Panasonic

Programmable Controller

FP7 CPU Unit

User's Manual

EtherNet/IP Communication Function

WUME-FP7CPUEIP-03

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(MEMO)

Introduction

Thank you for buying a Panasonic product. Before you use the product, please carefully read the installation instructions and the user's manual, and understand their contents in detail to use the product properly.

Types of Manual

- There are different types of user's manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website: https://industry.panasonic.com/global/en/downloads/?tab=manual

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit User's Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit		
	FP7 CPU Unit Command Reference Manual	WUME-FP7CPUPGR
	FP7 CPU Unit User's Manual (Logging Trace Function)	WUME-FP7CPULOG
	FP7 CPU Unit User's Manual (Security Function)	WUME-FP7CPUSEC
Instructions for Built-in LAN Port	FP7 CPU Unit User's Manual (LAN Port Communication)	WUME-FP7LAN
	FP7 CPU Unit User's Manual (Ethernet Extension Function)	WUME-FP7CPUETEX
	FP7 CPU Unit User's Manual (EtherNet/IP Communication Function)	WUME-FP7CPUEIP
Instructions for Built-in COM Port	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
FP7 Extension (Communication) Cassette (RS-232C and RS485 Type)		
FP7 Extension (Communication) Cassette (Ethernet Type)	FP7 Series User's Manual (Communication Cassette Ethernet Type)	WUME-FP7CCET
FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette User's Manual	WUME-FP7FCA
FP7 Digital Input/Output Unit	FP7 Digital Input/Output Unit User's Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit User's Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit User's Manual	WUME-FP7AOH
FP7 Thermocouple Multi-analog Input Unit	FP7 Thermocouple Multi-analog Input Unit FP7 RTD Input Unit User's Manual	WUME-FP7TCRTD
FP7 RTD Input Unit		
FP7 High-speed Counter Unit	FP7 High-speed Counter Unit User's Manual	WUME-FP7HSC
FP7 Pulse Output Unit	FP7 Pulse Output Unit User's Manual	WUME-FP7PG
FP7 Positioning Unit	FP7 Positioning Unit User's Manual	WUME-FP7POSP

Unit name or purpose of use	Manual name	Manual code
FP7 Serial Communication Unit	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
PHLS System	PHLS System User’s Manual	WUME-PHLS
Programming Tool Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

Safety Precautions

- Observe the following precautions to ensure personal safety or to prevent accidents.
- Before performing installation, operation, maintenance, or inspection, read this manual carefully to understand how to use the product correctly.
- Make sure that you fully understand the product, information on safety, and other precautions.
- This manual uses two safety symbols, different levels of safety precautions “Warning” and “Caution”, to indicate .

⚠ **WARNING**	Indicates a potentially hazardous situation which, if not handled correctly, could result in death or serious injury of the user.

- Take safety measures outside the product to ensure the safety of the entire system even if this product fails or an error occurs due to external factors.
- Do not use this product in atmospheres that contain flammable gases.
  Doing so may result in explosion.
- Do not throw this product into the fire.
  Doing so may cause the batteries or other electronic parts to explode.

⚠ **CAUTION**	Indicates a potentially hazardous situation which, if not handled correctly, could result in injury to the user or property damage.

- To prevent abnormal heat generation or smoke generation, use this product with some leeway from the guaranteed characteristics and performance values of the product.
- Do not disassemble or modify this product.
  Doing so may result in abnormal heat generation or smoke generation.
- Do not touch any terminals while the power is on.
  Doing so may result in electrical shock.
- Configure emergency stop and interlock circuits outside this product.
- Connect wires and connectors properly.
  Failure to do so may result in abnormal heat generation or smoke generation.
- Do not perform work (such as connection or removal) with the power turned on.
  Doing so may result in electrical shock.
- If this product is used in any way that is not specified by Panasonic, its protection function may be impaired.
- This product has been developed and manufactured for industrial use only.

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Handling Precautions

■ In this manual, the following symbols are used to indicate safety information that must be observed.

Stop	Indicates an action that is prohibited or a matter that requires caution.
!	Indicates an action that must be taken.
i Info.	Indicates supplemental information.

Note	Indicates details about the subject in question or information useful to remember.
1 2 Procedure	Indicates operation procedures.

FP7 Connector Compatibility

The connectors of old and new model FP7CPU units and add-on cassettes (hereinafter "cassettes") are shaped differently. Please use old model cassettes with old model units and new model cassettes with new model units as shown in the table below.

■ Old Model

Type	Old Product No.
CPU unit	AFP7CPS41ES, AFP7CPS41E, AFP7CPS31ES, AFP7CPS31E, AFP7CPS31S, AFP7CPS31, AFP7CPS21
Serial Communication Unit	AFP7NSC
Cassette	AFP7CCS1、AFP7CCS2、AFP7CCM1、AFP7CCM2、AFP7CCS1M1、AFP7CCET1、AFP7FCA21、AFP7FCAD2、AFP7FCTC2

■ New Model

Type	New Product No.
CPU unit	AFP7CPS4RES, AFP7CPS4RE, AFP7CPS3RES, AFP7CPS3RE, AFP7CPS3RS, AFP7CPS3R, AFP7CPS2R
Serial Communication Unit	AFP7NSCR
Cassette	AFP7CCRS1、AFP7CCRS2、AFP7CCRM1、AFP7CCRM2、AFP7CCRS1M1、AFP7CCRET1、AFP7FCRA21、AFP7FCRAD2、AFP7FCRTC2

Note

- Each FP7 unit can be connected to the CPU unit of a new or old model.
- Firmware version upgrades for the CPU unit are available for both new and old models.
- When attaching expansion cassettes to the FP7CPU unit, please use only old models, or only new models. Trying to attach a combination of old models and new models may cause damage.

Contents of the Changes in EtherNet/IP Communication Function Manual

The following functions have been added to improve the easy usability of the EtherNet/IP function.

Use the following version for using the added functions.

FP7 CPU UNIT : Ver.4.11 or later

FPWIN GR7(S) : Ver.2.10 or later

■ Improvements to EtherNet/IP Setting Tool Functionality

- The following setting items have been added to the EtherNet/IP basic configuration.
  This setting is available when the version of the FP7 CPU unit is Ver.4.11 or later.
  - RUN/IDLE bit operation of cyclic communication

For details, refer to "8.1.2 RUN/IDLE Bit".

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1 Introduction of EtherNet/IP Function

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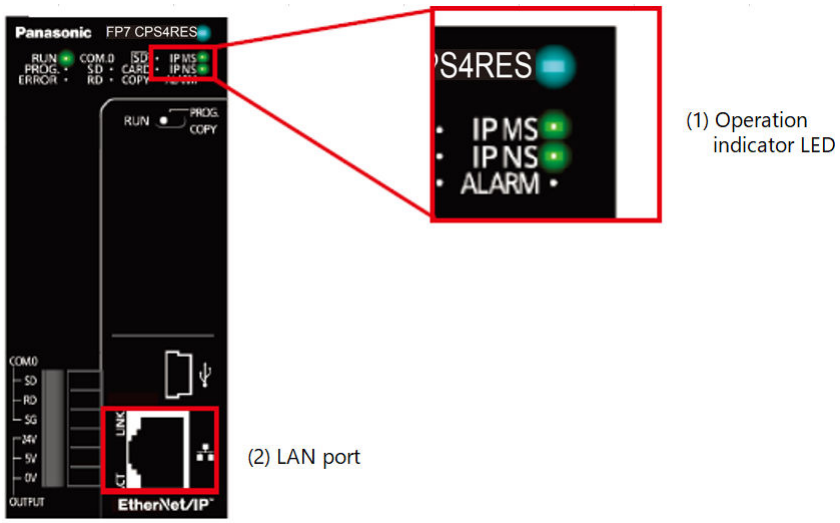
1.1 Introduction of EtherNet/IP Function

FP7 supports a new function "EtherNet/IP function".

This chapter describes the related names and functions, applicable models and the required versions for using this function.

■ Names and Parts



Name	Description	
(1) Operation indicator LED	MS	These LEDs display the operating condition of the unit.
	NS	Displays the communication status of network.
	For details on the lighting statuses of MS and NS, refer to "14.1 Lighting State of LED for EtherNet/IP Setting".	
(2) LAN port	Port for connecting to EtherNet LAN. The EtherNet/IP communication is performed using the LAN port.	

■ Models on which the EtherNet/IP function is usable

The EtherNet/IP function is available for the following four models.

Use the EDS files for each model stored in the version Ver.2.8 of GR7(s) or later.

The EDS files are also stored in the following folder.

格納先：C:\ProgramData\Panasonic Industry Control\EIP

Info.

- The ProgramData folder is a hidden folder.

The EDS files can be downloaded from our website.

- AFP7CPS3RE
- AFP7CPS4RE
- AFP7CPS3RES
- AFP7CPS4RES

■ Version of FP7 CPU unit on which the EtherNet/IP function is usable

Use the following version for using the EtherNet/IP function.

- FP7 CPU Unit: Ver.4.00 or later

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2 Description of EtherNet/IP Communication Function

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2.1 What is EtherNet/IP?

EtherNet/IP (Ethernet Industrial Protocol) is an industrial multi-vendor realtime Ethernet system for executing the communication protocol for CIP (Common Industrial Protocol) control in an application layer on standard Ethernet.

For information on CIP, refer to the documents of ODVA.

Use the following versions for using the FP7 EtherNet/IP function.

1. FP7 CPU unit: Ver.4.00 or later
2. FPWIN GR7(S): Ver.2.8 or later

Note

- The EtherNet/IP communication and Ethernet communication (such as communication with GR7(S)) can be used simultaneously.

2.2 Cyclic Communication Function

The cyclic communication is a function for connecting from a scanner device to an adapter device and sending data mutually in a specified cycle after completing the connection.

The scanner device is a controller such as PLC.

The adapter device is a device such as a robot controller, encoder or IO device.

Scan list is a list that defines the connections between the scanner device and multiple adapter devices.

A constant cycle is called RPI (Requested Packet Interval).

The side which opens the connection of the cyclic communication is called originator, and the side which the connection is opened is called target.

The scanner device can be used as the adapter device.

2.3 Definitions of Terms

The following terms are used in this manual and the EtherNet/IP setting tool.

Term	Description
Scan list	The scan list is the connection settings with adapter devices registered for a scanner device. The scanner device is connected with adapter devices according to the scan list.
EDS file (Electric data sheet)	An EDS file contains the information on the communication for registering adapter devices in the scan list. EDS files are provided for each product by each vendor. The EDS files of each adapter device should be registered for constructing the scan list with the setting tool.
Originator and Target	The side which handles the connection of the cyclic communication is called the originator. The side to which the cyclic communication is connected is called the target.
Node No.	Node numbers can be set when an adapter device is registered in the scan list. Numbers that do not overlap are allocated in the scan list as node numbers. Node numbers are not used in the cyclic communication, however, as each adapter is recognized by these numbers, they are used for monitoring the communication state of each node or controlling the start/stop of the communication.
Connection setting	The details of the connections of adapters registered in the scan list are set.
Node Name	Arbitrary node names can be given.
Device name	This is the device name of an adapter. The device name is registered in the EDS file.
Connection name	The type of the connection manager registered in the EDS file is selected by the name. By selecting this, the application type (communication method) is changed.
Application type	The communication method can be selected by the application type. The following communication methods are available: 1: Exclusive Owner (Two-way communication) 2: Input Only 3: Listen Only For a normal adapter device, select 1 (Two-way communication). Although Exclusive Owner and Input Only are independent connections, Listen Only can be connected only when either of the above connections is established, and it will be automatically cut if the above independent connections are disconnected. Also, it will be reconnected automatically when the above independent connection is reconnected. Although the FP7 can be used as an adapter, it can be connected only when "Input Only" is selected.
Compatibility check	A method for verifying the revision of a used EDS file and the information that the device actually used has is selected. Three verification methods are available. The default is "Follow Adapter Rule". 1 : Check 2 : Not Check 3 : Follow Adapter Rule
Communication method	Either instance communication (number specifications) or tag communication (symbol name specification) is displayed.

Term	Description
	For connecting from a scanner to adapters, there are methods which establish the connection by specifying numbers or by specifying symbols. Even when connecting by specifying symbols, numbers are assigned to packets during the actual cyclic communication. When selecting a connection, the methods available for the connection are displayed. When using the FP7 as an adapter, either method can be used, however, if using the instance method, the selectable instance numbers are 100 to 199.
Send trigger	The transmission timing is selected from Cyclic or COS (Change of state). However, COS depends on devices. COS is basically a cyclic communication, however, it also performs transmission when sent data changes. The FP7 does not support COS.
COS transmission disable time	Although COS performs transmission when sent data changes, transmission is not performed even if the unit detects the data change within this time.
Timeout period	In the cyclic communication, the timeout is judged on a receiver side to send transmission data as UDP packet. The timeout period is selected from 4, 8, 16, 32, 64, 128, 256 and 512 times of RPI. The timeout period should be 10 msec or more. RPI can be specified for T>O direction and O>T direction separately, so each timeout period may be different values.
Input setting (T>O)	This is the setting for the transmission from a target to the FP7 (originator).
RPI (Requested Packet Interval)	Set the transmission interval for the cyclic communication. Set a value within the communication capacity of the adapter. The usable RPI range depends on devices. For the FP7, it is 0.5 ms to 10 s (by 0.5 ms).
Connection type	Select a communication method that is selectable for the selected connection. 1 : 1:1 communicaion (Point to Point) 2 : Multicast communication (Multicast) The point-to-point communication is a 1 to 1 communication between the connection source and destination. Transmission packet is received by the source device or destination device only. Other devices connected to the same HUB does not receive the transmission packet. In the mutlicast communication, transmission data is sent as multicast packet. By connecting multiple sources to the same connection, single multicast packet can be received by the multiple connection sources. The multicast packet is basically received by all the devices connected to the same HUB, including devices unrelated to the communication, leading to unnecessary communication loads. Therefore, set not to exceed 100% with the load factor caclulation of the setting tool when using the mutlicast communication. Also, it is recommended to use a HUB with a multicast filter.
Instance ID/Tag name	Set an instance ID or tag name according to the communication method of the selected connection.
Data size	Set the communication data size according to the communication setting of each adapter device. Set this as well as changing the setting for the scanner, otherwise the communication cannot be performed as it does not match the setting of adapters.
Refresh method	There are the following two refresh operations.

Term	Description
	1 : Transfers the data sent to adapters to send buffers from allocated operation memories. 2 : Transfers the data sent from adapters to allocated operation memories from receive buffers. The refresh method can be selected from three types, Batch, Divice and Instruction.
Parameter change	Parameters that can be changed by EDS can be changed.
PPS performance index (Packet per sec)	This is an index of sent/received packets processed in one second.
Normal packet and large packet	Packet sizes of 504 bytes or less are called normal packets, and packets between 505 bytes and 1444 bytes in size are called large packets. The maximum communication performance varies depending on the data size used for communication. Performance index of FP7 When the size is 504 bytes or less: Max. 10000 pps When the size is 505 bytes or more: Max. 5000 pps
Protocol used for cyclic communication	The cyclic commuication is performed using UDP. The used port number is 2222.
Heartbeat	In the case of Input Only or Listen Only, data is only sent from the target, however, a packet called a "heartbeat" with a data size of 0 is also sent from the originator (FP7). For the RPI of this heartbeat, the value 16 times of the target is used automatically. Heartbeat is used for confirming the continuation of connection on the target side. It is used for detect the timeout.
Forward open	This is a command for opening the connection of EtherNet/IP and sent using TCP. The used port number is 44818.
Large forward open	This is a command for opening the connection when sending/receiving data whose size is larger than 504 bytes.
RUN/IDLE bit	This bit indicates the operation state (RUN/IDLE) of a device that is sent from a scanner or adapter duuring the cyclic communication. RUN: 1 IDLE: 0 When the RUN/IDLE bit does not become a RUN state, the adapter device may not operate properly. For details, refer to "8.1.2 RUN/IDLE Bit".

Info.

- Do not use "2222" and "44818" as the port numbers set for Ethernet communication connections.

3 Examples of Network Configuration Using Cyclic Communication Function

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3.1.1 Connecting One Adapter Device or Multiple Adapter Devices to One FP7 CPU 3-2
3.1.2 Linking FP7 CPUs in Multiple Blocks 3-2

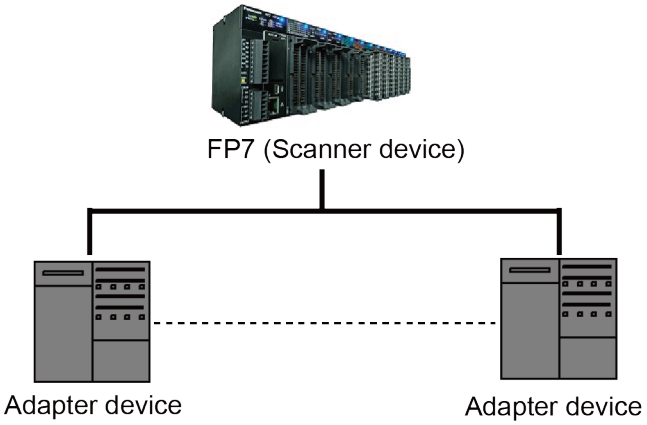
3.1 Examples of Network Configuration Using Cyclic Communication Function

Representative examples of the network configuration using the cyclic communication function are as follows.

Besides the following examples, flexible configurations are available.

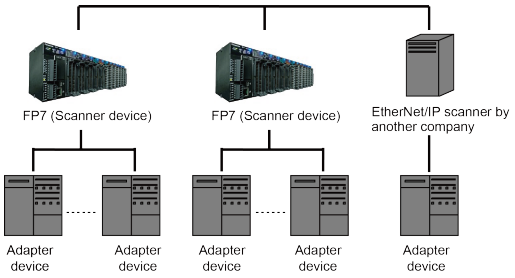
3.1.1 Connecting One Adapter Device or Multiple Adapter Devices to One FP7 CPU

One scanner device is connected to multiple adapter devices as shown below.



3.1.2 Linking FP7 CPUs in Multiple Blocks

The network is configured using multiple blocks of the configuration in 2.1.1 above and linking between each FP7 CPU.



4 Overview of System Configuration Method

4.1 Overview of System Configuration Method.....4-2

4.1 Overview of System Configuration Method

The system configuration is reviewed and selected by the following procedures.

1. **Selection of used adapters**
   Select adapter devices according to applications.
2. **Review of system configuration**
   Review the configurations of the system and network.
   Besides the network configuration for the EtherNet/IP communication, review how Ethernet communications other than the EtehrNet/IP communication is performed.
3. **Selection of Ethernet switch HUB**
   Select a HUB considering the network configuration and the functions of HUB.
   The used Ethernet switch HUB should be 100 Mpbs or more.
   Some HUBs have the following functions.

Switching HUB	Transfers only the data related to devices from the destination.
Multicast filter function	Controls the multicast packet transmission to adapters or scanners. This is used to suppress the communication load factor during the multicast communication of PLC link.
QOS (Quality of Service) function	Classifies and groups application data, and transfers data according to the priority of each group. The cyclic communication data of the EtherNet/IP communication can be transferred in preference to other Ethernet communication data. To make the priority of the cyclic communication of the EtherNet/IP communication higher, set the port number of UDP to 2222.

Info.

- A switching HUB (unmanaged switch) can be activated within a few seconds of the power supply being turned ON, however, a switch with features such as the multicast filter function or QOS function (Quality of Service) is called a managed switch, and it takes several tens of seconds to start up after the power supply is turned ON.
  Those differences should be considered in the system design.

5 Ethernet and EtherNet/IP Specifications of FP7

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5.2 Performance and Functions of FP7 5-3
5.2.1 IGMP Query 5-3
5.2.2 TTL 5-3
5.2.3 Multicast 5-3

5.1 Number of Connections for Each Communication

The number of connections for each communication is limited.

Communication	Maximum number of connections
Ethernet communication	Max. 216 connections
EtherNet/IP communication	Max. 256 connections (including I/O map connections)
UCMM message communication	Max. 256 connections

Info.

- For the whole FP7, the total number of connections for Ethernet and EtherNet/IP communication should be 272 or less.

  Number of connections of Ethernet communication + EtherNet/IP communication ≦ 272 connections

5.2 Performance and Functions of FP7

For using the EtherNet/IP function on the FP7, the following functions can be used.

5.2.1 IGMP Query

With this function, the FP7 checks periodically in which host group each EtherNet/IP device is registered on a LAN.

This function can be used when an Ethernet switch HUB with the multicast filter function and any devices which send an IGMP query do not exist in the network.

5.2.2 TTL

TTL (Time To Live) is used to set the hierarchies of the network in which transmission packets can live when sending multicast packets to another scanner.

5.2.3 Multicast

Data of one target can be sent to multiple originators.

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6 EtherNet/IP Setting Method

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6.2 How to Use EtherNet/IP Setting Tool 6-3
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6.5.1 What is PLC Link (Data Sharing between PLCs)? 6-6
6.5.2 Setting Method of PLC Link 6-6

6.1 Setting Method of Cyclic Communication

This chapter describes the procedures for making the cyclic communication setting of EtherNet/IP.

EtherNet/IP configuration is performed via the FPWIN GR7(S) **EtherNet/IP Settings**.

The EDS file for each EtherNet/IP device is necessary for registering the setting.

The EDS files for EtherNet IP devices are available on the site of each vendor.

Once the EDS file is registered, the registration is not required from the next time.

1) Displaying the EtherNet/IP setting screen

- Display the screen to configure EtherNet/IP from the FPWIN GR7(S).

2) Registering EDS files

- EDS files can be registered from the device list.

3) Registering devices in the scan list

- Select a device to be connected from the device list and register it to the scan list.
- When sending data from an adapter to another scanner, add the I/O map.

4) Cyclic communication configuration

- Changes the connection settings so that cyclic communications can be performed.

5) Adjusting the communication load factor

- Confirm the communication load factor, and perform "4) Cyclic communication configuration" again if required.

The setting is complete.

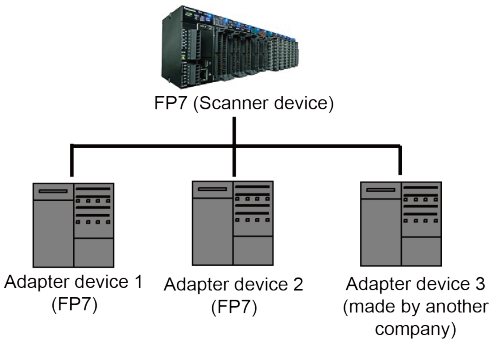
6.2 How to Use EtherNet/IP Setting Tool

For details on the various operation methods of the EtherNet/IP configuration tool, refer to "7 EtherNet/IP Setting Tool".

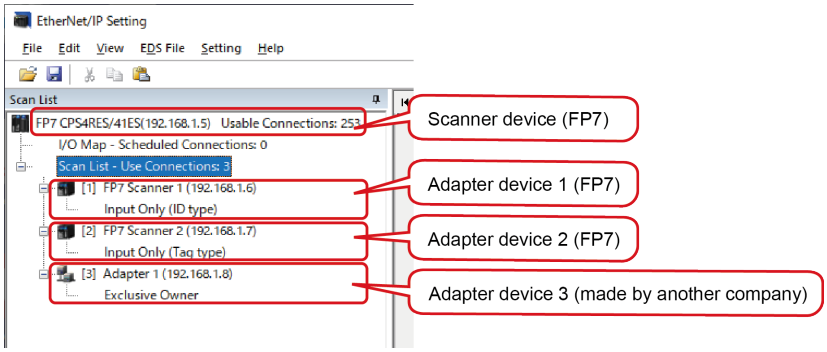
6.3 Setting Example of One Scanner Device and Multiple Adapter Devices

For configuring the system of one scanner device (FP7) and multiple adapter devices, the settings are as follows.

■ System Configuration



■ EtherNet/IP Setting Details

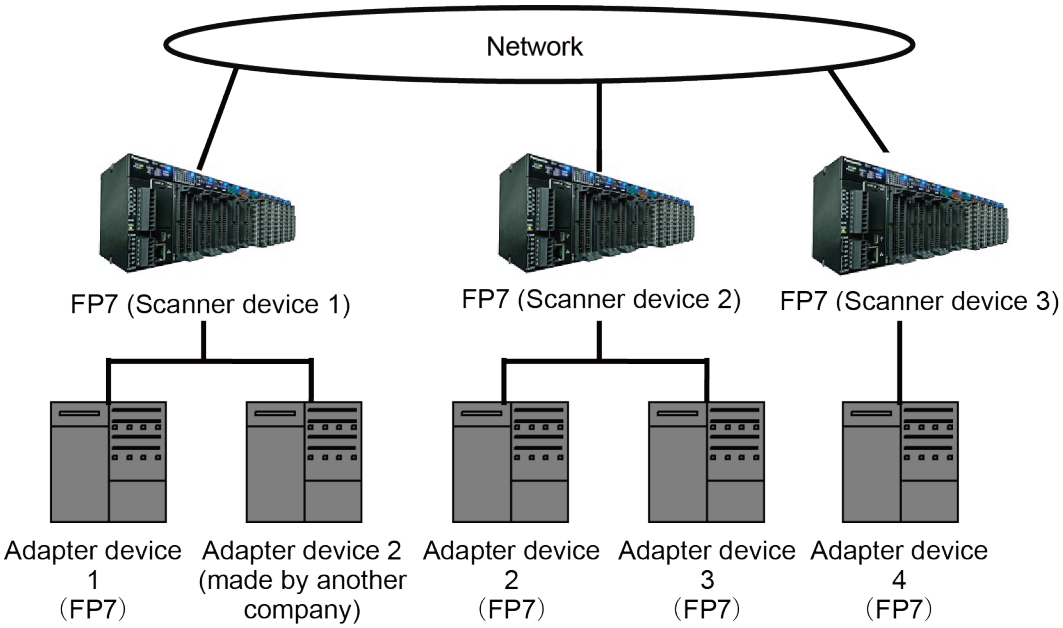


The detailed settings for each adapter device should be configured in accordance with the system configuration.

6.4 Setting Example of Multiple Scanner Devices and Multiple Adapter Devices

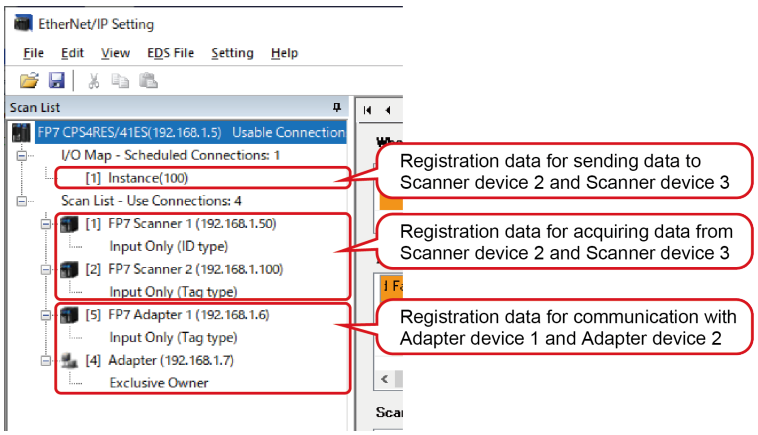
For configuring the system of multiple scanner devices (FP7) and multiple adapter devices, the settings are as follows.

■ System Configuration



■ EtherNet/IP Setting Details

Setting content of Scanner device 1



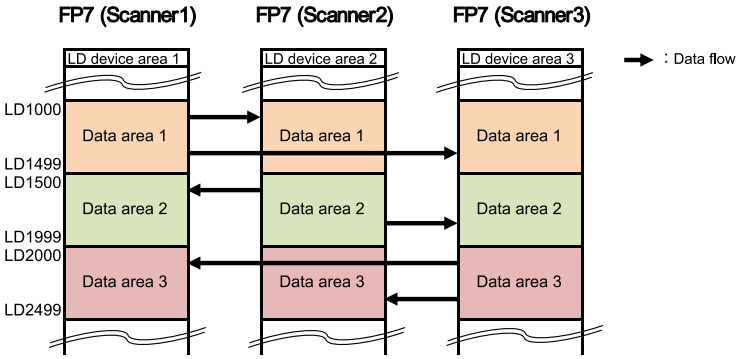
Configure the same settings for scanner devices 2 and 3.

6.5 Method of PLC Link

The method for making a link between PLCs is as follows.

6.5.1 What is PLC Link (Data Sharing between PLCs)?

By linking data between PLCs as below, data can be shared between multiple scanner devices.

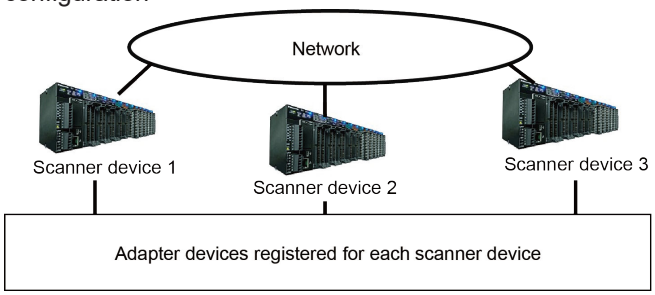


6.5.2 Setting Method of PLC Link

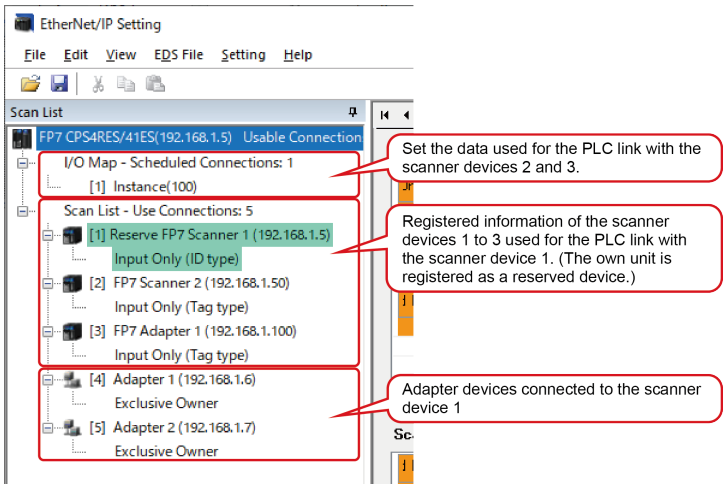
For performing the PLC link, register scanner devices to be linked in the scan list and data to be linked in the I/O map.

