Panasonic

PROGRAMMABLE CONTROLLER

FP0H Control Unit

User's Manual

Ethernet Communication

WUME-FP0HET-09

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(MEMO)

Introduction

Thank you for purchasing a Panasonic product. Before you use the product, please carefully read through the user's manual, and understand it in detail to use the product properly.

Types of Manuals

- This manual describes "Ethernet communication functions via LAN port" installed in FP0H Control Unit.
- For EtherNet/IP communication functions via LAN port, refer to the *FP0H Users Manual (EtherNet/IP Communication)*.
- There are different types of users manuals for the FP0H series. 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
FP0H Control Unit	FP0H User's Manual (Basic)	WUME-FP0HBAS
	FP0H Programming Manual	WUME-FP0HPGR
	FP0H Programming Manual (SD Card Access Instructions)	WUME-FP0HSD
Positioning Function/PWM Output/High-speed Counter Function	FP0H User's Manual (Positioning/PWM Output/High-speed Counter)	WUME-FP0HPOS
Serial Communication Function	FP0H User's Manual (COM Communication)	WUME-FP0HCOM
Ethernet Communication Function	FP0H User's Manual (Ethernet Communication)	WUME-FP0HET
EtherNet/IP Communication Function	FP0H User's Manual (EtherNet/IP)	WUME-FP0HEIP
Logging trace function	FP0H User's Manual (Logging/Trace Function)	WUME-FP0HLOG
FP0H Extension (Communication) Cassette	FP0H User's Manual (COM Communication)	WUME-FP0HCOM
FP0H Positioning Unit	FP0H Positioning Unit User's Manual	WUME-FP0HPG
FP0H Positioning Unit RTEX	FP0H Positioning Unit RTEX User's Manual (FPWIN GR7)	WUME-FP0HRTEXGR7

SAFETY PRECAUTIONS

- To prevent accidents or personal injuries, please be sure to comply with the following items.
- Prior to installation, operation, maintenance and check, please read this manual carefully for proper use.
- Before using, please fully understand the knowledge related to the equipment, safety precautions and all other precautions.
- Safety precautions are divided into two levels in this manual: Warning and Caution.

⚠ WARNING	Incorrect operation may lead to death or serious injury.

- Take appropriate safety measures to the external circuit of the product to ensure the security of the whole system in case of abnormalities caused by product failure or external.
- Do not use this product in areas with inflammable gases.
  Otherwise it may lead to an explosion.
- Do not put this product into a fire.
  Otherwise it could cause damage to the battery or other electronic parts.

⚠ CAUTION	Incorrect operation may lead to injury or material loss.

- To prevent the excessive exothermic heat or smoke generation of the product, a certain margin is required for guaranteed characteristics and performance ratings of relative products.
- Do not decompose or transform it.
  Otherwise it will lead to the excessive exothermic heat or smoke generation of the product.
- Do not touch terminal blocks during power-on.
  Otherwise it may result in an electric shock.
- Set an emergency stop and interlock circuit in the external devices.
- Connect wires and connectors reliably.
  Otherwise it may lead to the excessive exothermic heat or smoke generation of the product.
- Do not undertake construction (such as connection and disconnection) while the power supply is on.
  It could lead to an electric shock.
- If the equipment is used in a manner not specified by the Panasonic, the protection provided by the equipment may be impaired.
- This product has been developed/produced for industrial use only.

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Network Security

When this product is connected to a network, you might receive damage as listed below.

(1) Information leakage or outflow through this product

(2) Fraudulent operation of this product by a malicious third party

(3) Obstructing or stopping this product by a malicious third party

Sufficient network security measures, including the following measures, should be taken at your own risk to prevent such damages.

- Use this product on a network where safety is secured by using a firewall.

- When using this product on a system where a PC is connected, make sure that checking and cleaning of infection by computer virus or malicious program is performed periodically.
- In order to prevent malicious attacks, set user name and password to limit users who can log in.
- Take measures such as limiting an access through a user authentication method so as not to leak information to the network such as image data, authentication information (user name and password), alarm email information, FTP server information, DDNS server information, etc.
- Be sure to close all browsers immediately after accessing this product as an administrator.
- Periodically change the administrator's password.
- Do not install this product in a location where the product or cables can be easily damaged.
- Furthermore, it is recommended that the product be used in an environment that has VPN (Virtual Private Network) or leased line network.

Terms

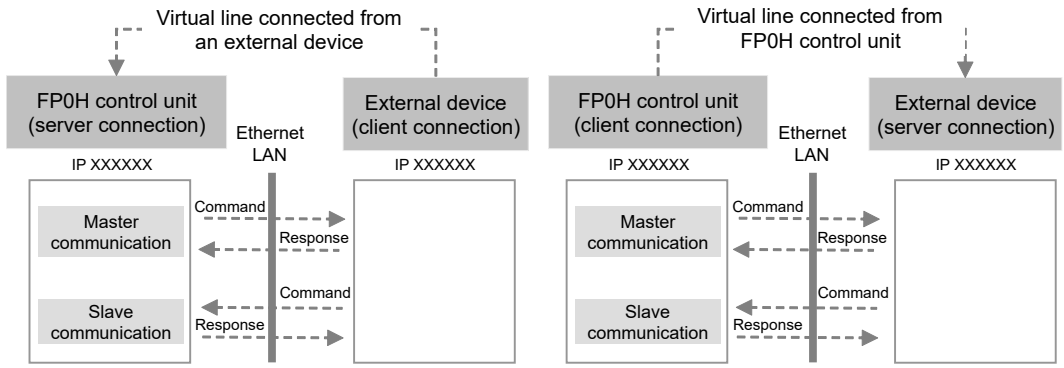
The following terms are used in software settings for connecting FP0H control unit to Ethernet LAN, and for explanation in the Users Manual.

■ Server connection and client connection

- These refer to methods for connecting a virtual communication line between FP0H and an external device.
- In server connection, connection from a client is waited for.
- In client connection, FP0H control unit connects a virtual communication line to a port of an external device. Connection is retried at a specified interval when connection fails.

■ Master communication and slave communication

- These refer to methods for actually sending / receiving message and data between FP0H and an external device.
- In master communication, PLC sends commands and receives responses.
- In slave communication, PLC receives commands from an external device and returns responses.
- In a system using FP0H, commands and responses can be sent and received on both sides, once connection is opened and a virtual communication line is connected, either in server connection or in client connection.



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1 Communication Functions of Control Unit

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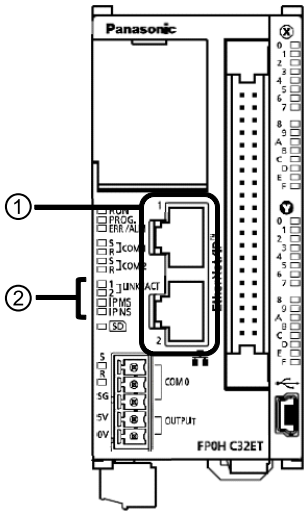
1.1 Overview of Ethernet Communication Functions

1.1.1 Ethernet Communication of FP0H Control Unit

FP0H control unit can be connected with a PC or FP7 and other higher models via Ethernet. Using TCP/IP or UDP/IP communication, it is possible to monitor and control the operations of control unit, and to read and write given data.

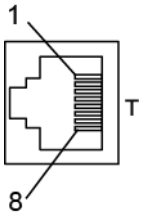
1.1.2 Names and Functions of Parts



No.	Name	Description
(1)	LAN port 1 LAN port 2	Installed in FP0H control unit (Ethernet type). Used for connection to Ethernet and EtherNet/IP. IP address and MAC address are common to LAN port 1 and LAN port 2. By using two ports, wiring can be simplified. The MAC address is imprinted on the side face of the unit.
(2)	LINK / ACK indicators	Turns ON when connection is established between FP0H control unit and a device on Ethernet. Flashes when some communication is in progress (e.g. transmission / reception of a command or response) with a device in established connection.

■ 100BASE-TX / 10BASE-T connector (RJ45)

This connector connects FP0H control unit and a communication device via UTP cable in Ethernet communication. The Ethernet communication interface of 100BASE-TX and 10BASE-T is supported. 100BASE-TX and 10BASE-T are automatically switched by the automatic negotiation function.



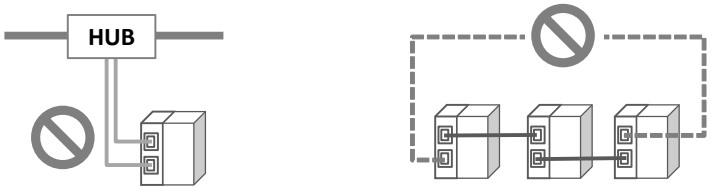
Pin No.	Signal name
1	TX+
2	TX-
3	RX+
4	Not used
5	Not used
6	RX-
7	Not used
8	Not used

1.1.3 Restrictions

■ Connecting to external devices

IP address and MAC address are common to LAN port 1 and LAN port 2.

- Do not connect cables connected to the two ports to the same switching HUB.
- For daisy chaining, do not connect the cables together to form a ring shape.



■ Number of user connections

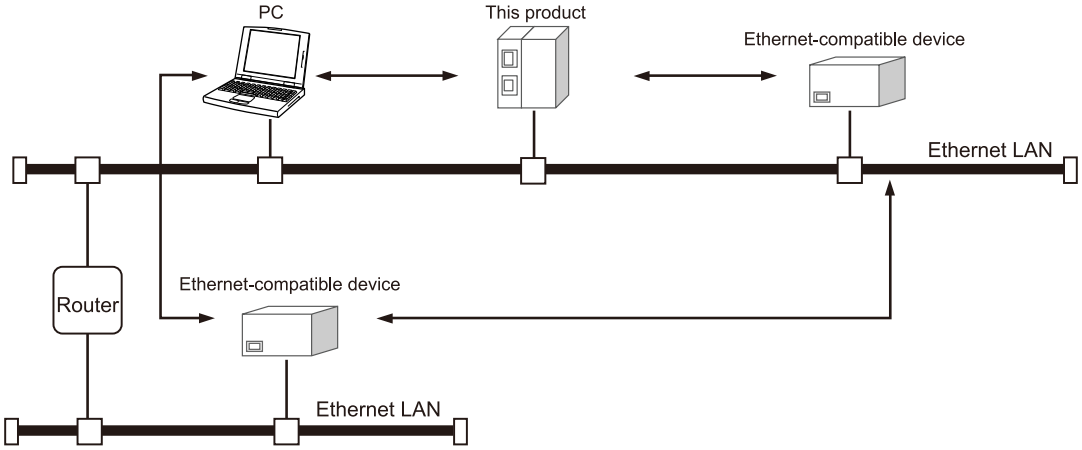
For the FP0H, the total number of connections for Ethernet communication and EtherNet/IP communication should be 9 or less.

Number of connections of Ethernet user communication + Ethernet/IP communication ≤ 9 connections

1.2 LAN Port Functions

1.2.1 FP0H Control Unit Functions

■ Configuration diagram



■ FP0H control unit communication functions

- FP0H control unit can open a virtual communication line with devices that support Ethernet connected to LAN, and can send / receive data to/from it.
- The IP address of FP0H control unit, protocol (TCP / UDP), connection method with a device, port No., and other settings can be performed on the configuration menu of the programming tool FPWIN GR7.
- Data can be read and written between PLC and external devices by specifying unit No. and memory addresses and executing instructions in a user program, because PLC automatically creates messages according to the protocol for F145 (SEND) / F146 (RECV) instructions in master communication.
- Communication functions can be selected in accordance with connected devices.

1.2.2 System Connection

■ System connection functions

- System connection is used for using the programming tool, via LAN port.
- One connection per control unit is available.

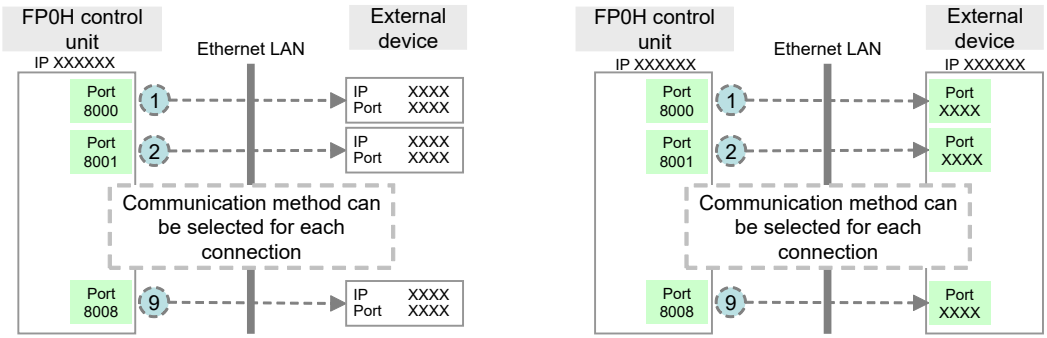
■ Supported operation mode

Communication port	MEWTOCOL-COM		MEWTOCOL-DAT		MODBUS-TCP		MC protocol		General-purpose communication
	Master	Slave	Master	Slave	Master	Slave	Master	Slave	
LAN port		•							

1.2.3 User Connection

■ User connection functions

- FP0H control unit can open virtual communication lines for up to 9 connections per control unit, with devices that support Ethernet connected to LAN, and can send / receive data to/ from them.
- Up to 9 connections are available, combining user connections and EtherNet/IP connections.
- Multiple connections can be opened and communication can be performed between FP0H control unit and multiple nodes, or with a single node.
- Operation mode to be used, open method, protocol, etc. can be selected for each connection.



(Note 1) The circled numbers above indicate an example of allocation of connection Nos.

■ Connection operations

- Connection is opened either by from FP0H control unit side, or from an external device side.
- In the configuration menu of FPWIN GR7, select an open method from server connection (any destination), server connection (specified destination), and client connection.
- Once connection is established, communication by a user program is enabled, depending on the operation mode.

■ Supported operation mode

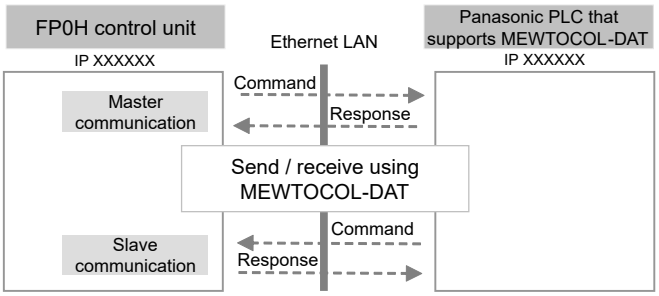
Communication port	MEWTOCOL-COM		MEWTOCOL-DAT		MODBUS-TCP		MC protocol		General-purpose communication
	Master	Slave	Master	Slave	Master	Slave	Master	Slave	
LAN port	●	●	●	●	●	●	●	●	●

1.3 Overview of Communication Functions

1.3.1 MEWTOCOL-DAT Master / Slave Communication (Binary Communication)

■ Overview of function

- Communication is performed using a communication protocol "MEWTOCOL-DAT" used by Panasonic PLC.
- One PLC has the transmission right, and communication is performed by sending commands to, and receiving responses from, PLCs that support "MEWTOCOL-DAT".
- No communication program is required on a slave PLC, because PLC automatically returns a response.
- Data can be read and written between PLCs by specifying unit Nos. and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because the master PLC automatically creates messages according to the protocol.
- In comparison to MEWTOCOL-COM communication (ASCII), a larger amount of data can be transferred at a time. The transmission format is also simpler and shorter. Therefore, this mode is suitable for data transmission / reception between PLCs.
- The data size that can be sent or received at a time is a maximum of 1020 words for register transmission, and 1 bits for bit transmission.



■ Purpose of MEWTOCOL-DAT communication

This is used for data transmission via Ethernet with Panasonic PLC that supports "MEWTOCOL-DAT".

- Programmable controller FP series

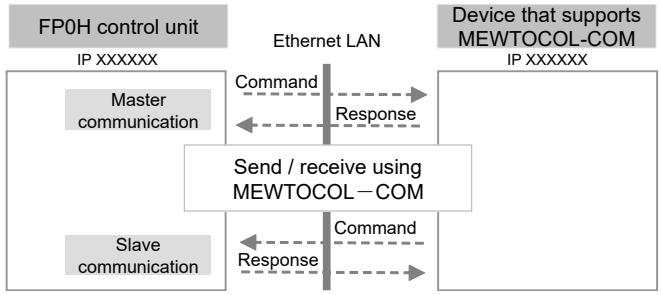
Info.

- When MEWTOCOL-DAT master / slave communication is used, select "TCP/IP" for communication protocol in order to assure communication reliability.

1.3.2 MEWTOCOL-COM Master / Slave Communication (ASCII Communication)

■ Overview of function

- Communication is performed using a communication protocol "MEWTOCOL-COM" used by Panasonic PLC.
- One device has the transmission right, and communication is performed by sending commands to, and receiving responses from, devices that support "MEWTOCOL-COM".
- No communication program is required on a slave PLC, because PLC automatically returns a response.
- Data can be read and written between PLCs by specifying unit Nos. and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because the master PLC automatically creates messages according to the protocol.
- MEWTOCOL-COM communication is ASCII-based, and is therefore suitable for the transmission / reception of character data.
- The data size that can be sent or received at a time is a maximum of 507 words for register transmission, 509 words for register reception, and 1 bit for bit transmission or reception.



■ Purpose of MEWTOCOL-COM communication

This is used for sending character data via Ethernet between Panasonic devices that support "MEWTOCOL-COM". This method is also used for connecting a programming tool.

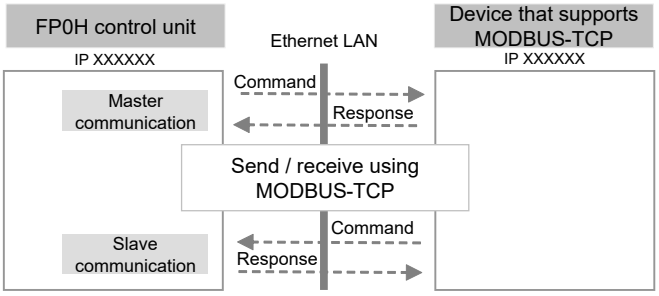
- Programmable controller FP series

1.3.3 MODBUS TCP Master / Slave Communication

■ Overview of function

- Used for communication with other devices that support the MODBUS TCP protocol.
- Master communication is performed when the master unit sends commands to slave units, and the slave unit returns responses (response messages) according to the instructions. Data can be read and written by specifying unit Nos. and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because PLC automatically creates messages according to the protocol.
- A higher device connected to PLC has the transmission right in slave communication. Slave communication is performed when the device sends a command, and PLC returns a response. In slave communication, no communication program is required on the PLC side, because PLC automatically returns a response.

- The data size that can be sent or received at a time is a maximum of 127 words for register transmission, and 2040 bits for bit transmission.



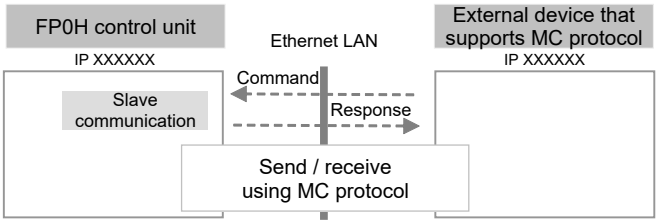
1.3.4 MC Protocol Communication

■ Overview of function

- Communication is performed with the communication protocol *MC protocol* that is released by Mitsubishi Electric Corporation for communication between PLCs and external devices.
- An external device (including PLC) or FP0H has the transmission right, and communication is performed by sending commands, and receiving responses, that support "MC protocol".
- Information according to the format as required by "MC protocol" including Ethernet header, IP header, TCP header or UDP header is added to commands and responses.
- The data size that can be sent or received at a time is a maximum of 960 words for transmission in word units, and 4054 bits for transmission in bit units.

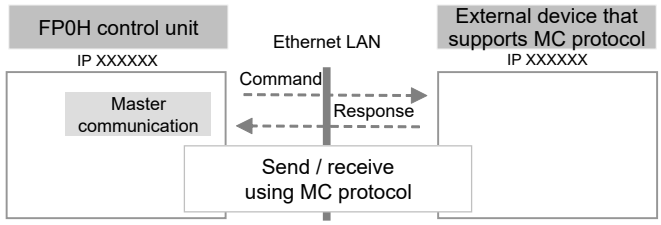
■ Slave communication

- When FP0H is used as a slave, no communication program is required on the FP0H side, because a response is automatically returned.



■ Master communication

- Data can be read and written between PLC and external devices by specifying memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because FP0H automatically creates messages according to the protocol.



1.3.5 General-Purpose Communication

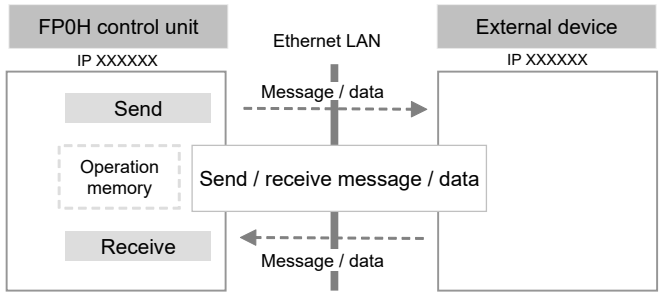
■ Overview of function

- General-purpose communication is used when PLC performs communication in accordance with the command communication specification of a connected device.
- A user program should process the creation and transmission of command messages to connected devices, and the reception of responses therefrom. Data transmission / reception with external devices is handled through data registers and other given operation memories.
- For transmission, a message / data aligned to a connected device is set to a given data register. The F159 (MTRN) instruction is executed to send data.
- For reception, data received from a connected device is temporarily stored in the buffer. The reception done flag turns ON. The reception done flag turns OFF when F159 (MTRN) instruction is executed. If the reception done flag is OFF, data can be received at any time.

  The user program copies received data into a given operation memory.
- The data size that can be processed at a time is a maximum of 2048 bytes per connection for transmission, and 4096 bytes for reception.

Info.

When a special header is added, max. 2036 bytes can be sent at a time, and max. 4084 bytes can be received at a time.



■ Purpose of general-purpose communication

Used for communication with devices from other manufacturers that have specific communication protocols.

