to +4	Device ID		
				+5	Always 0.		
				+6	Revision ID		
				+7	Always 0.		
				+8 to +9	Function ID		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
114 h	0 to 15 (Corresponds to port number)	IO-Link device diagnostic information	R	+0	Number of IO-Link communication errors.	-	●
				+1	IO-Link ISDU sum error count		
				+2 to +3	IO-Link transmission rate error (0.1% unit, signed)		
				+4 to +5	IO-Link transmission signal width error (0.1% unit, signed)		
				+6 to +7	Actual cycle time for IO-Link communication (0.1 ms units)		
				+8	IO-Link transmission rate (0: not communicating, 1: COM1, 2: COM2, 3: COM3)		
				+9	Process input data byte count		
				+10	Process output data byte count		
				+11	IO-Link communication status (0: NOCOM, 1: STARTUP, 2: PREOPERATE, 3: OPERATE, 4 to 7: Same as 0 to 3 with IO-Link Revision 1.0)		
				+12	IO-Link device on-request data byte count		
				+13	Process input data disabled status (0: Enabled, 1: Disabled)		
	0	Clear IO-Link communication error count	W	+0	Write 1 to clear all ports' IO-Link communication error count. Write 2 to 17 to clear Ports 0 to F separately.		
	1	Clear IO-Link ISDU checksum error count		+0	Write 1 to clear all ports' ISDU checksum error count. Write 2 to 17 to clear Ports 0 to F separately.		
1FE h	0 to 31	Readout of IO-Link communication trace data	R	+0 to +127	From the position where the port 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. The specified port number 31 is the most recent trace data, 30 is the previous one, and 0 is the oldest data. A ">" is inserted at the start of the send data and a ":" at the start of the receive data.	-	●
	0	Start of IO-Link communication trace	W	+0	Bits 3 to 0: IO-Link device port number Saves the specified IO-Link device send/receive data to buffer memory (4096 bytes). Bit 5: Set to 1 to stop the trace when an IO-Link communication error is generated. Bit 6: Set to 1 to stop the trace when an ISDU communication negative response is generated. Bit 7: Set to 1 to stop the trace when the buffer is full.	-	●
				+1	Bit 0: Set to 1 to add a line break instead of ">" at the start of send data.		

Master Unit parameter numbers	Target numbers	Data name	R/W	Off-set	Value	Front panel controls	Communication from EtherNet/IP Master
1FF h	0 (This product)	Readout of MAC address and serial No.	R	+0 to +5	6-byte MAC address data	-	●
				+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 to 6 Event generation type 0: Reservation, 1: Single, 2: Generated, 3: Cleared
Bits 5 to 4 Event type 0: Reservation, 1: Notification, 2: Warning, 3: Error
Bit 3 Event generation source 0: Device, 1: Master
Bits 2 to 0 Event cause 0: Unclear, 1 to 3: Reservation, 4: Application, 5 to 7: Reservation

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