■ System Configuration

Example) When setting the PLC link using the scanner devices 1 to 3 of the following system configuration



■ EtherNet/IP settings: Scan list

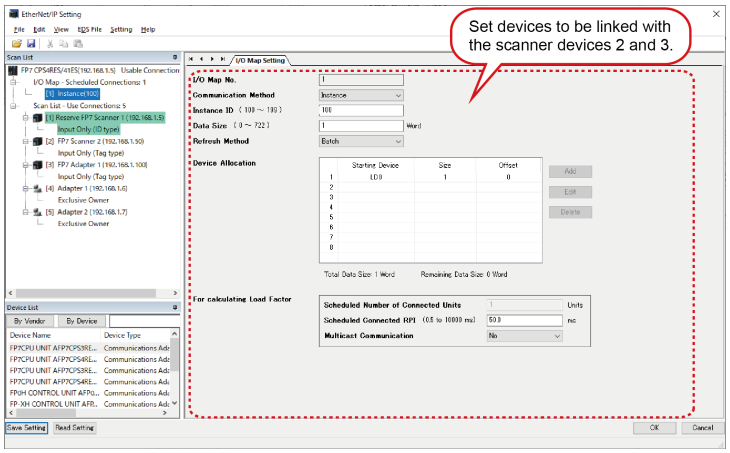


Info.

- To easily manage the PLC link and adapter settings, configure the PLC link as follows.
  1. (1) First, register scanner devices including the own unit. However, the home unit is registered as an invalid (reserved) device as it does not communication with itself.
  2. (2) Register the adapter device connected to the own unit after the scanner devices that the PLC link is set.

     Registering the scanner devices (including the master unit) and adapter devices in order in advance will allow you to match the node number of each scanner device with the contents of scanner devices 2 and 3.

■ EtherNet/IP settings: I/O map



■ EtherNet/IP settings: Connection settings

Configure scanner device 3 in the same way as above.

(MEMO)

7 EtherNet/IP Setting Tool

7.1 Selection for Using EtherNet/IP Function 7-2
7.1.1 How to Display the Built-in ET-LAN Setting Dialog Box 7-2
7.1.2 How to Change the Built-in ET-LAN Setting Dialog Box 7-3
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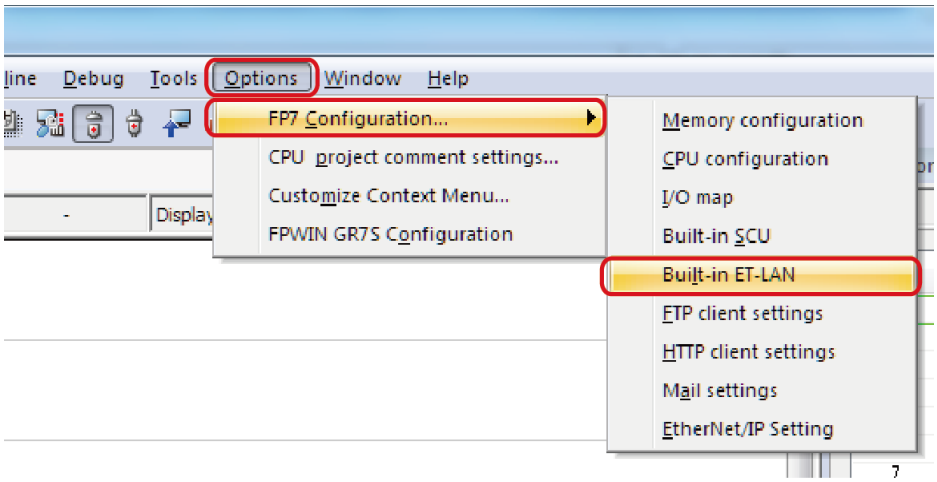
7.1 Selection for Using EtherNet/IP Function

When using the EtherNet/IP function, the EtherNet/IP function must be changed to "Use" in the "Built-in ET-LAN settings" dialog box.

7.1.1 How to Display the Built-in ET-LAN Setting Dialog Box

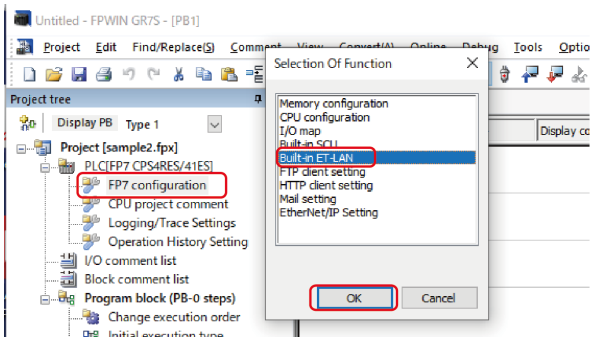
Follow the procedure below to open the "Built-in ET-LAN settings" dialog box.

Starting up via the GR7(S) menu



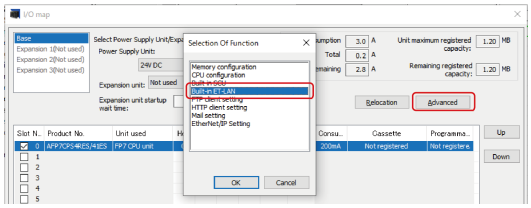
Select **Options**>**FP7 Configuration**>**Built-in ET-LAN**.

Starting up via the GR7(S) project tree



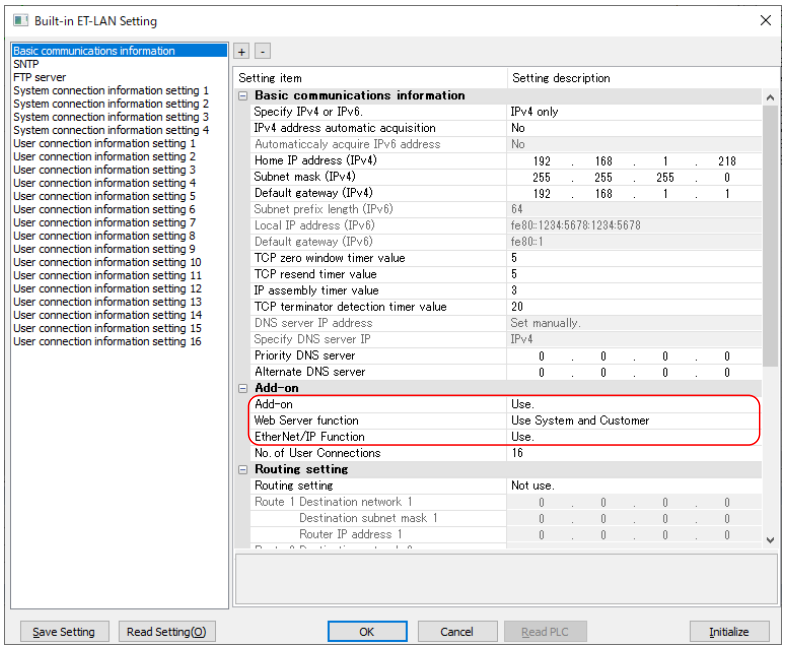
Double-click **FP7 Configuration**, and select "Built-in ET-LAN settings" and press the [OK] button.

Starting Method from I/O Map Setting Screen



Go to [Advanced] on the "I/O map settings" screen, then select "Built-in ET-LAN settings" and press the [OK] button.

7.1.2 How to Change the Built-in ET-LAN Setting Dialog Box

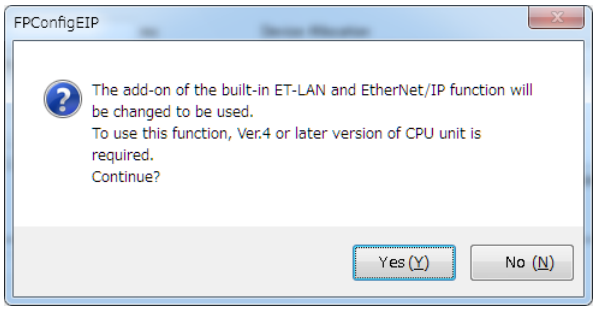


- **Add-on** must be set to "Use" in advance before **EtherNet/IP Function** can be changed to "Use".

Info.

- Before setting **Add-on** to "Use", confirm that the CPU unit version is Ver.3.0 or later.
- Before setting **EtherNet/IP Function** to "Use", confirm that the CPU unit version is Ver.4.0 or later.

- If **EtherNet/IP Function** in the "Built-in ET-LAN settings" dialog box is set to "Not Use", the following message will be displayed when the setting is complete, even if the EtherNet/IP has been configured.



- Selecting [Yes] will automatically change **EtherNet/IP Function** to "Use".

7.1.3 Restrictions and Precautions on Setting EtherNet/IP Function

■ Precautions on setting EtherNet/IP Function

- If the **EtherNet/IP Function** setting is changed from "Use" to "Not use", the EtherNet/IP setting information will be lost.

Info.

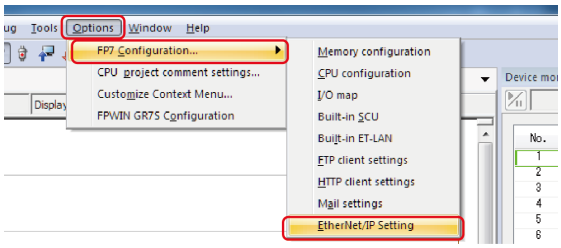
- When the **Add-on** setting is changed to "Not use", the EtherNet/IP setting information will be lost, as when changing the **EtherNet/IP Function**.

7.2 How to Display the EtherNet/IP Setting Screen

This chapter describes how to display the "EtherNet/IP setting" screen.

7.2.1 Starting up via the Menu

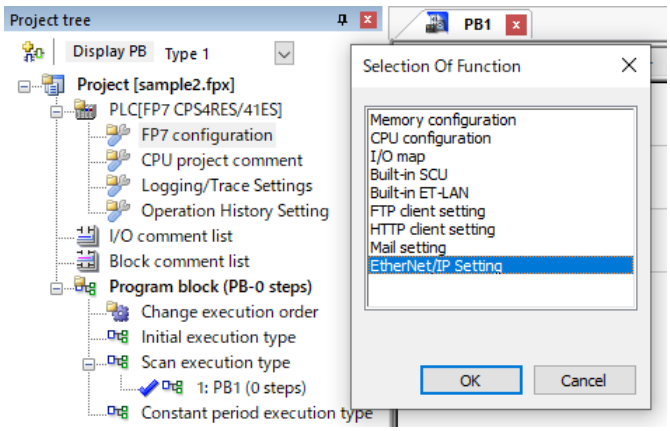
Starting up via the GR7(S) menu



Go to **Options**> **FP7 Configuration**>**EtherNet/IP settings**.

7.2.2 Starting up via the Tree Display Area

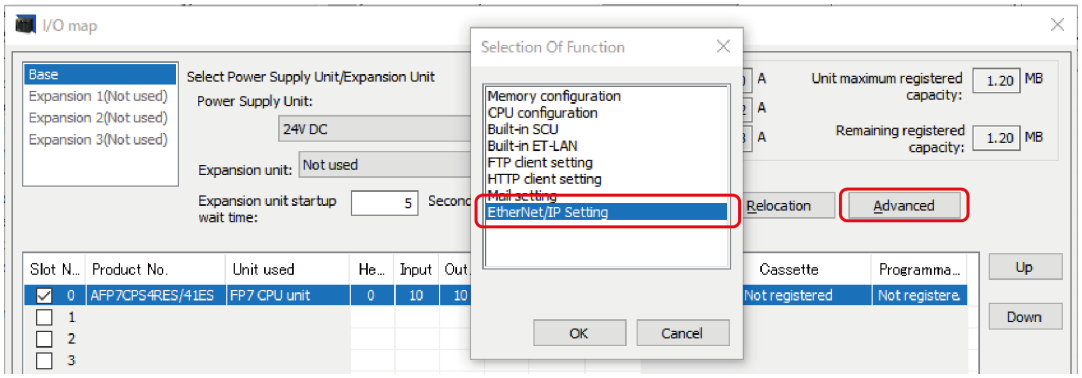
Starting up via the GR7(S) project tree



Double-click **FP7 Configuration**, select **EtherNet/IP settings**, and press the [OK] button.

7.2.3 Starting Method from I/O Map Setting Screen

Starting Method from I/O Map Setting Screen

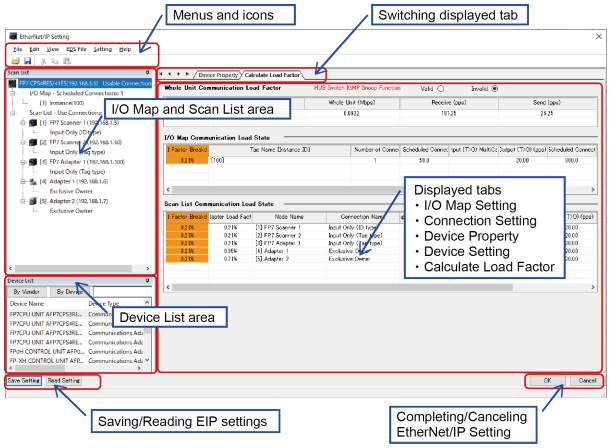


Go to [Advanced] on the "I/O map settings" screen, then select **EtherNet/IP settings** and press the [OK] button.

7.3 How to Operate EtherNet/IP Setting Tool

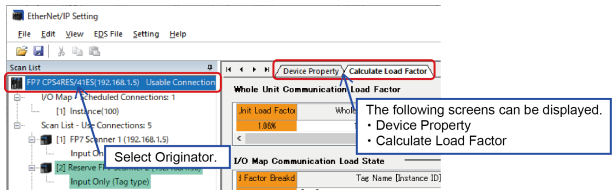
7.3.1 Structure of EtherNet/IP Setting Screen

This chapter describes the display contents of the "EtherNet/IP settings" screen.

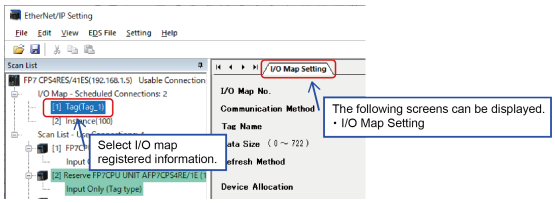


The items that can be selected by switching the display tabs vary according to the contents selected in the I/O map and scan list area.

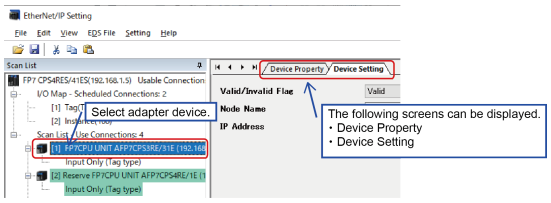
■ When originator is selected



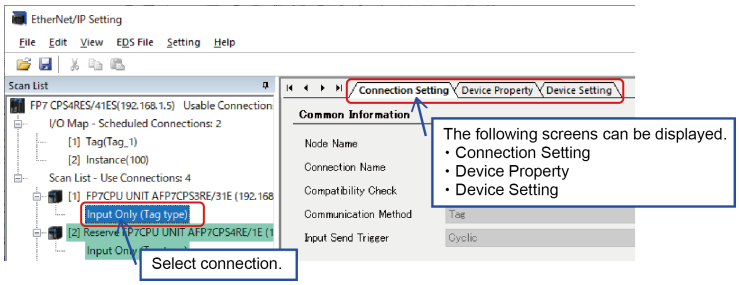
■ When I/O map registration information is selected



■ When adapter device is selected



■ **When adapter device connection is selected**



7.3.2 EtherNet/IP Setting Procedure

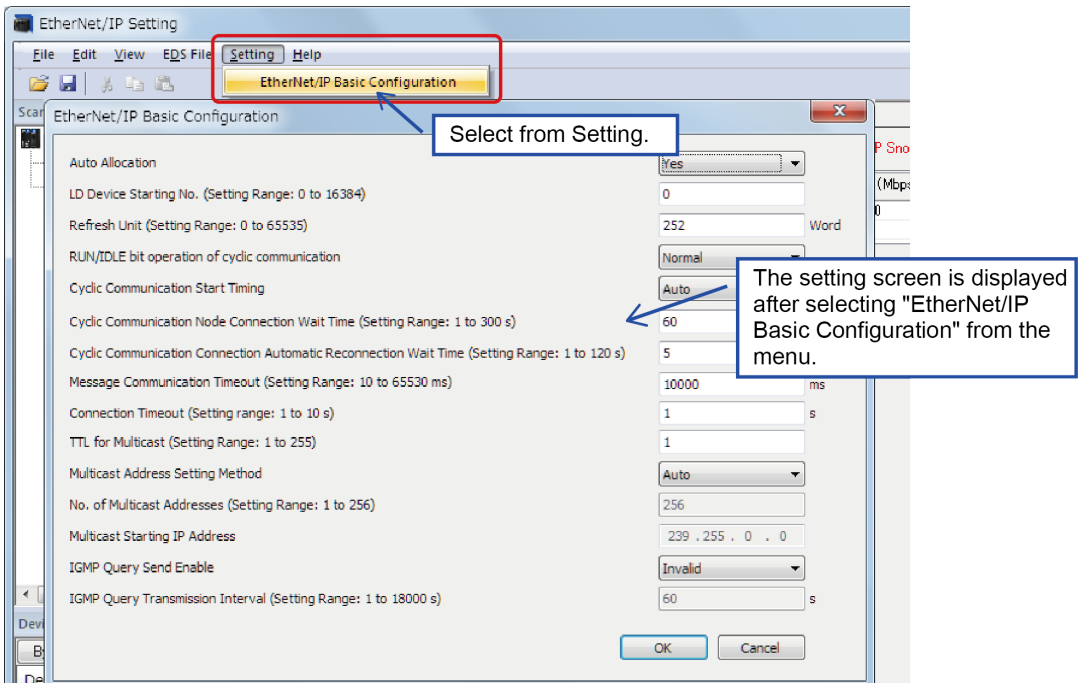
The procedure of the EtherNet/IP setting is described below.

EtherNet/IP Basic Configuration

Perform the basic EtherNet/IP configuration.

■ **Screen startup procedure (Start up from the EtherNet/IP settings menu)**

Select **Settings>Basic EtherNet/IP Configuration**.



Item	Description
Auto Allocation(Note 1)	Set the Auto Allocation of the device to "Yes" or "No". When Auto Allocation is set to "Yes", device allocation for I/O map and connection settings is performed automatically.
LD Device Starting No.	Set the starting device number to be allocated at the time of the device automatic allocation.
Refresh Unit	Set the number of data items that can be refreshed in a single scan.
RUN/IDLE bit operation of cyclic communication(Note 2)	Set to "Normal" or "Limited".
Cyclic Communication Start Time	Set to "Auto" or "Manual".
Cyclic Communication Node Connection Wait Time	Set the period of time during which retry is repeated without being determined an error.
Cyclic Communication Connection Automatic Reconnection Wait Time	Set the period of time during which reconnection is retried after the connection has timed out.
Message Communication Timeout	Set the timeout period of message communication.
Connection Timeout	Set the connection timeout period.
TTL for Multicast	Specify the number of routers that multicast transmission packets can pass.
Multicast Address Setting Method	Set to "Auto" or "Specify".
No. of Multicast Addresses	Set the number of multicast addresses. This item is valid when Multicast Address Setting Method is specified.
Multicast Starting IP Address	Set the starting IP address of multicast. This item is valid when Multicast Address Setting Method is specified.
Enable IGMP Query Send	Set IGMP query transmission to "valid" or "invalid".
IGMP Query Transmission Interval	Set the interval of IGMP query transmissions.

(Note 1) To allocate devices manually, set Auto Allocation to "No".

(Note 2) For details on operating the RUN/IDLE bit in the cyclic communication setting item, refer to "8.1.2 RUN/IDLE Bit".

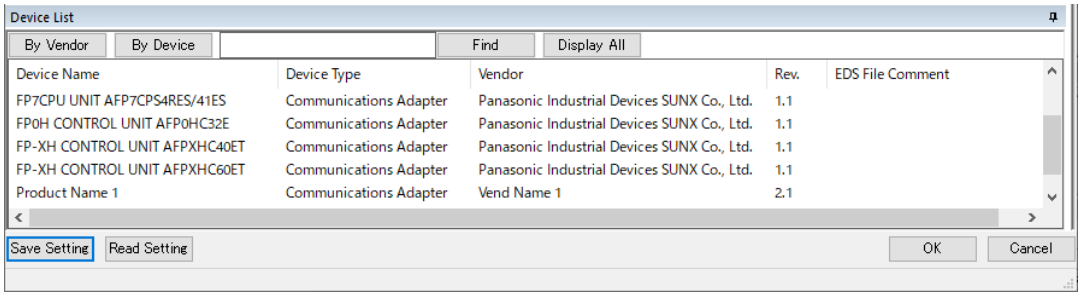
Registering EDS Files in the Device List

In Device List, registered EDS files can be confirmed, deleted and new EDS files can be added.
Only the explanation about the addition of EDS files is described in this chapter.
The EDS files for EtherNet IP devices are available on the site of each vendor.
Once the EDS file is registered, the registration is not required from the next time.

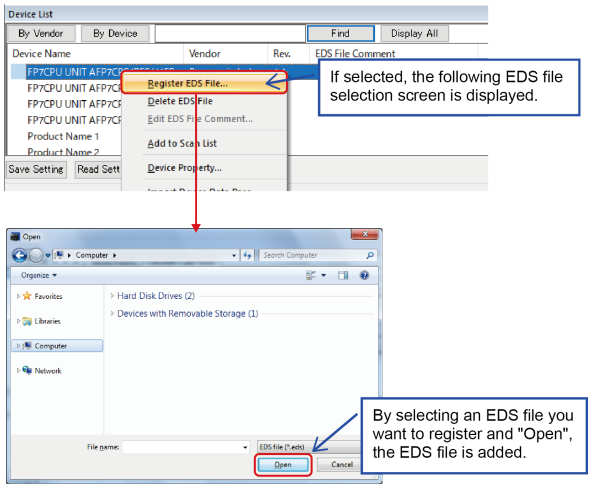
Info.

- For details on other operations besides adding EDS files, refer to "7.3.3 How to Use Device List".

Device List



■ Adding EDS files (1) (Adding via the right-click menu)

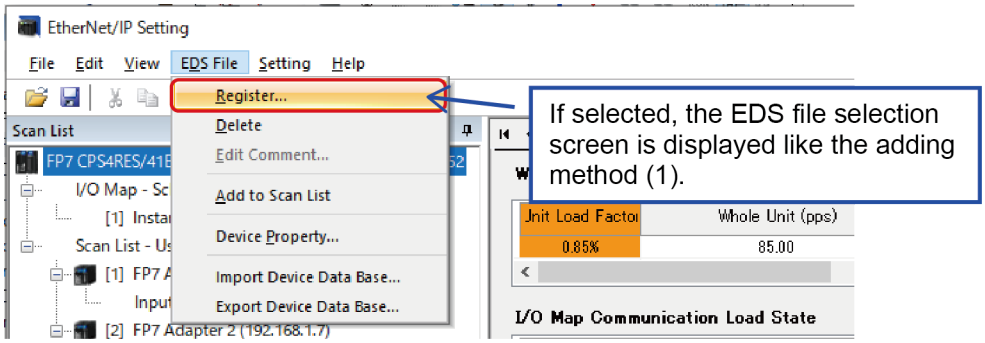


Multiple EDS files can be registered at once by selecting multiple files.

Info.

- EDS files for EtherNet/IP devices manufactured by Panasonic cannot be added.

■ Adding EDS files (2) (Adding via the EtherNet/IP settings menu)



Info.

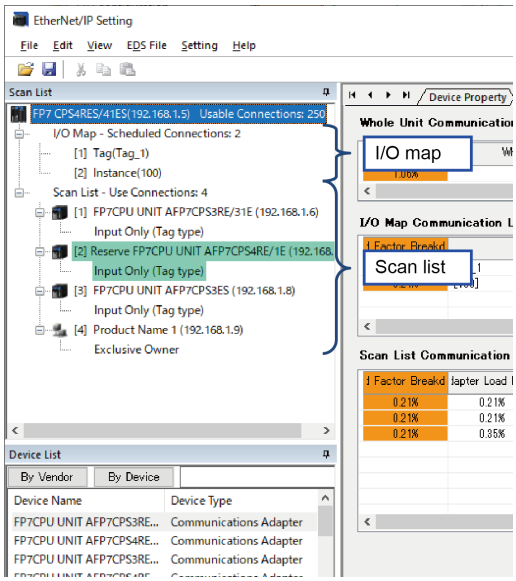
- EDS files for EtherNet/IP devices manufactured by Panasonic cannot be added.

How to Use I/O Map and Scan List

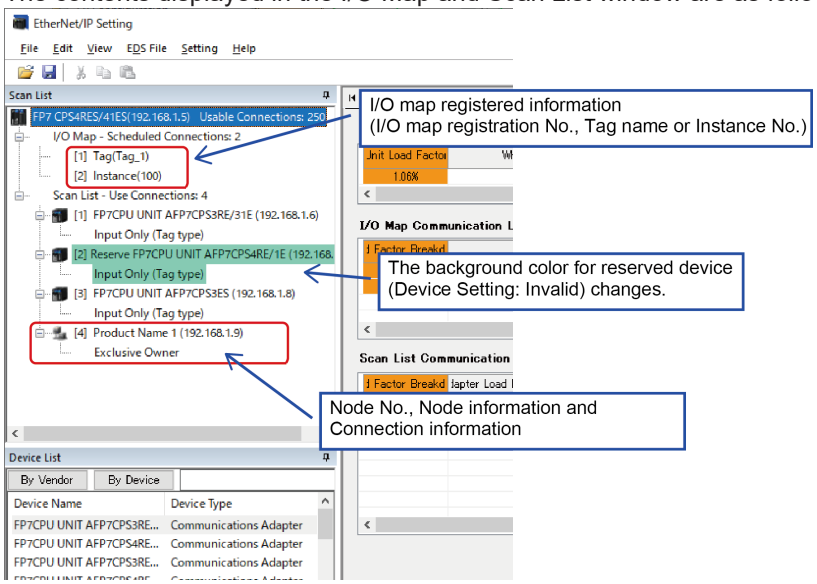
Scan list is registered in the I/O map and Scan List window.

Configuration of I/O Map and Scan List

The configuration of the I/O Map and Scan List window is as follows.



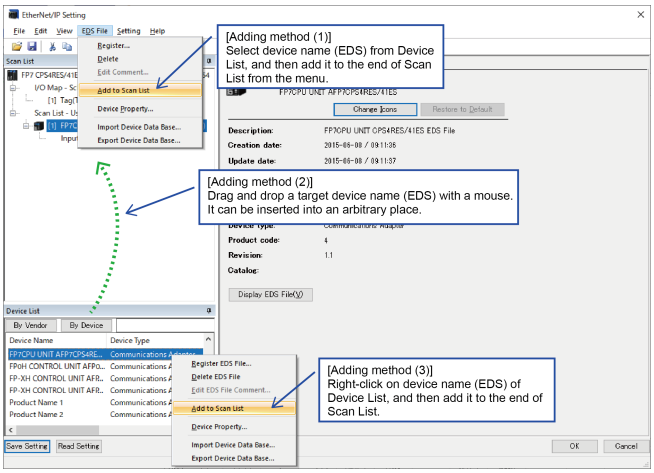
The contents displayed in the I/O Map and Scan List window are as follows.



Registering Adapter Devices

Adapter devices can be registered by the following three operations.

■ How to add adapter devices

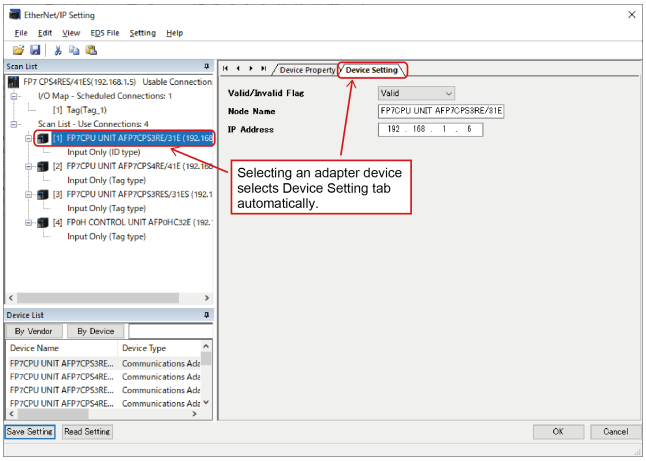


Info.

- If you drag and drop a node that is already registered, the adapter device will be registered after the dropped node.
- For more information on operations besides registering adapter devices, see "Editing Scan List".

How to Use “Device Setting” Tab

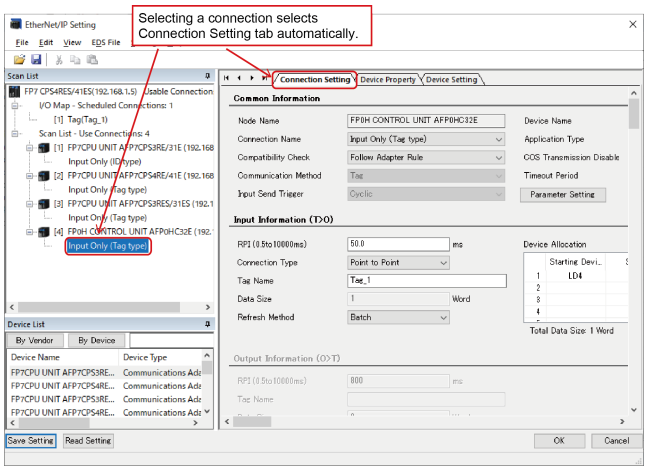
Configuration is performed via the "Device Settings" tab once an adapter device has been registered.



Item	Description
Valid/Invalid flag	Set communication with nodes to "valid" or "invalid". When this is set to Invalid, the adapter is treated as a reserved device.
Node Name	Specify the node name of the device. The specified node name is displayed in the scan list.
IP address	Set the IP address of the destination device.

How to Use "Connection Setting" Tab

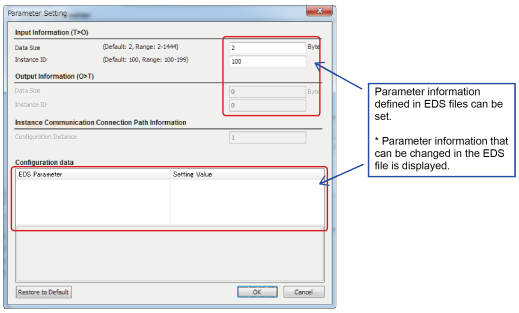
Set up via the "Connection Settings" tab.