(MEMO)

2 Installation and Wiring

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2.1 Installation Environment and LAN Port Wiring

2.1.1 Before Installation or Wiring

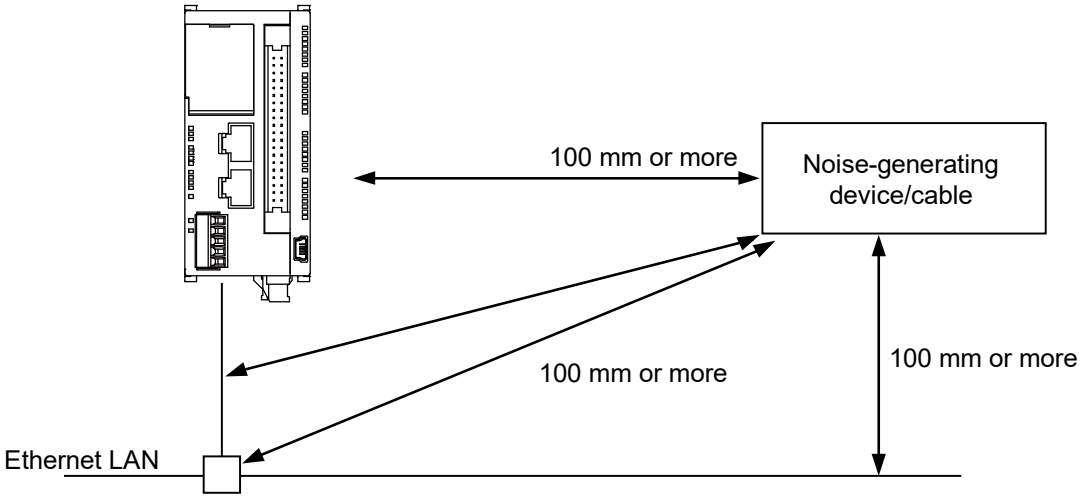
■ Noise suppression of Ethernet

Ethernet is a network used in offices and buildings, where there is comparatively little noise. It does not have a higher resistance to noise than ordinary FA application networks. Consequently, precautions are required when installing a hub or when laying cables.

2.1.2 Installation Environment and Noise Control Measures

■ Measures that can be taken in an installation environment

- A control unit, transceiver, hub, and communication cables should be installed as far as possible from high-voltage wires, high-voltage equipment, power lines, power equipment, equipment that generates strong breaker surges, and the wiring for any of this equipment. At least 100 mm of clearance should be allowed when installing the equipment or cables.



- If it is impossible to avoid installing the equipment or cables near noise-generating equipment, take measures including the following:
  - Place a programmable controller and hub inside metal panels.
  - Place communication cables inside metal ducts.
  - Attach a ferrite core to the communication cable near the control unit.
- An alternative measure is to use an optical transceiver close to the noise-generating section of the equipment and install an optical fiber to keep the noise from affecting nearby equipment. (This is also effective as a lightning shield for outdoor wiring.)
- Metal panels and metal ducts should be grounded at a grounding resistance of 100 Ω or less (Type-D / III grounding). Also, metal panels and metal ducts should be insulated so that they do not come in contact with communication devices or cables.

2.2 LAN Port Wiring

■ Selection of UTP cables

- Use UTP cables of Category 5 or higher.
- It is recommended to keep the UTP cable length to 10 m or shorter, considering noise resistance.
- In a noise-generating environment, attach a ferrite core to the UTP cable near the control unit. It is recommended to use a shielded cable.

- A specialized contractor should be consulted for the installation of 100BASE-TX and 10BASE-T hubs, laying of cables, and other works. Inappropriate works may result in a failure that seriously affects the entire network.

2.3 Noise Control Measures

2.3.1 Guidelines to Noise Generation

If any of the following are occurring, external noise may have entered the communication line. Take noise control measures.

- Check to see if a transmission / reception error is occurring, in synch with the operation of the device. If either of these is happening in synch with the operation of the device, take whatever measures are necessary to suppress the generation of noise from the device side.

2.3.2 Taking Corrective Measures through Application

Communication errors can be reduced by taking the following measures. Corrective measures should also be taken on the computer side, such as increasing the number of times that data is sent.

■ Increasing the number of retries

- On the FPWIN GR7 menu bar, select **Option and then** >**Ethernet Settings**, and adjust "TCP ULP timeout value" and "TCP retry timer value" under "Basic communication information" to increase the number of retries.
- The number of retries can be calculated by the following formula. In "TCP ULP timeout value", specify an integer multiple of "TCP retry timer value". When the value is not an integer multiple, the value is rounded up. The number of retries can be set to max. 12.

  Number of retries = "TCP ULP timeout value (packet existence duration)" / "TCP retry timer value"
- When using UDP/IP, the above settings are invalid. Data should be re-sent using application.

■ Increasing the timeout judgment time

When executing master communication instructions "F145 (SEND) / F146 (RECV)", select **Options**>**System register setting** in the tool software FPWIN GR7, and select "Time setting" in the list on the left. Increase the setting value in "Timeout time for SEND / RECV and RMRD / RMWT instructions". The default value is 10 seconds (setting value: 10000).

3 Configuration

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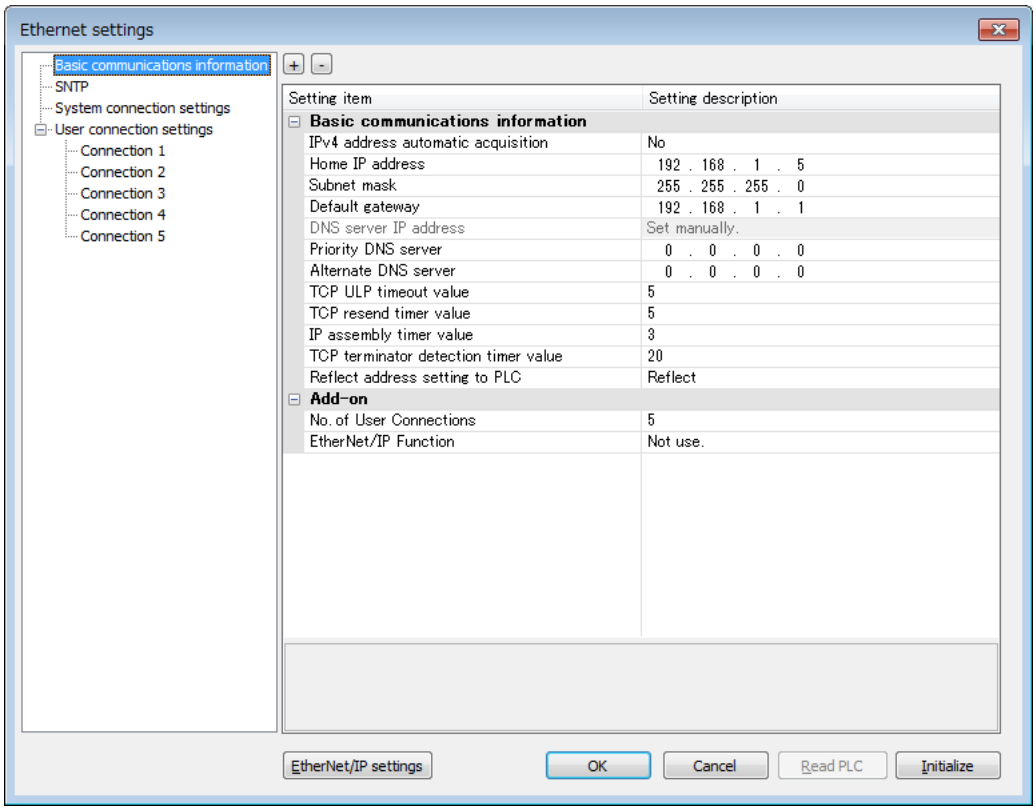
3.1 Setting of Basic Communications Information

3.1.1 Setting Procedure

- To use communication functions using LAN port, settings are required for communication conditions.
- Settings should be performed by the programming tool FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Option**>**Ethernet Settings** from the menu bar.
2. Select "Basic communications information" from the left list.
   Setting items are displayed.

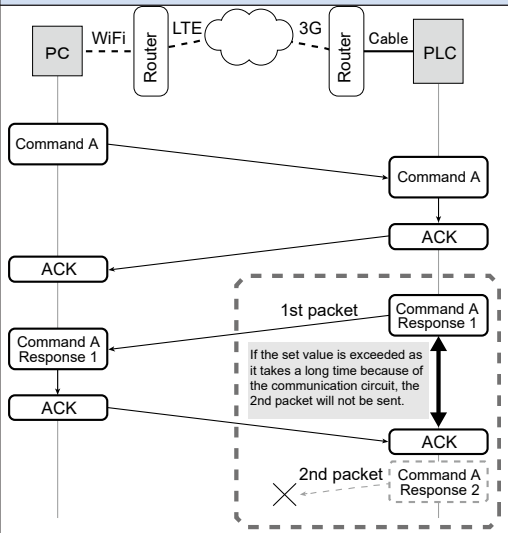
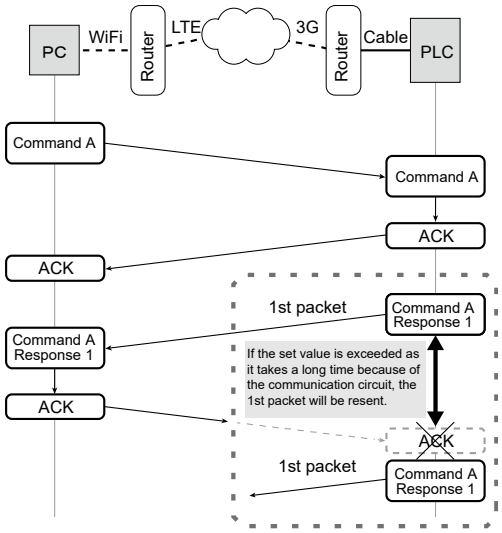


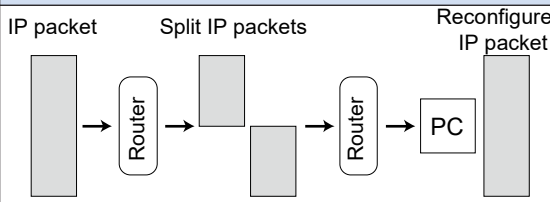
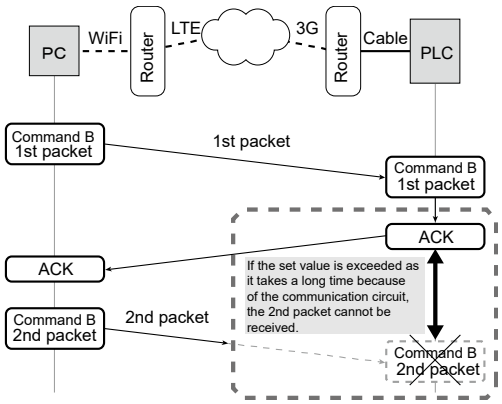
3. Specify conditions in "Basic communications information", and click [OK].
   For the descriptions of setting items, see the next page. The settings are registered in the project.

3.1.2 List of Setting Items

■ List of setting items (basic communications information)

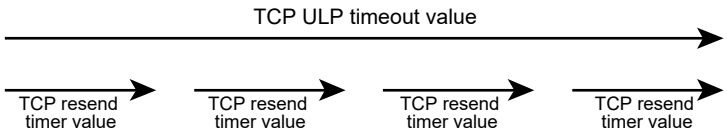
Setting item	Default	Description
IPv4 address automatic acquisition	No	When IP address is to be acquired automatically, change the value to "Yes".
Home IP address (IPv4) (Note 1)	192.168.1.5	Specify the IP address and subnet mask of the master unit.
Subnet mask (IPv4) (Note 1)	255.255.255.0	
Default gateway (IPv4) (Note 1)	192.168.1.1	● This is effective as long as the network (subnetwork) mask field is anything other than 0. ● If a default router (gateway) IP address has been set, communication will be carried out through the default router (gateway) without an error, even if the class, network address, or subnetwork address differs from that of the destination node. ● The network (subnetwork) address for the default router (gateway) IP address must be identical to the network (subnetwork) address for the source node IP address. If they are different, an error will occur. ● 0.0.0.0 and 255.255.255.255 causes an error.
DNS server IP address	Set manually	When IP address is to be acquired automatically, select the IP address setting method for the DNS server. When the DNS server is to be manually set, input the DNS server address.
Priority DNS server	0.0.0.0	
Alternate DNS server	0.0.0.0	
TCP ULP timeout value (Note 2)	5	Setting range: 0001 to 65535 (by 100 ms) This specifies packet existence duration when data transmission or other operations are performed in TCP. In "TCP ULP", specify an integer multiple of "TCP retry timer value". When the value is not an integer multiple, the value is rounded up. If the set value is exceeded as it takes a long time because of the communication circuit, the 2nd packet will not be sent. Increase the set value.

Setting item	Default	Description
		
TCP resend timer value (Note 2)	5	Setting range: 0001 to 65535 (by 100 ms) This specifies the time until data is re-sent if ACK is not sent by the destination node, when data transmission or other operations are performed in TCP. If the set value is exceeded as it takes a long time because of the communication circuit, the 1st packet will be resent. 
IP assembling timer value	3	Setting range: 0001 to 65535 (by 100 ms) This specifies the time to wait until all packets are received when an IP packet is split and sent before it passes through the router.

Setting item	Default	Description
		
TCP terminator detection timer value	20	Setting range: 0001 to 65535 (by 1 ms) This specifies time for monitoring the arrival of the next segment, when a split TCP segment is received. TCP reception is considered complete when no segment is received after the time above. If the set value is exceeded as it takes a long time because of the communication circuit, the next packet cannot be received. Increase the set value. 
Reflect address setting to PLC	Reflect	Set whether to rewrite the setting of IP address or not when downloading the entire project to PLC.

(Note 1) As for setting ranges for master unit IP address, subnet mask mask and default gateway, refer to "4.1.7 IP Address Setting Specification".

(Note 2) For "TCP ULP timeout value", set a value that is greater than that of "TCP resend timer value". When the set value is exceeded, a transmission error occurs. When the set value of "TCP resend timer value" is exceeded, data is resent.



■ List of setting items (add-on functions)

Setting item	Default	Remarks
No. of User Connections	5	Set the number of user connections that can be used for Ethernet. Up to 9 connections can be set. The number of connections available for EtherNet/IP is "9 - Number of user connections".
Ethernet/IP functions	Not use	Select to use or not use Ethernet/IP functions. (Note that the EtherNet/IP settings are lost when “Not use” is selected.)

3.2 Setting of SNTP Server

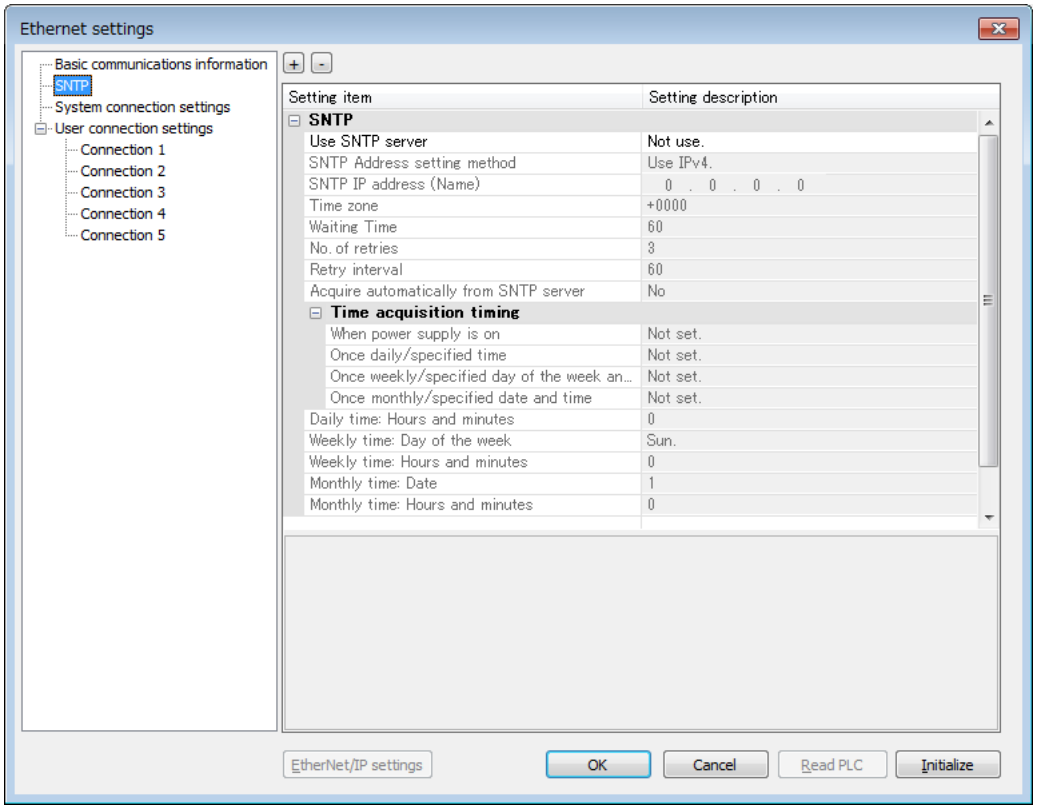
3.2.1 Setting Procedure

Use this setting when SNTP is used to adjust the time of calendar function.

Settings should be performed by the programming tool FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Option**>**Ethernet Settings** from the menu bar.
2. Select "SNTP" from the left list.
   Setting items are displayed.



3. Specify conditions for each item in "SNTP", and click [OK].
   For the description of setting items, see the next page. The settings are registered in the project.

3.2.2 List of Setting Items

■ List of setting items (SNTP)

Setting item	Default	Description
Use SNTP server	Not use	Select to use or not use SNTP server.
SNTP address setting method	Use IPv4.	Select a method to specify the SNTP server. **Use IPv4.** Specify the SNTP server by IP address (IPv4). **Specify by name** Specify the SNTP server by host name.
SNTP IP address (name)	0.0.0.0 or (blank)	Specify the SNTP server. Specify IP address or host name according to "SNTP address setting method".
Time zone	+0000	Setting unit: ±HHMM (HH: hours; MM: minutes) Setting range: +9999 to -9999 Set the standard time zone of each region using GMT as the starting point.
Timeout time	60	Set the timeout time of SNTP server. (Setting value x 100 ms) Setting range: 30 to 300
No. of retries	3	Set the number of retries by SNTP server. Setting range: 0 to 3
Retry interval	60	Set the retry interval for SNTP server. (Setting value x 10 s) Setting range: 0 to 8640
Acquire automatically from SNTP server	No	Set whether to automatically acquire time data from SNTP server or not.

■ List of setting items (Time acquisition timing)

Setting item	Default	Description
When power supply is ON	Not set	Automatically acquire time data from SNTP server when PLC is powered ON.
Once daily / specified time	Not set	Automatically acquire time data from SNTP server at a specified time once a day.
Once weekly / specified day of the week and time	Not set	Automatically acquire time data from SNTP server at a specified time once a week.
Once monthly / specified date and time	Not set	Automatically acquire time data from SNTP server at a specified time once a month.
Daily time: Hours and minutes	0	Set a time to automatically acquire time data every day. Setting range: 0 to 2359 (0:00 to 23:59)
Automatically acquire time data every week		
Weekly time: Day of the week	Day	Set a day of the week for acquisition.
Weekly time: Hours and minutes	0	Set a time for acquisition. Setting range: 0 to 2359 (0:00 to 23:59)
Automatically acquire time data every month		
Monthly time: Date	1	Set a date for acquisition.

Setting item	Default	Description
		Setting range: 1 to 28
Monthly time: Hours and minutes	0	Set a time for acquisition. Setting range: 0 to 2359 (0:00 to 23:59)

3.3 Setting of System Connection

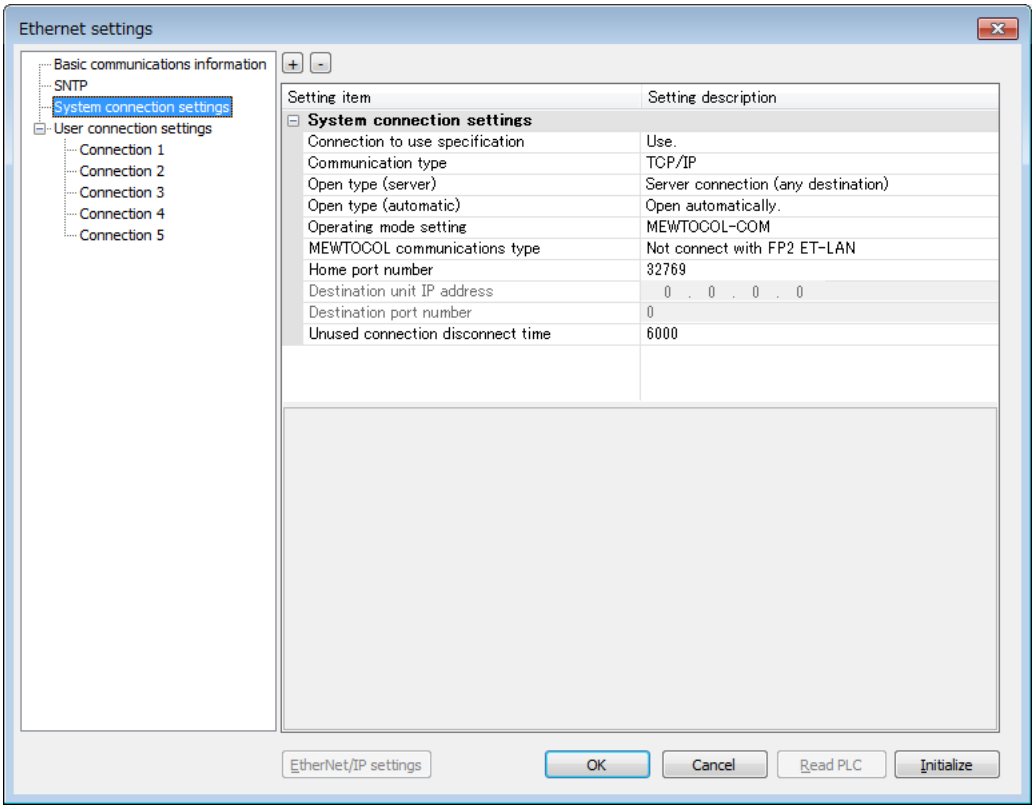
3.3.1 Setting Procedure

System connection is used for using the programming tool, via LAN port.

Settings should be performed by the programming tool FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Option**>**Ethernet Settings** from the menu bar.
2. Select "System connection settings" in the left list.
   Setting items are displayed.



3. Specify conditions for each item in "System connection settings", and click [OK].
   For the description of setting items, see the next page. The settings are registered in the project.

3.3.2 List of Setting Items

■ List of setting items

Setting item		Default	Description
Connection to use specification		Use	Select whether or not to use system connection.
Purpose of use	Communication type	TCP/IP	Select a communication protocol (TCP/IP).
	Open method (server / client)	Server connection (any destination)	Specify a connection function [Server connection (any destination unit)].
	Open method (Automatic/Manual)	Open automatically	Select an open method (Automatic/Manual).
	Operation mode setting	MEWTOCOL-COM	Select the operation mode MEWTOCOL-COM.
	MEWTOCOL communications type	Not connect with FP2 ET-LAN	Select "Not connect with FP2 ET-LAN".
Home port No.		32769	Specify the port No. of the master unit (source)
Destination unit IP address		0.0.0.0	Set an address of a destination unit (IP address / host name). This setting is not necessary for “any destination unit”.
Destination port number		0	Specify the port No. of a destination unit (destination). This setting is not necessary for “any destination unit”.
Unused connection disconnect time		6000	Input connection non-communication monitoring time. Automatically disconnects the connection when the duration of non-communication state exceeds the specified time. (Setting value x 10 ms) When 0 is specified, 1 minute is set for server connection, and automatic disconnection is not applied to client connection.

Info.

- System connection is designed for connecting the programming tool. Use it under the default setting [MEWTOCOL-COM, server connection (any destination unit), open automatically, and TCP/IP].

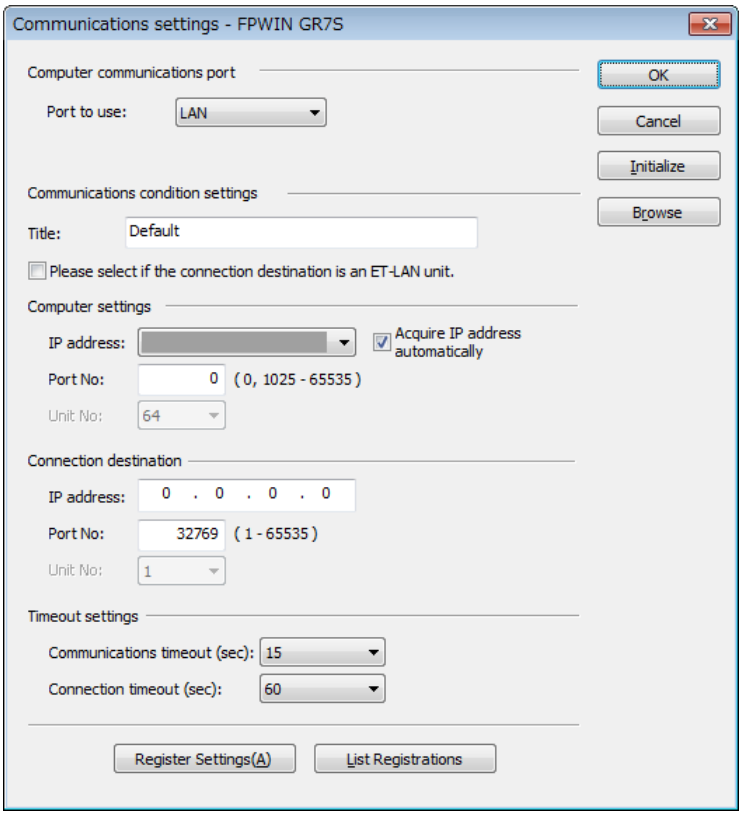
3.3.3 Setting on the Programming Tool

When system connection is used, communication setting on the programming tool FPWIN GR7 is required.

Procedure

1. Select **Online**>**Communications settings** from the menu bar.
   The “Communications Settings” dialog box is displayed.
2. Switch the port to be used to "LAN".

Setting items for LAN connection are displayed.



3. Into the "destination setting" field, enter "IP address" and "Port No."

Item	Settings
IP address:	Enter an IP address specified in the basic communication information.
Port No.	32769

4. Press the [OK] button.

- System connection may not be established when a connection limitation is applied to PC. In this case, check the communication setting on PC (e.g. subnet mask).

3.4 Setting of User Connections

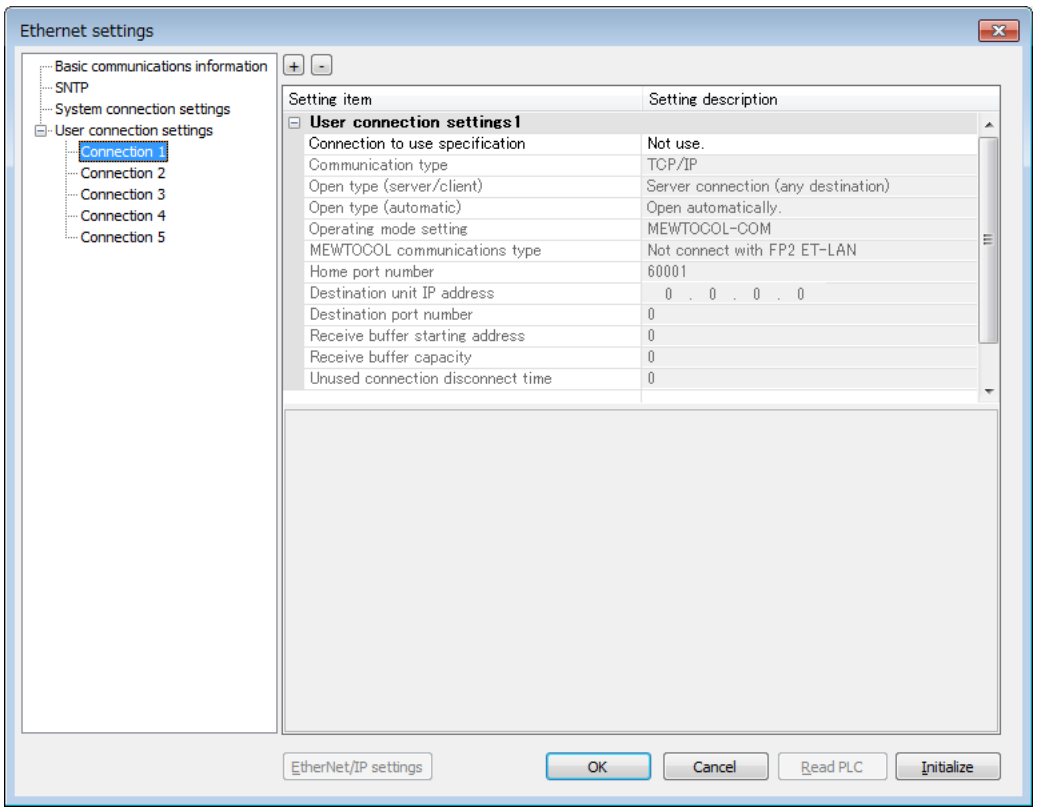
3.4.1 Setting Procedure

User connections are used for communication between FP0H control unit and external devices.
For more details, refer to "4 Settings and Operations of User Connections".
Settings should be performed by the programming tool FPWIN GR7.

- The following procedure applies when "Connection 1" is selected. Setting should be performed separately for each connection to be used.
- The number of available user connections varies by the number of user connections specified in "Basic communications informations". (Up to 9 connections)

Procedure

1. Select **Option**> **Ethernet Settings** from the menu bar.
2. Select "Connection 1" under "User connection settings" in the left list.
   Setting items are displayed.



3. Specify conditions for each item, and click [OK].
   For the description of setting items, see the next page. The settings are registered in the project.

3.4.2 List of Setting Items

■ List of setting items

Setting item			Default	Description
Connection to use specification			Not use	Select whether or not to use each connection.
Purpose of use	Communication type		TCP/IP	Select a communication protocol (TCP IP / UDP IP).
	Open method (server / client)		Server connection (any destination unit)	Specify a connection function (Server connection (any destination unit) / Server connection (specified destination unit) / Client connection).
	Open method (Automatic/ Manual)		Open automatically	Select an open method (Automatic/Manual).
	Operation mode setting		MEWTOCOL-COM	Select an operation mode [MEWTOCOL-COM/ MODBUS-TCP/MEWTOCOL-DAT/ general-purpose communication/MC protocol (QnA compatible 3E frame, binary)].
		MEWTOCOL communication type	Conditions to be selected vary by the selection of operation mode.	
		MEWTOCOL-DAT MEWTOCOL-COM is selected	Not connect with FP2 ET-LAN	Not connect with FP2 ET-LAN / Connect with FP2 ET-LAN To perform communication with FP2 ET-LAN unit, select"Connect with FP2 ET-LAN".
		General-purpose communication is selected	Not add a special header	Add a special header / Not add a special header To perform general-purpose communication between FP0H units or with FP7, select"Add a special header"to enable faster reception done judgment.
Home port No.			Connection 1: 60001 Connection 2: 60002 Connection 3: 60003 Connection 4: 60004 Connection 5: 60005 Connection 6: 60006 Connection 7: 60007 Connection 8: 60008 Connection 9: 60009	Specify the port No. of the master unit (source).
Destination unit IP address			0.0.0.0	Set an address of a destination unit (IP address).
Destination unit port number			0	Specify the port No. of a destination unit (destination).
Receive buffer starting address			0	Specify the starting number of data register used for the receive buffer of general-purpose communication. (The settable range varies according to the setting value of system register No. 0.)
Receive buffer capacity			0	Specify the receive buffer size of general-purpose communication. (Setting value x 1 word) Range: 1 to 2048

Setting item	Default	Description
		Note: The size of buffer address + receive buffer capacity should not exceed the usable range of data register.
Unused connection disconnect time	0	Input connection non-communication monitoring time. Automatically disconnects the connection when the duration of non-communication state exceeds the specified time. (Setting value x 10 ms) When "0" is specified, operation will be different depending on the open method. Server connection (any destination unit): Set to 60 seconds. Server connection (specified destination unit): Not disconnected automatically. Client connection: Not disconnected automatically.

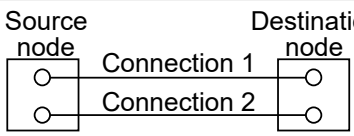
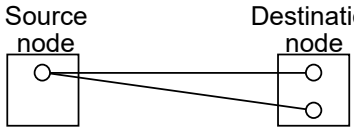
Info.

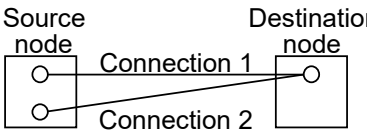
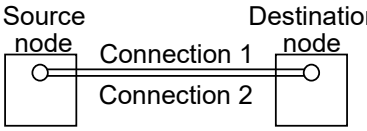
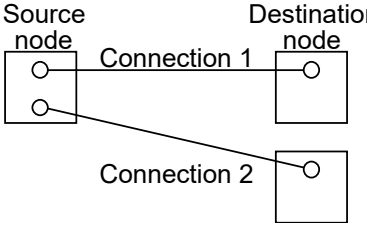
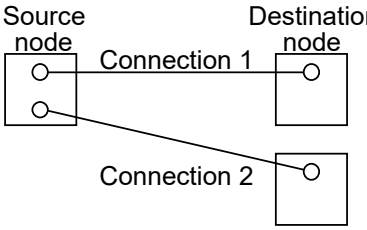
- In the client setting, select"Use"only for connections to be used. If the unit fails to establish connection with a unit for which"Use"is selected, a communication error results.
- The MEWTOCOL communication type is used for achieve compatibility with existing models of FP2 ET-LAN unit. For connection with other devices, use the default setting.
- For more details of Server connection / Client connection, refer to"4.1 Configuration Concerning Open Processing".

3.4.3 Port No. Specification

■ Port No. specification

- Port Nos. are allocated in order for various communication processes provided by TCP/IP or UDP/IP to be differentiated on a programmable controller or a computer.
- The specification conditions that apply to available port Nos. are different for TCP/IP and for UDP/IP as indicated in the table below.

	Setting status of port no. in open processing		Applicable communication protocol	
			TCP/IP	UDP/IP
Multiple connections with a single partner node		Multiple settings both for source node port No. and for destination node port No.	●	●
		Single setting for source node port No., multiple settings for destination node port No.	Cannot be set	

<table>
<tr><th rowspan="2"></th><th rowspan="2" colspan="2">Setting status of port no. in open processing</th><th colspan="2">Applicable communication protocol</th></tr>
<tr><th>TCP/IP</th><th>UDP/IP</th></tr>
<tr><td rowspan="2"></td><td> 
</td><td>Multiple settings for source node port No., single setting for destination node port No.</td><td>●</td><td>-</td></tr>
<tr><td> 
</td><td>Single setting for source node port No. and destination node port No.</td><td>●</td><td>-</td></tr>
<tr><td rowspan="2">Connections with multiple nodes</td><td> 
</td><td>Multiple settings for source node port No.</td><td>●</td><td>●</td></tr>
<tr><td> 
</td><td>Single setting for source node port No.</td><td colspan="2">Cannot be set</td></tr>
</table>

Info.

- It is recommended to specify a port No. of 8000 (1F40) or larger.
- The same port No. can be specified for the source node and the destination node.
- The same port No. can also be specified for TCP/IP and UDP/IP.

3.5 FTP Server Settings

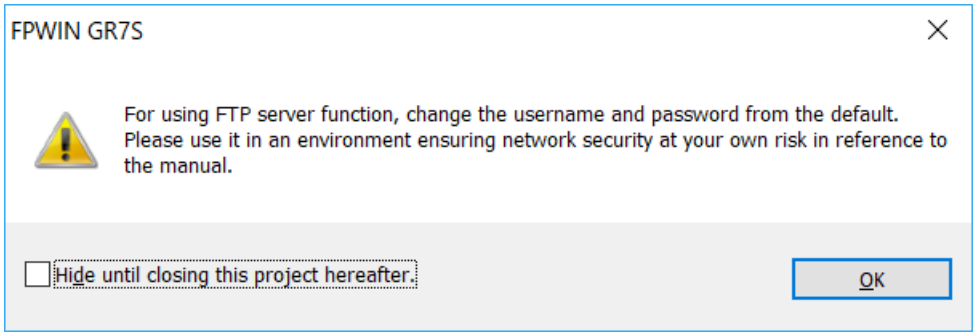
3.5.1 Setting Procedure

Configure FTP server settings when using the FTP server function.

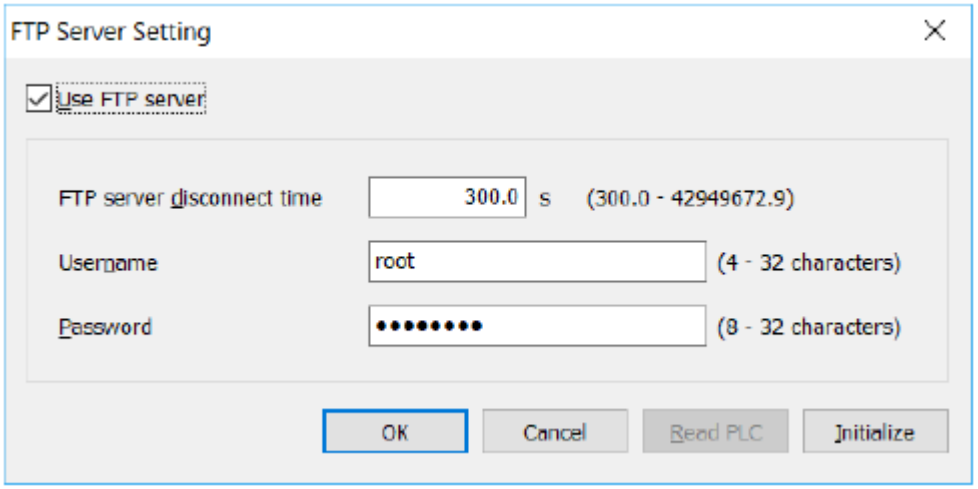
Settings should be configured with programming tool FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Option**>**FTP Server Settings** from the menu bar.
   The "FTP Server Settings" screen is displayed.
2. Check "Use FTP server".
   The following precaution is displayed.



3. Confirm the precaution and press the [OK] button.
   Each setting item is enabled.



4. Specify conditions for each item, and click [OK].
   For the descriptions of setting items, see the next page. The settings are registered in the project.

- You may be unable to transfer files, depending on the number of simultaneously transmittable files that you set with the FTP client tool. With the FTP client tool, set the number of simultaneously transmittable files to 1.

3.5.2 List of Setting Items

■ List of setting items (FTP server)

Setting item	Default	Description
Use FTP server	Invalid	Select whether to use the FTP server function.
Use SSL/TLS communication (Explicit mode)	Invalid	With the FTP server, set whether to use SSL/TLS communication (Explicit mode) under encrypted connection. (Note 1) The SSL/TLS version can be selected from "TLS1.1 or higher" or "TLS1.2 or higher".(Note 2)
Permit connection without encryption	Invalid	With the FTP server, select whether to allow communication even under insecure state by setting the FTP client without encryption or to allow only secure communication using the SSL/TLS (encryption). This item can be operated only when “Use SSL/TLS communication (Explicit mode)” is set to “Valid”. If set to “Valid”, select whether to use SSL/TLS (encryption) communication on the FTP client side.
FTP server disconnect time	300.0	Setting unit: 0.1 (second) Setting range: 300.0 to 42,949,672.9 Input the FTP connection non-communication monitoring time. Automatically disconnects the connection when the FTP non-communication state exceeds the specified time.
User name	root	Enter the user name to log in to the FTP server.
Password	Pana3755	Enter the password to log in to the FTP server.

(Note 1) The SSL/TLS communication cannot be used by both the FTP server function and FTP client function at the same time. When setting, "clear" the checkbox "Use SSL/TLS communication (Explicit mode)" of the FTP server function.

(Note 2) The SSL/TLS version can be selected with the unit firmware Ver. 1.80 or later.

3.5.3 FTP Server Standards

The FTP server provides FTPS functions according to the following SSL/TLS specifications.

■ SSL/TLS specifications for FTP servers

Item	Description
Protocol	TLS1.1/1.2
Cipher suite	The cipher suite is different depending on the cipher system of the certificate used. "When using the RSA certificate" ● TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">● TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
● TLS_RSA_WITH_AES_128_GCM_SHA256
● TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
● TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA
● TLS_DHE_RSA_WITH_AES_256_CBC_SHA256
● TLS_DHE_RSA_WITH_AES_128_CBC_SHA256
● TLS_DHE_RSA_WITH_AES_256_CBC_SHA
● TLS_RSA_WITH_AES_256_CBC_SHA256
● TLS_RSA_WITH_AES_128_CBC_SHA256
● TLS_RSA_WITH_AES_256_CBC_SHA
"When using the ECDSA certificate"
● TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
● TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256
● TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA
* Listed in the order of priority.
* Key length: ECDHE/ECDSA ＝ 256 bits, DHE/RSA ＝ 2048 bits
* The default state contains the RSA certificate.</td></tr>
<tr><td rowspan="3">Server certificate</td><td colspan="2">For the server certificate, the default certificate is used if the user certificate is set and the user certificate is used if the user certificate is not set.</td></tr>
<tr><td>"Default certificate"</td><td>This is a self-signed certificate in RSA 2,048 bits set as factory setting.
* The default certificate is just a self-signed certificate. If safer communication is required, use the user certificate.</td></tr>
<tr><td>"User certificate"</td><td>This is a certificate set by the user.
* Possible to set the RSA certificate or ECDSA certificate.</td></tr>
<tr><td>Connection method</td><td colspan="2">Explicit connection.
* Implicit connection is not supported.</td></tr>
<tr><td>Session resumption</td><td colspan="2">Handshake reduction is possible using the session ID.
* Session ID life time: 6,000 seconds</td></tr>
</table>

It is possible to set an optional certificate/secret key used for the SSL/TLS communication of the FTP server function.

* When this is not set, the default certificate is used.

Info.

For the method of writing the user certificate, refer to "3.7 Setting of SSL/TLS Certificate".

3.6 FTP Client Settings

Configure FTP client settings when using the FTP client function.
For details on how to configure settings, refer to the following sections:

- "9.4 File Transfer Settings"
- "9.5 How to Set Logging / Trace Transfer"

3.7 Setting of SSL/TLS Certificate

3.7.1 Setting Procedure

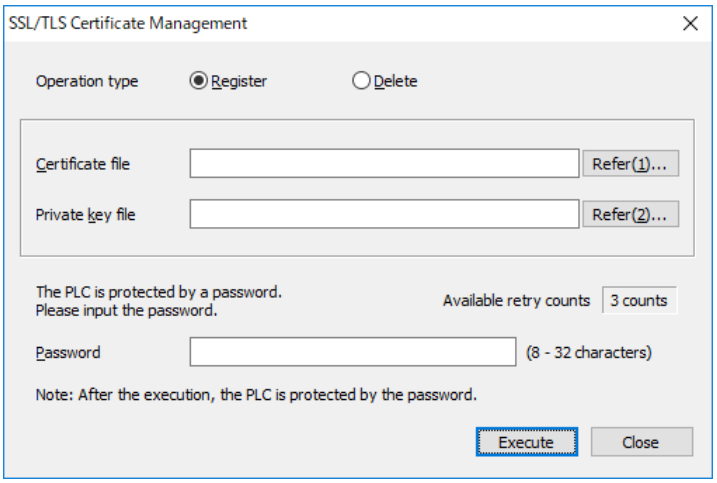
Set this when using an SSL/TLS certificate/secret key prepared by the user for the SSL/TLS communication of the FTP server function.

* When this is not set, the default self-signed certificate/secret key is used.

Settings should be performed by the programming tool FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Online**>**Switch to Online Mode** from the menu bar.
   Confirm that the communication state has switched to Online Mode.
2. Select **Tools**>**PLC Security Settings**>**SSL/TLS Certificate Management** from the menu bar.
   The "SSL/TLS Certificate Management" screen is displayed.



3. Select "Register" under "Operation type".
   Select “Delete” to delete the certificate and follow the following step 6 onwards.
4. Press the [Refer (1)] button and select a certificate file.

Certificate designation file

Item	Description
Extension	pem, cer, crt
File format	ASN.1(Base64)
Data Size	4,096 bytes or less

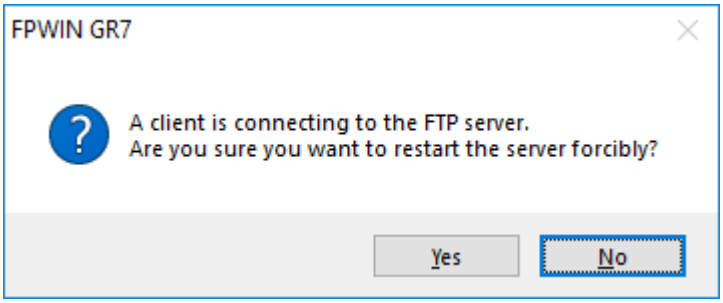
5. Press the [Refer (2)] button and select the secret key file that corresponds to the certificate selected in step 4.

Secret key designation file

Item	Description
Extension	pem, key
File format	ASN.1(Base64)
Data Size	4,096 bytes or less

6. If a password is set for the PLC, enter the password in the "Password" entry box on the "SSL/TLS Certificate Management" screen.
If a password is not set for the PLC, the “Password” entry box is not displayed.

7. Press the [Execute] button.
The designated certificate/secret key is transferred to the PLC and an attempt is made to restart the FTP server. When the FTP server is successfully restarted, the transferred certificate/secret key is reflected.
If there is a client being connected to the FTP server, an alarm message is displayed.



8. If there is a client being connected to the FTP server, press the [Yes] or [No] button.
- If the [Yes] button is pressed, the client being connected is forcibly disconnected and the FTP server is restarted.
- The transferred certificate/secret key is reflected instantaneously.
- If the [No] button is pressed, the FTP server is not restarted and the SSL/TLS communication is performed through using the previous certificate/secret key before the transfer is attempted.
- The transferred certificate/secret key is reflected by rebooting the power supply.

The same reflection timing applies when the certificate is deleted.

Checking certificate storage status

Check the higher 8 bits of the server certificate storage status (DT90591) to find out whether certificates are written by users or not.

DT90591 (Higher 8 bits)	Status
0x00	User certificate not written
0x01	User certificate written

- The user certificate is not included in the SD memory card auto run file.
- The user certificate is not transferred when a project is downloaded.