Common Information

Item	Description
Node Name	The name of node to which the connection is registered is displayed.
Device Name	The name of device to which the connection is registered is displayed.
Connection Name	Set up using the connection settings registered in EDS files.
Application Type	The application type of a selected connection setting is displayed.
Compatibility Check	Set the compatibility check of models to "Check", "Do Not Check" or "Follow Adapter Rule".
COS Transmission Disable Time	If Input Send Trigger is set to "Change of State (COS)", transmission disable time (RPI of input information × 1/4) is displayed.
Communication Method	The communication method ("Instance" or "Tag") currently specified in the connection settings is displayed.
Timeout Period	Set the communication timeout period of cyclic communication. Selectable items RPI x 4 / RPI x 8 / RPI x 16 / RPI x 32 RPI x 64 / RPI x 128 / RPIx 256 / RPI x 512
Input Send Trigger	Set a method for communicating data with scanners.

Item	Description
Parameter Setting	The following screen is displayed by pressing the [Parameter Settings] button. Parameters defined in EDS files can be set.



Device allocation

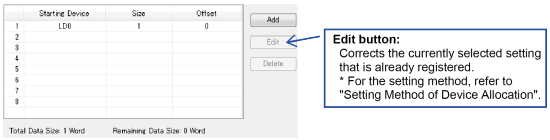
Set the device to be allocated to Send or Receive.
Up to eight device allocations can be registered for send or receive of each connection.
The maximum number of words that is available for device allocation is 16kw in total.
(Allocation cannot be performed beyond 16384 words.)

Info.

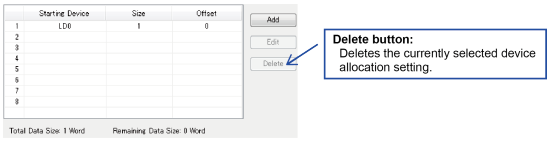
- To allocate devices manually, go to **EtherNet/IP Basic Configuration** and set "Auto Allocation" to "No".

■ Adding device allocation

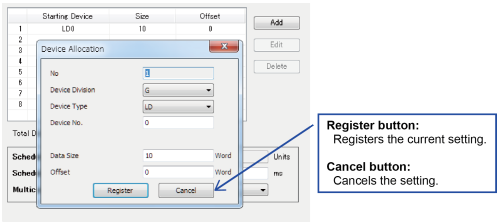
■ Editing device allocation



■ Deleting device allocation



■ Configuration method for device allocation

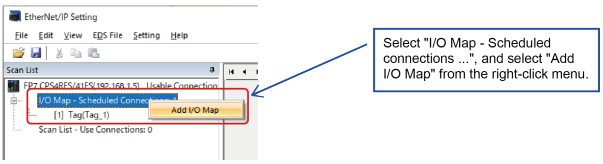


Item	Description
No.	The registration number is displayed.
Device division	Select either "G (Global)" or "L (Local)" as the device division.
Device Type	Select Device Type from WX, WY, WR, WL, DT, and LD.
Device No.	Set the starting number of the device.
PB No.	Set the PB No. of the local device. The setting is necessary when Device Division is set to L.
Data Size	Set a data size to maintain based on the device number.
Offset	Set the allocation destination of send or receive data using offsets.

Adding I/O Map Registered Information

Edit the I/O map to be operated as an adapter.

■ How to add I/O map

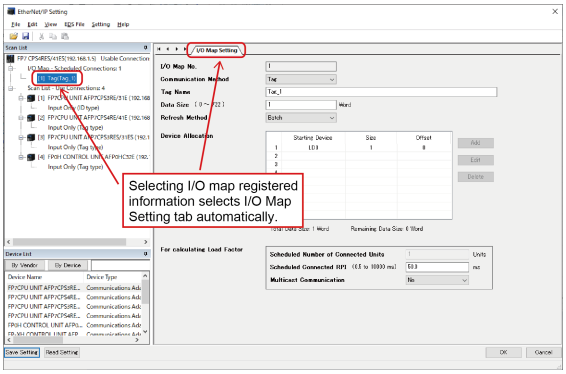


Info.

- For details on other operations besides adding I/O maps, refer to "Editing I/O Map".

Setting I/O Map Registered Information

Set I/O map registered information.



Item	Description
I/O Map No.	The I/O map number currently being configured.
Communication Method	Set up a communication method with other scanners using "Instance" or "Tag".
Instance ID	Sets an instance ID. Set this when "Instance" is set as the Communication Method.
Tag Name	Set a tag name. Set this when "Tag" is set as the Communication Method.
Data Size	Set the data size to be sent to another scanner.
Refresh Method	Select the setting method for send data from "Batch", "Divide" and "Instruction".
Device Allocation	Set the device to be allocated in the send data.
Scheduled Number of Connected Units	Set the number of units that you plan to connect with the other scanner.
Scheduled Connected RPI	Set an RPI value to be used at the time of connection.
Multicast Communication	Select "Yes" or "No" for Multicast Communication.

Info.

- The instance ID (or tag name) and data size should be the same as those specified in a destination scanner.
- The set values of "Scheduled Number of Connected Units", "Scheduled Connected RPI" and "Multicast Communication" are used for calculating the communication load factor.
- For more information on the device allocation configuration procedure, refer to "Device allocation".

How to Use "Calculate Load Factor" Tab

■ Overview of the calculation of load factor

The load factor is the ratio of the number of actually used packets to the maximum number of packets which the EtherNet/IP unit can send/receive in one second by cyclic communication.

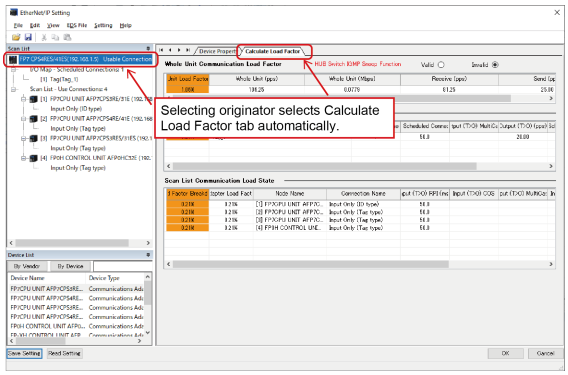
Packets other than by cyclic communication or unnecessary received packets are not considered for calculating the load factor.

Determines the check box for selecting whether to enable or disable the IGMP snoop function for HUB, and calculates load factors.

Reserved nodes are not included in the calculation of load factor.

The adapter communication load factor is displayed only when an EDS file exists.

Display of Load Factor Calculation



Item	Description
Whole Unit Communication Load State	The sum of the load factors of the whole unit is displayed.
I/O Map Communication Load Status	The load factors calculated from the I/O map settings are displayed.
Scan List Communication Load Status	The load factors calculated from the connection settings are displayed.
HUB Switch IGMP Snoop Function	Select whether or not to enable this function when calculating load factors. When this is set to Invalid, the title is displayed in red.

Info.

- * When the load factor is 100% or more, it is displayed in red.
  When the adapter load factor is 100% or more, the title is displayed in red.
  When the Multicast is enabled, the title background is displayed in yellow.

■ Whole Unit Communication Load Factor

Item	Description
Unit Load Factor	The communication load factor (%) of the whole unit is displayed.
Whole Unit (pps)	The communication volume per second used for the whole unit(Note 1) is displayed in pps.
Whole Unit (Mbps)	The communication volume per second used for the whole unit is displayed in Mbps(Note 2).
Receive (pps)	The communication volume per second in the receiving direction used for the whole unit(Note 3) is displayed in pps.
Send (pps)	The communication volume per second in the sending direction used for the whole unit(Note 4) is displayed in pps.

(Note 1) The sum value of Receive (pps) and Send (pps)

(Note 2) The size is calculated for the whole unit (Mbps), including preamble, each header size, FCS, and IFG (12 bytes).

(Note 3) The sum value of I/O map communication output T>O (pps) and scan list input T>O (pps)

(Note 4) The sum value of I/O map communication input O<T (pps) and scan list output O<T (pps)

■ I/O Map Communication Load Factor Status

Item		Description
Load Factor Breakdown		The breakdown of the load factors for tag name [instance name] units is displayed.
Tag Name [Instance ID]		Tag names [instance names] are displayed.
Scheduled Number of Connected Units		The scheduled number of connected units is displayed.
Output (T>O)	Scheduled Connected RPI	Scheduled connected RPI (communication interval) is displayed.
	MultiCast	When communication data is sent via multicasting, "•" is displayed.
	(pps)	The communication volume (pps) calculated by the output (T>O) scheduled connected RPI is displayed.
Input (O>T)	Scheduled Connected RPI	Values calculated by multiplying output (T>O) RPI by 16 are displayed. (Note 1)
	(pps)	Communication volumes (pps) calculated by multiplying output (T>O) RPI by 16 are displayed.

(Note 1) If the value calculated by multiplying RPI (ms) by 16 is 10s or more, the RPI is calculated as 10s.

■ Scan List Communication Load Status

Item		Description
Load Factor Breakdown		The breakdown of the unit load factor for each adapter is displayed.
Adapter Load Factor		The load factors calculated from the communication bands defined in the EDS files of each adapter and scanner are displayed.
Node Name		Node names of adapters and scanners are displayed.
Connection Name		Connection names of adapters and scanners are displayed.
Input (T>O)	RPI	The RPI (communication interval) in the receiving direction set in the connection settings is displayed.
	COS	If Input Send Trigger is set to "Change of State" in the connection settings, "•" is displayed.
	MultiCast	If Connection Type is set to "Multicast" in the connection settings , "•" is displayed.
	(pps)	The communication volume per second (pps) in the receiving direction is displayed.
Output (O>T)	RPI	The RPI (communication interval) in the sending direction in the connection settings is displayed.
	(pps)	The communication volume per second (pps) in the sending direction is displayed.

■ HUB Switch IGMP Snoop Function

Select whether to make this function valid or invalid for calculating the load factor.
If it is invalid, "HUB Switch IGMP Snoop Function" is displayed in red.
Even when you use a switch equipped with the IGMP snoop function, this function should be set to "Valid".

Info.

- When outputting IGMP queries to FP7, they must be configured with "EtherNet/IP Basic Configuration".
- If the adapter load factor exceeds 100% when multicast communication is set up, make the set RPI value longer or use a HUB for which the IGMP snoop function is enabled.

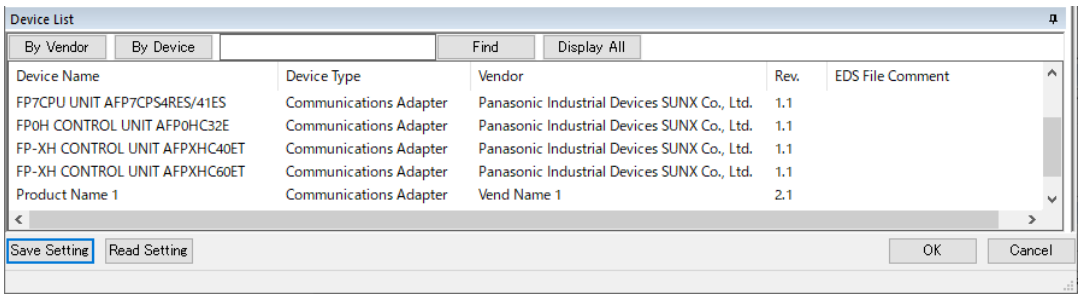
7.3.3 How to Use Device List

In Device List, registered EDS files can be confirmed, deleted and new EDS files can be added.
The EDS files for EtherNet IP devices are available on the site of each vendor.
Once the EDS file is registered, the registration is not required from the next time.

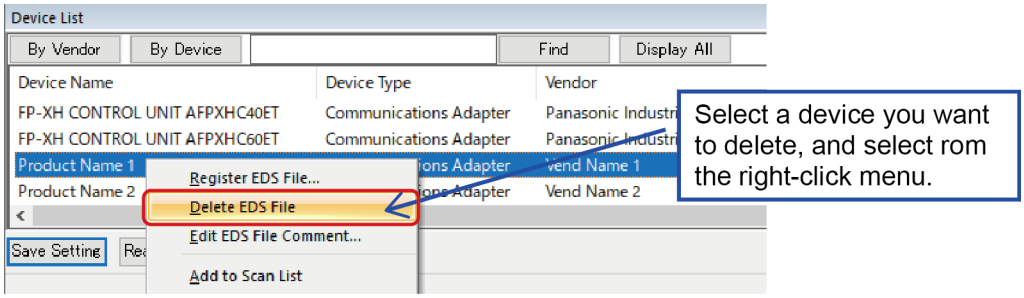
Info.

- For details on how to add EDS files to the device list, refer to "Registering EDS Files in the Device List".

Device List



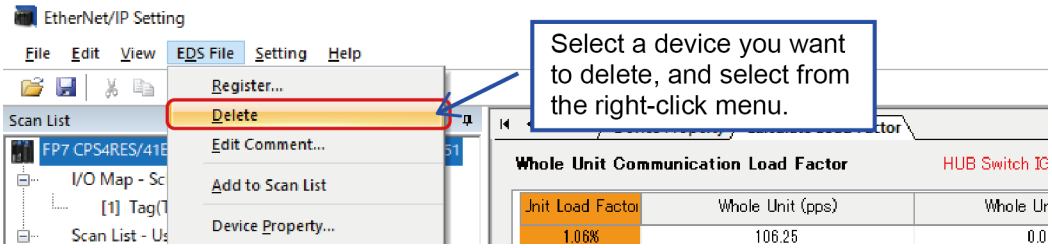
■ Deleting a registered EDS file (Deleting using the right-click menu)



Info.

- EtherNet/IP devices manufactured by Panasonic cannot be deleted.

■ Deleting a registered EDS file (Deleting from the EtherNet/IP settings menu)

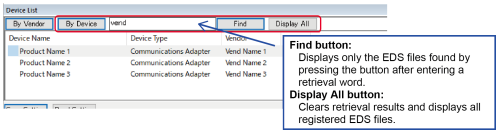


Info.

- EtherNet/IP devices manufactured by Panasonic cannot be deleted.

■ Sorting EDS files

■ Searching EDS files



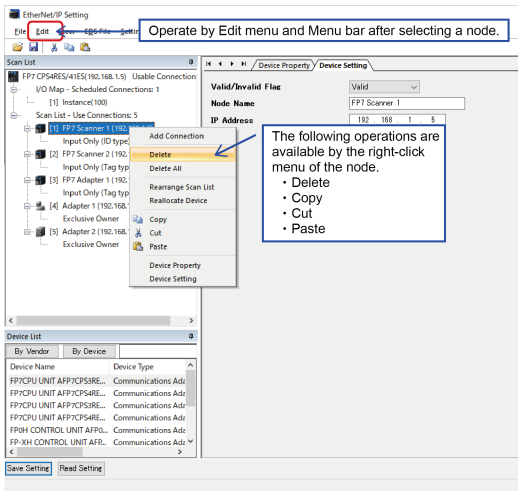
7.3.4 How to Use I/O Map and Scan List Screen

In this chapter, operation methods of I/O map and scan list screen are described.
For details on screen structure, refer to "Configuration of I/O Map and Scan List".

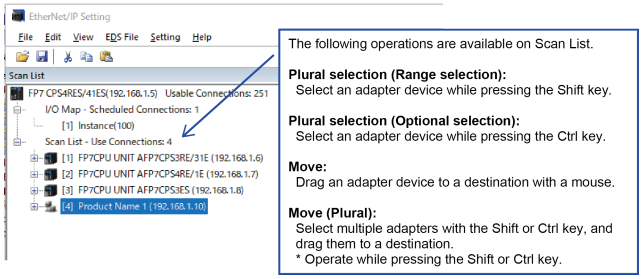
Editing Scan List

Edit the scan list.
For more information on how to add adapter devices to the scan list, refer to "Registering Adapter Devices".

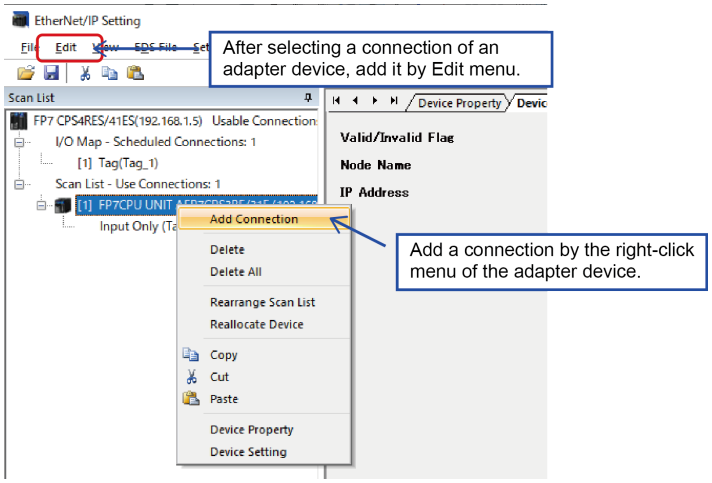
■ Editing adapter devices (deleting, moving and copying)



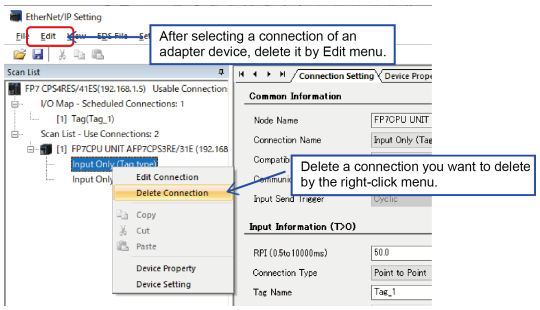
■ Operating adapter devices



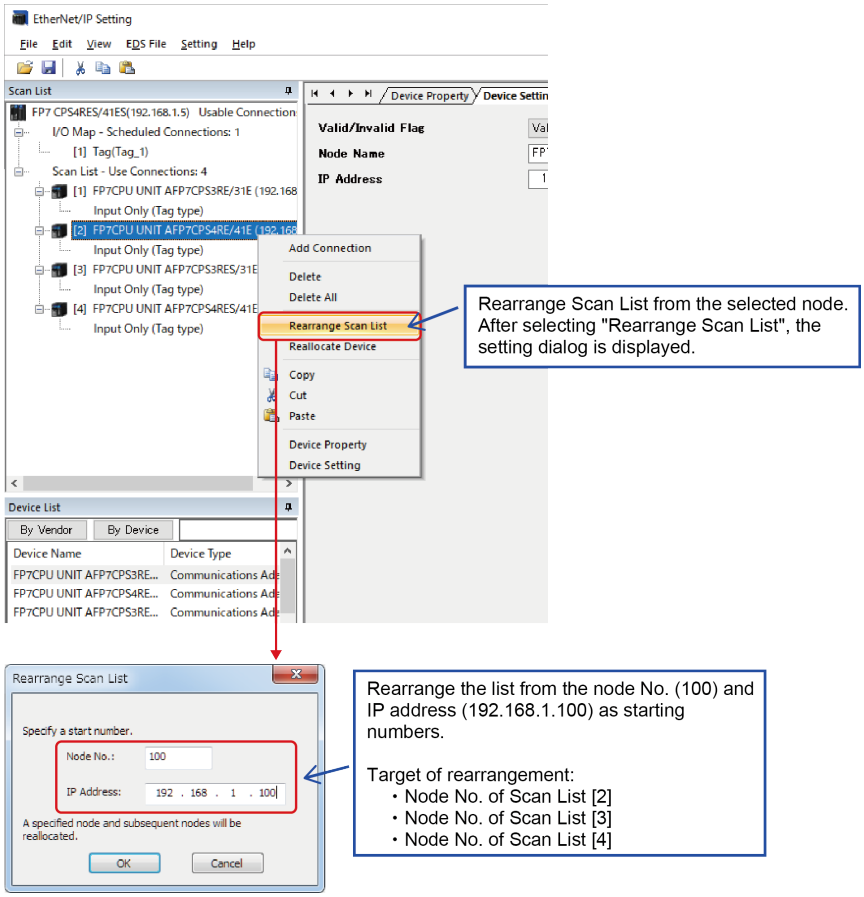
■ Adding connections to adapter devices



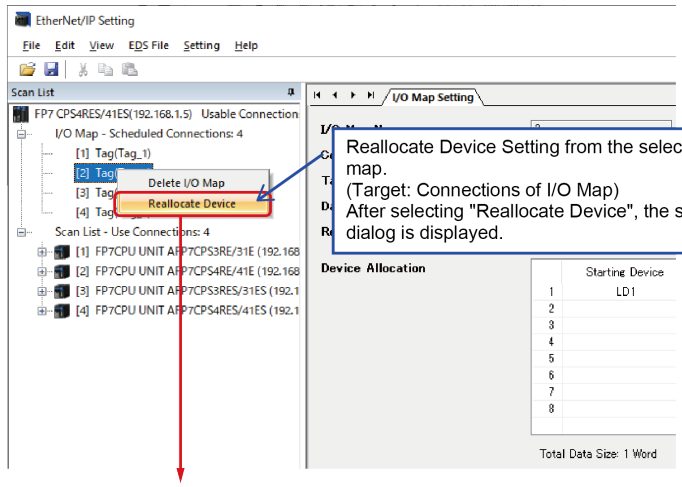
■ Deleting connections of adapter devices



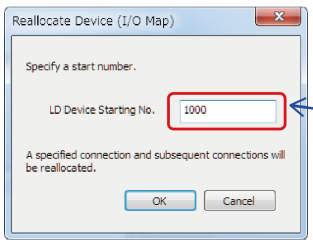
■ Rearrange Scan List



■ Reallocating devices (I/O Map)



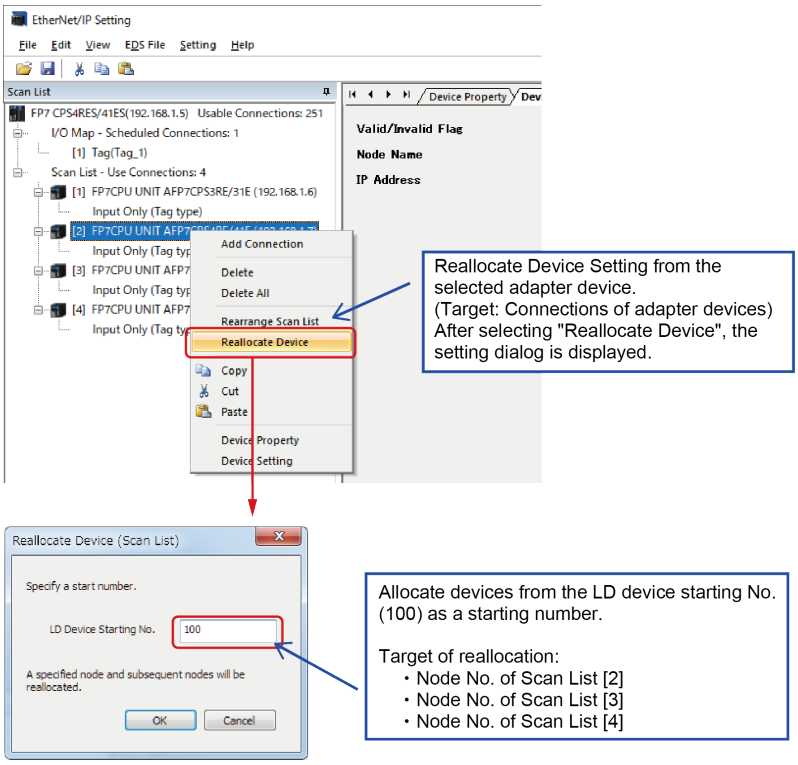
Reallocate Device Setting from the selected I/O map.
(Target: Connections of I/O Map)
After selecting "Reallocate Device", the setting dialog is displayed.



Allocate devices from the LD device starting No. (1000) as a starting number.

Target of reallocation:
- Connection of I/O map [2]
- Connection of I/O map [3]
- Connection of I/O map [4]

■ Reallocating devices (Adapter devices)

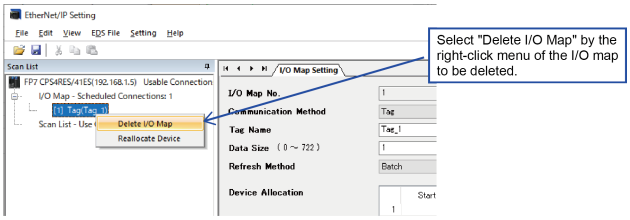


Editing I/O Map

Edit the I/O map to be operated as an adapter.

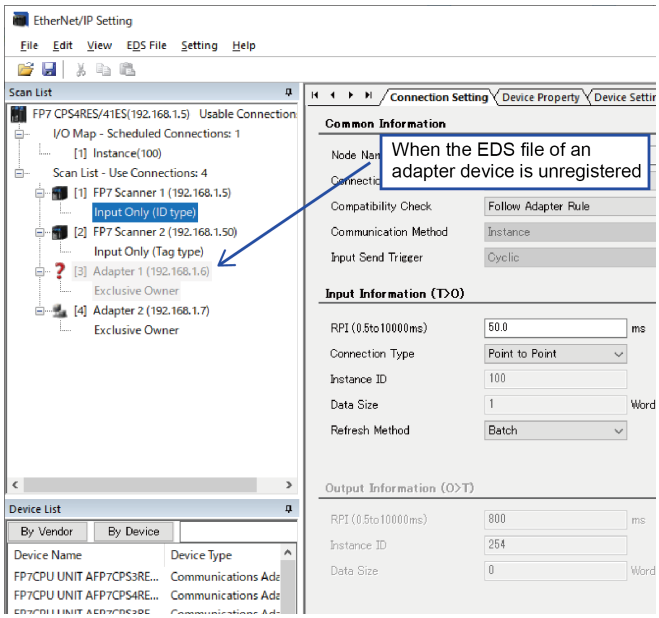
For details of how to add I/O maps, refer to "Adding I/O Map Registered Information".

■ Deleting I/O map



When EDS Files are Unregistered

When EDS files of adapter devices registered in the scan list are not registered in the device list, they are shown on the scan list as below.



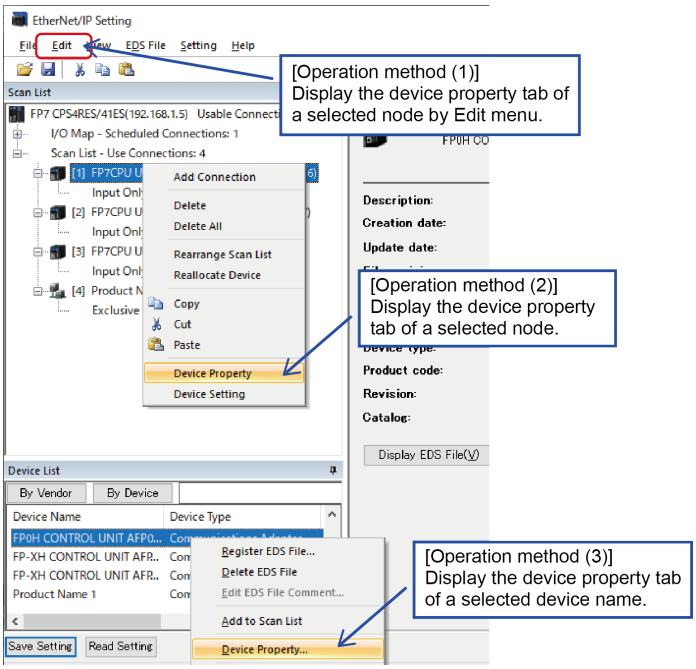
7.3.5 How to Use Device Property Setting

In this chapter, the Device Property window is described.

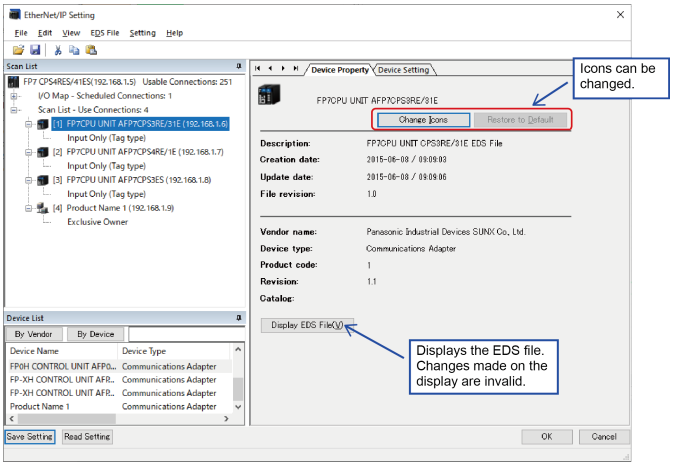
Device Property Setting

The Device Property can be displayed by the following three methods.

■ Displaying Device Property tab



■ Device Property



Item	Description
Icon	The device icon is displayed. If the EDS files are unregistered, "?" is displayed.
Device name	Displays the device name.
Description	Displays the text.
Created	Displays when the EDS file was created.
Updated	Displays the last time the EDS file was updated.

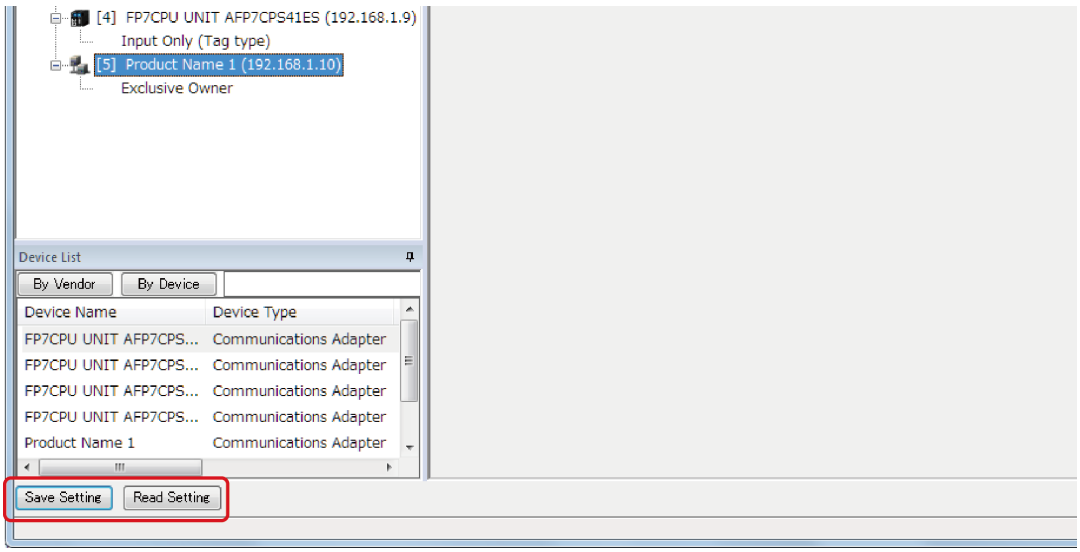
Item	Description
File revision	Displays the file revision.
Vendor name	Displays the vendor name.
Device type	Displays the device type.
Product code	Displays the product code.
Revision	Displays the revision.
Catalog	Displays the catalog number.