(MEMO)

4 Settings and Operations of User Connections

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4.1.5 Open Method (Automatic/Manual) 4-4
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4.1 Configuration Concerning Open Processing

4.1.1 Connection of FP0H Control Unit

■ Operations of FP0H control unit

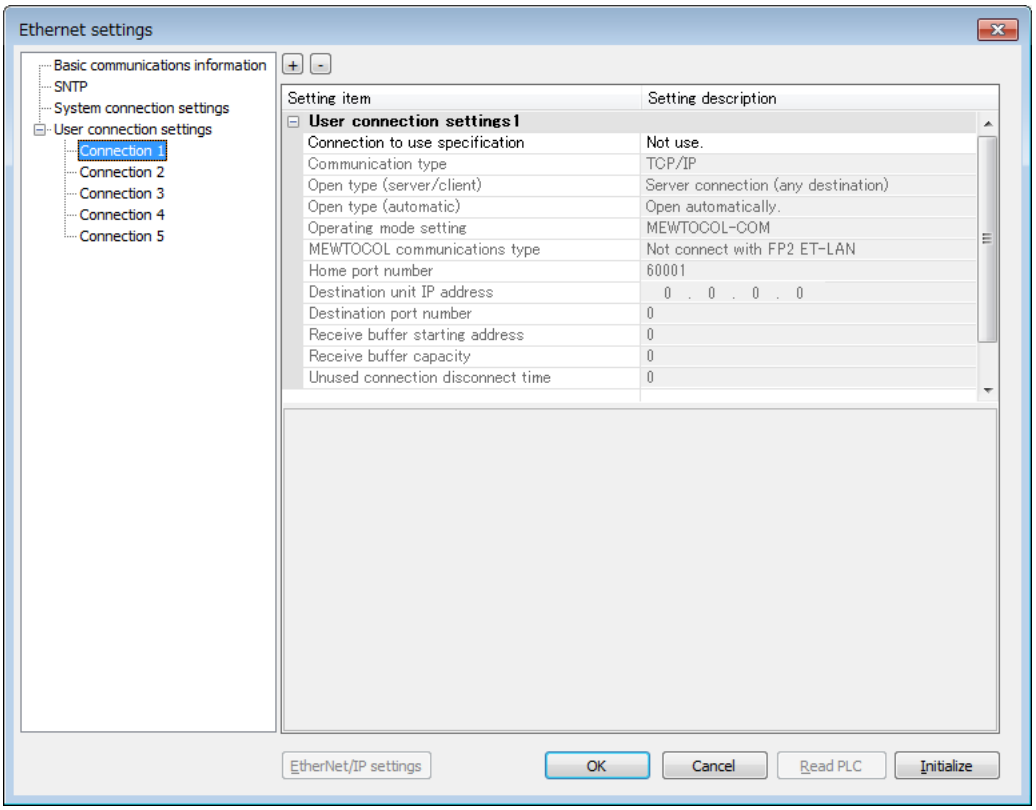
- FP0H control unit opens virtual communication lines with devices, based on the specified user connection settings (open method, communication method, port No., destination unit IP address).
- Virtual communication lines can be opened for up to 9 connections per FP0H control unit, combining user connections and EtherNet/IP connections.
- The lines for each connection can be used in different communication methods (TCP, UDP) and different operation modes (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, MC protocol, general-purpose communication).
- Once a line is connected, communication is enabled between PLC and devices, depending on the applicable operation mode. The connection status can be checked using a special relay (R9360 to R9405).

4.1.2 Setting Method for Individual Connections

Settings for user connections can be performed using the tool software FPWIN GR7. The following procedure is described assuming that FPWIN GR7 has already started.

Procedure

1. Select **Option**>**Ethernet Settings** from the menu bar.
   The "Ethernet settings" dialog box is displayed.
2. Select Connection No. under "User connection settings" in the left list.
   Setting items are displayed.



4.1.3 Use of Connection

- Select "Use" for user connection Nos. that will be actually used, among the 9 connections. By default, the value is set to "Not use".
- In client connection, if the unit fails to establish connection with a unit for which "Use" is selected, a communication error results.
- The maximum value for connections to be used is "9", and the initial value is "5". The value can be changed in "Basic communications informations".

4.1.4 Open Method (Server / Client)

Select an open method to establish connection. When communication method is set to TCP/IP, settings should be performed in accordance with connected devices to form a relationship between "Server connection" and "Client connection".

Setting item	Operation
Server connection (any destination)	Waits for connection from an unspecified client.
Server connection (specified destination)	Waits for connection from a specified client.

Setting item	Operation
Client connection	Connects with a destination port of server connection.

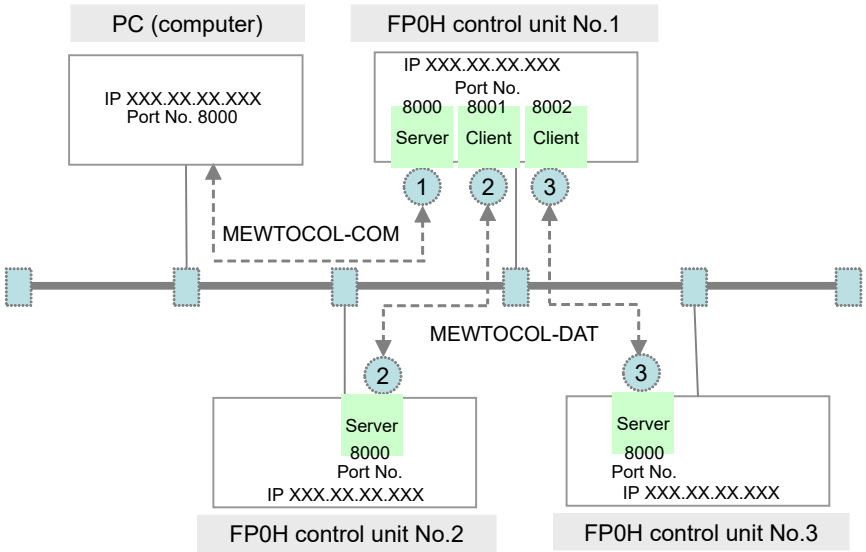
4.1.5 Open Method (Automatic/Manual)

Select an open method (Automatic/Manual).

Settings	Operation
Opens automatically. (Automatic opening)	● When powered ON, FP0H control unit automatically opens virtual communication lines with devices, based on user connection information specified in the configuration menu (open method, communication method, port No., destination unit IP address). ● For client connection, the unit repeatedly tries to reconnect in a specified interval when connection cannot be established (e.g. the connected device is powered OFF). ● For server connection, the unit sets connection in an open state, and waits for connection from the client.
Does not open automatically. (Manual opening)	Does not open automatically. Use ladder program to execute open processing.

4.1.6 How to Specify Connection Conditions

- In FP0H Ethernet communication, different operation modes, open methods, and communication methods can be specified for each user connection.
- Apply the same operation mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, MC protocol, general-purpose communication) and communication method (TCP/IP, UDP/IP) to connected units in each user connection. Specify device IP addresses and port Nos. one another.



(Note 1) The circled Nos. above indicate an example of allocation of connection Nos.

Setting example

Node	Connection No.	Operation mode setting	Open method	Communication method	Remarks
PC (personal computer)	-	MEWTOCOL-COM	Active open	TCP/IP	Use application that support MEWTOCOL-COM.
FP0H control unit No. 1	1	MEWTOCOL-COM	Server connection Open automatically	TCP/IP	
	2	MEWTOCOL-DAT	Client connection Open automatically	TCP/IP	
	3	MEWTOCOL-DAT	Client connection Open automatically	TCP/IP	
FP0H control unit No. 2	2	MEWTOCOL-DAT	Server connection Open automatically	TCP/IP	
FP0H control unit No. 3	3	MEWTOCOL-DAT	Server connection Open automatically	TCP/IP	

(Note 1) To connect with FP2 ET-LAN unit, select "Connect with FP2 ET-LAN" as MEWTOCOL communication type.

4.1.7 IP Address Setting Specification

■ List of usable IP addresses

Address range	Remarks
000.000.000.001 to 000.255.255.255	Although this range can be set, try not to use it wherever possible.
001.000.000.000 to 126.255.255.255	
128.000.000.000 to 223.255.255.255	

■ List of conditional IP addresses

○: Available; ×: Not available; △: Self IP address is not available, default gateway is available

Address range	Setting using instructions		Setting using tool software		
	E1	E2	T1	T2	T3
000.000.000.000	△	×	△	○	×
127.000.000.000 to 127.255.255.255	×	○	×	○	○
224.000.000.000 to 224.255.255.255	×	○	×	○	○
:	×	○	×	○	○
239.000.000.001 to 239.255.255.255	×	○	×	○	○

Address range	Setting using instructions		Setting using tool software		
	E1	E2	T1	T2	T3
240.000.000.001 to 240.255.255.255	×	○	×	○	○
:	×	○	×	○	○
247.000.000.001 to 240.255.255.255	×	○	×	○	○
248.000.000.001 to 248.255.255.255	×	○	×	○	○
:	×	○	×	○	○
255.000.000.001 to 255.255.255.254	×	○	×	○	○
255.255.255.255	×	○	×	×	×

(Note 1) The symbols E1 to E3 and T1 to T3 in the list above refer to combinations in the following table.

Code	Description
E1	Self address setting using F460 (IPv4SET) instruction
E2	Destination address setting using F461 (CONSET) instruction
T1	Master unit IP address (IPv4) setting using tool software
T2	SNTP IP address (name), priority DNS server, alternative DNS server and router IP address settings using tool software
T3	System connection IP address and user connection IP addresses 1 to 9 using tool software

(Note 2) When an invalid IP address is specified using an instruction, an operation error does not result. Instead, error codes CY (R9009) and DT90529 will be set.

■ Net mask setting

Masked bits should be left-justified for net mask setting. The following specifications are invalid.

Input notation	Binary notation
255.255.253.0	11111111. 11111111. 11111101. 00000000

■ Default gateway setting

- Setting may not be possible depending on the combination of IP address and default gateway.
- Specify “000.000.000.000” when default gateway is not to be used.
- Setting is not possible in the following case.
  (IP address AND net mask) ≠ (Default gateway address AND net mask)

■ Judgment based on the combination of IP address and net mask

- The following combination is not possible.
  IP address AND (Inverse all bits of net mask: 1’s complement) = 0
  IP address OR (net mask) = 255.255.255.255

* The combination above may occur when masks are set to omission using F460(IPv4SET) instruction.

Example: When net mask = 255.255.0.0, set IP address = 0.0.255.255 using IPv4SET.

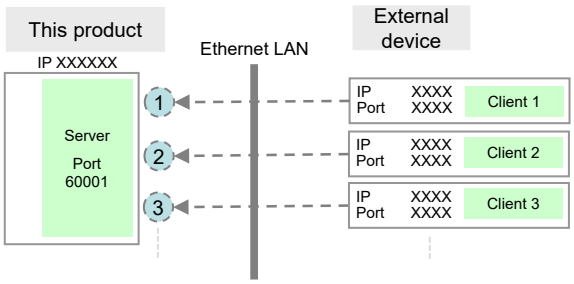
The set values for IP address, net mask and default gateway are initialized when communication process is performed using the combination above. Default values are as follows.

IP address = 192.168.1.5; Net mask = 255.255.255.0; Default gateway = 192.168.1.1

4.1.8 Multi Connection Server Function

■ Overview

- Using the multi-connection server function, you can assign the same port number to multiple connections. This allows multiple clients to simultaneously access one master unit server port.



■ Setting of User Connections

Under "User connection settings", perform the same server settings successively to multiple user connections.

- Each connection is called “multi-connection”.
- Each group of multi-connections is called “multi-connection group”.
- Within the multi-connection group, the settings for the items marked “●” in the following table are the same.

Item		Setting	(Note 1)
Use of connection		Select “Use”.	●
Purpose of use	Communication method	Select “TCP/IP”.	●
	Open method (Server / Client)	Select the server connection (any destination unit) or server connection (specified destination unit).	●
	Open method (Automatic / Manual)	Open automatically	●
	Operation mode setting	Select the operation mode to be used out of "MEWTOCOL-COM", "MEWTOCOL-DAT", "MODBUS-TCP", and "MC Protocol".	●
	MEWTOCOL communication type	Select according to the operation mode.	●
Master unit port number		Input the same number within the multi-connection group.	●
Destination unit IP address		Server connection (any destination unit): Not set Server connection (specified destination unit): Specify the IP address and port No. of the destination unit (client).	●
Destination unit port number			

Item	Setting	(Note 1)
Receive buffer starting address	Input when the operation mode is set to general-purpose communication.	
Receive buffer capacity		
Unused connection disconnect time	Input connection non-communication monitoring time.	●

(Note 1) Items whose settings are the same within the multi-connection group (●: same)

Setting example

Connection No.	Communication method	Server / Client	Open method	Operation mode setting MEWTOCOL communication type	Master unit port	Destination unit ● IP address ● Port	Connection disconnect time
1	TCP/IP	Server connection (any destination)	Open automatically	MEWTOCOL-COM Not connect with FP2 ET-LAN	60001	0.0.0.0 0	0
2	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
3	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
4	TCP/IP	Server connection (any destination)	Open automatically	MEWTOCOL-DAT Not connect with FP2 ET-LAN	60002	0.0.0.0 0	0
5	TCP/IP	Server connection (specified destination)	Open automatically	MODBUS-TCP -	502	0.0.0.0 502	0
6	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above

- Under the above settings, all the settings for connections 1 to 3 are the same and those for connections 5 and 6 are the same.
- The multi-connection groups are as follows.

Multi-connection group 1	Connection Nos. 1 to 3 This server setting allows simultaneous connection to three clients.
Multi-connection group 2	Connection Nos. 5 to 6 This server setting allows simultaneous connection to two clients.

■ **Wrong setting for the multi-connection server**

(Example 1) Not set to the continuous connections

Connection No.	Communication method	Server / Client	Open method	Operation mode setting MEWTOCOL communication type	Master unit port	Destination unit • IP address • Port	Connection disconnect time
1	TCP/IP	Server connection (any destination)	Open automatically	MEWTOCOL-COM Not connect with FP2 ET-LAN	60001	0.0.0.0 0	0
2	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
3	Same as above	Same as above	Same as above	Same as above	60002	Same as above	Same as above
4	Same as above	Same as above	Same as above	Same as above	60001	Same as above	Same as above

Same settings apply to connections 1, 2, and 4. However, in this case, connection 3 is missing.

Multi-connection group 1 consists of connections No. 1 and 2. Connection No. 4 does not belong to the multi-connection group.

(Example 2) Set to different operation modes

Connection No.	Communication method	Server / Client	Open method	Operation mode setting MEWTOCOL communication type	Master unit port	Destination unit • IP address • Port	Connection disconnect time
1	TCP/IP	Server connection (any destination)	Open automatically	MEWTOCOL-COM Not connect with FP2 ET-LAN	60001	0.0.0.0 0	0
2	Same as above	Same as above	Same as above	MEWTOCOL-DAT Not connect with FP2 ET-LAN	Same as above	Same as above	Same as above

Because the operation modes are different, the connections are not regarded as multi-connections.

(Example 3) Set to different connection disconnect times

Connection No.	Communication method	Server / Client	Open method	Operation mode setting MEWTOCOL communication type	Master unit port	Destination unit • IP address • Port	Connection disconnect time
1	TCP/IP	Server connection	Open automatically	MEWTOCOL-COM	60001	0.0.0.0 0	0

Connection No.	Communication method	Server / Client	Open method	Operation mode setting MEWTOCOL communication type	Master unit port	Destination unit • IP address • Port	Connection disconnect time
		(any destination)		Not connect with FP2 ET-LAN			
2	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	1000

Because the connection disconnect times are different, the connections are not regarded as multi-connections.

■ Restrictions on multi-connections

The following restrictions apply to the multi-connections.

1. The following instances are not established as multi-connections.
   When the Server / Client setting is set to "Client connection"
   When the communication setting is set to "UDP/IP"
   When the operation mode setting is set to "General-purpose communication"
2. F462 (OPEN) and F463 (CLOSE) instruction can be executed only for the first connection of a multi-connection group. When the instruction is executed, it applies to all the connections of the multi-connection group.
   If it is executed for connections other than the first connection, an operation error occurs.
3. The F461 (CONSET) instruction cannot be used for multi-connections.
   If multi-connections are included in the specified connection range, an operation error occurs.
4. The master communication instructions F145 (SEND) and F146 (RECV) instruction cannot be used for multi-connections.
   The SEND / RECV instruction executable flag of the special relay does not turn ON.
5. If connections are not regarded as multi-connections due to reasons mentioned in the above item 1 or due to differences in set values. Accordingly, proper communication is not possible.

4.1.9 UDP Destination Unit Optional Communication Function

- Using the UDP destination unit optional communication function, you can set “0” to both the destination unit IP address and the port number for UDP/IP communication. Under such setting, the connection receives data from an optional destination unit.
- Therefore, when using the slave communication for UDP/IP communication, it is recommended that both the destination unit IP address and the port number be set to “0”.
- If “0” is set to either the destination unit IP address or the port number, the one set to “0” is enabled to receive data. If the one not to set to “0” is different from the source, received data is discarded.

	Example 1	Example 2	Example 3
Destination unit IP address	0	192.168.1.6	0

	Example 1	Example 2	Example 3
Destination unit port number	0	0	10
Receiving operation	Possible to receive data from an optional destination unit.	Possible to receive data from an optional port with an IP address of 192.168.1.6.	Possible to receive data from port 10 with an optional IP address.

■ Restrictions

- When using the F145 (SEND) or F146 (RECV) instruction or F159 (MTRN) instruction, data is sent to the unit from which data has just been successfully received.
- Because this function is not supported by the multi-connection, if data is sent simultaneously to the same port, the received data may be discarded.

4.1.10 Recommended Connection Settings

■ Settings for slave communication

Communication method	TCP	UDP
Open method (Server / Client)	Server connection (any destination unit)	-
Open method (Automatic / Manual)	Open automatically	
Destination unit port No.	-	0
IP address of a destination unit	-	0
Master unit port No.	Specify	Specify

(Note 1) For using TCP in slave communication, server connection (any destination unit) is recommended.

■ Settings for master communication

Communication method	TCP		UDP
Open method (Server / Client)	Client connection	Server connection (any destination unit)	-
Open method (Automatic / Manual)	Open automatically		
Destination unit port No.	Specify	-	Specify
IP address of a destination unit	Specify	-	Specify
Master unit port No.	0	Specify	0

4.2 Communication Processing

4.2.1 Communication Operation

■ Operations after connection is established

- Once connection is established, communication is enabled between with devices, depending on the applicable operation mode.
- In the initial state, slave communication is enabled on FP0H control unit.
- To perform master communication from FP0H control unit to devices, use the special instruction F145 (SEND) / F146 (RECV). To perform general-purpose communication, use F159 (MTRN) instruction.
- PLC automatically creates a communication format according to the protocol of applicable communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, MC protocol) for master communication instructions [F145 (SEND) / F146 (RECV)].
- When a command is sent from a higher device to FP0H control unit, data is sent in a communication format according to the protocol of applicable communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, MC protocol), with an Ethernet header added when necessary (to be selected depending on the protocol and destination). In this case, no communication program is required on the PLC side, because a response is automatically returned by the FP0H control unit.

■ Transmission / reception check for each communication

- When FP0H control unit communicates with devices, it checks reception, reads data, and/or checks transmission completion, using a special relay (R) allocated to Ethernet.
- Flags are allocated to special relays R9360 to R9405.

4.3 Special Data Registers Used for Communication

Address	Description
DT90840	User connection 1: SEND / RECV / MTRN done code
DT90841	User connection 2: SEND / RECV / MTRN done code
DT90842	User connection 3: SEND / RECV / MTRN done code
DT90843	User connection 4: SEND / RECV / MTRN done code
DT90844	User connection 5: SEND / RECV / MTRN done code
DT90845	User connection 6: SEND / RECV / MTRN done code
DT90846	User connection 7: SEND / RECV / MTRN done code
DT90847	User connection 8: SEND / RECV / MTRN done code
DT90848	User connection 9: SEND / RECV / MTRN done code

(Note 1) The SEND / RECV / MTRN done code for each connection is as follows:

- When specifying the user connection for the F145 (SEND) / F146 (RECV) / F159 (MTRN) instruction, FFFFh is set when the connection is not established or disrupted.
- If a response waiting timeout error occurs when the F145 (SEND) or F146 (RECV) instruction is executed, 0073h is set.
- When the connection is completed normally, 0000h is set.
- All other values differ according to the protocol.

4.4 Special Relay Signals Used for Communication

4.4.1 I/O Allocation

Relay No.	Supported connection	Name	Description	Valid operation mode
R9360	Connection 1	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90840. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9361		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9362		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9363		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9364		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90840. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9365		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R9366 to R9367		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9368	Connection 2	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90841. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9369		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R936A		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R936B		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R936C		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90841. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R936D		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R936E to R936F		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9370	Connection 3	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90842.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
			● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	
R9371		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9372		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9373		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9374		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90842. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9375		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R9376 to R9377		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9378	Connection 4	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90843. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
R9379		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R937A		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R937B		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R937C		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90843. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R937D		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R937E to R937F		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9380	Connection 5	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90844. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9381		Reception done flag in general-purpose	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
		communication	● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	
R9382		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9383		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9384		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90844. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9385		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R9386 to R9387		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9388	Connection 6	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90845. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9389		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
R938A		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R938B		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R938C		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90845. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R938D		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R938E to R938F		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9390	Connection 7	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90846. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9391		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9392		Transmission done flag in general-purpose	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
		communication	● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	
R9393		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9394		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90846. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9395		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R9396 to R9397		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9398	Connection 8	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90847. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9399		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R939A		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
			● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	
R939B		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R939C		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90847. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R939D		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All
R939E to R939F		Not used		

Relay No.	Supported connection	Name	Description	Valid operation mode
R9400	Connection 9	Communication error flag	● Turns ON when a transmission error occurs during data communication. The done code is stored in DT90848. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.	General-purpose communication
R9401		Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication
R9402		Transmission done flag in general-purpose communication	● Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.	General-purpose communication

Relay No.	Supported connection	Name	Description	Valid operation mode
R9403		SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9404		SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored in DT90848. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP MC protocol
R9405		Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.	All

5 MEWTOCOL Master-Slave Communication

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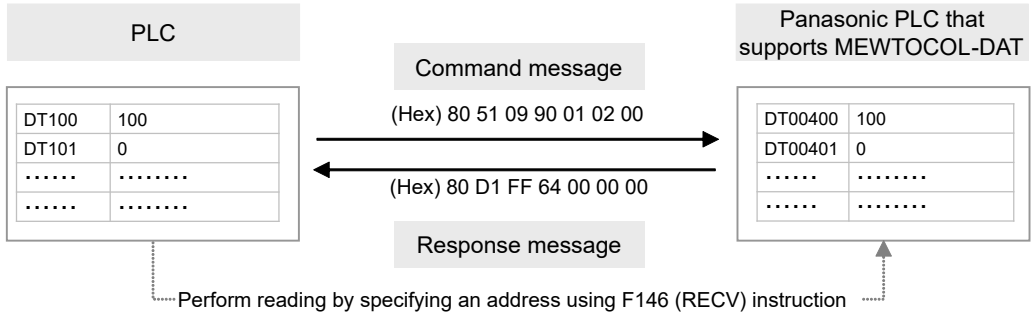
5.1 Types of MEWTOCOL Communication

5.1.1 MEWTOCOL-DAT (Binary Communication)

■ Procedure

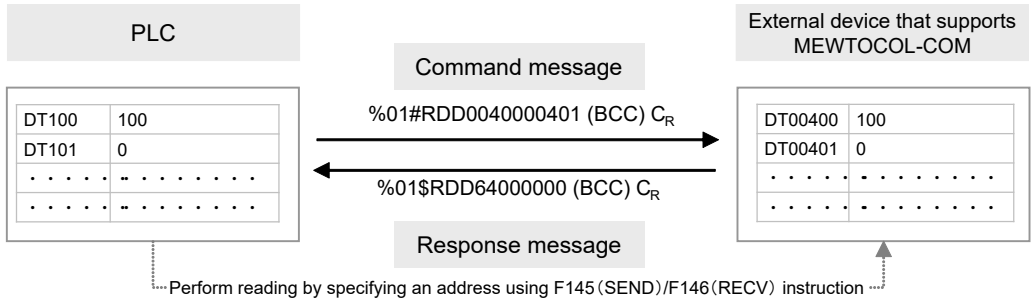
PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MEWTOCOL-DAT. Data can be read and written by specifying unit Nos. and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of MEWTOCOL-DAT. In communication via LAN, a header including send data size information is added.

5.1.2 MEWTOCOL-COM (ASCII Communication)

PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MEWTOCOL-COM. Data can be read and written by specifying unit Nos. and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of MEWTOCOL-COM. In communication via LAN, a header including send data size information is added.

5.2 List of MEWTOCOL Supported Commands

5.2.1 List of MEWTOCOL-DAT Commands

Type of instruction	Code	Description
Write data area	50H	Writes data to a data area.
Read data area	51H	Reads the contents of a data area.
Write contact information	52H	Turns ON or OFF a contact in the specified area.
Read contact information	53H	Reads the ON / OFF state of a contact in the specified area.

5.2.2 List of MEWTOCOL-COM Commands

■ Commands to be used

Type of instruction	Code	Description
Read contact area	RC (RCS) (RCP) (RCC)	Reads contact ON/OFF status. ● Specifies only a single contact. ● Specifies multiple contacts. ● Specifies a range in word units.
Write contact area	WC (WCS) (WCP) (WCC)	Turns contact ON or OFF. ● Specifies only a single contact. ● Specifies multiple contacts. ● Specifies a range in word units.
Read data area	RD	Reads the contents of a data area.
Write data area	WD	Writes data to a data area.
Register / reset contacts monitored	MC	Registers the contact to be monitored.
Register / reset data monitored	MD	Registers the data to be monitored.
Monitoring start	MG	Monitors a registered contact or data using MD and MC.
Preset contact area (fill command)	SC	Fills the area of a specified range with a 16-point ON / OFF pattern.
Preset data area (fill command)	SD	Writes the same contents to the data area of a specified range.
Read the status of PLC	RT	Reads PLC specification, an error code when an error occurs, etc.
Abort	AB	The reception of multi-frame response is aborted.

(Note 1) Some devices cannot be accessed due to format limitations of MEWTOCOL-COM communication commands.

Info.

- For more details of MEWTOCOL command, refer to "11.4 MEWTOCOL-COM Format".

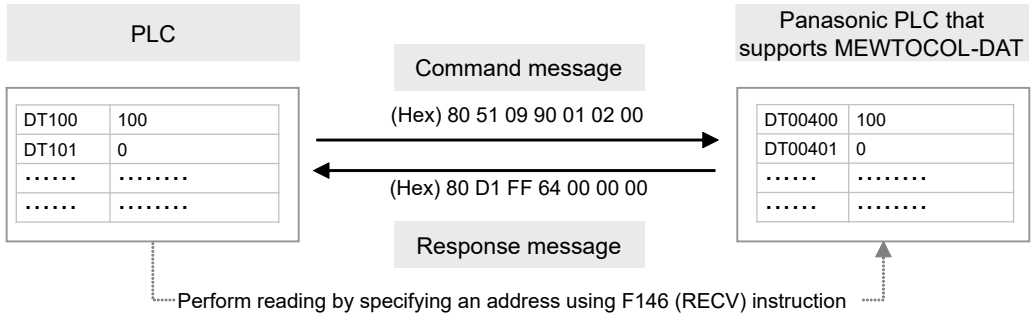
5.3 List of MEWTOCOL-COM Communication Error Codes

Code	Name	Description of error
!26	Unit number setting error	A command that cannot be used for global (unit no. FF) was received.
!40	BCC error	Transmission error occurred in received data.
!41	Format error	Command that does not match the format was received.
!42	NOT support error	An unsupported command was received.
!43	Multiframe process error	Another command was received during the multiframe processing.
!60	Parameter error	Specified parameter does not exist, or cannot be used.
!61	Data error	There is an error in the contact, data area, data number, size, range or format specification.
!62	Registration over error	The number of registration exceeded the restriction, or operation is performed without registration.
!63	PC mode error	Invalid command was executed in RUN mode or when copying data in an SD memory card.
!64	External memory error	There is an abnormality in hardware. There may be an abnormality in the internal ROM (F-ROM). At the time of ROM transfer, a specified content exceeds the capacity. A reading/writing error occurred.
!65	Protection error	Write operation was performed to a program or system register when the unit is protected (password setting).
!66	Address error	The code format of address data is incorrect, or the range specification is incorrect.
!67	Missing program error /Missing data error	Reading message or starting/reading sampling trace was executed when no program/data is registered.
!68	Rewriting is disabled while in RUN mode	Editing an instruction that cannot be rewritten in RUN mode (ED, SUB, RET, INT, IRET, SSTP or STPE) is attempted. Nothing is written to the CPU.
!71	Exclusive control error	A command that cannot be processed simultaneously with the command in process was executed.
!78	No SD card error	SD card is not inserted.
!80	Guarantee data abnormality error	Guarantee data (CRC code) is incorrect.
!81	No effective data error	There is no effective data.
!90	Logging trace error	Invalid command was executed during the logging trace operation.
!92	Unsupported SD card error	The card is not an industrial SD card manufactured by Panasonic.
!93	Server disabled error	A command was executed when the target server was disabled.
!94	Certificate writing error	Certificate was written using illegal procedure.
!97	Server connected error	A command was executed when the target server was connected.

5.4 MEWTOCOL Master Communication (RECV)

■ Procedure

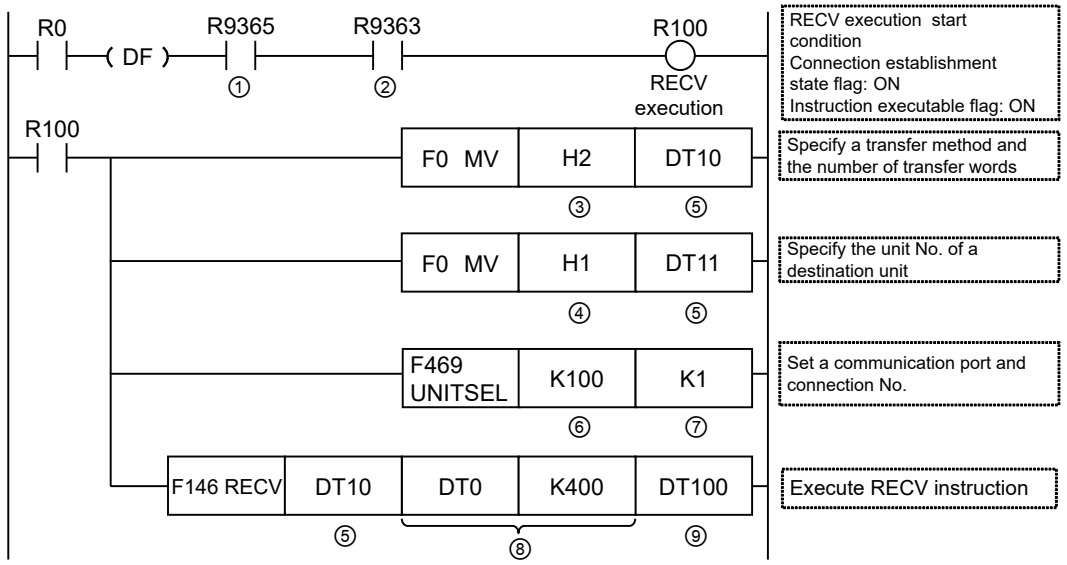
PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MEWTOCOL. Data can be read by specifying unit Nos. and memory addresses and executing F146 (RECV) instruction in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of MEWTOCOL-DAT. In communication via LAN, a header including send data size information is added.

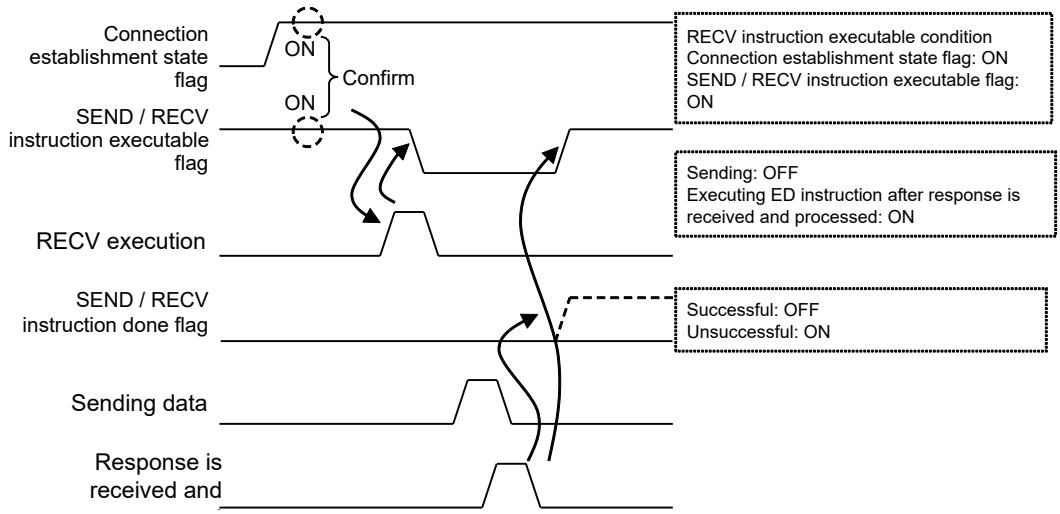
■ Sample program

- Send a command from the LAN port of the control unit, read data from the data areas DT400 to DT401 of an external device (unit No. 1), and write the data into the data registers DT100 to DT101 of PLC.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that transmission / reception is not in progress to the same port (SEND / RECV instruction executable flag R9363: ON), and start up F146 (RECV) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F146 (RECV) is executed by specifying the starting address of PLC memory area that stores control data that specifies the transfer method, the number of words, and the unit No. of a destination unit.



Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Number of transferred words	Specify the number of words in higher words of control data. Range ● H1 to H1FB (1 word to 507 words) (MEWTOCOL-COM) ● H1 to H3FC (1 word to 1020 words) (MEWTOCOL-DAT)
(4)	Unit No. of a destination unit	Specify a unit No. of a destination unit for the lower 8 bits in lower words of control data. Range: H01 to H40 (K1 to K64)
(5)	Memory area that stores control data	Specify the starting address of the area (2 words) that specifies the transfer method and the number of transfer data.
(6)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(7)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(8)	Destination unit send data storage area	Using two operands, specify the type and relative address of the memory area of a destination unit that stores receive data.
(9)	Master unit memory area to store receive data	Specify the starting address of memory area of the master unit that stores receive data.

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication.
- As for F145 (SEND) / F146 (RECV) instructions, up to 9 instructions can be executed simultaneously for different connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the"SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when an error occurs, and the error code is stored in"SEND / RECV / MTRN done code". (Example: !61 Data error = H61)

  For details of error codes, refer to "5.3 List of MEWTOCOL-COM Communication Error Codes".
- Specify "H1" for the unit No. of a destination unit in the case of communication with FP0H or FP7. The destination is determined by an IP address.

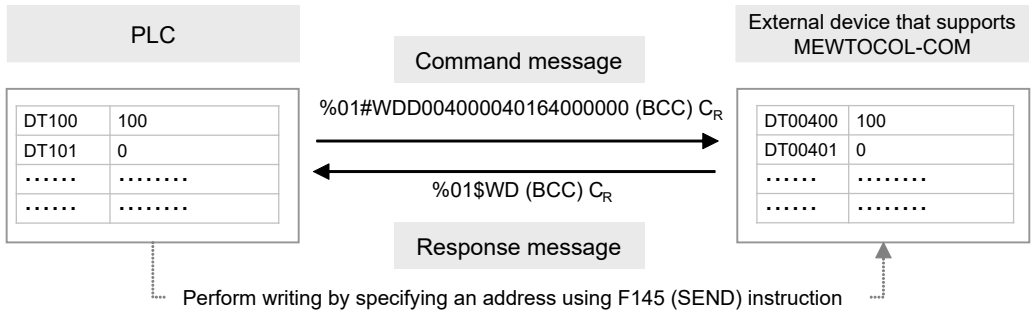
REFERENCE

10.2.2 F146 RECV [Data Receive Instruction (MEWTOCOL Master)]

5.5 MEWTOCOL Master Communication (SEND)

■ Procedure

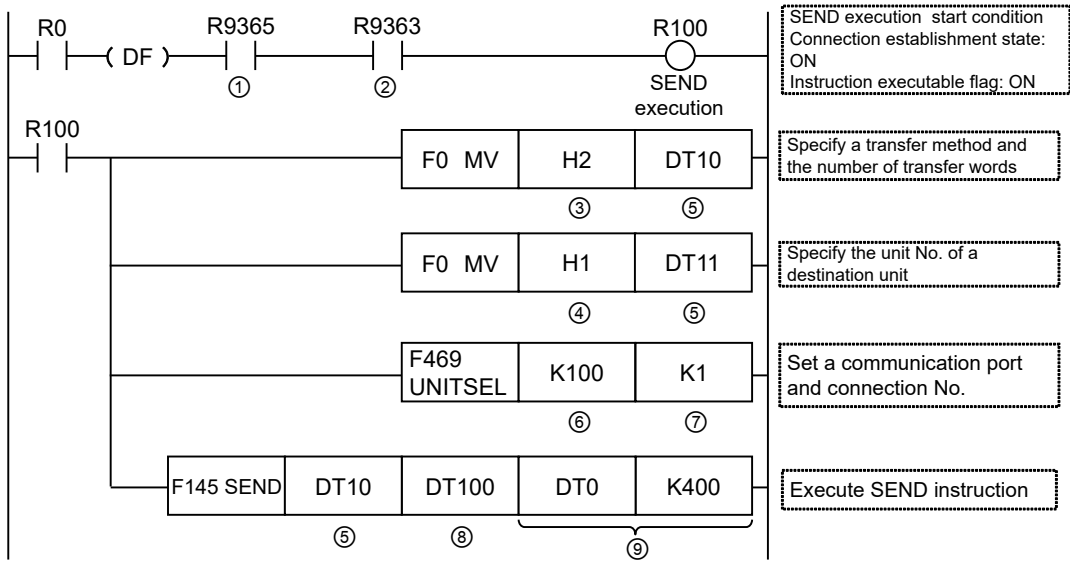
PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MEWTOCOL. Data can be written by specifying unit numbers and memory addresses and executing F145 (SEND) instruction in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of MEWTOCOL-COM. In communication via LAN, a header including send data size information is added.

■ Sample program

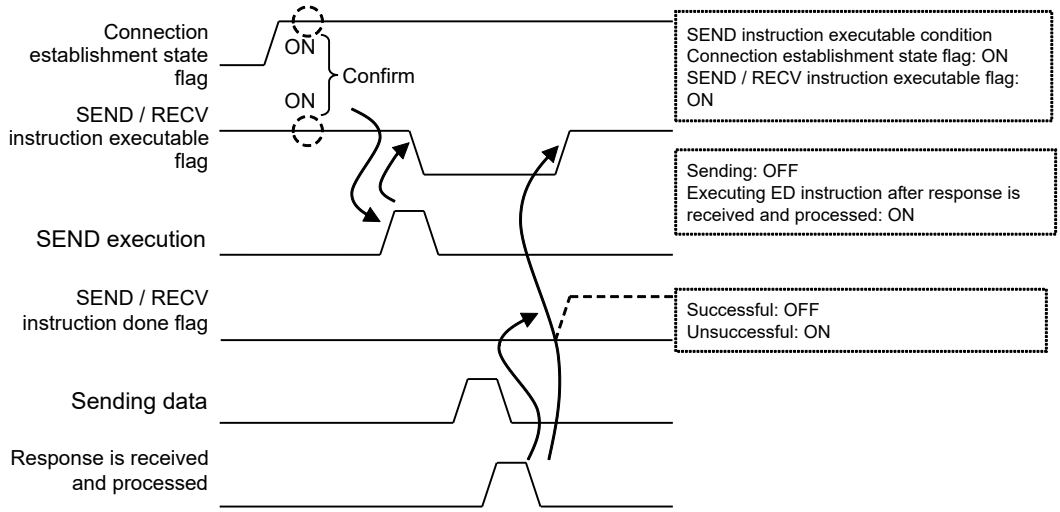
- Send a command from LAN port of the control unit, and write the content of the data registers DT100 to DT101 of PLC into the data areas DT400 to DT401 of an external device.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that transmission / reception is not in progress to the same port (SEND / RECV instruction executable flag R9363: ON), and start up F145 (SEND) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F145 (SEND) is executed by specifying the starting address of PLC memory area that stores control data that specifies the transfer method, the number of words, and the unit No. of a destination unit.



(Note 1) The slave side may not be able to respond, when the scan time of PLC as a master unit is short and interval between transmission sessions is short. In such cases, insert a timer instruction into the execution conditions for instructions, and make the sending interval longer.

Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Number of transferred words	Specify the number of words in higher words of control data. Range ● H1 to H1FB (1 word to 507 words) (MEWTOCOL-COM) ● H1 to H3FC (1 word to 1020 words) (MEWTOCOL-DAT)
(4)	Unit No. of a destination unit	Specify a unit No. of a destination unit for the higher 8 bits in lower words of control data. Range: H01 to H40 (K1 to K64)
(5)	Memory area that stores control data	Specify the starting number of the area (2 words) that specifies the transfer method and the number of transfer data.
(6)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(7)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(8)	Master unit memory area to store send data	Specify the memory area of a master unit that stores send data.
(9)	Destination unit send data storage area	Using two operands, specify the type and relative address of the memory area of a destination unit that stores send data.

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication.
- As for F145 (SEND) / F146 (RECV) instructions, up to 9 instructions can be executed simultaneously for different connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the "SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when the instruction terminates abnormally, and the error code is stored in "SEND / RECV / MTRN done code". (Example: !61 Data error = H61)

  For details of error codes, refer to "5.3 List of MEWTOCOL-COM Communication Error Codes".
- Specify "H1" for the unit No. of a destination unit in the case of communication with FP0H or FP7. The destination is determined by an IP address.

REFERENCE

10.2.1 F145 SEND [Data Send Instruction (MEWTOCOL Master)]

6 MODBUS TCP Master-Slave Communication

6.1 MODBUS TCP Format.....6-2
6.1.1 MODBUS TCP 6-2
6.1.2 Response Format of MODBUS TCP 6-2
6.2 List of MODBUS TCP Supported Commands 6-4
6.2.1 List of MODBUS Function Codes 6-4
6.3 MODBUS TCP Master Communication (RECV).....6-5
6.4 MODBUS TCP Master Communication (SEND).....6-9

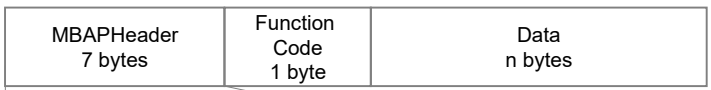
6.1 MODBUS TCP Format

6.1.1 MODBUS TCP

■ Data structure of MODBUS TCP format

- In MODBUS TCP, an MBAP header is added to function codes and data used in MODBUS-RTU.

MODBUS TCP format



MBAP header section

■ Data content

Fields		Field name	Description
MBAP Header	Transaction Identifier	Transaction identifier	00H is entered
	Protocol Identifier	Protocol identifier	00H is entered
	Length	Message length	Length of the following send/receive message is entered
	Unit Identifier	Unit identifier	Unit No. is entered (00H to FFH)(Note 1)
Function Code		Function code	The same function name as in MODBUS-RTU is entered
Data		Data	Data corresponding to the function code is entered

(Note 1) If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. is 01H to F7H.

Info.

- Function codes and data sections of MODBUS TCP are the same as those of MODBUS-RTU, except that CRC check code included in the MODBUS-RTU format is excluded.
- For detailed MODBUS specifications, refer to our website at https://www.modbus.org/.

6.1.2 Response Format of MODBUS TCP

■ Response in normal status

- For single write commands and loopback tests, the same data as sent data is returned.
- For multiple write commands, part of sent data (6 bytes from the beginning of the data) is returned.

■ Response in abnormal status

If a parameter that cannot be processed is found in a command (except Ethernet communication errors)

Field name	Description
Function code	Function code is input in “+80H” format. (Example) "81H" in the case of code 01 “Read Coil state”
Data	The following error codes are input: 1. Function code error 2. Device number error (out of range) 3. Device quantity error (out of range)

6.2 List of MODBUS TCP Supported Commands

6.2.1 List of MODBUS Function Codes

■ Supported commands

Code	Name (MODBUS)	Name	Remarks (Reference No.)	FP0H supported functions
01	Read Coil state	Read Y / R coils	0X	●
02	Read Input state	Read X contact	1X	●
03	Read hold register	Read DT	4X	●
04	Read input register	Read WL / LD	3X	●
05	Force Single Coil	Write single Y / R	0X	●
06	Preset Single Register	Write DT1 word	4X	●
08	Diagnostics	Loopback Test	-	-
15	Force Multiple Coils	Write multiple Y / R	0X	●
16	Preset Multiple Registers	Write DT multiple words	4X	●
22	Mask Write Register	Write DT mask	4X	-
23	Read / Write Registers	Read / write DT	4X	-

(Note 1) The types of MODBUS function codes vary by instructions used.

■ Correspondence table between MODBUS reference Nos. and device Nos.