Info.

- * The displayed contents for the device name to catalog are the information defined in the corresponding EDS file.

7.3.6 How to Use "Save Setting" and "Read Setting"

This function is used to save the settings on the EtherNet/IP setting screen to a file.
Saved settings can be read as necessary.



7.3.7 Migration of Device Database

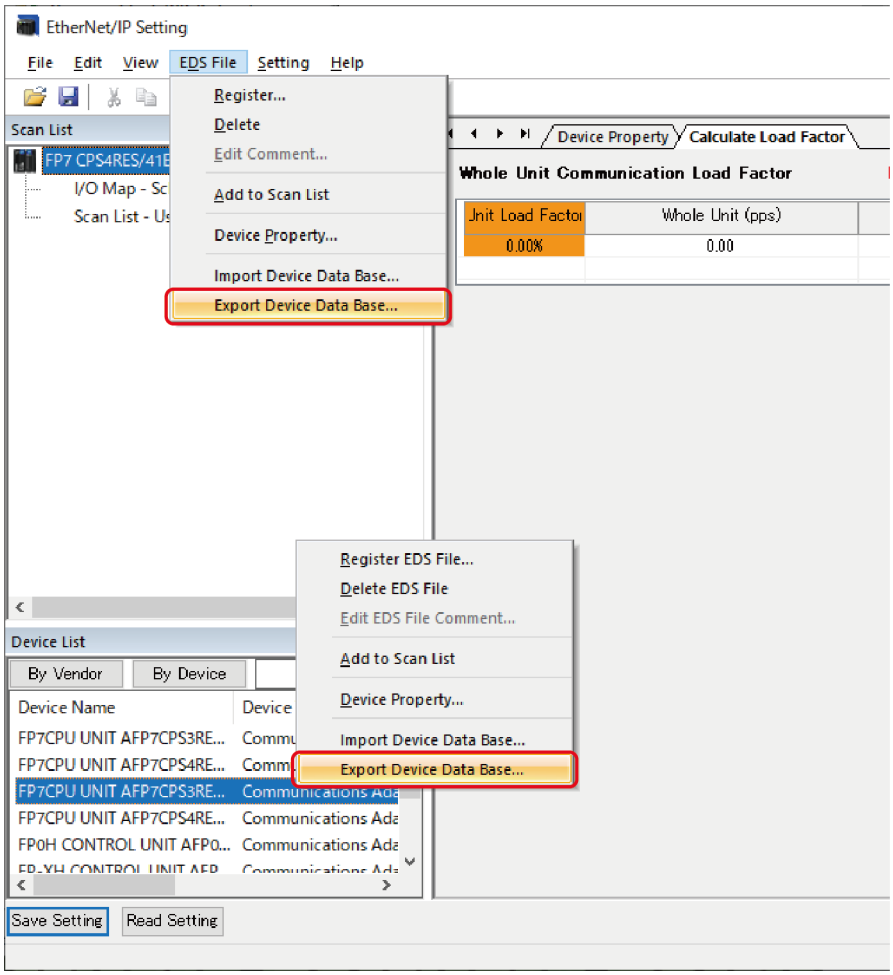
Registration information of EDS files can be exported or imported.

Export of Device Database

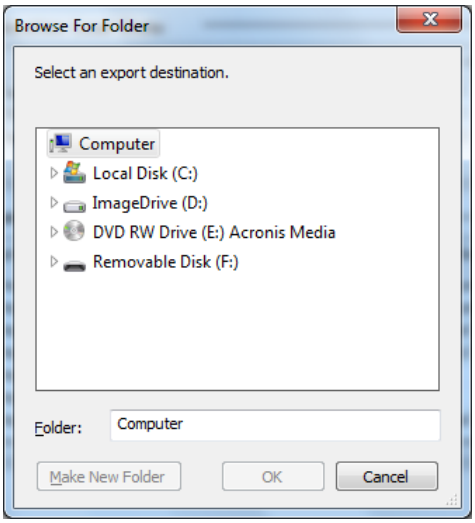
The procedure of the export function is described below.

1 2 Procedure

1. Select **Export Device Database**.
   Select from the **EDS File** menu or the right-click menu of the device list.



2. Select an output destination of the device database.

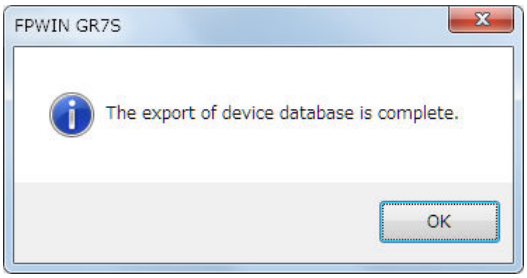


You can create a new folder using **Create a New Folder**.

Info.

- As registered EDS files, icon files, and device database files are output to the selected folder, specify an empty folder as the storage destination.

3. The export is complete.



Import of Device Database

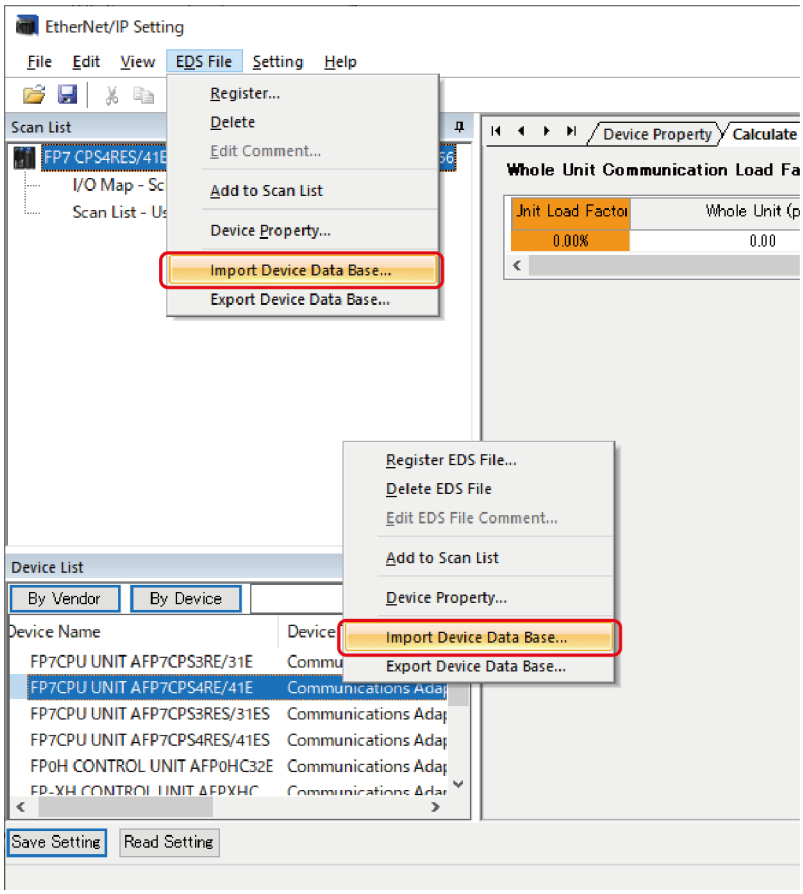
The procedure of the import function is described below.

Info.

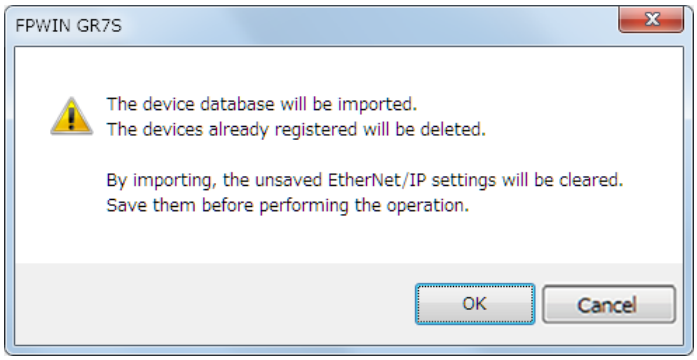
- Once the import is performed, the registered information of the device list will be overwritten by the contents of the imported device database. We recommend to export and store the registered information before performing the import.

Procedure

1. Select **Import Device Data Base**.
Select from the **EDS File** menu or the right-click menu of the device list.



After the selection, the following notes on the import operation is displayed.
If there are no issues, click [OK]. Otherwise, click [Cancel].

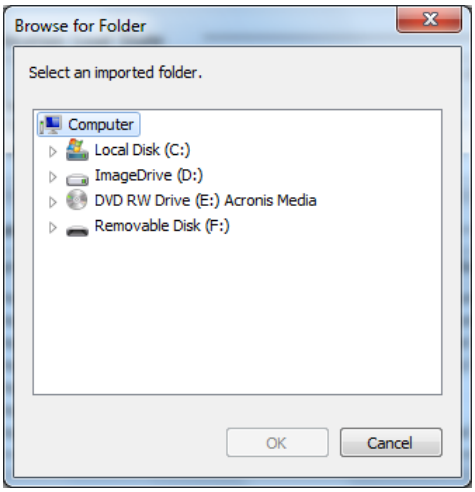


Info.

- Always save the EtherNet/IP setting before import.
  As the EtherNet/IP setting is finished after importing database, the information that is still in the middle of change operation will be cleared.

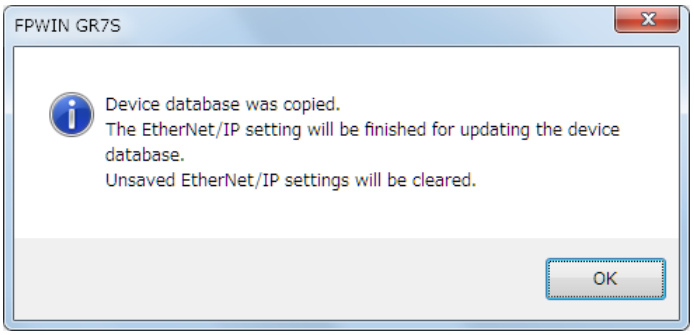
2. Select an import folder.

Specify the folder in which the device database to be imported is stored.



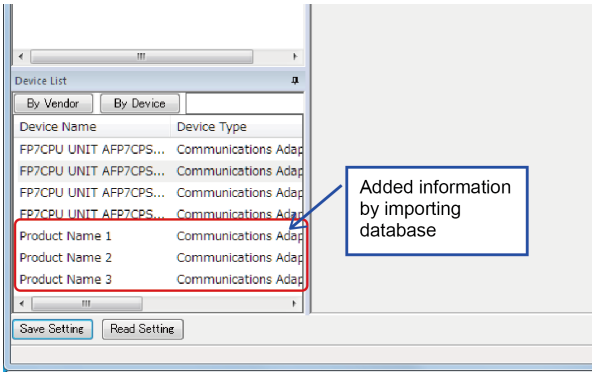
3. Reactivate the EtherNet/IP setting screen.

After clicking [OK], the EtherNet/IP configuration is completed automatically, so bring up the EtherNet/IP configuration screen again.



4. The import is complete.

When the EtherNet/IP screen is displayed again, the registered contents of the device list has been changed to the imported contents.



When You Want to Restore the Registration Information Before Import

If you need to restore the previous registration information after the completion of import, import folders stored in the following folder.

Info.

- AppData (Application Data for Windows XP) folder is a hidden folder.

For Windows (R) 7

C:\Users\(Account name of PC)\AppData\Roaming\Panasonic Industry Control\EIP\backup

For Windows (R) XP

C:\Documents and Setting\(Account name of PC)\Application Data\Panasonic Industry Control\EIP\backup

This folder is backup data before reflecting imported data.

If the import operation fails, registration information will not be backed up.

When the information has been backed up manually, import the backed-up folder.

8 Control Data

8.1 Types of Control Data 8-2
8.1.1 Unit Annunciation Relays 8-2
8.1.2 RUN/IDLE Bit 8-2
8.1.3 Cyclic Communication State Tables of EtherNet/IP 8-3
8.1.4 Read by ETSTAT Instruction 8-4
8.2 Startup Operation of Cyclic Communication 8-5
8.3 Abnormality Judgement and Operation 8-6

8.1 Types of Control Data

There are two types of control data, unit annunciation relays (from X6B) and communication state tables.

8.1.1 Unit Annunciation Relays

There are the following unit annunciation relays.

Annunciation device	Description
X6B	EtherNet/IP preparation complete = 1; Others = 0
X6C	Cyclic communication: All nodes communicating normally = 1; Others = 0
X6D	Cyclic communication: All nodes stop = 1; Others = 0
X6E	Contains abnormal communication abnormal node = 1; Does not contain = 0
X6F	EtherNet/IP Start/Stop controllable = 1, Uncontrollable = 0

Info.

- Unit annunciation relay numbers vary according to the base numbers of the unit I/O map registration.

8.1.2 RUN/IDLE Bit

The RUN/IDLE bit indicates the operation state of a device that is sent from a scanner or adapter during the cyclic communication. 1 is sent for the RUN state, and 0 is sent for the IDEL state.

When the operation state of a scanner is IDLE, an adapter device connected to that scanner may not operate normally.

As for adapter devices, it may not be sent depending on the settings of EDS files.

■ FP7 operation

In FP7, the RUN/IDLE bit becomes RUN in the following cases.

The conditions under which the RUN/IDLE bit becomes RUN vary according to the "RUN/IDLE bit operation of cyclic communication" setting in the basic EtherNet/IP settings ("Normal" or "Limited").

- Normal

  When the following two conditions are met, it becomes the RUN state.

  In other conditions, it is in the IDLE state.

  1. (1) The FP7 operation mode is RUN mode.
  2. (2) It is communicating with all nodes registered in the scan list except the FP7 normally.

- Limited

  A value corresponding to the FP7 operation mode is set regardless of the communication state with adapters registered in the scan list.

  RUN mode: RUN

  PROG mode: IDLE

Info.

- Only the normal operation is available when the version of the FP7 CPU unit is older than Ver.4.10.

■ Selecting RUN/IDLE bit operation of cyclic communication

Configure "RUN/IDLE bit operation of cyclic communication" in the basic EtherNet/IP settings according to use scenario.

- Normal

  Select for performing the EtherNet/IP communication with all adapters registered in the scan list.

  Info.

  - When using with this setting, if normal communication cannot be achieved with all adapter devices in the scan list (except FP7), even adapter devices that are communicating normally may not operate properly because the RUN/IDLE bit is sent as IDLE.

- Limited

  Select this setting for the use in situations where a part of devices in the scan list are activated and the others are stopped such as a test operation.

  * e.g. Communication cannot be performed because the power supply of an adapter is OFF.

Besides this setting, the similar operation can be performed by the following method.

1. (1) Register only the adapter devices that you want to activate in the scan list.
2. (2) Set the other adapter devices in the scan list to be disabled.

8.1.3 Cyclic Communication State Tables of EtherNet/IP

There the following types of cyclic communication state tables.

Table type	Description
Cyclic communication registration node table	Bit corresponding to the node number to which the connection is registered = 1; Invalid node = 0
Cyclic communication normal node table	When the first refresh is complete after connection establishment = 1, Other states = 0
Cyclic communication stop node table	Bit corresponding to the node to be stopped when the stop request processing is complete = 1, Others = 0
Cyclic communication abnormal node table	Node that the cyclic commuication error occurs =1, Others = 0
Cyclic communication: RUN/IDLE bit monitor	RUN/IDLE bit received from an adapter device registered in the scan list When the following two conditions are met, the bit that corresponds to the node number will turn ON (1). In other conditions, it turns OFF (0). ● Communicating with the target node normally ● The RUN/IDLE bit received from the target node is in RUN (1) **Info.** ● The communication condition with the FP7 node connected to the source is not reflected.

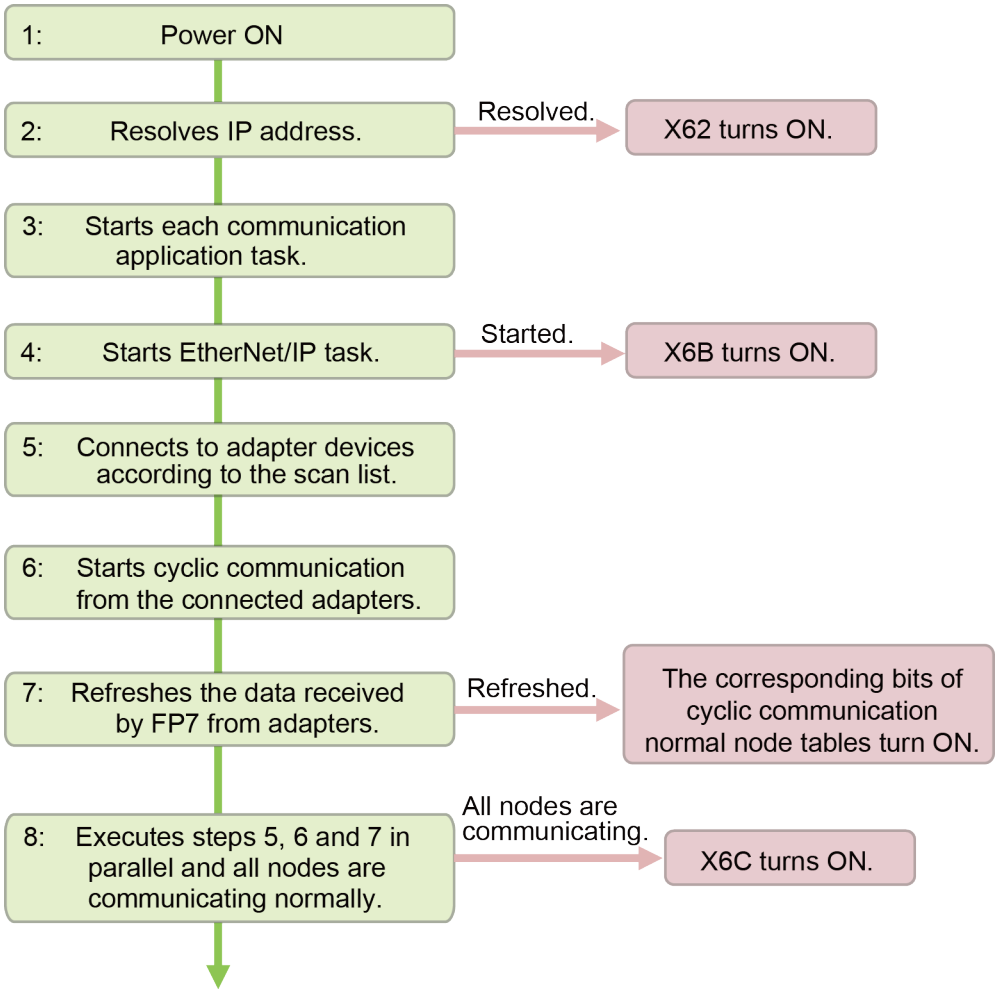
8.1.4 Read by ETSTAT Instruction

Communication state tables can be read by the ETSTAT instruction and monitored.
For details, refer to "9.1.1 ETSTAT (Acquiring EtherNet/IP Information)".

8.2 Startup Operation of Cyclic Communication

There are the following two startup methods of cyclic communication.

1. 1. Automatic start
2. 2: Start by Instructions: Start/Stop communication



Info.

- Precautions when starting the system which uses the EtherNet/IP function at high speed:

  When the power supply of an Ethernet switch is turned ON at the same time as the start of the system, a normal switch (unmanaged) is activated in a few seconds. However, as for a managed switch, it takes several tens of seconds. Until the switch is activated, the EtherNet/IP communication cannot be started.

  For starting the system at high speed, turn on the power supply of the Ethernet switch in advance, and start the system.

8.3 Abnormality Judgement and Operation

Abnormality judgement is performed on the following contents.

Abnormality judgement	Details
Connection timeout period	The timeout period when FP7 sends a forward open command and connects to adapter devices. When a response to the forward open command is not returned within the set time, it determines that the timeout occurs. By setting this period short, it is possible to make the reconnection time shorter when the power is turned on again.
Cyclic communication start wait time (Abnormality judgement when starting cyclic communication)	If connection is not established when starting the cyclic communication, the operation is retried after the connection timeout period, however, the communication abnormal node flag is set after the elapse of this time. The abnormality judgement is not performed before this time passes. The reconnection is retried automatically even after the determination of the communication abnormal node.
Cyclic communication abnormality judgement time (Abnormality judgement after connection)	When the timeout occurs during the transmission from an adapter while the cyclic communication is performed properly, the reconnection is retried automatically, however, it judges as a communication error when the reconnection is not established within this set time. The reconnection is retried automatically even after the determination of the communication abnormal node. By setting this time short, it is possible to judge communication errors quickly.

9 High-level Instructions

9.1 High-level Instructions Used for EtherNet/IP Control 9-2
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9.1.2 EIPNDST (EtherNet/IP Node Status Acquisition Instruction) 9-7
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9.1 High-level Instructions Used for EtherNet/IP Control

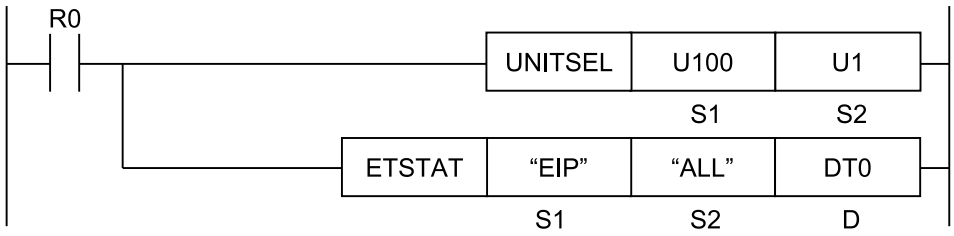
■ **High-level instructions that can be used for EtherNet/IP control are as follows.**

List of instructions

Instruction	Application
ETSTAT	Information acquisition of EtherNet/IP
EIPNDST	EtherNet/IP node status acquisition instruction
EIPSTART	Cyclic communication start request
EIPSTOP	Cyclic communication stop request
EIP_IN	EtherNet/IP input refresh
EIP_OT	EtherNet/IP output refresh

9.1.1 ETSTAT (Acquiring EtherNet/IP Information)

■ **Ladder diagram**



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

(Note 2) By copying and pasting the following text in the instruction list box of FPWIN GR7, the operand part of the above program can be input.

ETSTAT "EIP" "ALL" DT0

■ **List of operands**

Operand	Description
S1	Starting address of the device area that stores the string data that indicates a read type, or a character constant.
S2	Starting address of the device area that stores the string data that indicates a target to be read, or a character constant.
D	Specify the starting address of the device area that stores the read information.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TS CS	TE CE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●												●	●
S2	●	●	●	●			●	●												●	●
D	●	●	●	●			●	●													●

■ Processing

- Reads the parameter information or status information specified by [S1] and [S2], and stores it in the area starting with [D].
- The number of words in the storage area starting with [D] varies according to the type of read data and the target.

■ Precautions for programming

- Insert the UNITSEL instruction immediately before this instruction and specify the unit (built-in ET-LAN in the CPU unit) and the connection number.
- For [S1] and [S2], specify the starting address of the device storing the string data which indicates the set parameters or a character constant. When specifying a device area for an operand, set string data using the SSET instruction in advance. However, the ESSET instruction cannot be used because the format is different.
- Both upper and lower case characters can be used. "Abcd", "ABCD" and "abcd" are all synonymous.
- This instruction is not available in interrupt programs.

■ Setting of [S1] and [S2]

Setting item	Settings		
S1	Read type	For specifying the read of the EtherNet/IP communication state	Specify "EIP".
S2	Read target	For specifying the communication state of EtherNet/IP	Specify "ALL" or "ALL + Number".
		For specifying the cyclic communication registration node table	Specify "NODE".
		For specifying the cyclic communication normal node table	Specify "NORMAL".
		For specifying the cyclic communication stop node table	Specify "STOP".
		For specifying the cyclic communication abnormal node table	Specify "ERR".
		For specifying the RUN/IDLE bit monitor (PLC standby flag)	Specify "PLC".

(Note 1) The RUN/IDLE bit monitor is available for the CPU unit Ver.4.11 or later.

■ Setting of [S2] and targets to be read

- The read contents vary according to the character string set in [S2].
- The number of read words varies according to the maximum registered node number.

Name	Number of words (Note 1)	Character string set in [S2] and read object (●: Read, Blank: Not read)						
		ALL	ALL + Number (1 to 16) (Note 2)	NODE	NORMAL	STOP	ERR	PLC
Registered maximum node number	1	●	●					
Cyclic communication registration node table (Note 3)	0 to 16	●	●	●				
Cyclic communication normal node table (Note 3)	0 to 16	●	●		●			
Cyclic communication stop node table (Note 3)	0 to 16	●	●			●		
Cyclic communication abnormal node table (Note 3)	0 to 16	●	●				●	
RUN/IDLE bit monitor (PLC standby flag) (Note 3)	0 to 16	●	●					●
Read word count (Note 1)		1 to 81	1 to 81	1 to 17	1 to 17	1 to 17	1 to 17	1 to 17

(Note 1) The number of read words varies according to the registered maximum node number.

Maximum node number	Number of valid words
0	0
1 to 16	1
17 to 32	2
33 to 48	3
49 to 64	4
:	:
225 to 239	15
241 to 256	16

(Note 2) When specifying "ALL + Number (1 to 16)" for [S2], the information for the number of effective words that is specified by the "Number" is read.

(Note 3) The bits in the following table are allocated to the node table numbers and RUN/IDLE bit monitor.

	Bit No.															
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Node number	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	:															
	256	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241

■ Example of processing

Example 1) When specifying the reading of EtherNet/IP communication state

[S1]... "EIP" [S2]... "ALL" [D]...DT20

	Value	
DT20	U15	Maximum registration node number
DT21	0111 1111 1111 1111	Cyclic communication registration node table (Node nos. 1 to 16)
DT22	0111 1000 1011 1111	Cyclic communication normal node table (Node nos. 1 to 16)
DT23	0000 0111 1010 0000	Cyclic communication stop node table (Node nos. 1 to 16)
DT24	0000 0000 0100 0000	Cyclic communication abnormal node table (Node nos. 1 to 16)
DT25	0000 0000 0000 1111	RUN/IDLE bit monitor (PLC standby flag) (Node nos. 1 to 16)

Example 2) When specifying the reading of EtherNet/IP communication state

When the maximum registered node number is "0", only the value of [D] is updated and the values after [D+1] are not updated.

[S1]... "EIP" [S2]... "ALL" [D]...DT20

	Value	
DT20	0	Maximum registration node number

Example 3) When specifying the reading of cyclic communication registration node table

When setting "ALL+2" for [S2], the information for 32 (=2x16) nodes (node numbers 1 to 32) is read.

[S1]... "EIP" [S2]... "ALL+2" [D]...DT20

	Value	
DT20	15	Maximum registration node number
DT21	1st word	Cyclic communication registration node table (Node nos. 1 to 16)
DT22	2nd word	Cyclic communication registration node table (Node nos.17 to 32)
DT23	1st word	Cyclic communication normal node table (Node nos. 1 to 16)
DT24	2nd word	Cyclic communication normal node table (Node nos. 17 to 32)
DT25	1st word	Cyclic communication stop node table (Node nos. 1 to 16)

	Value	
DT26	2nd word	Cyclic communication stop node table (Node nos. 17 to 32)
DT27	1st word	Cyclic communication abnormal node table (Node nos. 1 to 16)
DT28	2nd word	Cyclic communication abnormal node table (Node nos. 17 to 32)
DT29	1st word	RUN/IDLE bit monitor (PLC standby flag) (Node nos. 1 to 16)
DT30	2nd word	RUN/IDLE bit monitor (PLC standby flag) (Node nos. 1 to 32)

Example 4) When fixing the number of valid words (The communication states of node numbers 1 to 16 are displayed.)

[S1]... "EIP" [S2]... "ALL+1" [D]...DT20

When setting "ALL+1" for [S2], the information for only one word (node numbers 1 to 16) is read regardless of the maximum registered node number.

	Value	
DT20	100	Maximum registration node number
DT21	1st word	Cyclic communication registration node table (Node nos. 1 to 16)
DT22	1st word	Cyclic communication normal node table (Node nos. 1 to 16)
DT23	1st word	Cyclic communication stop node table (Node nos. 1 to 16)
DT24	1st word	Cyclic communication abnormal node table (Node nos. 1 to 16)
DT25	1st word	RUN/IDLE bit monitor (PLC standby flag) (Node nos. 1 to 16)

Example 5) When specifying the reading of cyclic communication registration node table

[S1]... "EIP" [S2]... "NODE" [D]...WX100

	Value	
WX100	40	Maximum registration node number
WX101	1111 1111 1111 1111	Cyclic communication registration node table (Node nos. 1 to 16)
WX102	1111 1111 1111 1111	Cyclic communication registration node table (Node nos.17 to 32)
WX103	0000 0000 1111 1111	Cyclic communication registration node table (Node nos. 33 to 48)

Example 6) When specifying the reading of cyclic communication normal node table

[S1]... "EIP" [S2]... "NORMAL" [D]...WY100

	Value	
WY100	7	Maximum registration node number
WY101	0000 0000 0111 1111	Cyclic communication normal node table (Node nos. 1 to 16)

Example 7) When specifying the reading of cyclic communication stop node table

[S1]... "EIP" [S2]... "STOP" [D]...WR100

	Value	
WR100	8	Maximum registration node number
WR101	0000 0000 1111 1111	Cyclic communication stop node table (Node nos. 1 to 16)

Example 8) When specifying the reading of cyclic communication abnormal node table

[S1]... "EIP" [S2]... "ERR" [D]...WR100

	Value	
WR100	5	Maximum registration node number
WR101	0000 0000 0000 1000	Cyclic communication abnormal node table (Node nos. 1 to 16)

Example 9) When specifying the reading of RUN/IDLE bit monitor (PLC standby flag)

[S1]... "EIP" [S2]... "PLC" [D]...WR2000

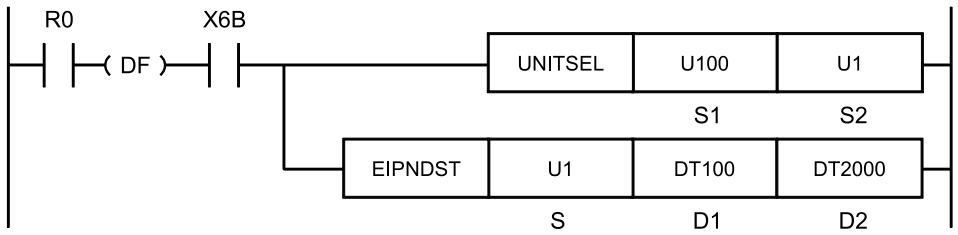
	Value	
WR2000	50	Maximum registration node number
WR2001	1111 1111 1111 1111	RUN/IDLE bit monitor (Node nos. 1 to 16)
WR2002	1111 1111 1111 1111	RUN/IDLE bit monitor (Node nos. 17 to 32)
WR2003	1111 1111 1111 1111	RUN/IDLE bit monitor (Node nos. 33 to 48)
WR2004	0000 0000 0000 0011	RUN/IDLE bit monitor (Node nos. 49 to 64)

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the read area is out of the range.
	To be set when the read type [S1] is set to an item other than "IPv4", "IPv6", "FTPc", "HTTPc", "SMTPc" or "EIP".
	To be set when the target to be read [S2] is set to an item other than "MAC", "CONNECT", "IDx", "LOGx", "IDALL", "LOGALL", "ALL", "NODE", "NORMAL", "STOP", "ERR" or "PLC".
	To be set when a combination other than the combinations listed in the restrictions on combination is specified for the type [S1] and target [S2] to be read.
	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	Set when executed in an interrupt program.