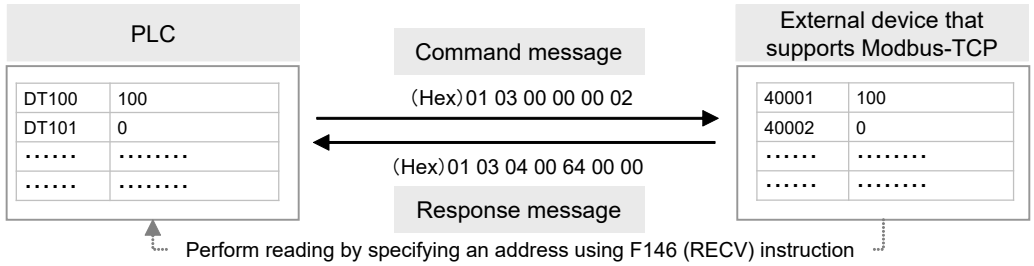
MODBUS reference Nos.		Data on BUS (hexadecimal)	FP0H device No.
Coil	000001-001760	0000-06DF	Y0-Y109F
	002049-010240	0800-27FF	R0-R511F
Input	100001-101760	0000-06DF	X0-X109F
Hold register	400001-465533	0000-FFFC	DT0-DT65532
Input register	300001-300128	0000-007F	WL0-WL127
	302001-302256	07D0-08CF	LD0-LD255

(Note 1) The table above indicates correspondence between MODBUS reference Nos. for accessing FP0H through MODBUS protocol from a higher device and operation device Nos. of FP0H.

6.3 MODBUS TCP Master Communication (RECV)

■ Procedure

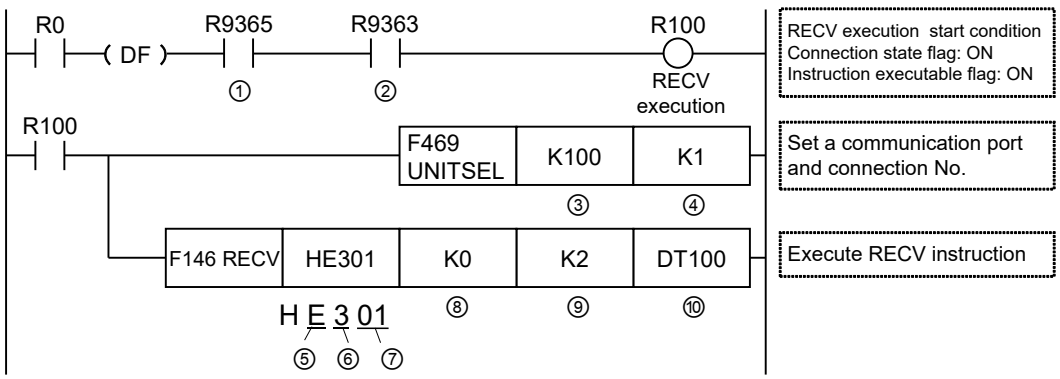
PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MODBUS. Data can be read by specifying unit Nos. and memory addresses and executing F146 (RECV) instruction in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of Modbus function. In communication via LAN, a header including send data size information is added.

■ Sample program

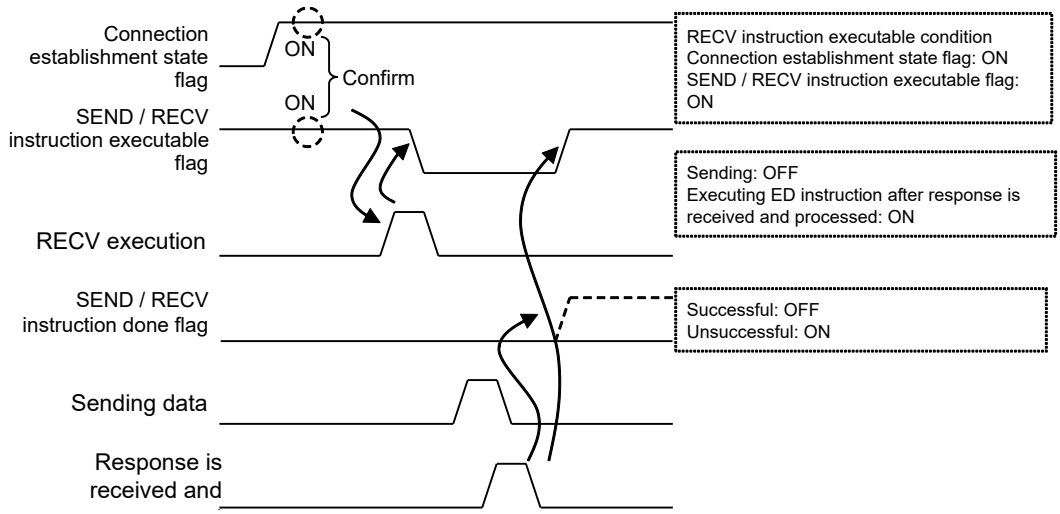
- Send a MODBUS command from the LAN port of the control unit, read data from the data areas 40001 to 40002 (MODBUS addresses 0000H to 0001H) of an external device, and write the data into the data registers DT100 to DT101 of PLC.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that transmission / reception is not in progress to the same port (SEND / RECV instruction execution in progress flag R9363: ON), and execute F146 (RECV) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- Using F146 (RECV), it is possible to directly specify the port No., MODBUS command to be used, unit No. of a destination unit, the number of receive data, and the starting address of PLC memory area that stores data. Check addresses of connected devices in the instruction manuals of devices.



Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(4)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(5)	COM port number of a master unit	Specify a COM port No. for Bit 15 to Bit 12 of control data. HF: COM0 port, H1: COM1 port, H2: COM2 port, HE: LAN port To perform Ethernet communication, specify "HE".
(6)	MODBUS command	Specify a MODBUS command for Bit 11 to Bit 8 of control data. H1: Command 01 (Read coil state) H2: Command 02 (Read input state) H3: Command 03 (Read hold register) H4: Command 04 (Read input register)
(7)	Unit No. of a destination unit	Specify a unit No. of a destination unit for Bit 7 to Bit 0 of control data. Range: H01 to HFF (K1 to K255)(Note 1)
(8)	MODBUS address of a destination unit	Specify the MODBUS starting address of the memory area of a destination unit that stores receive data. Range: H0 to HFFFF
(9)	Number of receive data	In the case of bit data, the max. number is 2040 (07F8H). In the case of word data, the max. number is 127 (7FH).
(10)	Master unit memory area to store receive data	Specify the starting address of memory area of the master unit that stores receive data.

(Note 1) If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. is H01 to HF7 (K1 to K247).

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns ON when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns ON when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication.
- As for F145 (SEND) / F146 (RECV) instructions, up to 9 instructions can be executed simultaneously for different connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the "SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when the instruction terminates abnormally, and the error code is stored in "SEND / RECV / MTRN done code". (Example: Function code error = H1)

  For details of error codes, refer to "6.1.2 Response Format of MODBUS TCP".
- In MODBUS-TCP mode, specify a communication unit in the operand of F145 (SEND) / F146 (RECV) instruction.

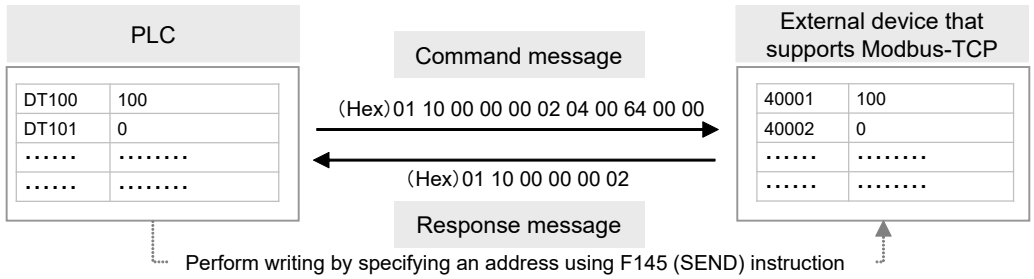
REFERENCE

10.2.4 F146 RECV [Data Receive Instruction (MODBUS Master: Function Code Specification)]

6.4 MODBUS TCP Master Communication (SEND)

■ Procedure

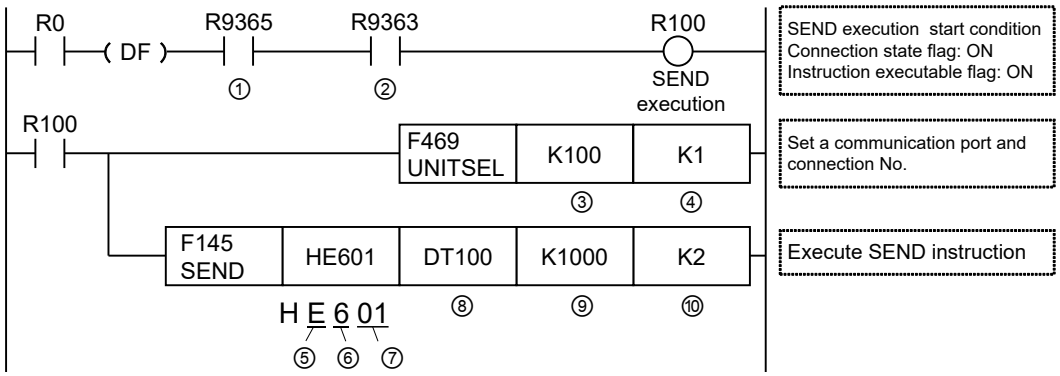
PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MODBUS. Data can be written by specifying unit Nos. and memory addresses and executing F145 (SEND) instruction in a user program, because PLC automatically creates messages according to the protocol.



(Note): The figure above shows the data section of Modbus function. In communication via LAN, a header including send data size information is added.

■ Sample program

- Send a MODBUS command from LAN port of the control unit, and write the content of the data registers DT100 to DT101 of PLC into MODBUS addresses 1000 to 1001.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that transmission / reception is not in progress to the same port (SEND / RECV instruction execution in progress flag R9363: ON), and execute F145 (SEND) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- Using F145 (SEND), it is possible to directly specify the port No., MODBUS command to be used, the starting address of PLC memory area that stores data to be sent, unit No. of a destination unit, and the number of send data. Check addresses of connected devices in the instruction manuals of devices.



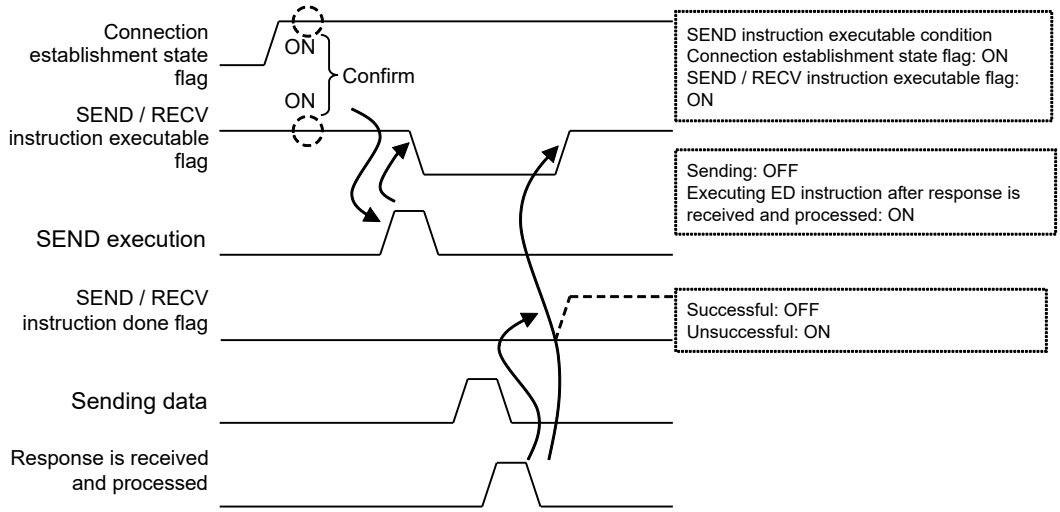
(Note 1) The slave side may not be able to respond, when the scan time of PLC as a master is units short and interval between transmission sessions is short. In such cases, insert a timer instruction into the execution conditions for instructions, and make the sending interval longer.

Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(4)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(5)	COM port No. of a master unit	Specify a COM port No. for Bit 15 to Bit 12 of control data. HF: COM0 port, H1: COM1 port, H2: COM2 port, HE: LAN port To perform Ethernet communication, specify "HE".
(6)	MODBUS command (Note 1)	Specify a MODBUS command for Bit 11 to Bit 8 of control data. H5: Command 05 (Force a single coil) or Command 15 (Force multiple coils) H6: Command 06 (Preset a single register) or Command 16 (Preset multiple registers) HD: One-bit transfer by Command 15 HE: One-word transfer by Command 16
(7)	Unit No. of a destination unit	Specify a unit No. of a destination unit for Bit 7 to Bit 0 of control data. Range: Possible to specify from H00 to HFF (K0 to K255).(Note 2)
(8)	Master unit memory area to store send data	Specify the starting address of memory area of the master unit that stores send data.
(9)	Destination unit send data storage area	Specify the MODBUS starting address of the memory area of a destination unit that stores send data. Range: H0 to HFFFF
(10)	Number of send data	In the case of bit data, the max. number is 2040 (07F8H). In the case of word data, the max. number is 127 (7FH).

(Note 1) When H5 or H6 is specified, if multiple points are specified for the number of send data, they are automatically converted into Command 15 or 16 for sending multiple bits or words.

(Note 2) If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. is H01 to HF7 (K1 to K247).

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns ON when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns ON when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication.
- As for F145 (SEND) / F146 (RECV) instructions, up to 9 instructions can be executed simultaneously for different connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the "SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when the instruction terminates abnormally, and the error code is stored in "SEND / RECV / MTRN done code". (Example: Function code error = H1)

  For details of error codes, refer to "6.1.2 Response Format of MODBUS TCP".
- In MODBUS-TCP mode, specify a communication unit in the operand of F145 (SEND) / F146 (RECV) instruction.

REFERENCE

10.2.3 F145 SEND [Data Send Instruction (MODBUS Master: Function Code Specification)]

7 General-Purpose Communication

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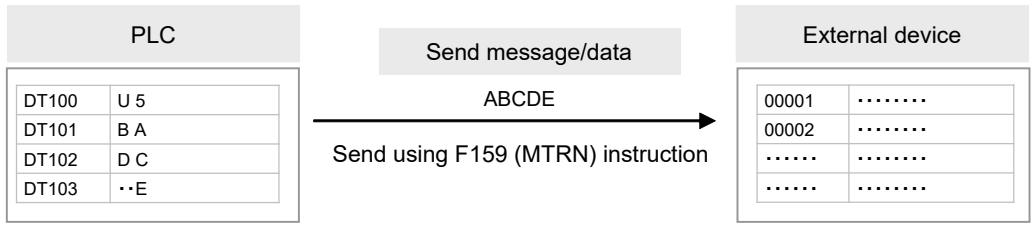
7.1 Sending Operation

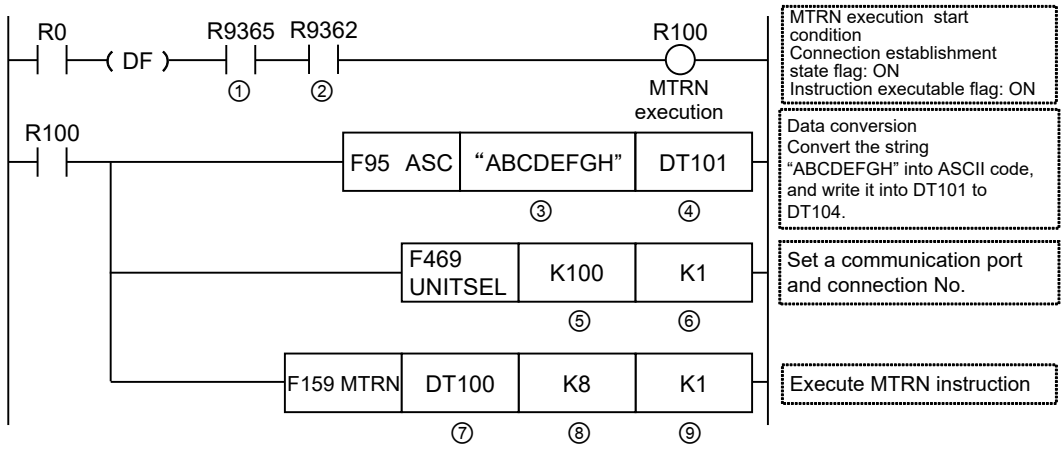
7.1.1 Overview of Sending Operation

Transmission in general-purpose communication is performed by executing F159 (MTRN) instruction, after creating a send data table in a given operation memory.



■ Sample program

- Confirm that Connection 1 is established in general-purpose communication mode (Connection establishment state flag R9365: ON), and that transmission / reception is not in progress to the same port (Transmission done flag in general-purpose communication R9362: ON), and start up F159 (MTRN) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F159 (MTRN) is executed by specifying the starting address of PLC memory area that stores data to be sent, and the number of send data. Check addresses of connected devices in the instruction manuals of devices.

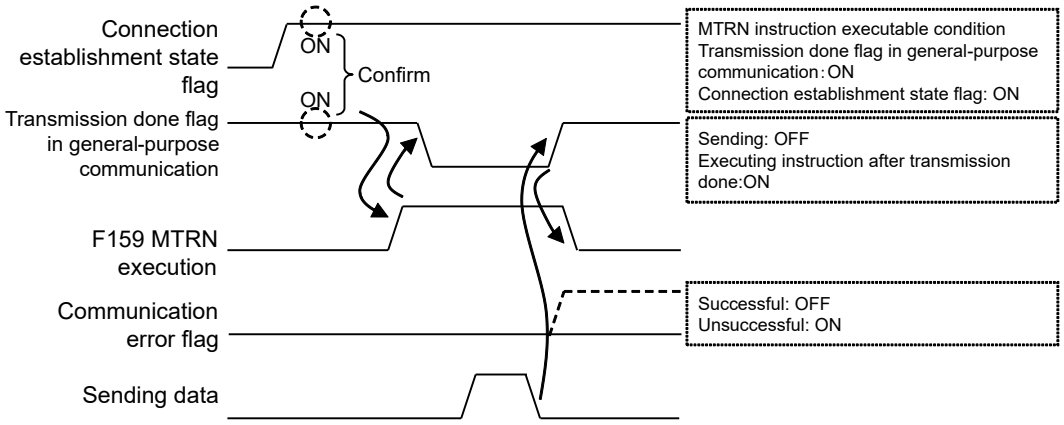


Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	Transmission done flag in general-purpose communication	This is inserted to confirm that no F159 (MTRN) instruction is in progress for the same connection. Turns ON when an instruction is executable.

Code	Description	
(3)	Character constant to be sent	Input a character constant to be sent. In the case of input using FPWIN GR7, select "M" as a device type. On FPWIN GR7, a character constant is bracketed by double quotation marks.
(4)	Area that stores send data	Specify the starting address of the data register to be sent.
(5)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(6)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(7)	Master unit memory area to store send data	Specify the starting address of memory area of the master unit that stores send data.
(8)	No. of send bytes	Specify the number of send bytes. Max. 2048 bytes
(9)	Port No.	This input is invalid, because transmission is performed based on the connection No. specified by F469 (UNITSEL).

■ Timing chart

- Data is sent in ascending order from lower bytes in the table specified by F159 (MTRN) instruction.
- During transmission, the transmission done flag in general-purpose communication for this connection turns OFF. When transmission is complete, the flag turns ON.
- The send result (0: Successful; 1: Unsuccessful) is stored in the communication error flag.



■ I/O allocation

Name	Description
Communication error flag	• Turns ON when a transmission error occurs during data transmission. • Turns OFF when transmission is requested using an F159 (MTRN) instruction.
Transmission done flag in general-purpose communication	• Turns ON when data transmission is completed while connection is established in the general-purpose communication mode. • Turns OFF when the execution of F159 (MTRN) is started.

Name	Description
	● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

(Note 1) Each contact is used for reading the operation state. Do not write over it with a user program.

■ Special relays / special data registers

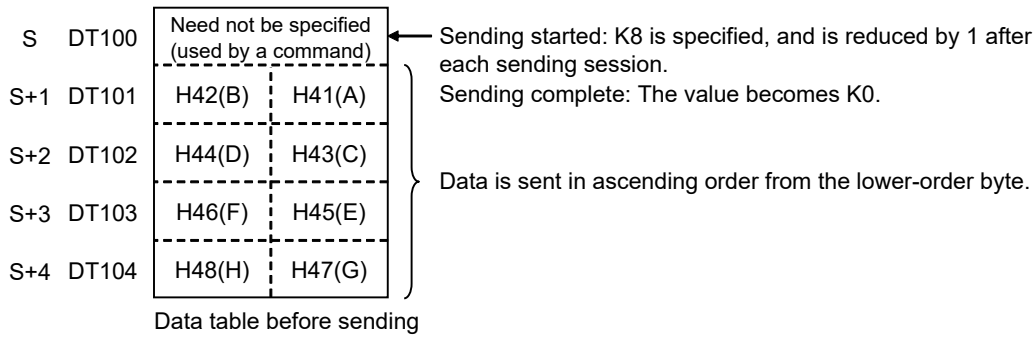
	Connection								
	1	2	3	4	5	6	7	8	9
Communication error flag	R9360	R9368	R9370	R9378	R9380	R9388	R9390	R9398	R9400
Transmission done flag in general-purpose communication	R9362	R936A	R9372	R937A	R9382	R938A	R9392	R939A	R9402
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

7.1.2 Content of Send Data

Send data is stored as follows in a given memory area (e.g. data register DT). The number of send data bytes is stored in the starting word. The value is switched to "0" when transmission is complete.

■ Structure of send data

Example: When an 8-byte data "ABCDEFGH" is sent



Data table before sending

Info.

- No header or terminator is added to data sent from the FP0H unit. Depending on the protocol of an external device, if a header and a terminator need to be sent, store them as part of send data.
- The maximum data that can be sent in a single session is 2048 bytes.

7.2 Receiving Operation

7.2.1 Overview of Receiving Operation

■ Procedure

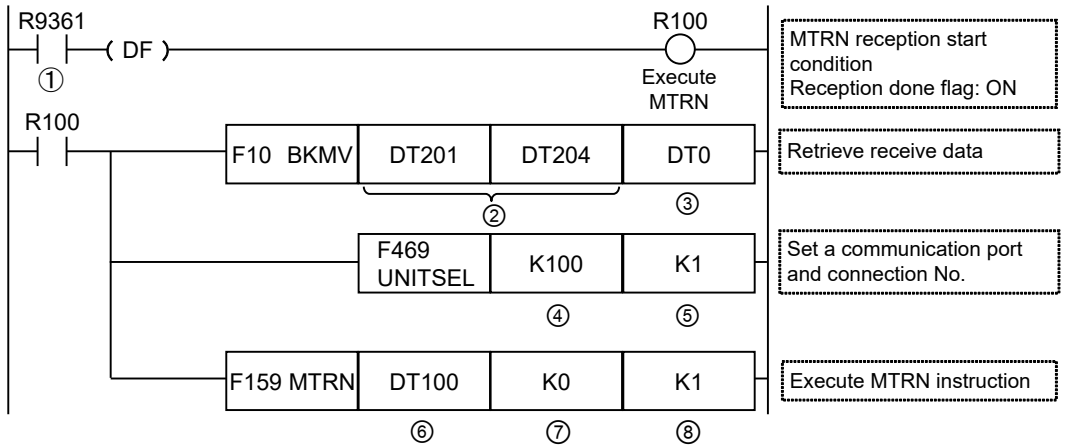
- Data received in Ethernet port is stored in a "receive buffer". The "reception done flag" turns ON at the same time.
- The receive data needs to be transferred from the "receive buffer" to a given area.
- When F159 (MTRN) instruction is executed, the "reception done flag" turns OFF, and enables reception at any time.