9.1.2 EIPNDST (EtherNet/IP Node Status Acquisition Instruction)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ List of operands

Operand	Description
S	Device area that stores the node number (1 to 256) of the EtherNet/IP device whose status is acquired, or a constant.
D1	Device address for storing the acquired status
D2	Device address for storing the execution result of the instruction

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●								●	●				●
S2	●	●	●	●			●	●													●
D	●	●	●	●			●	●													●

■ Processing

- The status of the node for the node number that is specified by [S] is stored in the device that is specified by [D1], and the execution result of the instruction is stored in [D2].
- The node status is acquired when the trigger (execution condition) turns ON.

■ Precautions for programming

- Execute this instruction after X6B (EtherNet/IP preparation done) turns ON. If the instruction is executed before X6B turns ON, the EtherNet/IP communication preparation incomplete error is returned as an execution result in [D2].
- Multiple EIPNDST instructions cannot be executed simultaneously. A multiple execution error occurs. Be sure to execute this instruction after confirming the completion of the previous execution.

■ Operand [S] setting

Specify node numbers in the range of 1 to 256.

■ Operand [D1] setting

The results of read node statuses are set as follows.

Bits	Name	Definition
0	Owned	Turns ON when FP7 is a target and connected from an originator.
1	Reserved	It is always 0.
2	Configured	Turns ON when the settings of the EtherNet/IP device are different from the factory default settings.
3	Reserved	It is always 0.
4 to 7	Extended Device Status	Shows the detailed status of EtherNet/IP device. It is a vendor-specific status or a status according to CIP.(Note 1)

Bits	Name	Definition
8	Minor Recoverable Fault	Stores the error information of the EtherNet/IP device. Error contents vary depending on vendors. Recoverable Fault: In a recoverable state Unrecoverable Fault: In an unrecoverable state
9	Minor Unrecoverable Fault	
10	Major Recoverable Fault	
11	Major Unrecoverable Fault	
12 to 15	Reserved	It is always 0.

(Note 1) For bits 4 to 7, the following field definition contents for "Extended Device Status" are stored. FP7 does not return the codes that are indicated as "Not supported" in the following table.

Bits 4 to 7	Name	FP7
0000	During self-testing operation or unknown	Not supported
0001	During the update of firmware	Not supported
0010	More than one I/O connection is in a fault state	Not supported
0011	No I/O connection has been established	
0100	Setting error of non-volatile memory	Not supported
0101	Major Fault. The bit 10 or 11 is ON.	Not supported
0110	More than one I/O connection is established and there is more than one connection that receives RUN mode.	
0111	More than one I/O connection is established and all received connections are in the Idle mode.	
1000 to 1001	Reserved	Not supported
1010 to 1111	Peculiar to vendors. Or peculiar to products	Not supported

■ Operand [D2] setting

Specify the area that stores the execution result. One of the following execution codes is stored.

	Name	Value	Description
[D]	Normal end	0	The acquisition of a specified node status is complete.
	In progress	1	The acquisition of a specified node is in progress.
	Timeout	2	Communication timeout (10 seconds)
	Multiple executions	3	Multiple execution of the EIPNDST instruction
	Communication error	4	In the case of communication errors

	Name	Value	Description
	CIP error	5	In the case of a CIP error
	EtherNet/IP communication preparation incomplete	6	When the preparation of EtherNet/IP communication is incomplete
[D2+1]	CIP general status	1 to 255	If the value of [D] is "5", CIP general status and CIP extended status are stored. If the value of [D] is not "5", "0" is stored in [D2+1] and [D2+2].
[D2+2]	CIP extended status	0 to 65535	

■ Usage example

Example 1) Acquires the node status of node number 1.

- EtherNet/IP configuration setting

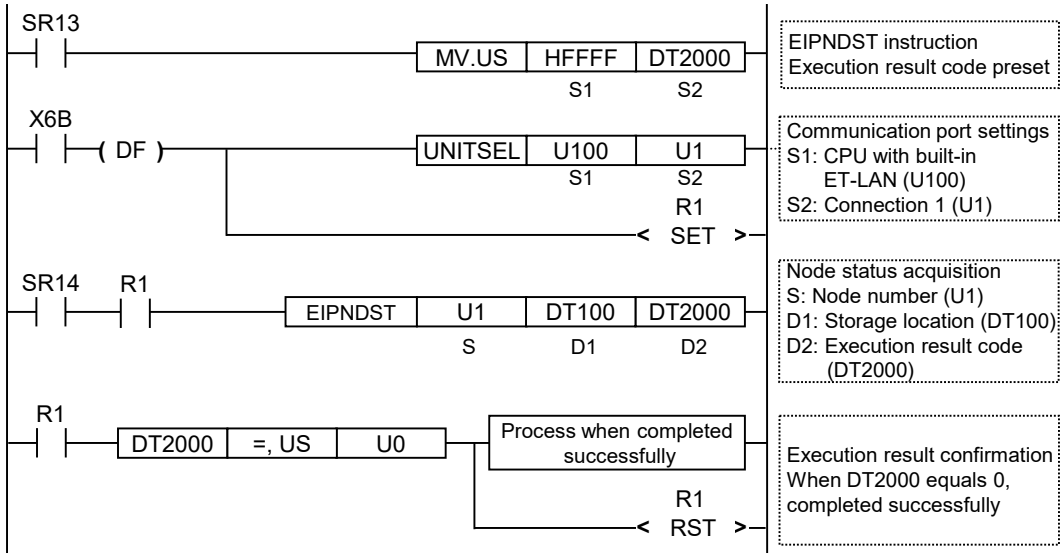
  The EtherNet/IP devices that the node status is acquired should be registered in the scan list.

Node	IP address	Valid/Invalid flag
1	192.168.1.6	Invalid
2	192.168.1.7	Enabled

There is no problem even if the valid/invalid flag is invalid when acquiring the node status. Select valid or invalid to determine whether to perform the cyclic communication or not.

■ Sample program

- The UNITSEL instruction is used to specify the connection number of the built-in ET-LAN in the CPU unit.
- The acquisition result of the node status is stored in DT100 and the execution result is in DT2000. When the operation is complete successfully, 0 is stored in DT2000, and the node status is stored in DT100 and subsequent DTs.



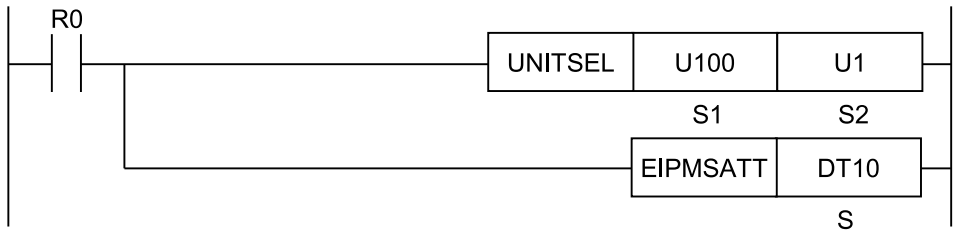
The initial preset is required to acquire the execution result of the EIPNDST instruction.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range values in indirect access (index modification).
	Set when executed in an interrupt program.
	To be set when the node specified by [S] does not exist.
	To be set when the 3-word device area that starts from the device that is specified by [D2] cannot be allocated.

9.1.3 EIPMSATT (EIP Message Send Destination Setting)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ Available operation units

No operation unit.

■ List of operands

Operand	Description
S	Specify the starting device number that stores the message communication targets.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
S	●	●	●	●			●	●													●

■ Outline of operation

- This instruction specifies the Ethernet unit to be targeted by the UNITSEL instruction.
- It sets the destination data of EIPMSEND instruction in the send buffer.
- The EIPMBODY instruction is used in combination with the EIPMSATT and EIPMSEND instruction.
- When this instruction is called while message communication is being performed, no operation is performed.

■ Processing

- Sets the destination data specified by [S] in the send buffer.

Destination data

S	1st byte of IP address
S+1	2nd byte of IP address
S+2	3rd byte of IP address
S+3	4th byte of IP address
S+4	Service code
S+5	Class ID (Note 1)(Note 2)
S+6	Instance ID (Note 1)(Note 2)
S+7	Attribute ID (Note 1)(Note 2)

(Note 1) The setting range is 0000 to FFFEH. Omitted if set to FFFFH.

(Note 2) For corresponding service codes, class IDs, instance IDs, attribute IDs, refer to relevant manuals for each EtherNet/IP device.

■ Example of processing

Example 1) When executing the Get_Attribute_Single service for an EtherNet/IP device (IP address: 192.168.1.10) to read the product code of the Identity object.

[S]... DT10

	Value
DT9	
DT10	U192
DT11	U168
DT12	U1
DT13	U10
DT14	000EH
DT15	0001H
DT16	0001H
DT17	0003H
DT18	

Setting item	Set value
Destination IP address	192.168.1.10
Service code	000EH
Class ID	0001H
Instance ID	0001H
Attribute ID	0003H

Example 2) When executing the Continuous Data Read service for an EtherNet/IP device (IP address: 192.168.2.1) to continuously read the device data of the PLC object.

[S]... DT100

	Value
DT99	
DT100	U192
DT101	U168
DT102	U2
DT103	U1
DT104	004BH
DT105	0065H
DT106	0001H
DT107	FFFFH (Note 1)
DT108	

(Note 1) FFFFH is specified when this is omitted.

Setting item	Set value
Destination IP address	192.168.2.1
Service code	004BH
Class ID	0065H
Instance ID	0001H
Attribute ID	_(Note 1)

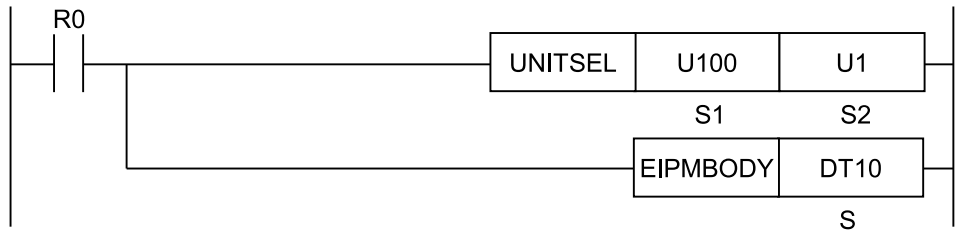
(Note 1) FFFFH is specified when this is omitted.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not an Ethernet unit.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range in indirect access (index modification).
	To be set when the device address of [S+7] is outside the device range.

9.1.4 EIPMBODY (EIP Message Body Setting)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ Available operation units

No operation unit.

■ List of operands

Operand	Description
S	Specify the starting device number that stores the message body.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
S	●	●	●	●			●	●													●

■ Outline of operation

- This instruction specifies the Ethernet unit to be targeted by the UNITSEL instruction.
- It sets the message body data of EIPMSEND instruction in the send buffer.
- The EIPMBODY instruction is used in combination with the EIPMSATT and EIPMSEND instruction.
- When this instruction is called while message communication is being performed, no operation is performed.

■ Processing

- Sets the send buffer in the message body data specified by [S]. The data created by the CIPMSET instruction can be used as the contents of the message body data.

Message body data

	Higher byte	Lower byte
1 word	Message body size (0 to 502 bytes)	
2 words	Message body data	
:		

(Note 1) For details about the commands and responses, refer to relevant manuals for each EtherNet/IP device.

■ Examples of the maximum service data size

---: Omitted

	Service code	Size	Segment	Class ID	Segment	Instance ID	Segment	Attirubte ID	Service data
1	1byte	0x00	-	-	-	-	-	-	Max. 502 (bytes)
2	1byte	0x01	0x20	1byte	-	-	-	-	Max. 500 (bytes)
3	1byte	0x02	0x0021	2byte	-	-	-	-	Max. 498 (bytes)
4	1byte	0x02	0x20	1byte	0x24	1byte	-	-	Max. 498 (bytes)
5	1byte	0x03	0x20	1byte	0x0025	2byte	-	-	Max. 496 (bytes)
6	1byte	0x03	0x0021	2byte	0x24	1byte	-	-	Max. 496 (bytes)
7	1byte	0x04	0x0021	2byte	0x0025	2byte	-	-	Max. 494 (bytes)
8	1byte	0x03	0x20	1byte	0x24	1byte	0x30	1byte	Max. 496 (bytes)
9	1byte	0x04	0x20	1byte	0x24	1byte	0x0031	2byte	Max. 494 (bytes)
10	1byte	0x04	0x20	1byte	0x0025	2byte	0x30	1byte	Max. 494 (bytes)
11	1byte	0x05	0x20	1byte	0x0025	2byte	0x0031	2byte	Max. 492 (bytes)
12	1byte	0x04	0x0021	2byte	0x24	1byte	0x30	1byte	Max. 494 (bytes)
13	1byte	0x05	0x0021	2byte	0x24	1byte	0x0031	2byte	Max. 492 (bytes)
14	1byte	0x05	0x0021	2byte	0x0025	2byte	0x30	1byte	Max. 492 (bytes)

	Service code	Size	Segment	Class ID	Segment	Instance ID	Segment	Attirubte ID	Service data
15	1byte	0x06	0x0021	2byte	0x0025	2byte	0x0031	2byte	Max. 490 (bytes)

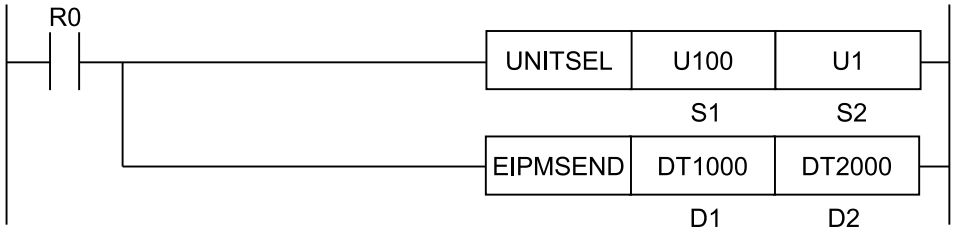
(Note 1) The maximum data size per connection is 504 bytes.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not an Ethernet unit.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range in indirect access (index modification).
	Set when a value outside the range is specified for the parameter.
	To be set when the end of the message body data specified by [S] exceeds the device limit.

9.1.5 EIPMSEND (EIP Message Send)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction. Set a desired value for [S2].

■ Available operation units

No operation unit.

■ List of operands

Operand	Description
D1	Specify the device address storing received data.
D2	Specify the device address for setting execution results of instructions.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
D1	●	●	●	●			●	●													●
D2	●	●	●	●			●	●													●

■ Outline of operation

- This instruction sends an EIP message when the execution condition turns ON.
- This instruction specifies the Ethernet unit to be targeted by the UNITSEL instruction.
- A UCMM message set by the EIPMSATT and EIPMBODY instructions is sent.
- The response is stored.
- Call this instruction after X6B (EIP preparation done) turns ON. If it is called before X6B turns ON, the EIP communication preparation incomplete error is returned.
- The instruction cannot be used in interrupt programs.
- Multiple EIPMSEND instructions cannot be executed simultaneously. A multiple execution error occurs. The next execution must be executed after confirming the completion of an instruction.

■ Processing

- A UCMM message is sent, received data is stored in [D1] and execution results are stored in [D2]. The destination and the content to be sent are set by the EIPMSATT and EIPMBODY instructions.

  D1: Received data size (byte)

  D1+1: Received data

D1	Received data size (1 to 504 bytes)
D1+1	Received data
D1+2	
D1+x	

(Note 1) When a timeout, multiple execution, or communication error occurs, values are not stored in the received data size and received data.

D2: Execution results

Name	Value	Description
Normal end	0	Message communication is complete.
In progress	1	Message communication is being performed.
Timeout	2	Communication timeout (10 seconds)
Multiple executions	3	Multiple executions of EIPMSEND instruction
Communication error	4	In the case of communication errors
CIP error	5	In the case of CIP errors

Name	Value	Description
EIP communication preparation incomplete	6	When the preparation of EIP communication is incomplete.
Send message size error	7	When the send message size exceeds 504 bytes.

D2+1: CIP general status

D2+2: CIP extended status

	Value	Description
D2+1	1 to 255	CIP general status (Note 1)
D2+2	0 to 65535	CIP extended status (Note 1)

(Note 1) When the execution result is other values than "5", "0" is stored in D2+1 and D2+2.

■ Example of processing

Example) Performing message communication using the connection 1 of the built-in ET-LAN in the CPU unit

- During the configuration setting, it is necessary to set the built-in ET-LAN connection and the EIP scan list.
- The slot number for the built-in ET-LAN needs to be specified to be “100”.

1. First, using the UNITSEL instruction, specify “100” as the slop number for the built-in ET-LAN (S1 = U100), and user connection 1 (S2 = U1).

UNITSEL	U100	U1
	S1	S2

2. Set the destination data using the EIPMSATT instruction.

EIPMSATT	DT100
	S

3. Create a value to be set in the message body data using the CIPMSET instruction.

CIPMSET	DT200	U5	DT500
	S1	Example 1	D

4. Set the message body data using the EIPMBODY instruction.

EIPMBODY	DT500
	S

5. Perform message communication using the EIPMSEND instruction. Received data is stored in D1 and execution results are stored in D2.

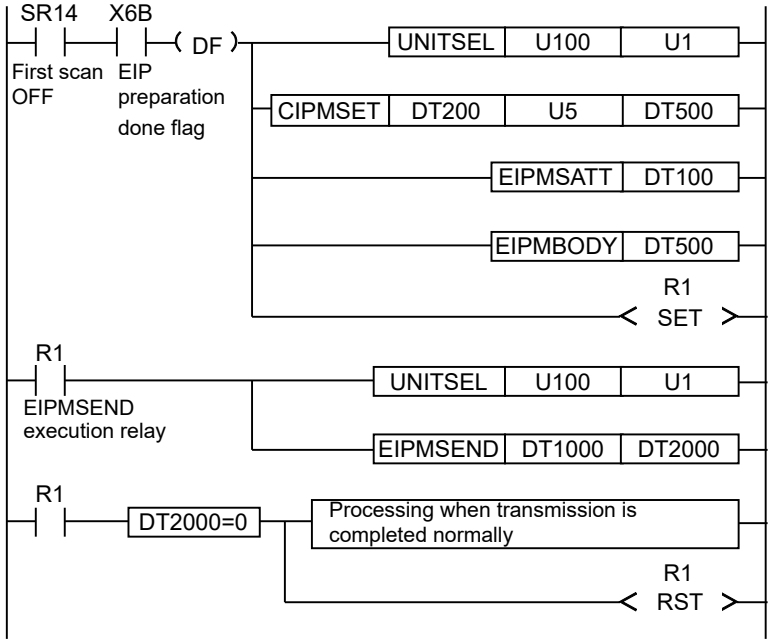
EIPMSEND	DT1000	DT2000
	D1	D2

6. **Results produced when message communication is completed normally**

DT1000	U6 (No. of bytes)		Received data size
DT1001	H00	H8E	Received data
DT1002	H00	H00	
DT1003	H00	HE	

DT2000	H0	Execution result

■ **Program example**

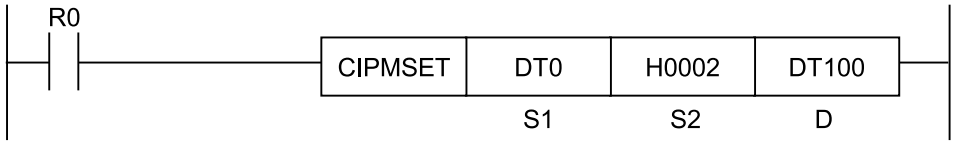


■ **Flag operations**

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not an Ethernet unit.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range in indirect access (index modification).
	Set when executed in an interrupt program.
	To be set when 253-word device cannot be assured from the device address specified by [D1].
	To be set when 3-word device cannot be assured from the device of D2.

9.1.6 CIPMSET [CIP Message Data Setting (Merging)]

■ **Ladder diagram**



■ Available operation units

No operation unit.

■ List of operands

Operand	Description
S1	Specify the starting device of send data to be added.
S2	Specify the data format of added send data or the device storing it.
D	Specify the starting device of send data to be created.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32 bit v			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●													●
S2	●	●	●	●			●	●								●	●				●
D	●	●	●	●			●	●													●

■ Outline of operation

- This instruction is used to create data to be sent in the message communication of CIP.
- If there already exists CIP message data in the storage destination, the data is added to the existing CIP message data.

■ Processing

- The data specified to be added by [S1] is added (merged) to the CIP message specified by [D] according to the format specified by [S2].

S1: Specify the starting device of the data to be added.
When writing character string data, create data using the SSET instruction.
For character string data, specify data that contains character string length.

S2: Specify the format and size of the data to be added.

Specified range: 0 to 502 (000H to 1F6H)

Set value	Description	
0	Character string	Specify when the data to be added is character strings. Add data equivalent to “Starting device value of S1 + 2”.
1 to 502	Other than character string	Specify when the data to be added is other than character strings. Add data equivalent to “set value”.

D: Specify the starting device of the data to be added.
The number of bytes of the currently stored data is set in the starting device.
For character string data, specify data that contains character string length.
If the starting device is not 0, it is recognized that message data already exists and the new data is added next to the position shifted from the starting data by the number of bytes of the existing data.

When writing is completed, the added data size length is added to the CIP data length.

CIP message send data format

	Value
D	CIP data length
D+1 onward	CIP data

Complex data consisting of short type, double type, and string data type

Example) [D]: DT100 Data write starting position

- When there is no data

	Value	
DT100	0000H	
DT101	41H (A)	42H (B)
DT102	43H (C)	44H (D)

- When there is data

	Value	
DT100	0002H	
DT101	41H (A)	42H (B)
DT102	43H (C)	44H (D)

■ Precautions for programming

- Even if the add source (S1) range overlaps with the add destination (D) range, data is added without causing any error.

■ Example of processing

Example 1) Creating a new CIP message. (Data other than character string data is written in 2 bytes)

[S1]... DT10 [S2]... H0002 [D]...DT100

S1: Data to be added

	Value	
DT0	00H	05H
DT1	42H (B)	41H (A)
DT2	44H (D)	43H (C)
DT3	00H	45H (E)

S2: Format of the data to be added

	Value
S2	0002H

D: CIP message storage destination

	Value	
DT100	0000H	Data length
DT101	34H	12H

Operation result

S1: Data to be added

	Value	
DT0	00H	05H
DT1	42H (B)	41H (A)
DT2	44H (D)	43H (C)
DT3	00H	45H (E)

Move data equivalent to 2 bytes

D: CIP message storage destination

	Value	
DT100	0002H	Data length
DT101	0005H	

Example 2) Creating a new CIP message. (Writing character string data “while the data size is set to 0”)

[S1]... DT0 [S2]... H0000 [D]...DT100

S1: Data to be added

	Value	
DT0	00H	05H
DT1	42H (B)	41H (A)
DT2	44H (D)	43H (C)
DT3	00H	45H (E)

S2: Format of the data to be added

	Value
S2	0000H

↑
Writing character string data

D: CIP message storage destination

	Value		
DT100	0000H		Data length
DT101	34H	12H	
DT102	78H	56H	
DT103	12H	90H	
DT104	56H	34H	

Operation result

S1: Data to be added

	Value	
DT0	00H	05H
DT1	42H (B)	41H (A)
DT2	44H (D)	43H (C)
DT3	00H	45H (E)

Move data of string length + 2 bytes

D: CIP message storage destination

	Value		
DT100	0007H		Data length
DT101	0005H		String length
DT102	'B'	'A'	
DT103	'D'	'C'	
DT104	56H	'E'	

Example 3) Adding data to the existing CIP message. (Data other than character string data is written in 4 bytes)

[S1]... DT1 [S2]... H0004 [D]...DT100

S1: Data to be added

	Value	
DT1	00H	03H
DT2	32H (2)	31H (1)
DT3	00H	33H (3)

S2: Format of the data to be added

	Value
S2	0004H

D: CIP message storage destination

	Value		
DT100	0003H		Data length
DT101	0001H		Written data
DT102	12H	'A'	
DT103	56H	34H	
DT104	90H	78H	

Operation result

S1: Data to be added

	Value	
DT1	00H	03H
DT2	32H (2)	31H (1)
DT3	00H	33H (3)

Move data equivalent to 4 bytes

D: CIP message storage destination

	Value		
DT100	0003H→0007H		Data length
DT101	0001H		
DT102	03H	'A'	
DT103	31H	00H	
DT104	90H	32H	

Example 4) Adding data to the existing CIP message. (Writing character string data "while the data size is set to 0")

[S1]... DT1 [S2]... H0000 [D]...DT100

S1: Data to be added

	Value	
DT1	00H	03H
DT2	32H (2)	31H (1)
DT3	00H	33H (3)

S2: Format of the data to be added

	Value
S2	0000H

↑
Writing character string data

D: CIP message storage destination

	Value		
DT100	0003H		Data length
DT101	0001H		Written data
DT102	12H	'A'	
DT103	56H	34H	
DT104	90H	78H	

Operation result

S1: Data to be added

	Value	
DT1	00H	03H
DT2	32H (2)	31H (1)
DT3	00H	33H (3)

Move data of string length + 2 bytes →

D: CIP message storage destination

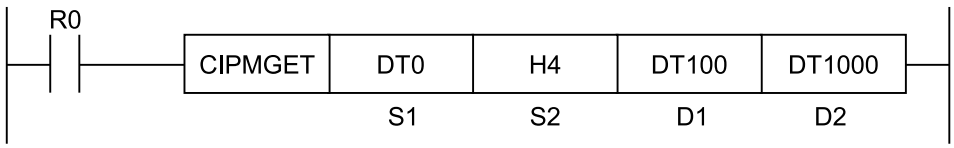
	Value		
DT100	0003H		Data length
DT101	0001H		
DT102	03H	'A'	
DT103	'1'	00H	String length
DT104	'3'	'2'	

■ **Flag operations**

Name	Description
SR7 SR8 (ER)	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range in indirect access (index modification).
	Set when a value outside the range is specified for the parameter.
	To be set when the data size after the addition exceeds 502.

9.1.7 CIPMGET (CIP Message Data Getting)

■ **Ladder diagram**



■ Available operation units

No operation unit.

■ List of operands

Operand	Description
S1	Specify the starting device of received data (CIP data type).
S2	Specify the data format of acquired data or the device storing it.
D1	Specify the device storing the byte offset position from the beginning of the received data which specifies the acquisition position.
D2	Specify the starting device of the device storing acquired data.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TS CS	TE CE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●													●
S2	●	●	●	●			●	●								●	●				●
D1	●	●	●	●			●	●													●
D2	●	●	●	●			●	●													●

■ Outline of operation

- This instruction acquires string data and numerical data from the data received in the message communication of CIP.
- Data other than string data is read from lower bytes.

■ Processing

- Data is separated and transferred to the memory specified by [D2] according to the number of data specified by [S2] from the position shifted by the offset of [D1] from the CIP message receive data specified by [S1].

S1: Specify the starting device of CIP message receive data.

Example) S1 = DT0

CIP message send data format

	Value	
D	CIP data length	
D+1	Service code	} CIP receive header
D+2	General Status	
D+3 onward	CIP data	Complex data consisting of short type, double type, and string data type

		Value		
	DT0	0011H		Data length
	DT1	CIP receive header		
	DT2			
Stores the following three data items as CIP message data:	DT3	0001H		1st data: '1'
• 1 • AB • 1234H	DT4	02H	31H (1)	(Note): The starting one word of the character string data is for the character string length.
	DT5	41H (A)	00H	2nd data: 'AB'
	DT6	34H	42H (B)	(Note): The starting one word of the character string data is for the character string length.
	DT7	ffH	12H	3rd data: 1234H

S2: Specify the data format and data size of the data to be acquired.
Specified range: 0 to 504 (000H to 1F8H)

Set value	Description	
0	Character string	Specify when acquired data is character strings. Acquire data equivalent to “Starting device value of S1 + 2”.
1 to 504	Other than character string	Specify when acquired data is other than character strings. Acquire data equivalent to “set value”.

D1: Specify the device that stores the data acquisition starting position.
Update the data equivalent to the number of data acquired after the instruction is completed.
Starting data length size is not included in the starting position.

Example) When acquiring the second data Data acquisition starting position

[S1]... DT0 [D1]... DT10

- Before the instruction is issued

	Value
DT10	000BH

- After the instruction is issued

	Value
DT10	000FH

CIP message receive data example

	Value		
DT0	000DH		Total data length
DT1	CIP receive header		
DT2			
DT3	0001H		1st data
DT4	02H	31H (1)	
DT5	41H (A)	00H	2nd data: Acquisition data
DT6	34H	42H (B)	
DT7	ffH	12H	3rd data

Offset position

	Value		
DT0			The data length is not included in the offset position.
DT1	1	0	The CIP header is also extracted.
DT2	3	2	
DT3	5	4	
DT4	7	6	
DT5	9	8	
DT6	B	A	
DT7	D	C	

D2: Specify the storage destination device for the acquired data.

■ Precautions for programming

- With this instruction, delimitation of the CIP message data cannot be checked. Therefore, operation continues without detecting an error even an illegal offset position is specified. Fully grasp the content of a received CIP message, and then set the offset position and data size.
- Even if the acquisition source (S1) range overlaps with the storage location (D2) range, data is acquired without causing any error.

■ Example of processing

Example 1) Acquiring data sequentially from the start of the CIP message.

CIP message receive data example

	Value			
DT0	000DH		Total data length	Acquire data from the start of CIP message data. Data is acquired to the following device.
DT1	00CBH		CIP receive header	→ (1)DT1000
DT2	0000H			
DT3	0001H		1st data	→ (2)DT2000
DT4	02H	31H (1)		
DT5	41H (A)	00H	2nd data	→ (3)DT3000
DT6	34H	42H (B)		
DT7	ffH	12H	3rd data	→ (4)DT4000

(1) Acquiring CIP receive header information from its start

[S1]... DT0 [S2]... H4 [D1]... DT100 [D2]... DT1000

S2: Acquired data format

	Value
S2	0004H

D1: Offset position

	Value
DT100	0000H

D2: Acquired data storage destination

	Value
DT1000	0000H
DT1001	ffffH

Operation result

S1: CIP message receive data

	Value	
DT0	000DH	
DT1	00CBH	
DT2	0000H	
DT3	0001H	
DT4	02H	31H (1)
DT5	41H (A)	42H (B)
DT6	34H	
DT7	ffH	12H

Acquiring data equivalent to 4 bytes

D1: Offset position

	Value
DT100	0000H→0004H

D2: Acquired data

	Value
DT1000	00CBH
DT1001	0000H

Offset position after updating

	Value		
DT0			
DT1	1	0	CIP receive data
DT2	3	2	
DT3	5	4	1st data
DT4	7	6	
DT5	9	8	2nd data
DT6	B	A	
DT7	D	C	3rd data

(2) Acquiring character string data from the offset position

[S1]... DT0 [S2]... H0 [D1]... DT100 [D2]... DT2000

S2: Acquired data format

	Value
S2	0000H

↑

Acquisition of the character string data

D1: Offset position

	Value
DT100	0004H(Note 1)

D2: Acquired data storage destination

	Value
DT2000	0000H
DT2001	ffffH

(Note 1) The D1 offset position is updated to the start position of the 1st data item when the CIPMGET instruction is issued (1).

Operation result

S1: CIP message receive data

	Value	
DT0	000DH	
DT1	00CBH	
DT2	0000H	
DT3	0001H	
DT4	02H	31H (1)
DT5	41H (A)	00H
DT6	34H	42H (B)
DT7	ffH	12H

Acquiring data equivalent to the character string length + 24 bytes

→

D1: Offset position

	Value
DT100	0004H→0007H

D2: Acquired data

	Value	
DT2000	0001H	
DT2001	ffH	'1'

Offset position after updating

	Value		
DT0			
DT1	1	0	CIP receive data
DT2	3	2	
DT3	5	4	1st data
DT4	7	6	
DT5	9	8	2nd data
DT6	B	A	
DT7	D	C	3rd data

(3) Acquiring character string data from the offset position

[S1]... DT0 [S2]... H0 [D1]... DT100 [D2]... DT3000

S2: Acquired data format

	Value
S2	0000H

↑

Acquisition of the character string data

D1: Offset position

	Value
DT100	0007H(Note 1)

D2: Acquired data storage destination

	Value
DT3000	0000H
DT3001	0000H

(Note 1) The D1 offset position is updated to the start position of the 2nd data item when the CIPMGET instruction is issued (2).

Operation result

S1: CIP message receive data

	Value	
DT0	000DH	
DT1	00CBH	
DT2	0000H	
DT3	0001H	
DT4	02H	31H (1)
DT5	41H (A)	00H
DT6	34H	42H (B)
DT7	ffH	12H

Acquiring data equivalent to the character string length + 24 bytes

→

D1: Offset position

	Value
DT100	0007H→000BH

D2: Acquired data

	Value	
DT3000	0002H	
DT3001	‘B‘	‘A‘

Offset position after updating

	Value		
DT0			
DT1	1	0	CIP receive data
DT2	3	2	
DT3	5	4	1st data
DT4	7	6	
DT5	9	8	2nd data
DT6	B	A	
DT7	D	C	3rd data

(4) Acquiring data other than character string data from the offset position

[S1]... DT0 [S2]... H2 [D1]... DT100 [D2]... DT4000

S2: Acquired data format

	Value
Example 1	0002H

D1: Offset position

	Value
DT100	000BH(Note 1)

D2: Acquired data storage destination

	Value
DT4000	0000H
DT4001	0000H

(Note 1) The D1 offset position is updated to the start position of the 3rd data item when the CIPMGET instruction is issued (3).

Operation result

S1: CIP message receive data

	Value	
DT0	000DH	
DT1	00CBH	
DT2	0000H	
DT3	0001H	
DT4	02H	31H (1)
DT5	41H (A)	00H
DT6	34H	42H (B)
DT7	ffH	12H

Acquiring data equivalent to 2 bytes →

D1: Offset position

	Value
DT100	000BH→000DH

D2: Acquired data

	Value
DT4000	1234H
DT4001	0000H

Offset position after updating

	Value		
DT0			
DT1	1	0	CIP receive data
DT2	3	2	
DT3	5	4	1st data
DT4	7	6	
DT5	9	8	2nd data
DT6	B	A	
DT7	D	C	3rd data

■ Flag operations

Name	Description
SR7	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
SR8	To be set in case of out-of-range in indirect access (index modification).
(ER)	Set when a value outside the range is specified for the parameter.

Name	Description
	To be set when [D1] (offset position) exceeds the value of the 1st word (total number of data) of [S1] (CIP message) before processing.
	To be set when [D1] (offset position) exceeds the value of the 1st word (total number of data) of [S1] (CIP message) after processing.

■ CIP status codes

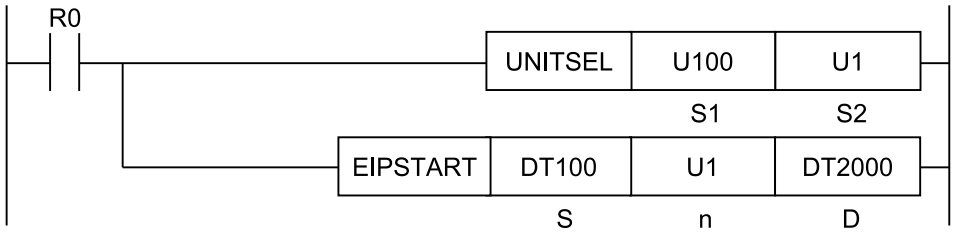
Status code	Status name	Description
0x00	Success	Execution of the service by the specified object was successful.
0x01	Communications Related Problem	A connection-related service was unsuccessful along the connection path.
0x02	Resource unavailable	The resources required for the object to perform the requested service were not available.
0x03	Invalid parameter value	To select the correct value for this condition, refer to Status Code 20 (hexadecimal number).
0x04	Path segment error	The path segment identifier or segment syntax was not interpreted by the processing node. Path processing is stopped if an error occurs in the path segment.
0x05	Path destination unknown	The path references an object class, instance, or structural element that is not identified or contained in the processing node. Path processing is stopped if a path destination unknown error occurs.
0x06	Partial transfer	Only part of the expected data was transferred.
0x07	Connection lost	The messaging connection was interrupted.
0x08	Service not supported	The requested service was not implemented. Or, it was not defined for this object class/instance.
0x09	Invalid attribute value	Invalid attribute data was detected.
0x0A	Attribute list error	An attribute in the Get_Attribute_List or Set_Attribute_List response has a non-zero status.
0x0B	Already in requested mode/state	The object is already in the mode/state being requested by the service.
0x0C	Object state conflict	The object cannot perform the requested service in the current mode/state.
0x0D	Object already exists	The requested instance of the object to be created already exists.
0x0E	Attribute not settable	A request to modify a non-modifiable attribute was received.
0x0F	Privilege violation	A permission/privilege verification was unsuccessful.
0x10	Device state conflict	The device cannot perform the requested service in the current mode/state.
0x11	Reply data too large	The data transmitted in the response buffer is larger than the allocated response buffer.
0x12	Fragmentation of a primitive value	The service specified an operation that is going to fragment a primitive data value, i.e. half a REAL data type.
0x13	Not enough data	The service did not supply enough data to perform the specified operation.
0x14	Attribute not supported	The attribute specified in the request is not supported
0x15	Too much data	The service supplied more data than was expected.

Status code	Status name	Description
0x16	Object instance does not exist	The specified object does not exist in the device.
0x17	Service fragmentation out of sequence	The fragmentation sequence for this service is not active for this data.
0x18	No stored attribute data	The attribute data of this object was not stored before the requested service.
0x19	Store operation failure	The attribute data of this object was not stored due to a detected error during the attempt.
0x1A	Routing failure, request packet too large	The service request packet was too large for transmission on a network in the path to the destination. The routing device was forced to stop the service.
0x1B	Routing failure, response packet too large	The service response packet was too large for transmission on a network in the path from the destination. The routing device was forced to stop the service.
0x1C	Missing attribute list entry data	The service did not provide an attribute from the attribute list required by the service to perform the requested behavior.
0x1D	Invalid attribute value list	The service returns the list of attributes that contains status information about invalid attributes.
0x1E	Embedded service error	An embedded service resulted in an error.
0x1F	Vendor specific error	A vendor-specific error was detected. The additional code field of the error response specifies the detected error. This general error code must only be used if none of the error codes displayed in this table or in an object class definition accurately represents the detected error.
0x20	Invalid parameter	A parameter associated with the request was invalid. This code is used if a parameter does not comply with the requirements of this specification and/or the requirements defined in an application object specification.
0x21	Write-once value or medium already written	An attempt was made to write to a write-once medium (for example, WORM drive, PROM) that has already been written. Or, an attempt was made to modify a value that cannot be modified once established.
0x22	Invalid Reply Received	An invalid response is received (for example, reply service code does not correspond to the request service code, or the response message is shorter than the minimum expected response size). This status code can be used for other purposes of invalid responses.
0x23	Buffer Overflow	The message received is larger than the receiving buffer can handle. The entire message was discarded.
0x24	Message Format Error	The format of the received message is not supported by the server.
0x25	Key Failure in path	The key segment that was included as the first segment in the path does not correspond to the target module. The object-specific status must specify which part of the key check was unsuccessful.
0x26	Path Size Invalid	The size of the path sent with the service request is either not large enough to allow the request to be forwarded to an object, or too much routing data has been included.
0x27	Unexpected attribute in list	The attribute cannot be set at this time.
0x28	Invalid Member ID	The member ID specified in the request does not exist in the specified class/instance/attribute.

Status code	Status name	Description
0x29	Member not settable	A request to modify a non-modifiable member was received.
0x2A	Group 2 only server general failure	This error code is reported by DeviceNet Group 2 only. It is used only as substitute for those with a code space of 4K or less, for the service not supported, for the attribute not supported, and for the attribute not settable.
0x2B	Unknown Modbus Error	A CIP to Modbus translator has received an undefined Modbus exception code.
0x2C	Attribute not gettable	A request to read a non-readable attribute was received.
0x2D	Instance Not Deletable	The requested object instance cannot be deleted.
0x2E	Service Not Supported for Specified Path 1	The object supports the service, but not for the designated application path (for example, attribute). Note: This cannot be used in cases where more specific general status codes are applied. Example: 0x0E (attributes are not settable) or 0x29 (members are not settable).
0x2F to 0xCF		Reserved by CIP for future extensions.
0xD0 to 0xFF	Reserved for Object Class specific errors	This range of error codes is to be used to indicate errors specific to the object class. Use of this range should only be performed when none of the error codes presented in this table accurately reflect the error that was encountered.

9.1.8 EIPSTART (Cyclic Communication Start Request)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ List of operands

Operand	Description
S	Specify the starting address of the device area that stores the start request node number table.
n	Specify the device address storing the maximum node number (1 to 256) or a constant.
D	Specify the device address storing execution results.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TS CS	TE CE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●													●
S2	●	●	●	●			●	●								●	●				●
D	●	●	●	●			●	●													●

■ Processing

- The instruction requests the starting of the EtherNet/IP cyclic communication according to the start request node number table that is stored in the area that starts from [S].
- For [n], specify the maximum node number among the nodes to which the start of the EtherNet/IP cyclic communication is requested.
- The execution result is stored in [D].

■ Operand [S] setting

- Specify the starting address of the device area that stores the start request node number table.
- Use a user program to create the start request node number table. Turn ON the bits (that is, set the bits to 1) that correspond to the node numbers to which the start request is made.

(Example) When [S] is set to WR100 and the start request is made to nodes number 1 and 2

Set bit 0 (R1000) and bit 1 (R1001) in WR100 to "1" and execute the EIPSTART instruction.

	Bit No.															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Node number	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	:															
	256	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241

■ Operand [n] setting

- Specify the device address storing the maximum node number or a constant.
- The number of valid words for the start request node number table varies (from 1 to 16 words) according to the maximum node number that is specified by [n].

Maximum node number	Number of valid words
0	0
1 to 16	1
17 to 32	2
33 to 48	3
49 to 64	4

Maximum node number	Number of valid words
:	:
225 to 239	15
241 to 256	16

■ Operand [D] setting

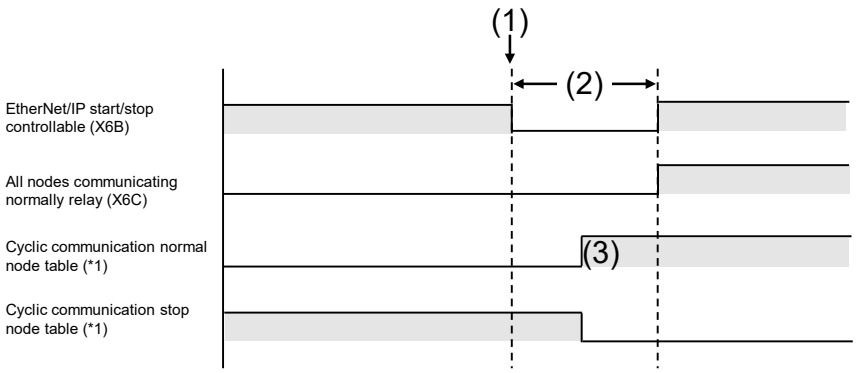
Specify the device address storing execution results.

Code	Status	Description
0	Normal end	The specified node start is complete.
1	In progress	The specified node start processing is in progress.
2	Start failed	The specified node start failed.
3	Multiple executions	Multiple execution of the EIPSTART instruction or the EIPSTOP instruction

■ Relay operation

When the cyclic communication start request instruction is executed and the cyclic communication of the specified node starts normally, the cyclic communication normal node table for the node is turned ON and the cyclic communication stop node table for the node is turned OFF.

Example) Relay operation when the cyclic communication start request is made on a stopped node



(Note 1) The state can be checked by the ETSTAT instruction.

(1)	Cyclic Communication Start Request (EIPSTART)	(2)	Instruction reception impossible period	(3)	The specified node start is complete.

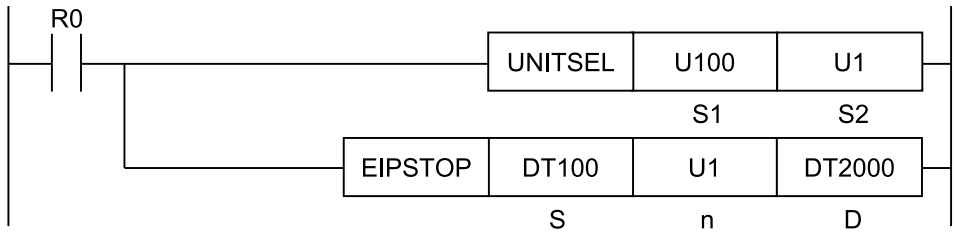
■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	Set when executed in an interrupt program.

Name	Description
	To be set when the value of [n] exceeds 256.
	To be set when the address that is specified by [S] + [Number of valid words for [n]] is out of the device range.
	To be set in the case of out-of-range in indirect access (index modification).

9.1.9 EIPSTOP (Cyclic Communication Stop Request)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ List of operands

Operand	Description
S	Specify the starting address of the device area that stores the stop request node number table.
n	Specify the device address storing the maximum node number (1 to 256) or a constant.
D	Specify the device address storing execution results.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TS CS	TE CE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●													●
S2	●	●	●	●			●	●								●	●				●
D	●	●	●	●			●	●													●

■ Processing

- The instruction requests the stopping of the EtherNet/IP cyclic communication according to the stop request node number table that is stored in the area that starts from [S].
- For [n], specify the maximum node number among the nodes to which the stop of the EtherNet/IP cyclic communication is requested.

- The execution result is stored in [D].

■ Operand [S] setting

- Specify the starting address of the device area that stores the stop request node number table.
- Use a user program to create the stop request node number table. Turn ON the bits (that is, set the bits to 1) that correspond to the node numbers to which the stop request is made.

Example) When [S] is set to WR100 and the stop request is made to nodes number 1 and 2
Set bit 0 (R1000) and bit 1 (R1001) in WR100 to "1" and execute the EIPSTOP instruction.

	Bit No.															
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Node number	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	:															
	256	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241

■ Operand [n] setting

- Specify the device address storing the maximum node number or a constant.
- The number of valid words for the stop request node number table varies (from 1 to 16 words) according to the maximum node number that is specified by [n].

Maximum node number	Number of valid words
0	0
1 to 16	1
17 to 32	2
33 to 48	3
49 to 64	4
:	:
225 to 239	15
241 to 256	16

■ Operand [D] setting

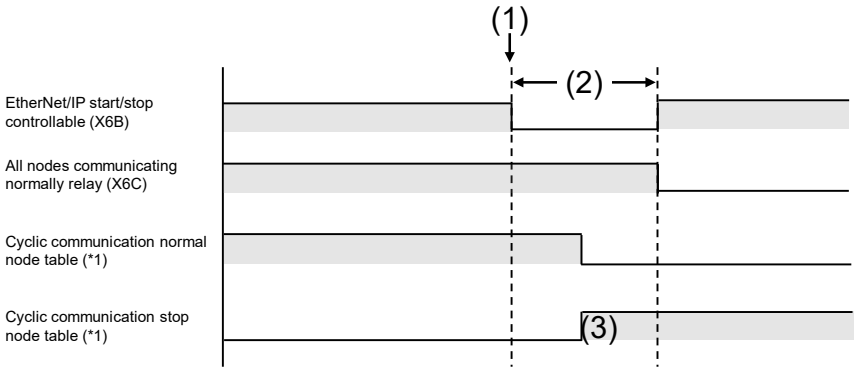
Specify the device address storing execution results.

Code	Status	Description
0	Normal end	The specified node stop is complete
1	In progress	The specified node stop processing is in progress.
2	Start failed	The specified node stop failed.
3	Multiple executions	Multiple execution of the EIPSTART instruction or the EIPSTOP instruction

■ Relay operation

When the cyclic communication stop request instruction is executed and the cyclic communication of the specified node stops normally, the cyclic communication stop node table for the node is turned ON and the cyclic communication normal node table for the node is turned OFF.

Example) Relay operation when the cyclic communication stop request is made on a started node



(Note 1) The state can be checked by the ETSTAT instruction.

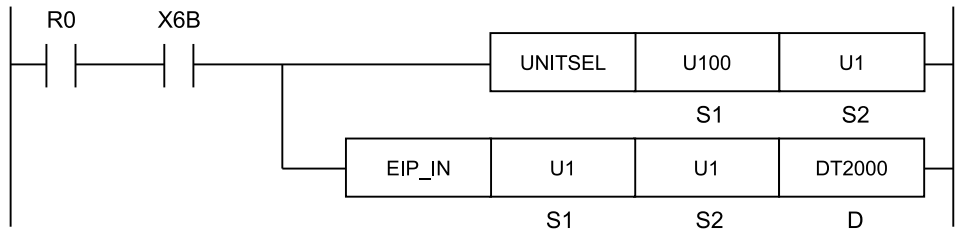
(1)	Cyclic Communication Stop Request (EIPSTOP)	(2)	Instruction reception impossible period	(3)	The specified node stop is complete

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	Set when executed in an interrupt program.
	To be set when the value of [n] exceeds 256.
	To be set when the address that is specified by [S] + [Number of valid words for [n]] is out of the device range.
	To be set in the case of out-of-range in indirect access (index modification).

9.1.10 EIP_IN (EtherNet/IP Input Refresh)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ List of operands

Operand	Description
S1	Specify the target node number of the input refresh.
S2	Specify the target connection number of the input refresh.
D	Specify the device address storing refresh results.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TS CS	TE CE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●								●	●			●	●
S2	●	●	●	●			●	●								●	●			●	●
D	●	●	●	●			●	●													●

■ Processing

- Only when the connection that is to be refreshed receives new data, this instruction refreshes data for the connection. "Input refresh" means that the data is copied from the receive buffers to the allocated devices.

■ Precautions for programming

- Execute this instruction after the EtherNet/IP preparation done flag (X6B) turns ON. If the instruction is executed before the flag turns ON, the EtherNet/IP communication preparation incomplete error occurs.
- This instruction causes a processing load. Do not execute the instruction successively in one scan.
- Before executing this instruction, use the cyclic communication normal node table to confirm that the communication of the specified connection is performed normally. The cyclic

communication normal node table can be checked by using the "ETSTAT (Acquiring EtherNet/IP Information)" instruction.

- Use this instruction only for the connections in which the refresh method of the "EtherNet/IP setting" is set to "Instruction" by the tool software. An operation error occurs if the batch refresh method or the division refresh method is specified.

■ Operand [S1] setting

Specify a node number to be refreshed. An error occurs when a value over the maximum value specified by the scan list is specified.

An error also occurs when a reserved node is specified.

	Set value
Scan List	1 to 256

■ Operand [S2] setting

Specify a connection number to be refreshed. Specify a relative number within nodes for the connection number.

An error occurs when a value over the maximum value specified by the scan list is specified.

	Set value
Connection number	1 to 256

■ Operand [D] setting

- Specify the device address storing refresh results.
- When there is no new received data, the refresh operation is not performed.

Execution result	Description
0	Refresh operation is complete successfully.
1	No data is received. Refresh is not performed.
2	EtherNet/IP communication preparation incomplete

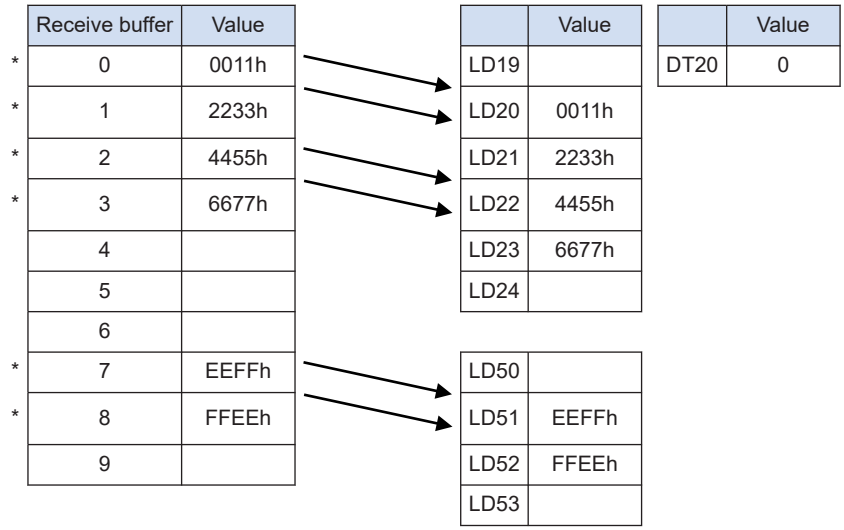
■ Usage example

Example 1) Refreshing data from the receive buffer of connection number 1 of node number 1 (when the refresh is completed normally)

[S1]... U1 [S2]... U1 [D]... DT20

- EtherNet/IP configuration setting

Setting item	Settings
Node number	1
Connection	1
Input information (T>0) device allocation	LD20 to LD23
	LD51 to LD52



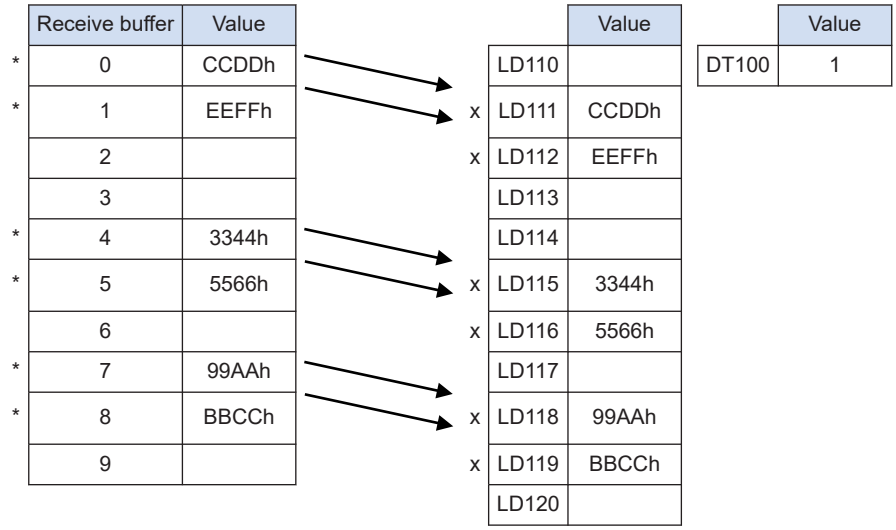
(Note 1) Receive buffers to which devices are allocated

Example 2) Refreshing data from the receive buffer of the connection 2 of the node number 5 (when there is no new data)

[S1]... U5 [S2]... U2 [D]... DT100

- EtherNet/IP configuration setting

Setting item	Settings
Node number	5
Connection	2
Input information (T>0) device allocation	LD111 to LD112
	LD115 to LD116
	LD118 to LD119



(Note 1) Receive buffers to which devices are allocated

Example 3) When refreshing data by the periodical interrupt processing when the scan time is long and RPI is short. (When acquiring for each received data)

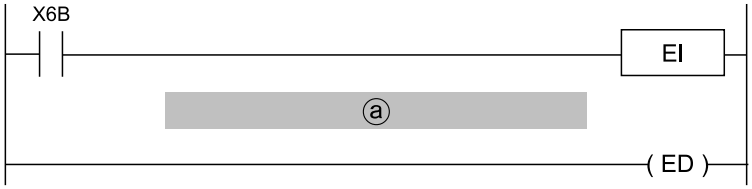
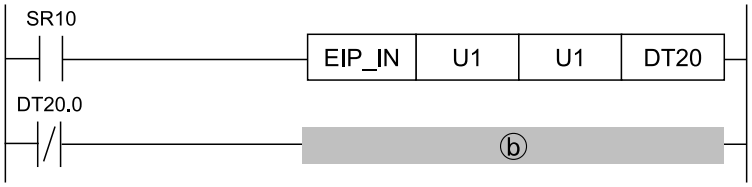
Scan time: 10 ms,

RPI (transmission interval for the EtherNet/IP cyclic communication): 500 µs

- When the scan time is longer than the setting time of RPI, the refresh cannot be executed during the processing. In this case, describe the EIP_IN instruction in a fixed cycle execution type PB and use interrupt processing to execute the refresh.
- If the interrupt cycle is set to the same value as that of RPI, the refresh instruction may be executed while the receive buffer is being written, and the operation may fail. Perform the processing after checking the refresh result.

EtherNet/IP configuration setting

Setting item	Settings
Node number	1
Connection	1
Input information (T>0) device allocation	LD0 to LD1

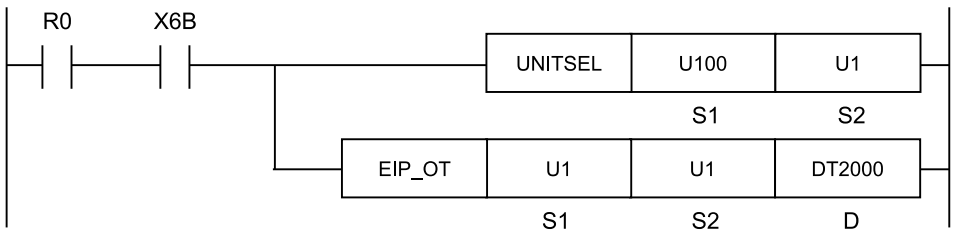
Every scan execution Program block		
	(a)	Processing that takes 10 ms or more
Constant period execution time (0.1 ms units) Program block 0.5-ms cyclic program		
	(b)	Only when refresh is completed successfully, data can be adopted (LD0 and LD1 in this case).

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range values in indirect access (index modification).
	Set when a value outside the range is specified for the parameter.
	To be set when the node that is specified by [S1] or the connection that is specified by [S2] does not exist.
	Use this instruction only for the connections in which the refresh method of the EtherNet/IP setting is set to Instruction. An operation error occurs when the connection that other refresh method other than that has been specified is specified.
	To be set when the connection for which the number of input data is 0 is specified.
	To be set when the connection for which the number of refreshed data is 0 is specified.

9.1.11 EIP_OT (EtherNet/IP Output Refresh)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U100 (built-in ET-LAN in the CPU unit) and S2=U1 (connection number 1) are specified by the UNITSEL instruction.

■ List of operands

Operand	Description
S1	Specify a target node number of output fresh.
S2	Specify a target connection number of output refresh.
D	Specify the device address storing refresh results.

■ Devices that can be specified (indicated by ●)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	" "	
S1	●	●	●	●			●	●								●	●				●
S2	●	●	●	●			●	●								●	●				●
D	●	●	●	●			●	●													●

■ Processing

- This instruction executes the output refresh for connections to be refreshed. "Output refresh" means that the data is copied from the allocated devices to the send buffers.

■ Precautions for programming

- Execute this instruction after the EtherNet/IP preparation done flag (X6B) turns ON. If the instruction is executed before the flag turns ON, the EtherNet/IP communication preparation incomplete error occurs.
- This instruction causes a processing load. Do not execute the instruction successively in one scan.
- Before executing this instruction, use the cyclic communication normal node table to confirm that the communication of the specified connection is performed normally. The cyclic communication normal node table can be checked by using the "ETSTAT (Acquiring EtherNet/IP Information)" instruction.
- Use this instruction only for the connections in which the refresh method of the "EtherNet/IP setting" is set to "Instruction" by the tool software. An operation error occurs if the batch refresh method or the division refresh method is specified.

■ Operand [S1] setting

- Specify the node number that data is set to the send buffer.
- The I/O map is used for sending data to a destination scanner device (PLC).

	Set value
I/O map	0
Scan List	1 to 256

■ Operand [S2] setting

Specify a connection number to be refreshed. Specify a relative number within nodes for the connection number.