Info.

- Receive buffer is a given area in the data register (DT).
- Specify an area under "User connection setting" in programming software FPWIN GR7.

■ Sample program

- Set data area in receive buffer at DT200 to DT204.
- When the reception done flag in general-purpose communication (R9361) in Connection 1 turns ON, reception program based on F159 (MTRN) instruction is started up.
- Receive data is transferred from the "receive buffer" to an area starting with data register DT0.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F159 (MTRN) instruction is executed with no data, in order to reset the receive buffer writing points and to turn OFF the "reception done flag R9361" contact. The system is now prepared to receive the next data. (The data in the receive buffer is not cleared.)



Code	Description	
(1)	Reception done flag in general-purpose communication	Turns ON when the terminator is received while connection is established in the general-purpose communication mode. Turns OFF when the execution of F159 (MTRN) is started.

Code	Description	
(2)	Data area of receive buffer	Specify the area of data stored in a receive buffer. In this example, 4-word area (DT201 to DT204) is specified to retrieve 8-byte data.
(3)	Area that transfers receive data	Received data is transferred to a given area from the receive buffer.
(4)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(5)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(6)	Given area	To execute F159 (MTRN) instruction, specify a dummy area.
(7)	Number of send bytes	Specify “0” for reception.
(8)	Port No.	This input is invalid, because transmission is performed based on the connection No. specified by F469 (UNITSEL).

(Note 1) For details of instruction programming, refer to the *FP Series Programming Manual*.

Info.

- Note that the reception done flag in general-purpose communication changes even while a scan is in progress. (e.g., if the reception done flag is used multiple times as an input condition, there is a possibility of different statuses existing within the same scan.) As a protective measure, replace it with an internal relay at the beginning of the program.
- The max. received bytes is 4084 when a special header is added, and 4096 when no special header is added.

■ I/O allocation

Name	Description
Communication error flag	● Turns ON when a transmission error occurs during data transmission. ● Turns OFF when transmission is requested using an F159 (MTRN) instruction.
Reception done flag in general-purpose communication	● Turns ON when the terminator is received while connection is established in the general-purpose communication mode. ● Turns OFF when the execution of reception done flag in general-purpose communication instruction F159 (MTRN) is started. ● Turns OFF when connection is MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP or MC protocol.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
Communication error flag	R9360	R9368	R9370	R9378	R9380	R9388	R9390	R9398	R9400

	Connection								
	1	2	3	4	5	6	7	8	9
Reception done flag in general-purpose communication	R9361	R9369	R9371	R9379	R9381	R9389	R9391	R9399	R9401
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

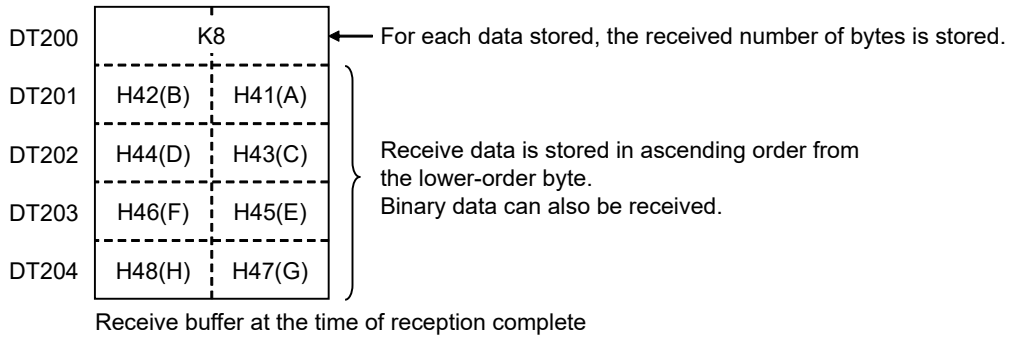
7.2.2 Content of Receive Data

Receive data is stored in the receive buffer (data register DT) specified in the system register. The number of receive data bytes is stored in the starting word.

■ Structure of receive data

Example: When 8-byte data "ABCDEFGH" is received

Specify 200 for the receive buffer starting number, and 5 for the receive buffer capacity.



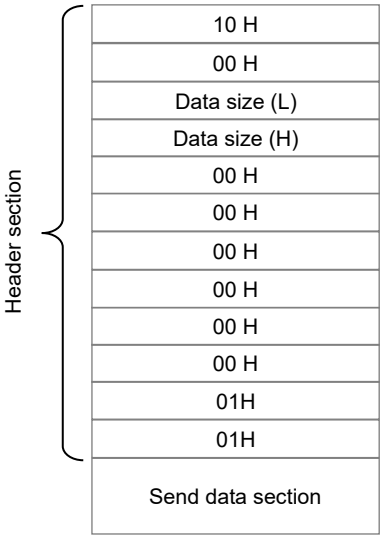
Info.

- Depending on the communication format of an external device, if a header and a terminator are contained, they are stored in the operation memory as part of receive data. When necessary, insert a program to extract data content.

7.3 Transmission Format in General-Purpose Communication

■ Operational difference based on a selected communication type

- Data for transmission / reception in Ethernet communication varies based on setting in “User connection information: Communication type”.

Communication type	Not add a special header	Add a special header
Message format	Do not add a header to a message. Only send data is sent. 	A header is added to a message before sending. The header contains send data size information. 
Receiving operation	When no data is received for TCP terminator detection timer value (default: 20 ms) or longer, reception is considered complete.	Reception is completed when data of the send data size contained in the header has been received.
How to select	Usual communication based on protocol specified by another manufacturer	High-speed general-purpose communication with FP0H or FP7

Info.

- For more details of communication type setting screen, refer to "3.4 Setting of User Connections".

(MEMO)

8 MC Protocol Communication Functions

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8.1 Overview of MC Protocol Communication Functions

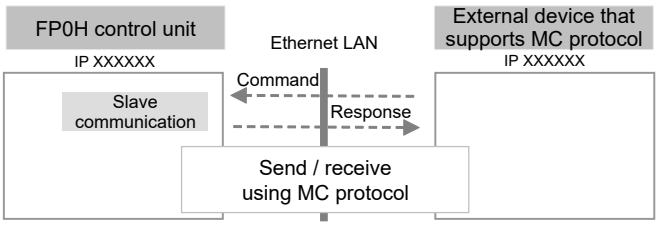
8.1.1 MC Protocol Communication

■ Overview of function

- Communication is performed with the communication protocol "MC protocol" that is released by Mitsubishi Electric Corporation for communication between PLCs and external devices.
- An external device (including PLC) or FP0H has the transmission right, and communication is performed by sending commands, and receiving responses, that support "MC protocol".
- Information according to the format as required by "MC protocol" including Ethernet header, IP header, TCP header or UDP header is added to commands and responses .
- The data size that can be sent or received at a time is a maximum of 960 words for transmission in word units, and 4054 bits for transmission in bit units.

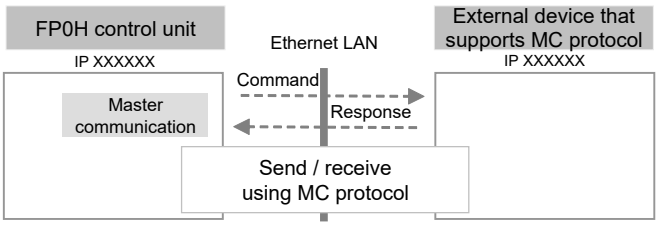
■ Slave communication

- When FP0H is used as a slave, no communication program is required on the FP0H side, because a response is automatically returned.



■ Master communication

- Data can be read and written between PLC and external devices by specifying memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because FP0H automatically creates messages according to the protocol.



8.1.2 Communication Specifications of MC Protocol

- TCP/IP and UDP/IP communication methods are available.
- Communication using QnA compatible 3E frame and binary codes is supported.
- Both slave communication and master communication "F145 (SEND) / F146 (RECV) instructions" are supported.

■ Description

Items	Specification	
Connection	1 to 9	
Communication method	TCP/IP	UDP/IP
Master unit port No.	5000 (recommended)	
Supported frame	QnA compatible 3E frame	
Communication data code	Binary code	

(Note 1) When multiple connections are used, use different port Nos. for each connection.

■ Operation mode setting for slave communication

Specify MC protocol, 3E frame or binary as a communication method of a given connection of built-in Ethernet.

■ How to use master communication

Execute F145 (SEND) / F146 (RECV) instructions for connections for which slave communication is specified.

Note that F145 (SEND) (bulk write) and F146 (RECV) (bulk read) are only supported in master communication.

■ Supported commands

Only the following commands are supported both for master communication and for slave communication.

Support by FP0H	Function	Data unit	Command	Subcommand
○	Bulk read	Bits	0401	0001
		Word	0401	0000
○	Bulk write	Bits	1401	0001
		Word	1401	0000

8.1.3 I/O Relays Used for MC Protocol Communication

For I/O relays used for MC protocol communication, refer to "4.4.1 I/O Allocation".

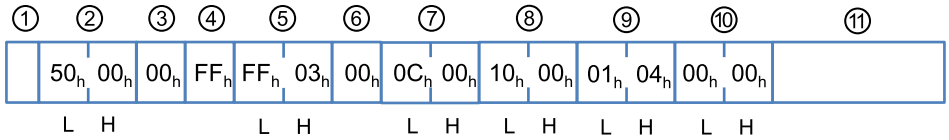
8.2 Communication Format

8.2.1 Command and Response Formats

- For details, refer to *MELSEC Communication Protocol Reference Manual* published by Mitsubishi Electric Corporation.
- FP0H series only supports QnA compatible 3E frame and binary communication. Restrictions are indicated below.

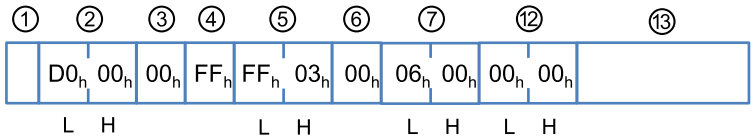
■ Command format

Transferable units differ depending on device types. They are identified by subcommands in the protocol.



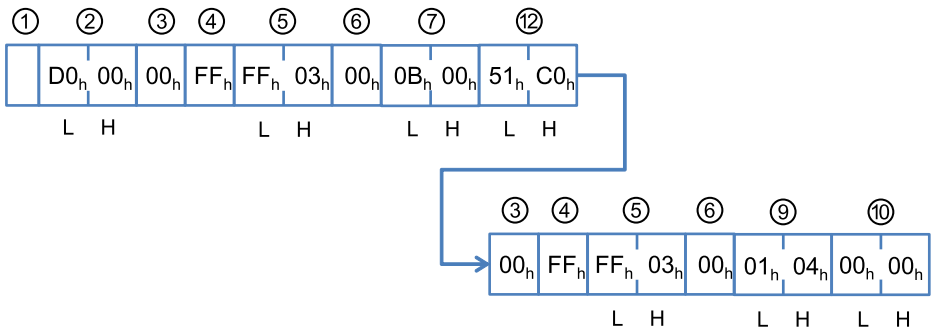
■ Response format (in a normal state)

- "00" is returned to the exit code in a normal state.
- In the case of a read command, response data is returned. In the case of a write command, there is no response data part.



■ Response format (in an error state)

In an error state, an error code is stored in the exit code, and the data in the error information section is added.



■ Elements that compose command responses

No.	Name	Description
(1)	Header	Ethernet header, IP header, TCP or UDP header
(2)	Subheader	For binary communication supported by FP0H series, it is the following 4-byte data. Command: 00h 50h; Response: 00h D0h
(3)	Network No.	FP0H control unit only supports “00h”.
(4)	PC No.	FP0H control unit only supports “FFh”.
(5)	Destination unit I/O No.	FP0H control unit only supports “03FFh”.
(6)	Destination unit No.	FP0H control unit only supports “00h”.
(7)	Request data length or response data length	The number of bytes of the subsequent command or response
(8)	CPU monitor timer	Not supported in FP0H control unit.
(9)	Command	Bulk read: “0401h”; Bulk write: “1401h”
(10)	Subcommand	Bit transmission: “0001h”; Word transmission: “0000h”
(11)	Request data section	The starting address of the device to read or write data, the device type, and the number of points are specified.
(12)	Exit code	In a normal state: “0000h”; In an error state: An error code is returned.
(13)	Response data section	For a read command, the starting address of read device, device type, the number of points and data are returned.

Info.

- For more details of request data section and response data section, refer to "8.2.3 Formats of Request Data Section and Response Data Section".

8.2.2 Commands and Subcommands

- FP0H series only supports the following commands.
- Command and subcommand codes are created as 4-digit hex 2-byte codes which show the command type information. Subcommands indicate transfer units.
- When performing master communication from FP0H control unit, the transfer unit and subcommand vary depending on the type of memory area specified for the operand of F145 (SEND) / F146 (RECV) instruction.

■ Supported commands and codes

Function	Transfer units	Code in MC protocol	
		Command	Subcommand
Bulk read	Bit	0401	0001
	Word	0401	0000
Bulk write	Bit	1401	0001
	Word	1401	0000

8.2.3 Formats of Request Data Section and Response Data Section

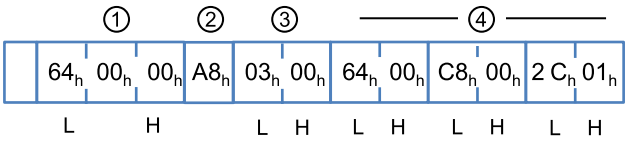
- Device information added to the rear section of each command and response is indicated.
- The data sequence and the number of data vary depending on the unit of read / write and the device type.
- These data are sent in ascending order from lower bytes.

■ Components of request data section and response data section

No.	Name	Description
(1)	Start device	The starting number of a target device for read and write is specified as 6-digit hex 3-byte data.
(2)	Device code	The device code to indicate a device type is specified.
(3)	Number of devices	The number of devices to be read and written is specified. The number of words is specified for word devices and the number of bits is specified for bit devices. For reading and writing bit devices such as internal relays in word unit, specify the number of words.
(4)	Data	The data sequence varies depending on the device type and transfer unit for performing read and write.

■ Reading and writing word devices

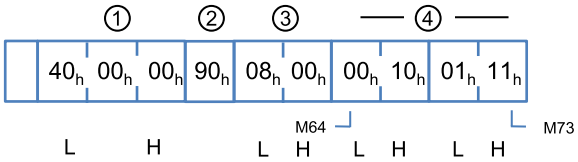
For reading or writing 3 words, D00100 to D00102 (FP0H device No.: DT100 to DT102), from the device No. 100 of the data register in MC protocol



No.	Name	Description
(1)	Start Device	Specify H000064=100 with the starting device number as 3-byte data.
(2)	Device code	Specify the device code A8.
(3)	Number of devices	Specify “3” as the number of words.
(4)	Send / Receive data on MC protocol	Read or write 3-word data.

■ Reading and writing bit devices (in bit units)

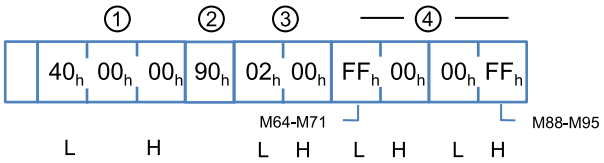
For reading or writing 8 points (8 bits), M64 to M71 (FP0H device No.: R40 to R47), from the device No. 64 of the internal relay in MC protocol



No.	Name	Description
(1)	Start Device	Specify H000040=64 with the starting device No. as 3-byte data.
(2)	Device code	Specify the device code 90.
(3)	Number of devices	Specify “8” as the number of bits.
(4)	Send / Receive data on MC protocol	The values of the internal relays M64 to M71 (FP0H device No.: R40 to R47) in MC protocol are converted to 4-bit hex data per internal relay, and sent / received in ascending order from lower bytes.

■ Reading and writing bit devices (in word unit)

For reading or writing 2 points (2 words, 32 points), M64 to M95 (FP0H device number: R40 to R5F), from the device number 64 of the internal relay in MC protocol



No.	Name	Description
(1)	Start Device	Specify H000040=64 with the starting device No.as 3-byte data.
(2)	Device code	Specify the device code 90.
(3)	Number of devices	Specify “2” as the number of words.
(4)	Send / Receive data on MC protocol	The values of the internal relays M64 to M95 (FP0H device No.: R40 to R5F) in MC protocol are converted to 1-bit data per internal relay, and sent / received in ascending order from lower bytes.

8.2.4 Device Codes and Device Nos.

A correspondence table of MC protocol and FP0H device Nos. is provided below.

■ Correspondence table of usable devices for the MC protocol slave communication functions of FP0H

MC Protocol			FP0H device No.	Transfer unit	RD	WT
Device name	Device code BIN	Device No.				
Input (Note 1)	9C	X0000 to X06DF	X0000 to X109F	Bit Word	○	○

MC Protocol			FP0H device No.	Transfer unit	RD	WT
Device name	Device code BIN	Device No.				
Output (Note 1)	9D	Y0000 to Y06DF	Y0000 to Y109F	Bit Word	○	○
Link relay (Note 1)	A0	B0000 to B07FF	L0000 to L0127F	Bit Word	○	○
Internal relay	90	M0000 to M8191	R0000 to R511F	Bit Word	○	○
Latch relay (Note 2)	92	L0000 to L8191	R0000 to R511F	Bit Word	○	○
Data register	A8	D00000 to D65532	DT0000 to DT65532	Word	○	○
File register	AF	-	-	Word	-	-
	B0	-	-	Word	-	-
Link register (Note 1)	B4	W0000 to W00FF	LD0000 to LD0255	Word	○	○
Timer (current value) (Note 3)	C2	TN0000 to TN1023	EV0000 to EV1023	Word	○	○
Timer (contact) (Note 3)	C1	TS0000 to TS1023	T0000 to T1023	Bit Word	○	×
Counter (current value) (Note 3)	C5	CN0000 to CN1023	EV0000 to EV1023	Word	○	○
Counter (contact) (Note 3)	C4	CS0000 to CS1023	C0000 to C1023	Bit Word	○	×
Special relay	91	SM0000 to SM0831	R9000 to R951F	Bit Word	○	×
Special data register	A9	SD0000 to SD0999	DT90000 to DT90999	Word	○	×

(Note 1) The device No. of the MC protocol of inputs, outputs, link relays and link registers are expressed in hexadecimal. The device No. of other devices are expressed in decimal.

(Note 2) FP0H allocates latch relays to internal relays. Set them in the hold area if necessary.

(Note 3) The timer / counter area is determined by the "starting No. of the system register No.5 counter".

When a corresponding device No. is contained in the counter area for timer, "4031: Address too long" results. The same applies to counter.

■ Device codes in MC protocol

- A device code is inserted into the request data section of a command as a hexadecimal 2-digit 1-byte code which indicates device type information.
- For performing master communication from FP0H control unit, specify the respective corresponding Nos. from H0 to H8 in the operand of the F145 (SEND) / F146 (RECV) instructions. When F145 (SEND) / F146 (RECV) instructions are executed, the Nos. are converted into device codes before sending.

■ Device types and transfer units

- Transferable units differ depending on device types. They are identified by subcommands in the protocol. The following text should be added.

- This is an example of using all data as global devices. When using local devices, the maximum values are smaller than the following memory settings.

■ Max. value of usable data registers DT according to memory settings

Patterns	System register No.0 Sequence program area capacity	Data register capacity
1	24 k words	65533 words
2	32 k words	32765 words
3	40 k words	24573 words
4	64 k words	12285 words

Info.

- There is a limit to the range that can be used in the master communication function. For details, refer to Programming Manual.

REFERENCE

10.2.7 F145 SEND [Data Send Instruction (MC Protocol Master)]
10.2.8 F146 RECV [Data Receive Instruction (MC Protocol Master)]

8.3 Bulk Read and Bulk Write

Command types and devices for bulk read and bulk write

	Device	
	Bits	Word
Bit RD	○	×
Word RD	○	○
Bit WT	○	×
Word WT	○	○

8.3.1 Example of Bulk Read

■ **Form of bulk read command in bit unit (binary) and an example of reading 8 points of internal relays M100 to M107 (FP0H device No.: R64 to R6B)**

Command

Form		Example	
Command	L	0x01	0x0401 bulk read
	H	0x04	
Subcommand	L	0x01	0x0001 in bit units
	H	0x00	
Start device	L	0x64	
		0x00	
	H	0x00	
Device code		0x90	Device M
Number of devices	L	0x08	
	H	0x00	

Response

Form		Example				
Exit code	L	0x00				
	H	0x00				
Data of a specified device		0x00	M100	off	M101	off
		0x10	M102	on	M103	off
		0x01	M104	off	M105	on
		0x11	M106	on	M107	on

The maximum number of points (bits) that can be read at a time is 4054.

■ **Form of bulk read command in word unit (binary) and an example of reading 32 points of internal relays M100 to M131 (FP0H device No.: R64 to R83)**

Command

Form		Example	
Command	L	0x01	0x0401 bulk read
	H	0x04	
Subcommand	L	0x00	0x0000 in word units
	H	0x00	
Start device	L	0x64	0x000064
		0x00	
	H	0x00	
Device code		0x90	Device M
Number of devices	L	0x02	
	H	0x00	

Response

Form		Example	
Exit code	L	0x00	
	H	0x00	
Data of a specified device	L	0x00	M107 - M100
	H	0x00	M115 - M108
	L	0x34	M123 - M116
	H	0x12	M131 - M124

The maximum number of points (words) that can be read at a time is 960. When specifying a bit device, one point = 16 bits.

■ **Form of bulk read command in word unit (binary) and an example of reading 3 points from data register D0 to DT2 (FP0H device number: DT0 to DT2)**

Command

Form		Example	
Command	L	0x01	0x0401 bulk read
	H	0x04	
Subcommand	L	0x00	0x0000 in word units
	H	0x00	
Start Device	L	0x00	0x000000
		0x00	
	H	0x00	
Device code		0xA8	Device D

Form		Example	
Number of devices	L	0x03	
	H	0x00	

Response

Form		Example		
Complete code	L	0x00		
	H	0x00		
Data of a specified device	L	0x34	D0 value 0x1234	4660 in decimal
	H	0x12		
	L	0x02	D1 value 0x0002	2 in decimal
	H	0x00		
	L	0xEF	D2 value 0xCDEF	-12817 in signed decimal
	H	0xCD		52719 in unsigned decimal

The maximum number of points (words) that can be read at a time is 960. When specifying a bit device, one point = 16 bits.