	Set value
I/O map number or connection number	1 to 256

■ Operand [D] setting

- Specify the device address storing refresh results.
- If this instruction is executed in a cycle faster than RPI, the output refresh may not be performed.

Execution result	Description
0	Refresh operation is complete successfully.
1	Refresh is not performed.
2	EtherNet/IP communication preparation incomplete

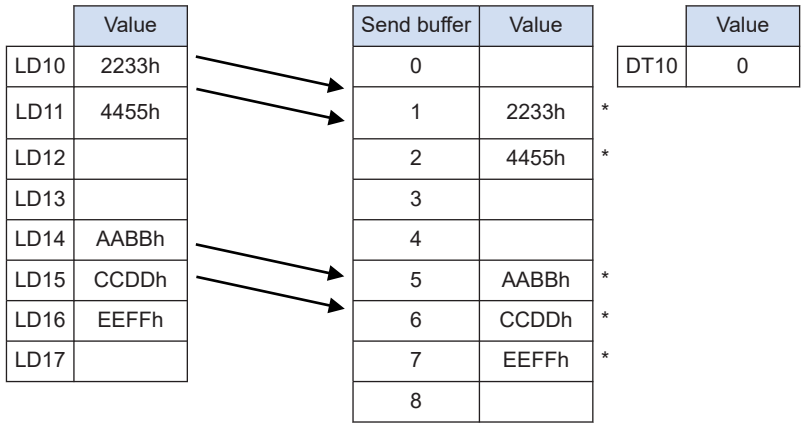
■ Usage example

Example 1) When performing the output refresh for the send buffer of the I/O map number 1 (Normal end)

[S1]... U0 [S2]... U1 [D]... DT10

- EtherNet/IP configuration setting

Setting item	Settings
I/O map number	1
Device Allocation	LD10 to LD11
	LD14 to LD16



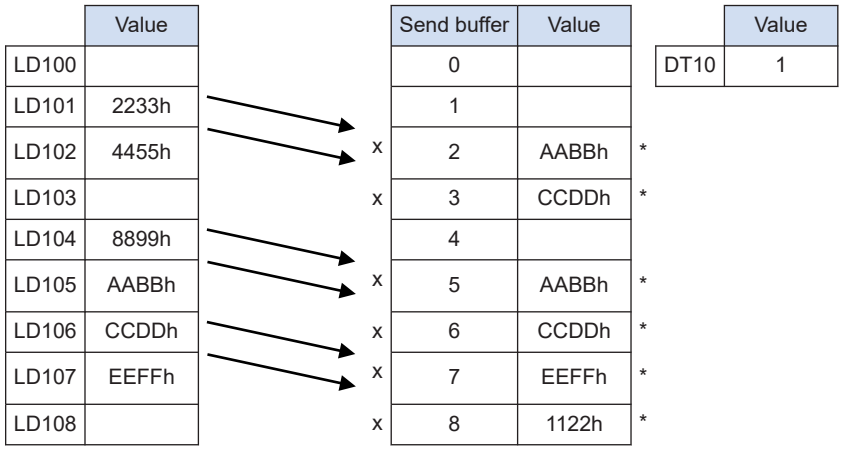
(Note 1) Send buffers to which devices are allocated

Example 2) When performing the output refresh for the send buffer of the connection number 5 of the node number 2 (Abnormal end)

[S1]... U2 [S2]... U5 [D]... DT100

- EtherNet/IP configuration setting

Setting item	Settings
Node number	2
Connection	5
Output Information (O>T) Device Allocation	LD101 to LD102
	LD104 to LD107



(Note 1) Send buffers to which devices are allocated

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set when the unit specified by UNITSEL is not the built-in ET-LAN.
	To be set when the EtherNet/IP function is set to Not Use in the Ethernet unit configuration.
	To be set in case of out-of-range values in indirect access (index modification).
	Set when a value outside the range is specified for the parameter.
	To be set when the I/O map, node, or connection that is specified by [S1] or [S2] does not exist.
	Use this instruction only for the connections in which the refresh method of the EtherNet/IP setting is set to Instruction. An operation error occurs when the connection that other refresh method other than that has been specified is specified.
	To be set when the connection for which the amount of output data is 0 is specified.
	To be set when the connection for which the number of refreshed data is 0 is specified.

10 Data Refresh of Cyclic Communication

10.1 What is Data Refresh? 10-2
10.1.1 Input Refresh T>O Direction 10-2
10.1.2 Output Refresh O>T Direction 10-2
10.2 Data Refresh Method 10-3
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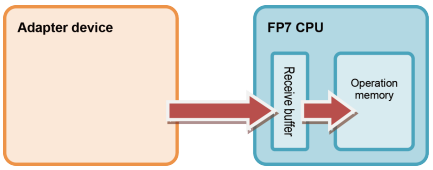
10.1 What is Data Refresh?

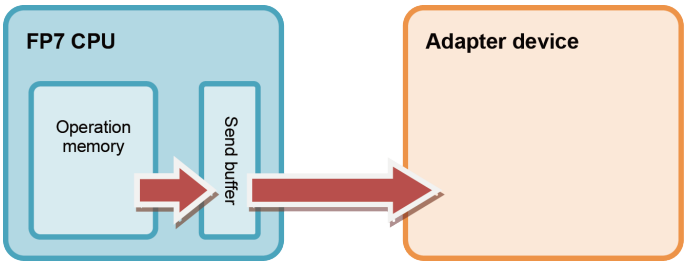
10.1.1 Input Refresh T>O Direction

Data is refreshed as follows at the time of input.



10.1.2 Output Refresh O>T Direction

Data is refreshed as follows at the time of output.



10.2 Data Refresh Method

There are the following data refresh methods.

Abnormality judgement	Details
Batch refresh	In refresh processing at the beginning of scan, if there is incoming data in the receive buffer for cyclic communication in the case of input direction, it is copied to the operation memory. In the case of output direction, if there is a space in the send buffer for cyclic communication, data is copied from the operation memory. The batch refresh processing is always performed for all the specified connections.
Division refresh	Data is copied at the same time as the batch refresh, however, if the number of transferred words exceeds the number of words specified by the refresh capacity during basic setup, the refresh process will be interrupted and data will be refreshed in the next scan. As the number of transferred data during one scan can be limited, it is possible to suppress and smooth the fluctuation of scanning due to the transfer processing. However, the response time of connections postponed to subsequent scan processings becomes long.
Instruction refresh	Data is not copied automatically like batch refresh and division refresh. Data can be refreshed using the EIP_IN instruction for the input refresh, and using the EIP_OT instruction for the output refresh. Concrete usage example When a scan time is long, received data in the input direction of the RPI shorter than the scan time is surely loaded. The EIP_IN instruction is executed in an interrupt program of a fixed cycle.

10.3 Delay Time of Transmission Data

When data sent to an adapter device from the FP7 is received or controlled by the adapter device, a delay occurs in the FP7 and adapter device.

■ Delay time of FP7

A delay caused by the transmission cycle of an adapter device and the FP7 refresh timing occurs.

The delay time on the FP7 side depends on the scan time of the FP7 and the RPI value of the EtherNet/IP communication.

Pattern	Relation between scan time and RPI	Delay time
1	Scan time < RPI and Scan time × 4 ≧ RPI	Scan time
2	Scan time < RPI and Scan time × 4 < RPI	Scan time × 4 or Larger value of RPI × 1/16
3	Scan time ≒ RPI	Scan time (RPI)
4	Scan time > RPI	RPI

■ Delay time of adapter devices

The delay time of an adapter device is the total of the delays caused by reception processing and output control to output devices.

Delay time on adapter side = Delay due to receive processing + Delay due to output control to output device

Info.

- The delay time of adapter devices varies depending on the device.
  Refer to manuals of adapter devices.

10.4 Delay Time of Reception Data

When data sent to the FP7 from an adapter device is received, a delay occurs in the adapter device and FP7.

■ Delay time of adapter devices

The delay time of an adapter device is the total of the delays caused by input processing and transmission processing.

Adapter delay time = Delay due to input processing + Delay due to transmission processing

Info.

- The delay time of adapter devices varies depending on the device.
  Refer to manuals of adapter devices.

■ Delay time of FP7 (scanner)

A delay caused by the transmission cycle of an adapter device and the FP7 refresh timing occurs.

The delay time on the FP7 side depends on the scan time of the FP7 and the RPI value of the EtherNet/IP communication.

Pattern	Relation between scan time and RPI	Delay time
1	Scan time < RPI	Scan time
2	Scan time ≒ RPI	Scan time (RPI) × 2
3	Scan time > RPI	RPI

(MEMO)

11 Cyclic Communication Load Factor

11.1 Calculation Method of Load Factor 11-2
11.2 PLC Link and Ethernet Switch 11-4

11.1 Calculation Method of Load Factor

The communication load factor is a value obtained by dividing the number of communication packets that an EtherNet/IP device sends/receives per second by a cyclic communication allowable communication band (the number of packets that can be sent/received per second).

Info.

- The load factors used with FP7 and each adapter device must be 100% or less.

■ Load factor of FP7

$$\text{Adapter communication load factor} = \frac{\textit{Number of communication packets sent/received per second (pps)}}{\textit{Cyclic communication allowable communication band (pps)}} \times 100\%$$

Calculation procedure (1) Calculation of the number of communication packets sent/received per second (pps)

Calculated from RPI* pps = 1000 ÷ RPI [ms]
When the COS (Change of State) trigger is set, it calculated as a communication cycle RPI x 1/4.

Example 1) For connection configurations where RPI is 0.5 [ms]
1000 ÷ 0.5 = 2000 pps

Example 2) For connection configurations where RPI is 0.5 [ms] and the COS trigger is set
1000 ÷ (0.5 × (1/4)) = 500 pps

Calculation procedure (2) Calculation of the cyclic communication allowable communication band (pps)

Acquired from the data size per packet*2 and EDS information "capacity" for FP7.
FP7_EDS [Capacity] definition
2 to 510 bytes: 10,000 pps
511 to 1450 bytes: 5000 pps

*2. Connection transmission/reception data size = Raw data size + 32-bit header size*3

*3. Without 32-bit header: 2 bytes
With 32-bit header: 6 bytes

Example 3) When the connection transmission raw data size is 256 bytes without 32-bit header
(256 + 2) = 258 bytes ≦ 510 ⇒ 10,000 pps

Example 4) When the connection transmission raw data size is 512 bytes with 32-bit header
(512 + 6) = 518 bytes ≧ 511 ⇒ 5000 pps

Calculation procedure 3) Calculating the uni communication load factor from the number of sent/received packets (pps) and sent/received data size

Example 5) When the send data size is 256 bytes and the receive data size is 86 bytes
Number of send packets (2000 pps) ÷ 10,000 pps × 100% = 20%
Number of receive packets (125 pps) ÷ 10,000 pps × 100% = 1.25%
⇒ The unit communication load factor is 20% + 1.25% = 21.25%.

■ Load factor of adapter

The load factor is calculated from the EDS information "capacity" of each adapter and scanner. When EDS information is not registered, "Impossible to calculate" is displayed.

$$\text{Adapter communication load factor} = \frac{\textit{Number of communication packets sent/received per second (pps)}}{\textit{Cyclic communication allowable communication band (pps)}} \times 100\%$$

Calculation procedure (1-1) Calculation of the number of communication packets sent/received per second (pps)*4

The calculation method is the same as calculation procedure (1) for unit load factor.

*4 When the IGMP snoop function is "Invalid" and the connection type is "Point to Point", multicast communication packets (pps) are added.

Calculation procedure 2) Calculating the cyclic communication allowable communication band (pps)

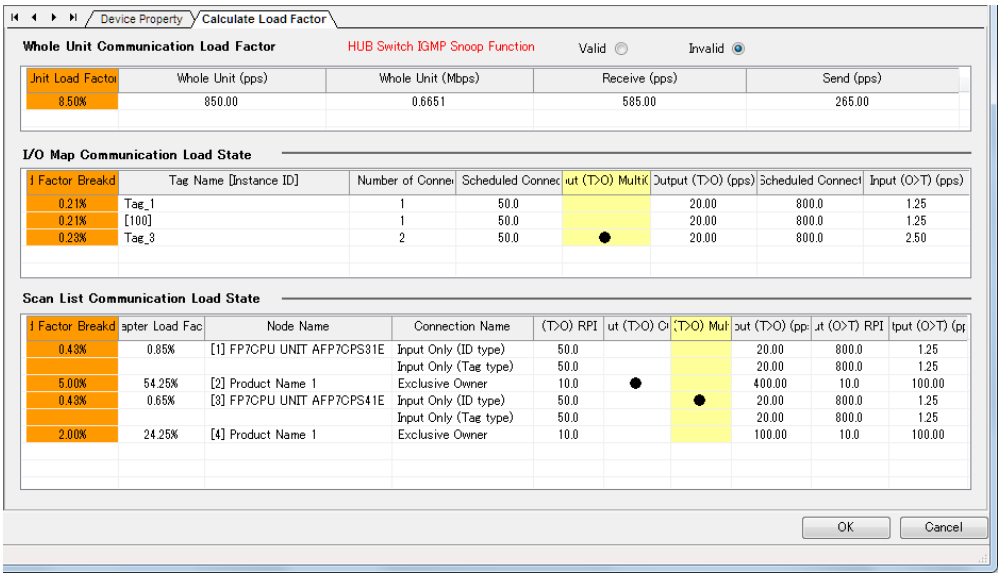
Retrieve from the data size per packet*2 and EDS information "capacity" for adapters and scanners.

The calculation method is the same as the calculation procedure 2) of unit load factor.

Calculation procedure 3) Calculating the uni communication load factor from the number of sent/received packets (pps) and sent/received data size

The calculation method is the same as calculation procedure (3) for unit load factor.

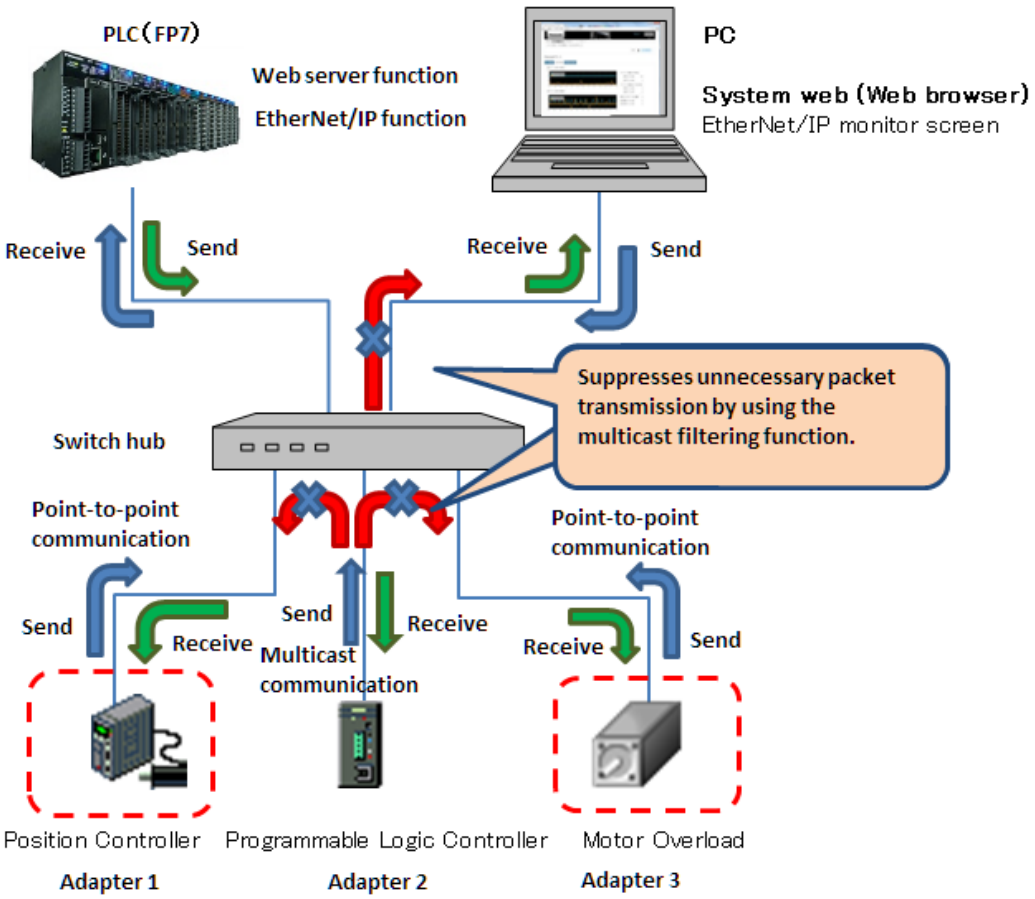
Load factor calculation screen of EtherNet/IP configuration tool



11.2 PLC Link and Ethernet Switch

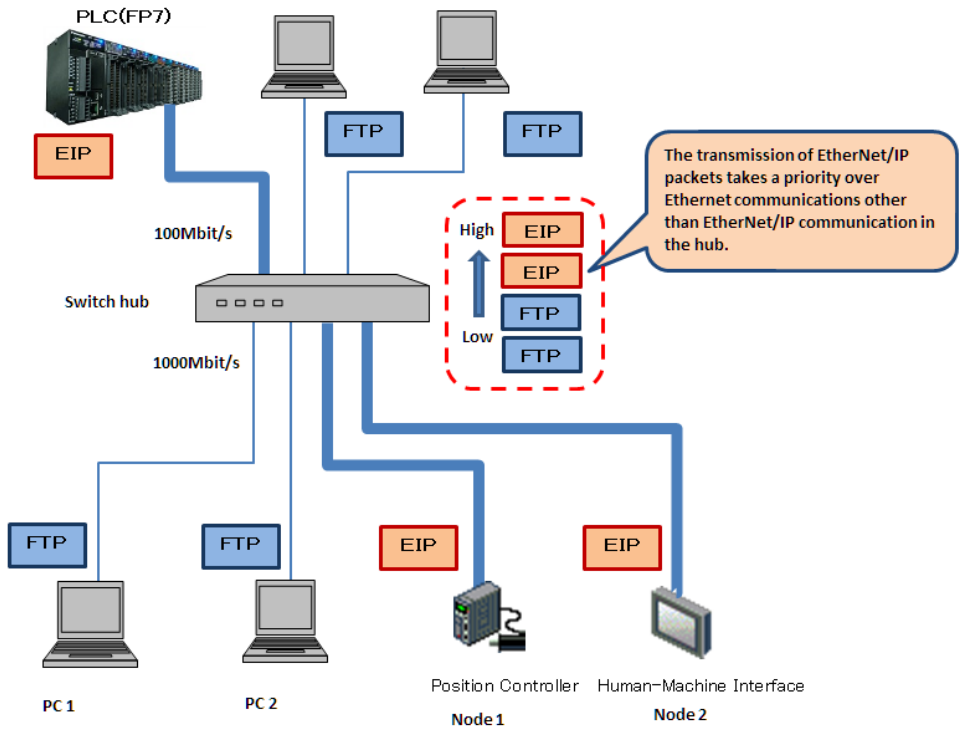
■ Multicast filter function

This function is used to suppress unnecessary multicast packet transmission.



■ QOS (Quality of Service) function

The transmission of EtherNet/IP packets takes a priority over Ethernet communications other than EtherNet/IP communication in the hub.


PLC(FP7)
EIP
FTP
FTP
100Mbit/s
Switch hub
1000Mbit/s
High
EIP
EIP
FTP
FTP
Low
The transmission of EtherNet/IP packets takes a priority over Ethernet communications other than EtherNet/IP communication in the hub.
FTP
FTP
EIP
EIP
PC 1
PC 2
Position Controller
Node 1
Human-Machine Interface
Node 2

(MEMO)

12 Other Ethernet Communications

12.1 Performance of Other Ethernet Communications at the Time of Cyclic Communication 12-2

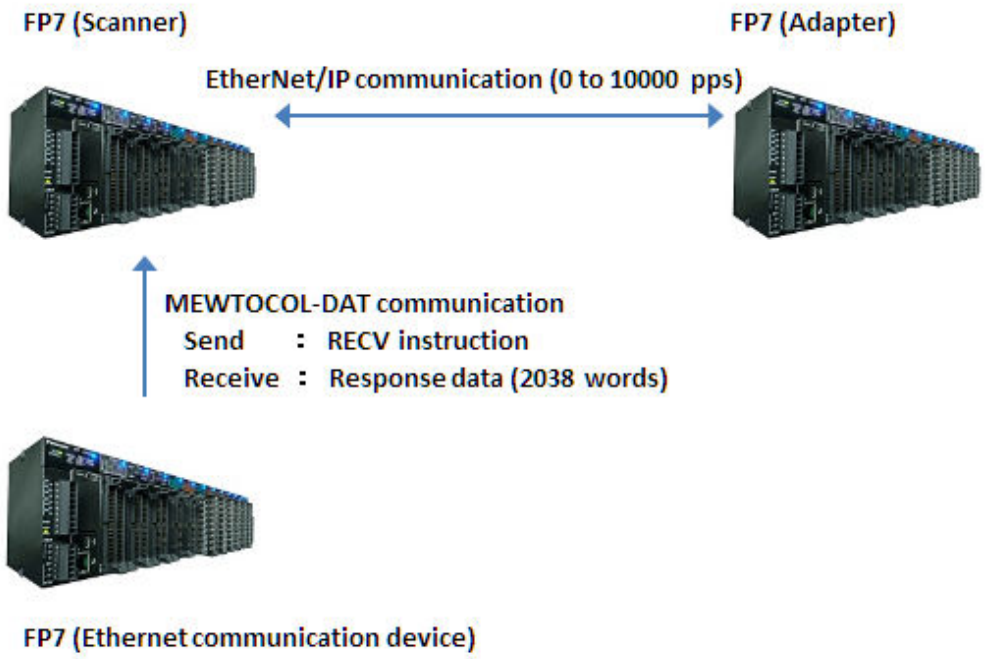
12.1 Performance of Other Ethernet Communications at the Time of Cyclic Communication

As the EtherNet/IP communication takes a priority over other Ethernet communications, the baud rates of other Ethernet communications are decreased when the EtherNet/IP communication is performed simultaneously.

The following information serves as a standard in the determination of the decrease in baud rate.

■ MEWTOCOL-DAT (1)

System Configuration



The connection settings used for the EtherNet/IP communication are as follows.

Send/Receive	Details	
Number of connections	66	
Application type	Input Only (ID type)	
RPI	(Note 2)	
Data size per connection(Note 1)	Connections 1 to 65	252 words
	Connection 66	4 words
Connection type	Point to Point	
Refresh method	Batch	

(Note 1) The total data size of 66 connections is 16,384 words (the maximum value for which device allocation is available).

(Note 2) RPI is measured with the following settings.

pps	RPI	
0 pps	The EtherNet/IP function is set to Invalid.	
2500 pps	Connections 1 to 3	29 ms
	Connections 4 to 66	28 ms
5000 pps	Connection 1	15 ms
	Connections 2 to 66	14 ms
7500 pps	Connections 1 to 3	10 ms
	Connections 4 to 66	9 ms
10000 pps	Connections 1 to 65	7 ms
	Connections 66	8 ms

The Ethernet communication (MEWTOCOL-DAT) between FP7 (Ethernet communication device) and FP7 (Scanner) is performed as follows.

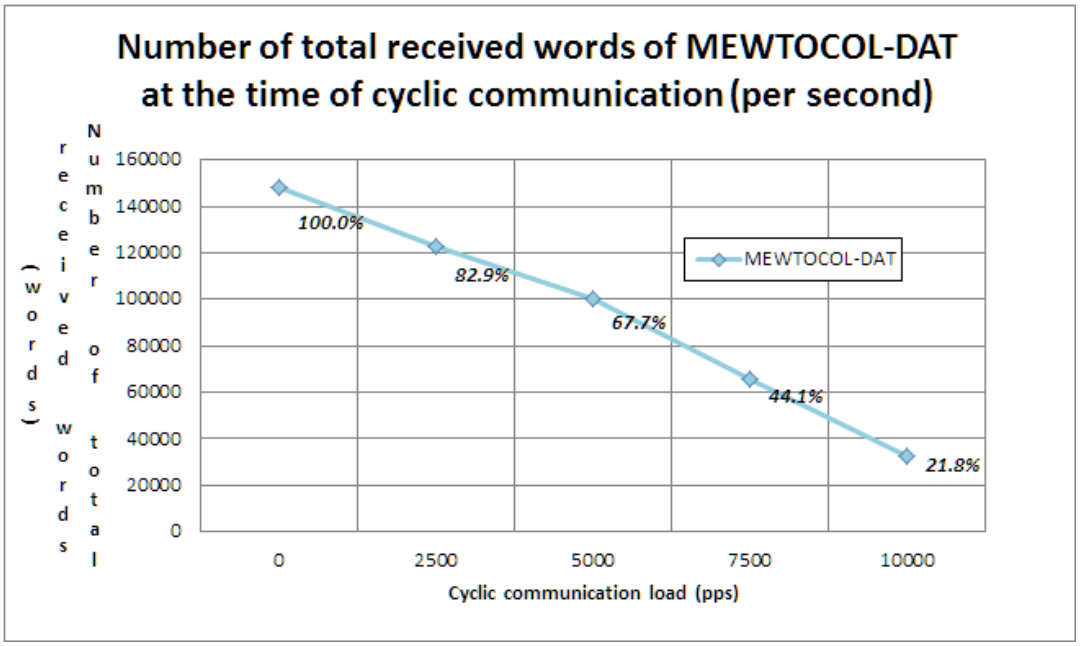
Send/Receive	Details
Communication protocol	MEWTOCOL-DAT
Number of connections	1
Send(Note 1)	RECV instruction is issued. (2038 words are requested.)
Receive(Note 2)	Response data for RECV instruction is sent. (Response data of 2038 words is received.)

(Note 1) FP7 (Ethernet communication device) to FP7 (Scanner)

(Note 2) FP7 (Scanner) to FP7 (Ethernet communication device)

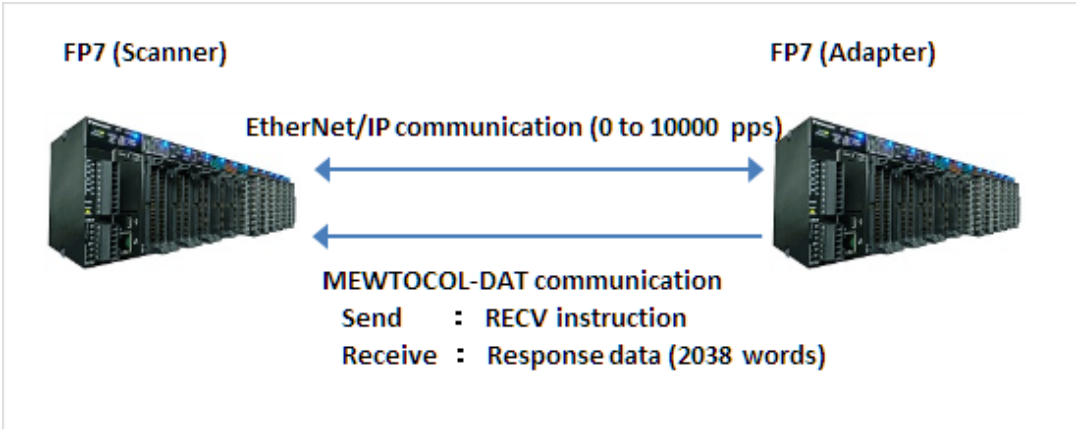
Decrease in baud rate due to increase in PPS

As a result of performing Ethernet communication from FP7 (Ethernet communication device) during the EtherNet/IP communication between FP7 (scanner) and FP7 (adapter), the baud rate is decreased as follows.



■ **MEWTOCOL-DAT (2)**

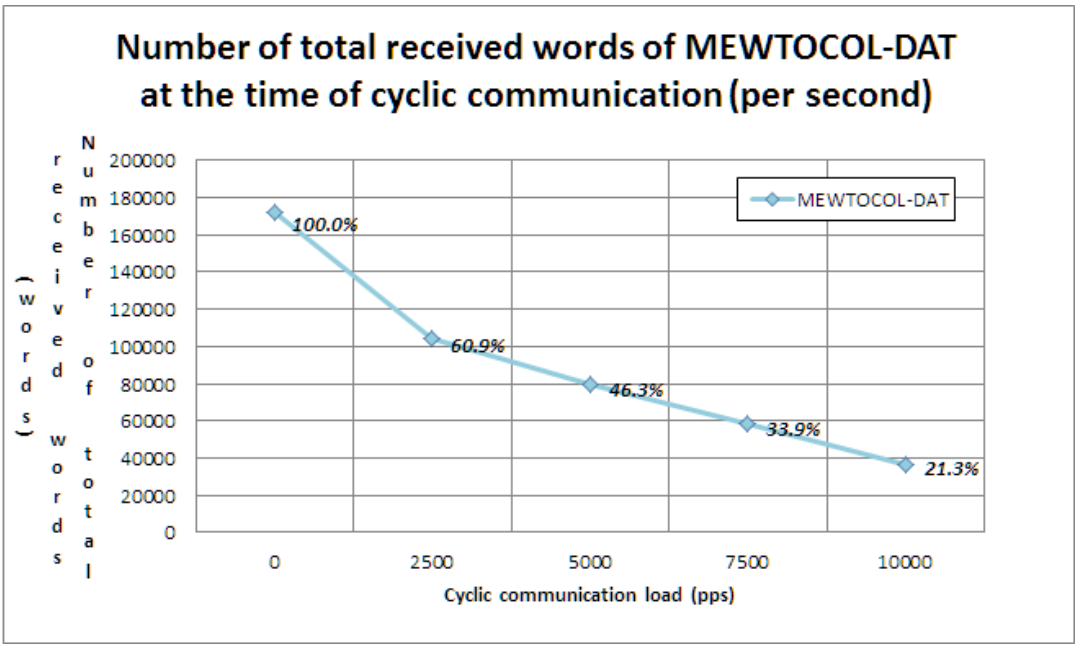
System Configuration



*The settings for EtherNet/IP communication and MEWTOCOL-DAT communication are the same as those for the above "MEWTOCOL-DAT (1)".

Decrease in baud rate due to increase in PPS

As a result of performing Ethernet communication from FP7 (scanner) during the EtherNet/IP communication between FP7 (scanner) and FP7 (adapter), the baud rate is decreased as follows.


Number of total received words of MEWTOCOL-DAT at the time of cyclic communication (per second)
Number of total received words (words)
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
MEWTOCOL-DAT
100.0%
60.9%
46.3%
33.9%
21.3%
0
2500
5000
7500
10000
Cyclic communication load (pps)

(MEMO)

13 Monitoring Communication Status Using the System Web

13.1 Overview of FP7 System Web 13-2
13.2 Starting System Web Screen 13-4
13.3 Overview of EtherNet/IP Monitor 13-5
13.4 CPU Status Indication > EtherNet/IP Monitor 13-6

13.1 Overview of FP7 System Web

■ What is FP7 System Web?

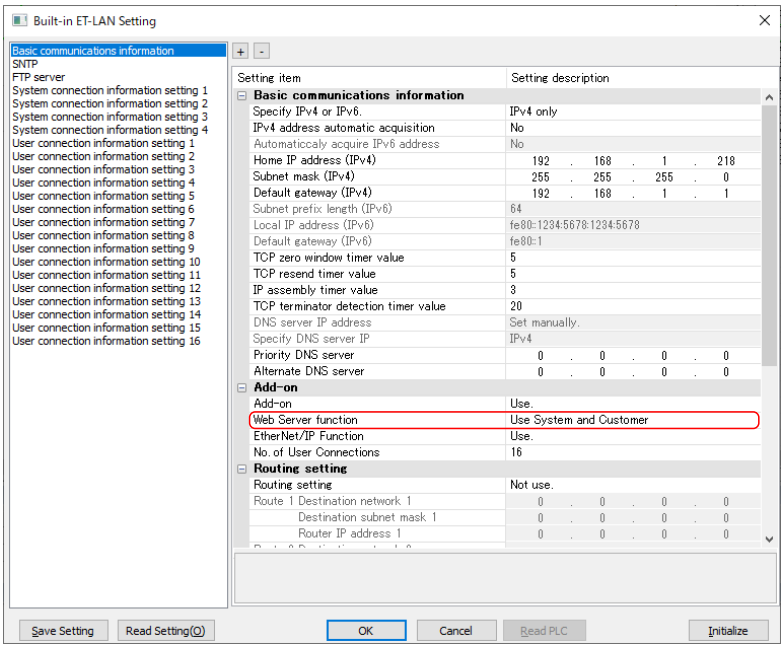
The FP7 system web is a content prepared for the FP7 CPU unit as standard.

The basic information and operation state of FP7 can be monitored on a browser by using this function.

■ For using the FP7 system web

To use the system web function, the web server function in the **built-in ET-LAN setting** of the FP7 configuration should be set to "Use System Only" or "Use System and Customer".

For details on the startup method of the "built-in ET-LAN setting" dialog, refer to "7.1.1 How to Display the Built-in ET-LAN Setting Dialog Box".

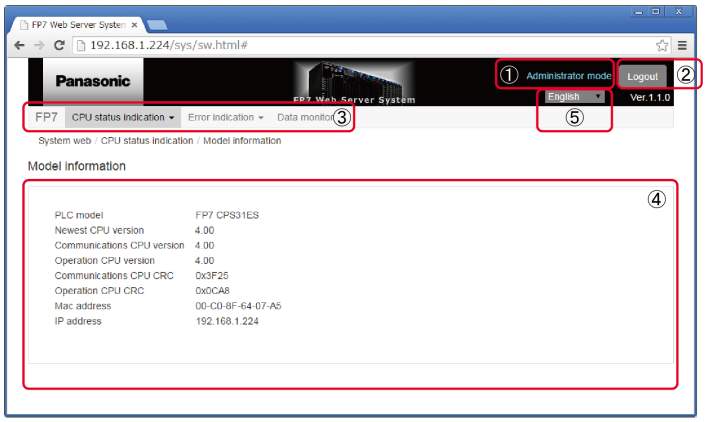


■ Notes concerning FP7 system web

In this manual, the system web screens other than the EtherNet/IP communication state monitor are omitted.

■ Screen configuration

Screen configuration of FP7 system web



Info.

- The old model product number is displayed on the screen.

Item		Description
(1) Administrator mode		Displays the level of the logged-in user.
	1) For administrator	Administrator mode (Blue)
	2) For user	No indication
(2) Log out		Returns to the login screen.
(3) System menu		The menu for selecting functions.
	1) FP7	Links to the website of our product (FP7).
	2) CPU status indication	Displays the FP7 model information, operation state, and system monitor area.
	3) Error indication	Displays unit errors and error alarm relays.
	4) Data monitor	Monitors the data of a specified device.
(4) Drawing area		Displays the screen of a selected function.
(5) Language		Switches the language between Japanese and English.

13.2 Starting System Web Screen

It is necessary to access and log in the FP7 web server for starting the FP7 system web screen. Enter a user ID (root) and password (pass) on the login screen.

■ How to access the FP7 web server

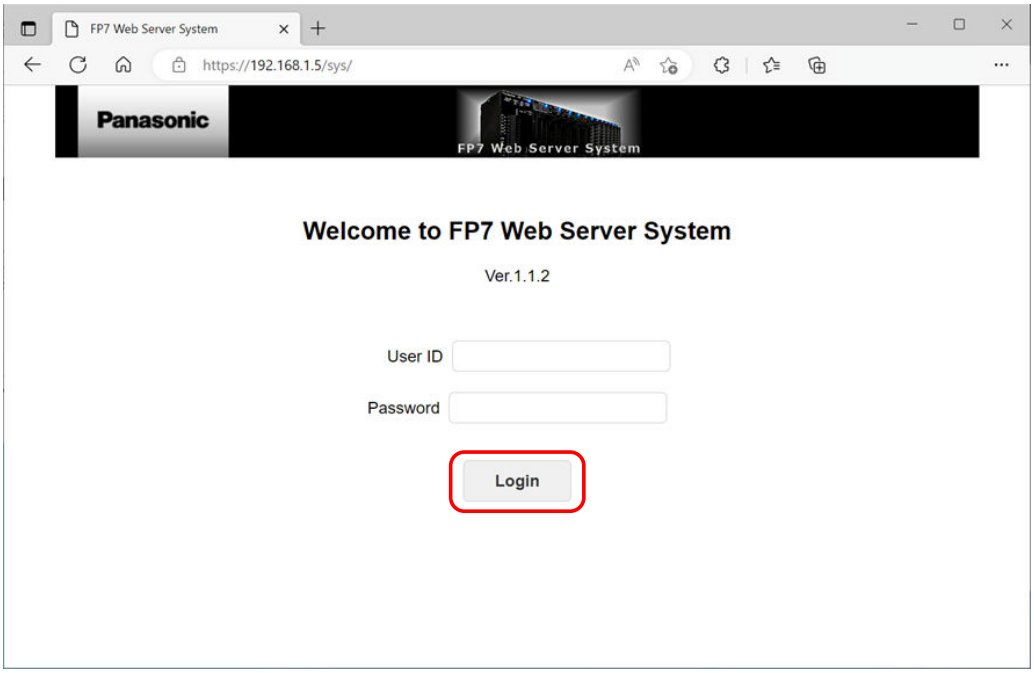
IP address/sys/
Example) 192.168.1.224/sys/
http://192.168.1.224/sys/index.html is displayed.

Info.

- If the FP7 unit is password-protected, you can only log in with a registered ID and password.

Procedure

1. Enter "User ID" and "Password" on the start-up screen and click "Login".

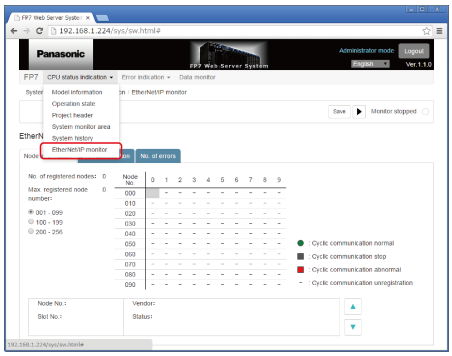


- **When entering Login ID or Password failed**
  The following error message is displayed until the third try.
  "User ID or Password is invalid."
  The following error message is displayed from the fourth try.
  (The system is restored when the unit is rebooted or one hour elapses.)
  "FP7 was locked due to three failed login attempts. Please reboot FP7."
- **When the entered login ID and password are correct**
  The initial screen (**CPU status indication**>**Model information**) is displayed.

13.3 Overview of EtherNet/IP Monitor

Displays EtherNet/IP communication status via the "node information", "load information" and "number of errors" tabs.

Select **CPU status indication**>**EtherNet/IP monitor** in the **system menu** as shown below.



13.4 CPU Status Indication > EtherNet/IP Monitor

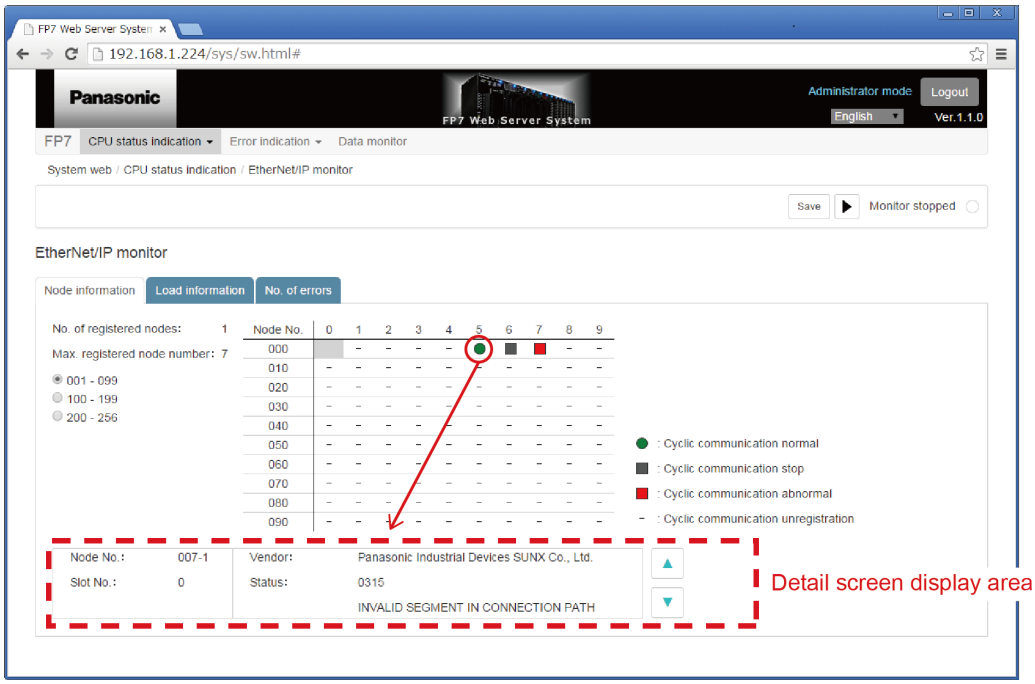
Displays the FP7 "EtherNet/IP monitor".

■ Common function to each screen

[Save] button
Saves the displayed EtherNet/IP monitor information. (CSV format)

Procedure

1. When the "Node information" tab is selected



- "Node information" (EtherNet/IP operation status monitor)
  It shows the following information.
  1. Number of registered nodes: (0 to 256)
  2. Maximum number of registered nodes: (0 to 256)
  3. Operation state of each node: (Cyclic communication: ● Normal/■ Stop/■ Abnormal/- Unregistered)

  Clicking the list display shows detail information (the following items) in the lower part of the screen.

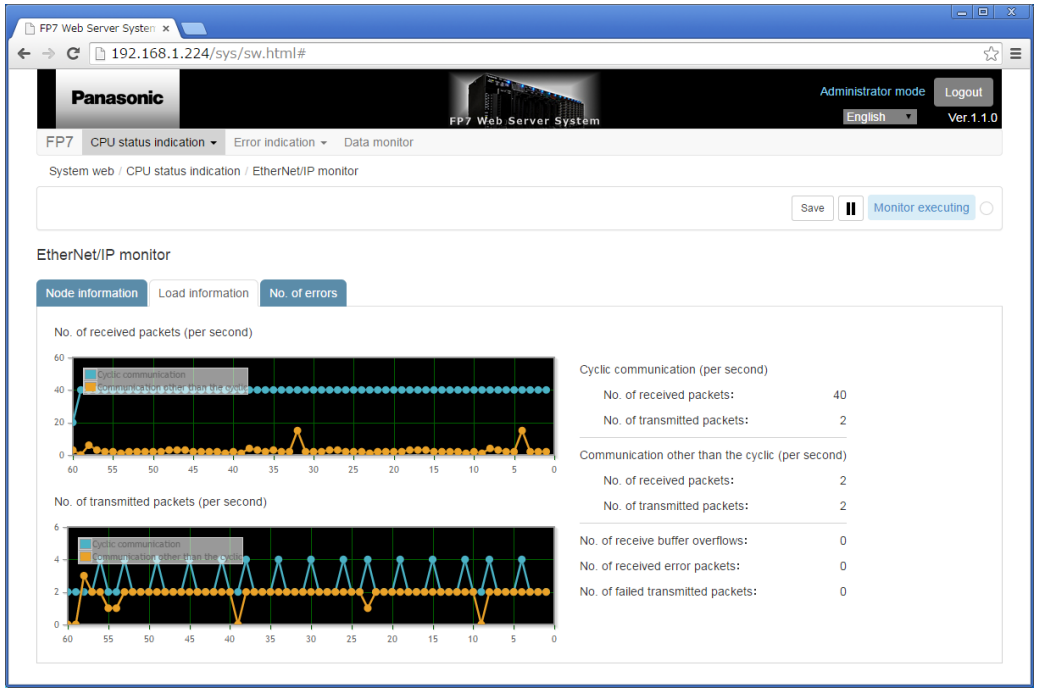
  "Node No.", "Slot No.", "Vendor", "Status": Code and content

  When more than one error occurs within one node, you can switch between them with the [▲] and [▼] buttons.

  The list display is switched by selecting a node range (No. "001–099", "100–199", or "200–256").
- [Run/stop monitoring] button

Update processing is performed only once. It returns to the monitoring-stopped state after updating data.

2. When "Load information" is selected



- "Load information" (EtherNet/IP operation status monitor)

  It shows the following information.

  1. 1) Cyclic communication: No. of received packets (per second)
  2. 2) Cyclic communication: No. of transmitted packets (per second)
  3. 3) Communication other than cyclic communication: No. of received packets (per second)
  4. 4) Communication other than cyclic communication: No. of transmitted packets (per second)
  5. 5) Number of receive buffer overflows (Total)
  6. 6) Number of received error packets (Total)
  7. 7) No. of failed transmitted packets (Total)

  It shows the following information graphically.

  - Number of receive packets (per second): ● Cyclic / ● Others
  - Number of send packets (per second): ● Cyclic / ● Others

  Horizontal axis: Scaled at the interval of one second. Shifted to the left after displaying the whole graph.

  Vertical axis: Automatically adjusted according to the number of packets.

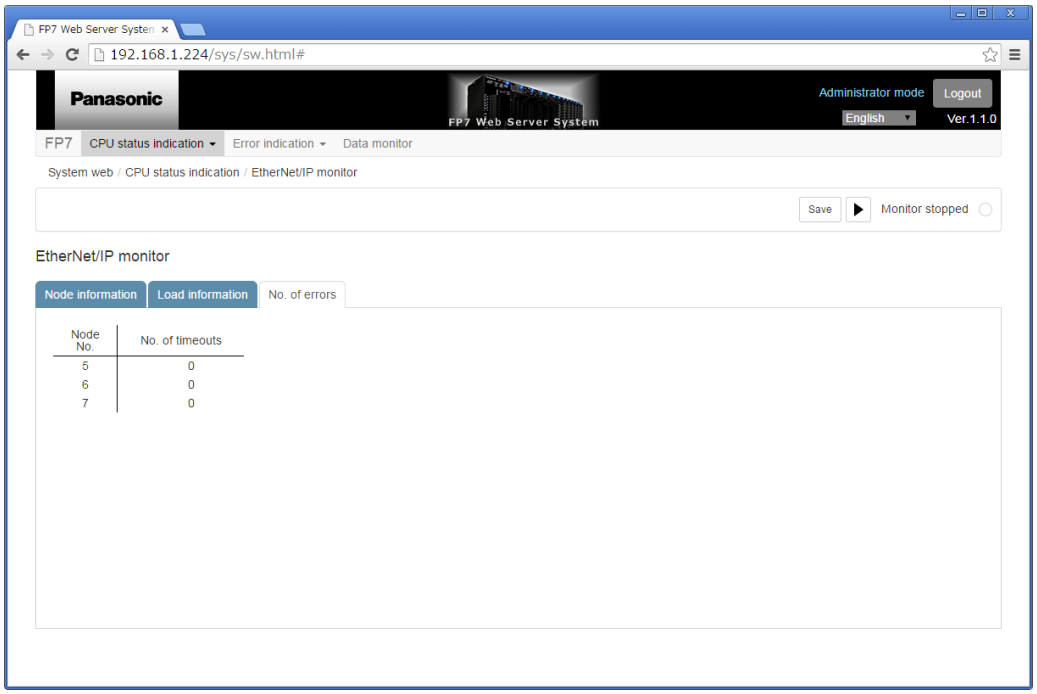
Info.

  - The graph is reset by switching the tab or starting monitoring.

- [Run/stop monitoring] button

When monitoring is running: Updates and displays data at the interval of one second.
When monitoring is stopped: Stops data updates.

3. When "No. of errors" is selected



- "No. of errors" (EtherNet/IP operation status monitor)
  It shows the following information.
  1. 1) Node No.
  2. 2) No. of timeouts

Info.

- The number of communication errors is displayed for each node. The display varies according to the number of registered nodes.

- [Run/stop monitoring] button
  Update processing is performed only once. It returns to the monitoring-stopped state after updating data.

14 LED Display

14.1 Lighting State of LED for EtherNet/IP Setting 14-2
14.1.1 Lighting Patterns When Starting PLC 14-2
14.1.2 Lighting Patterns When PLC is Operating 14-2

14.1 Lighting State of LED for EtherNet/IP Setting

The state of the EtherNet/IP communication can be confirmed from the LED lighting state.

14.1.1 Lighting Patterns When Starting PLC

The lighting-up of the indicator is checked when the PLC starts.

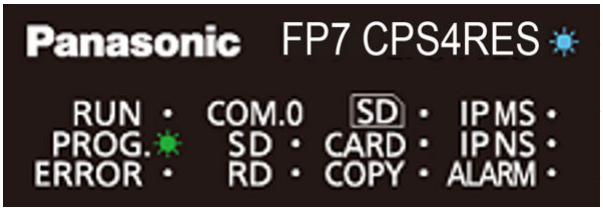
The lighting-up of the indicator is checked after the PLC is powered on and after all the LEDs other than MS and NS turn on and turn off.

The procedure of checking the lighting-up of the indicator is as follows.

Each lighting time of the lighting order 1 to 4 is 0.25 seconds.

After the check, the indicator varies according to the state of the EtherNet/IP setting.

Example) For FP7 (CPS4RES)



Order of checking the lighting-up of indicator

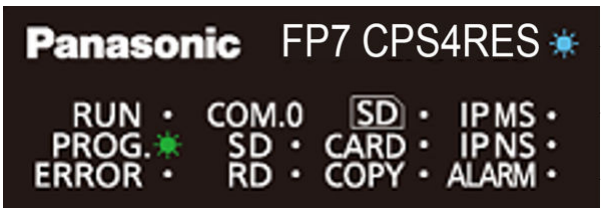
Lighting oder	Lighting state	
	MS	NS
1	Green ON	OFF
2	Red ON	OFF
3	Green ON	Green ON
4	Green ON	Red ON
5	Green ON	OFF

14.1.2 Lighting Patterns When PLC is Operating

The state of the PLC can be confirmed from the lighting state of the LEDs when the PLC is operating.

The PLC states indicated by the LEDs are as follows.

Example) For FP7 (CPS4RES)



MS (Module status indicator)

Lighting state	PLC state
OFF	The EtherNet/IP function is disabled.
Green ON	The EtherNet/IP function is activated.
Red ON	This state does not exist.
Red Flashing	Recoverable fault occurs. (such as a setting that load factor exceeds)

NS (Network status indicator)

Lighting state	PLC state
OFF	The EtherNet/IP function is disabled or IP address is not established.
Green ON	More than one connection is established.
Green Flashing	Connection is not established or IP address is acquired.
Red ON	IP address duplication is detected.

When LED is flashing, the lighting state changes between ON and OFF at the interval of 0.5 seconds.

(MEMO)

15 List of Cyclic Communication Errors

15.1 Cyclic Communication: List of Abnormal Statuses 15-2

15.1 Cyclic Communication: List of Abnormal Statuses

■ **The details of status numbers when cyclic communication errors occur are as follows.**

Abnormal status (Hexadecimal)	Status name
0100	CONNECTION IN USE OR DUPLICATE FORWARD OPEN
0103	TRANSPORT CLASS AND TRIGGER COMBINATION NOT SUPPORTED
0106	OWNERSHIP CONFLICT
0107	TARGET CONNECTION NOT FOUND
0108	INVALID NETWORK CONNECTION PARAMETER
0109	INVALID CONNECTION SIZE
0110	TARGET FOR CONNECTION NOT CONFIGURED
0111	RPI NOT SUPPORTED.
0112	RPI VALUE(S) NOT ACCEPTABLE
0113	OUT OF CONNECTIONS
0114	VENDOR ID OR PRODUCT CODE MISMATCH
0115	DEVICE TYPE MISMATCH
0116	REVISION MISMATCH
0117	INVALID PRODUCED OR CONSUMED APPLICATION PATH
0118	INVALID OR INCONSISTENT CONFIGURATION APPLICATION PATH
0119	NON-LISTEN ONLY CONNECTION NOT OPENED
011A	TARGET OBJECT OUT OF CONNECTIONS
011B	THE PRODUCTION INHIBIT TIME IS GREATER THAN THE RPI
011C	TRANSPORT CLASS NOT SUPPORTED
011D	PRODUCTION TRIGGER NOT SUPPORTED
011E	DIRECTION NOT SUPPORTED
011F	INVALID ORIGINATOR TO TARGET NETWORK CONNECTION FIXVAR
0120	INVALID TARGET TO ORIGINATOR NETWORK CONNECTION FIXVAR
0121	INVALID ORIGINATOR TO TARGET NETWORK CONNECTION PRIORITY
0122	INVALID TARGET TO ORIGINATOR NETWORK CONNECTION PRIORITY
0123	INVALID ORIGINATOR TO TARGET NETWORK CONNECTION TYPE
0124	INVALID TARGET TO ORIGINATOR NETWORK CONNECTION TYPE
0125	INVALID ORIGINATOR TO TARGET NETWORK CONNECTION REDUNDANT_OWNER
0126	INVALID CONFIGURATION SIZE
0127	INVALID ORIGINATOR TO TARGET SIZE
0128	INVALID TARGET TO ORIGINATOR SIZE
0129	INVALID CONFIGURATION APPLICATION PATH
012A	INVALID CONSUMING APPLICATION PATH

Abnormal status (Hexadecimal)	Status name
012B	INVALID PRODUCING APPLICATION PATH
012C	CONFIGURATION SYMBOL DOES NOT EXIST
012D	CONSUMING SYMBOL DOES NOT EXIST
012E	PRODUCING SYMBOL DOES NOT EXIST
012F	INCONSISTENT APPLICATION PATH COMBINATION
0130	INCONSISTENT CONSUME DATA FORMAT
0131	INCONSISTENT PRODUCE DATA FORMAT
0132	NULL FORWARD OPEN FUNCTION NOT SUPPORTED
0133	CONNECTION TIMEOUT MULTIPLIER NOT ACCEPTABLE
0203	CONNECTION TIMED OUT
0204	UNCONNECTED REQUEST TIMED OUT
0205	PARAMETER ERROR IN UNCONNECTED REQUEST SERVICE
0206	MESSAGE TOO LARGE FOR UNCONNECTED_SEND SERVICE
0207	UNCONNECTED ACKNOWLEDGE WITHOUT REPLY
0301	NO BUFFER MEMORY AVAILABLE
0302	NETWORK BANDWIDTH NOT AVAILABLE FOR DATA
0303	NO CONSUMED CONNECTION ID FILTER AVAILABLE
0304	NOT CONFIGURED TO SEND SCHEDULED PRIORITY DATA
0305	SCHEDULE SIGNATURE MISMATCH
0306	SCHEDULE SIGNATURE VALIDATION NOT POSSIBLE
0311	PORT NOT AVAILABLE
0312	LINK ADDRESS NOT VALID
0315	INVALID SEGMENT IN CONNECTION PATH
0316	FORWARD CLOSE SERVICE CONNECTION PATH MISMATCH
0317	SCHEDULING NOT SPECIFIED
0318	LINK ADDRESS TO SELF INVALID
0319	SECONDARY RESOURCES UNAVAILABLE
031A	RACK CONNECTION ALREADY ESTABLISHED
031B	MODULE CONNECTION ALREADY ESTABLISHED
031C	MISCELLANEOUS
031D	REDUNDANT CONNECTION MISMATCH
031E	NO MORE USER CONFIGURABLE LINK CONSUMER RESOURCES AVAILABLE IN THE PRODUCING MODULE
031F	NO USER CONFIGURABLE LINK CONSUMER RESOURCES CONFIGURED IN THE PRODUCING MODULE
0800	NETWORK LINK OFFLINE
0810	NO TARGET APPLICATION DATA AVAILABLE

Abnormal status (Hexadecimal)	Status name
0811	NO ORIGINATOR APPLICATION DATA AVAILABLE
0812	NODE ADDRESS HAS CHANGED SINCE THE NETWORK WAS SCHEDULED
0813	NOT CONFIGURED FOR OFF-SUBNET MULTICAST
0814	INVALID PRODUCE/CONSUME DATA FORMAT

16 Appendix

16.1 Supported data type.....16-2

16.1 Supported data type

The following table shows the data types supported by the FP0H control unit.

The names and data codes of the supported data types are prescribed by the Common Industrial Protocol (CIP).

Supported data type	Data size	Data code	Description
BOOL	1 byte	C1	Boolean logic with logical values TRUE and FALSE
SINT	1 byte	C2	Signed 8-bit integer value
INT	2 bytes	C3	Signed 16-bit integer value
DINT	4 bytes	C4	Signed 32-bit integer value
LINT	8 bytes	C5	Signed 64-bit integer value
USINT	1 bytes	C6	Unsigned 8-bit integer value
UINT	2 bytes	C7	Unsigned 16-bit integer value
UDINT	4 bytes	C8	Unsigned 32-bit integer value
ULINT	8 bytes	C9	Unsigned 64-bit integer value
REAL	4 bytes	CA	32-bit floating-point value
LREAL	8 bytes	CB	64-bit floating-point value
STRING	Variable according to the size of character string	D0	Character string (1-byte character)
BYTE	1 byte	D1	Bit string: 8 bits
WORD	2 bytes	D2	Bit string: 16 bits
DWORD	4 bytes	D3	Bit string: 32 bits
LWORD	8 bytes	D4	Bit string: 64 bits

Change Log

Manual numbers can be found at the bottom of the manual cover.

Date	Manual No.	Record of Changes
Sep. 2015	-	-
Apr. 2019	WUME-FP7CPUEIP-01	Revised edition Added "Types of Manual" Added "Chapter 16: Appendix"
Jul. 2022	WUME-FP7EIP-02	2nd Edition ● Changed product type following FP7 update ● Changed manual format
Apr. 2024	WUME-FP7EIP-03	3rd Edition ● Change in Corporate name

Order Placement Recommendations and Considerations

The Products and Specifications listed in this document are subject to change (including specifications, manufacturing facility and discontinuing the Products) as occasioned by the improvements of Products. Consequently, when you place orders for these Products, Panasonic Industry Co., Ltd. asks you to contact one of our customer service representatives and check that the details listed in the document are commensurate with the most up-to-date information.

[Safety precautions]
Panasonic Industry Co., Ltd. is consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally cause failures at a given statistical probability. Furthermore, their durability varies with use environments or use conditions. In this respect, check for actual electrical components and devices under actual conditions before use. Continued usage in a state of degraded condition may cause the deteriorated insulation. Thus, it may result in abnormal heat, smoke or fire. Carry out safety design and periodic maintenance including redundancy design, design for fire spread prevention, and design for malfunction prevention so that no accidents resulting in injury or death, fire accidents, or social damage will be caused as a result of failure of the Products or ending life of the Products.

The Products are designed and manufactured for the industrial indoor environment use. Make sure standards, laws and regulations in case the Products are incorporated to machinery, system, apparatus, and so forth. With regard to the mentioned above, confirm the conformity of the Products by yourself.

Do not use the Products for the application which breakdown or malfunction of Products may cause damage to the body or property.
i) usage intended to protect the body and ensure security of life
ii) application which the performance degradation or quality problems, such as breakdown, of the Products may directly result in damage to the body or property

It is not allowed the use of Products by incorporating into machinery and systems indicated below because the conformity, performance, and quality of Products are not guaranteed under such usage.
i) transport machinery (cars, trains, boats and ships, etc.)
ii) control equipment for transportation
iii) disaster-prevention equipment / security equipment
iv) control equipment for electric power generation
v) nuclear control system
vi) aircraft equipment, aerospace equipment, and submarine repeater
vii) burning appliances
viii) military devices
ix) medical devices (except for general controls)
x) machinery and systems which especially require the high level of reliability and safety

[Acceptance inspection]
In connection with the Products you have purchased from us or with the Products delivered to your premises, please perform an acceptance inspection with all due speed and, in connection with the handling of our Products both before and during the acceptance inspection, please give full consideration to the control and preservation of our Products.

[Warranty period]
Unless otherwise stipulated by both parties, the warranty period of our Products is three years after the purchase by you or after their delivery to the location specified by you. The consumable items such as battery, relay, filter and other supplemental materials are excluded from the warranty.

[Scope of warranty]
In the event that Panasonic Industry Co., Ltd. confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industry Co., Ltd. during the warranty period, Panasonic Industry Co., Ltd. shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.
However, the following failures and defects are not covered by warranty and we are not responsible for such failures and defects.
(1) When the failure or defect was caused by a specification, standard, handling method, etc. which was specified by you.
(2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us.
(3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
(4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
(5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
(6) When the failure or defect was caused by a natural disaster or other force majeure.
(7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

The above terms and conditions shall not cover any induced damages by the failure or defects of the Products, and not cover your production items which are produced or fabricated by using the Products. In any case, our responsibility for compensation is limited to the amount paid for the Products.

[Scope of service]
The cost of delivered Products does not include the cost of dispatching an engineer, etc. In case any such service is needed, contact our sales representative.

Panasonic Industry Co., Ltd.

(MEMO)

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Please visit our website for inquiries and about our sales network.

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