8.3.2 Examples of Bulk Write

■ **Form of bulk write command in bit unit (binary) and an example of writing 8 points from internal relay M100 to M107 (FP0H device No.: R64 to R6B)**

Command

Form		Example		
Command	L	0x01	0x0401 Bulk write	
	H	0x14		
Subcommand	L	0x01	0x0001 in bit units	
	H	0x00		
Start device	L	0x64		
		0x00		
	H	0x00		
Device code		0x90	Device M	
Number of devices	L	0x08		
	H	0x00		
Data of a specified device		0x00	M100 OFF	M101 OFF
		0x10	M102 ON	M103 OFF
		0x01	M104 OFF	M105 ON
		0x11	M106 ON	M107 ON

The maximum number of points (bits) that can be written at a time is 4054.

■ **Form of bulk write command in word unit (binary) and an example of writing 3 points from data register D100 to DT102 (FP0H device No.: DT100 to DT102)**

Command

Form		Example		
Command	L	0x01	0x0401 bulk write	
	H	0x04		
Subcommand	L	0x00	0x0000 in word units	
	H	0x00		
Start device	L	0x64	0x000064	
		0x00		
	H	0x00		
Device code		0xA8	Device D	
Number of devices	L	0x03		
	H	0x00		
Data of a specified device	L	0x34	Value written to D100 0x1234	4660 in decimal
	H	0x12		
	L	0x02	Value written to D101 0x0002	2 in decimal
	H	0x00		
	L	0xEF	Value written to D102 0xCDEF	-12817 in signed decimal
	H	0xCD		52719 in unsigned decimal

Response

Form		Example	
Exit code	L	0x00	
	H	0x00	

The maximum number of points (words) that can be written at a time is 960.

8.4 Exit Codes When Communication Error Occurs

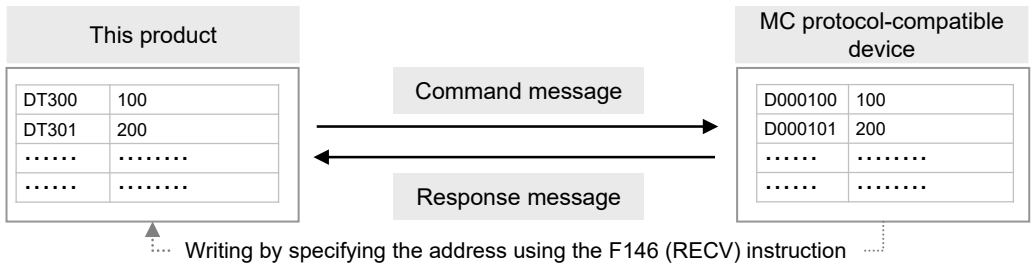
When a wrong command is sent or an error occurs in the control unit, a different exit code is returned. The description, causes, and processing of exit codes returned in an error state are as follows.

Code	Timing of occurrence
4031	Address is too long (Starting device + Number of written points)
C051	The number of devices is outside the specified range.
C056	The starting device is outside the specified range.
C059	Command search There is no command that matches the receive data command in the MC protocol command table.
C059	The subcommand is outside the specified range.
C05B	The device code is outside the specified range.
C05C	Subcommand is in bit unit (0001) and device code indicates a word device.
C05F	Receive header content check [Network No.] check
C05F	Receive header content check [PC No.] check
C05F	Receive header content check [Destination unit I/O No.] check
C05F	Error in the number of received and written data
C060	Error in written contact data (except 0 / 1)
C061	Receive header content check The number of receive data is smaller than the minimum received bytes that support header content check
C061	The number of receive data is smaller than the minimum number of receive bytes.

8.5 MC Protocol Master Communication (RECV)

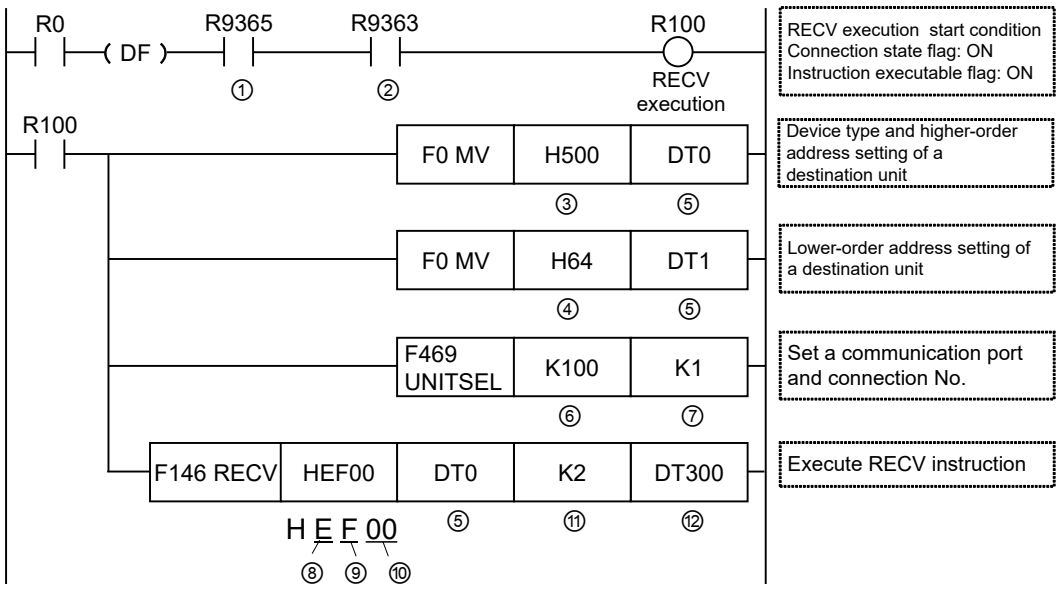
■ Procedure

PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MC protocol. Specify a memory address and execute F146 (RECV) instruction in a user program. PLC automatically creates messages according to the protocol.



■ Sample program

- Send an MC protocol command (bulk read) from a LAN port of the control unit, read data from the addresses D000100 to D000101 of an external device, and write the data into the data registers DT300 to DT301 of PLC.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that reception is not in progress to the same port (SEND / RECV instruction executable flag R9363: ON), and start up F146 (RECV) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F146 (RECV) instruction specifies the communication port of the master unit, transfer unit (word / bit), bit No. (in the case of bit transfer), the starting address of PLC memory area that stores the device type and address of a destination unit, the number of data, and the data area of the master unit.



Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Device type and device address of a destination unit (higher-order)	Specify the destination unit device type in the higher byte, and specify the device (higher) address in the lower byte. Note: A decimal address should be converted into hexadecimal before specification.
(4)	Destination unit device address (lower-order)	Specify the destination unit device address (higher word). Note: A decimal address should be converted into hexadecimal before specification.
(5)	Memory area that stores the device type and device address of a destination unit	Specify the starting address of the device area in the master unit that stores the starting address of the source device in the destination unit.
(6)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(7)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(8)	Ethernet communication	Specify Ethernet communication (HE).
(9)	Transfer units	Specify the transfer unit for data to be received. H0: Bit unit HF: Word unit
(10)	Master unit bit No.	For bit data transfer, it is necessary to specify this value. The value is H0 for word data transfer.
(11)	Number of receive data	In the case of bit data, the max. number is 960. In the case of word data, the max. number is 4054.
(12)	Master unit memory area to store receive data	Specify the starting address of memory area of the master unit that stores receive data.

(Note 1) For details on the instructions, refer to the *FP-XH Series Programming Manual*.

■ Table of device code specified range

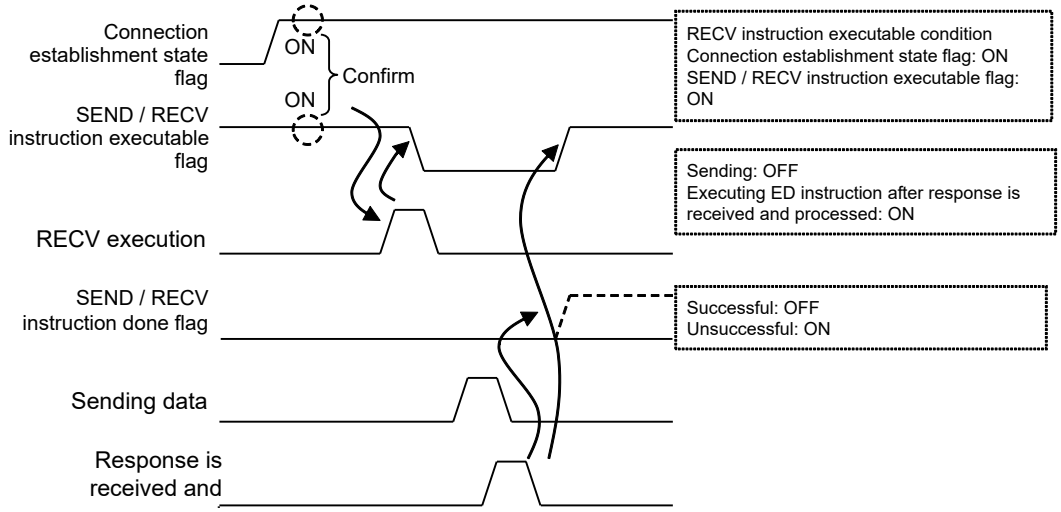
Device name	Device on MC protocol	Device type	Device code
X relay	X	Bits	H0
Y relay	Y	Bits	H1
Link relay	B	Bits	H2
Internal auxiliary relay	M	Bits	H3
Latch relay	L	Bits	H4
Data memory (add-on)	D	Word	H5
File register	R	Word	H6
File register	ZR	Word	H7

Device name	Device on MC protocol	Device type	Device code
Link register	W	Word	H8

■ Number of receive data for a receiving device

Receiving device	Transfer method	Number of receive data	Remarks
16-bit device: WX, WY, WR, WL, DT, LD	Word transfer	1 to 960	
1-bit device: X, Y, R, L, DT.n, LD.n	Bit transfer	1 to 4054	When the number of receive data is an odd number, a four-bit dummy code H0 is added.

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication. (Such as when performing a data request from a higher-order PC).
- Up to 9 instructions can be executed simultaneously for different COM ports and connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the "SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when the instruction terminates abnormally, and the error code is stored in "SEND / RECV / MTRN done code". (Example: HC051 when the number of devices is outside the specified range)

  For details of error codes, refer to "8.4 Exit Codes When Communication Error Occurs".

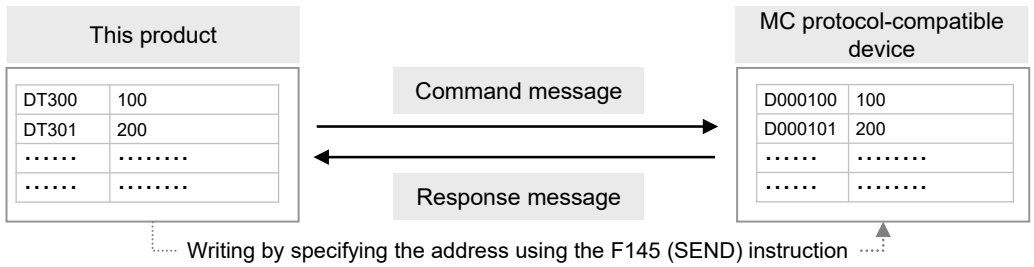
REFERENCE

10.2.8 F146 RECV [Data Receive Instruction (MC Protocol Master)]

8.6 MC Protocol Master Communication (SEND)

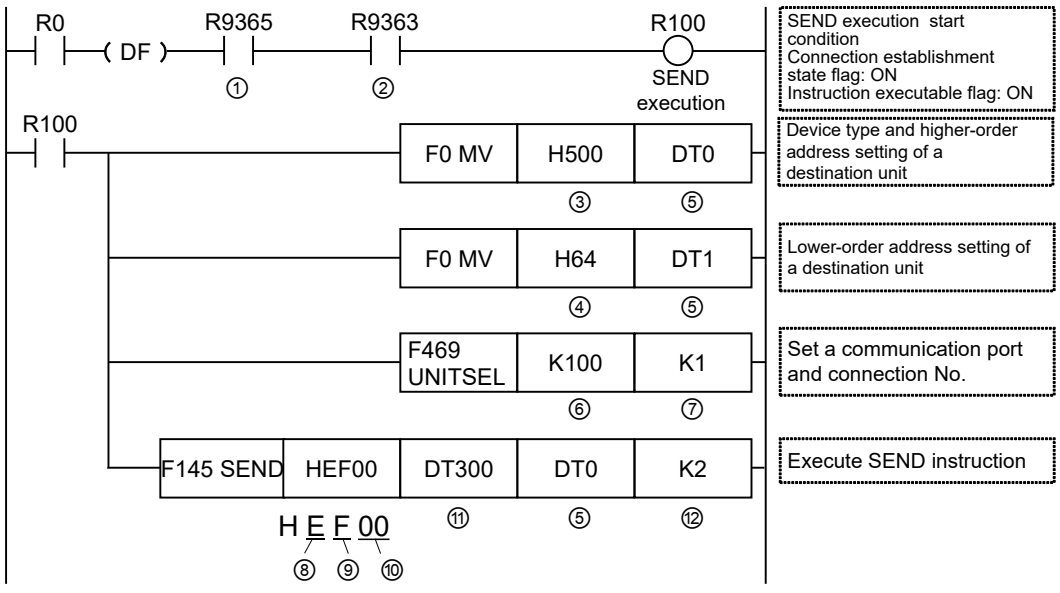
■ Procedure

PLC has the transmission right in master communication, and master communication is performed by sending commands to, and receiving responses from, devices that support MC protocol. Specify a memory address and execute F145 (SEND) instruction in a user program. PLC automatically creates messages according to the protocol.



■ Sample program

- Send an MC protocol command (bulk write) from LAN port of the control unit, and write the content of PLC data registers DT300 to DT301 into external device addresses D000100 to D000101.
- Confirm that Connection 1 is established in a master mode (Connection establishment state flag R9365: ON), and that transmission is not in progress to the same port (SEND / RECV instruction executable flag R9363: ON), and start up F145 (SEND) instruction.
- Using F469 (UNITSEL) instruction, specify the slot No. (LAN port: K100) and the connection No. (K1).
- F146 (RECV) instruction specifies the communication port of the master unit, transfer unit (word / bit), bit No. (in the case of bit transfer), data area of the master unit, the number of data, and the starting address of PLC memory area that stores the device type and address of a destination unit.



Code	Description	
(1)	Connection establishment state flag	This is inserted to confirm that connection has been established. Turns ON when connection is established.
(2)	SEND / RECV instruction executable flag	This is inserted to confirm that no F145 (SEND) / F146 (RECV) instruction is in progress for the same connection. Turns ON when an instruction is executable.
(3)	Device type and device address of a destination unit (higher-order)	Specify the destination unit device type in the higher byte, and specify the device (higher) address in the lower byte. Note: A decimal address should be converted into hexadecimal before specification.
(4)	Destination unit device address (lower-order)	Specify the destination unit device address (higher word). Note: A decimal address should be converted into hexadecimal before specification.
(5)	Memory area that stores the device type and device address of a destination unit	Specify the starting address of the device area in the destination unit that stores the starting address of the source device in the master unit.
(6)	Slot No. of a master unit	Specify the slot No. of a master unit. K0: Serial communication port K100: LAN port To perform Ethernet communication, specify LAN port (K100).
(7)	Connection No.	Specify the connection No. of a communication target. Range: K1 to K9
(8)	Ethernet communication	Specify Ethernet communication (HE).
(9)	Transfer units	Specify the transfer unit for data to be received. H0: Bit unit HF: Word unit
(10)	Master unit bit No.	For bit data transfer, it is necessary to specify this value. The value is H0 for word data transfer.
(11)	Memory area of a master unit that stores send data;	Specify the starting address of a master unit device that stores send data.
(12)	Number of send data	In the case of bit data, the max. number is 960. In the case of word data, the max. number is 4054.

(Note 1) For details on the instructions, refer to the *FP-XH Series Programming Manual*.

■ Table of device code specified range

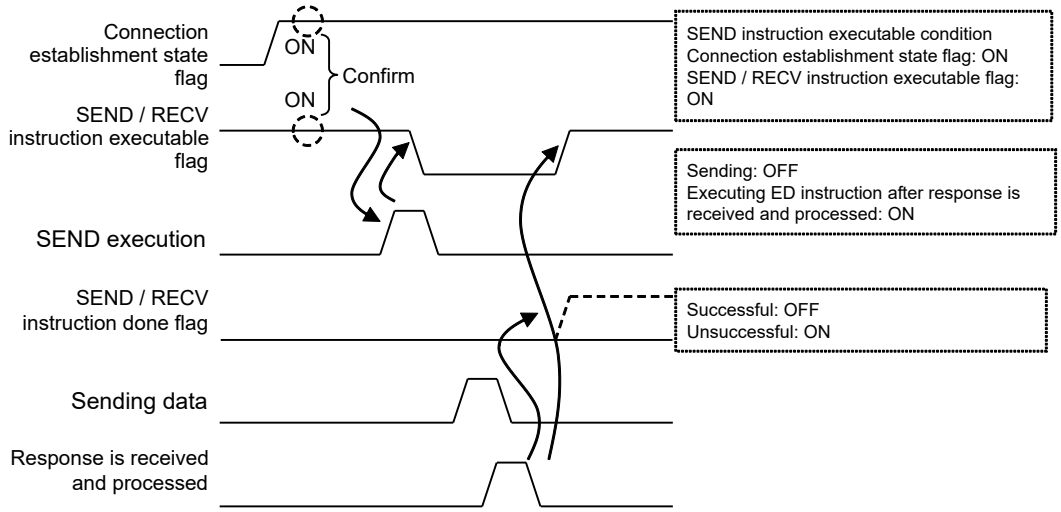
Device name	Device on MC protocol	Device type	Device code
X relay	X	Bits	H0
Y relay	Y	Bits	H1
Link relay	B	Bits	H2
Internal auxiliary relay	M	Bits	H3
Latch relay	L	Bits	H4
Data memory (add-on)	D	Word	H5
File register	R	Word	H6
File register	ZR	Word	H7

Device name	Device on MC protocol	Device type	Device code
Link register	W	Word	H8

■ Number of receive data for a receiving device

Receiving device	Transfer method	Number of receive data	Remarks
16-bit device: WX, WY, WR, WL, DT, LD	Word transfer	1 to 960	
1-bit device: X, Y, R, L, DT.n, LD.n	Bit transfer	1 to 4054	When the number of receive data is an odd number, a four-bit dummy code H0 is added.

■ Timing chart



■ I/O allocation

Name	Description
SEND / RECV instruction executable flag	● Indicates the executability of F145 (SEND) or F146 (RECV) instruction. OFF: Not executable (execution in progress) ON: Executable ● Turns OFF when connection is general-purpose communication.
SEND / RECV instruction done flag	● Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction. The done code is stored. OFF: Successful ON: Unsuccessful (communication error has occurred) ● Turns OFF when connection is general-purpose communication.
Connection establishment state flag	● Turns ON when connection is established. ● Turns OFF when connection is unestablished.

■ Special relays / special data registers

	Connection								
	1	2	3	4	5	6	7	8	9
SEND / RECV instruction executable flag	R9363	R936B	R9373	R937B	R9383	R938B	R9393	R939B	R9403
SEND / RECV instruction done flag	R9364	R936C	R9374	R937C	R9384	R938C	R9394	R939C	R9404
SEND / RECV / MTRN done code	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405

Info.

- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time for a connection under slave communication. (Such as when performing a data request from a higher-order PC).
- Up to 9 instructions can be executed simultaneously for different COM ports and connections.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the "SEND / RECV instruction done flag" to confirm the completion of transmission / reception. The flag turns ON when the instruction terminates abnormally, and the error code is stored in "SEND / RECV / MTRN done code". (Example: HC051 when the number of devices is outside the specified range)

  For details of error codes, refer to "8.4 Exit Codes When Communication Error Occurs".

REFERENCE

10.2.7 F145 SEND [Data Send Instruction (MC Protocol Master)]

9 FTP Client Function

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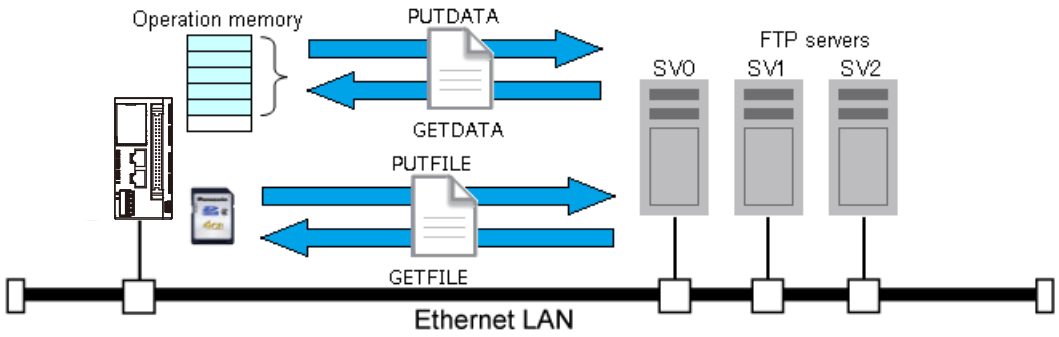
9.1 Overview of FTP Client Function

■ Overview of function

- The FTP client function is used to transmit data and files between PLC and FTP servers using the file transmission protocol.
- Two transfer methods are available, which are an arbitrary transfer by the transfer setting and an automatic transfer when a logging/trace file is determined.

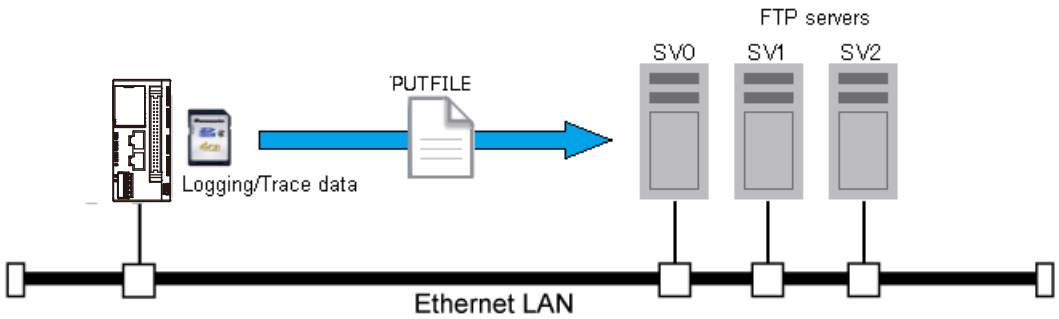
■ FTP file transfer

Specified files in an SD memory card or contents in the operation memory are filed with the transfer trigger specified with the setting tool or an instruction, and uploaded to FTP servers, or files downloaded from FTP servers are saved into an SD memory card or reflected in the operation memory.



■ Logging/Trace transfer

Logging/trace files will be uploaded to FTP servers once the logging/trace process is complete and files are determined.



9.2 FTP Client Function Specifications

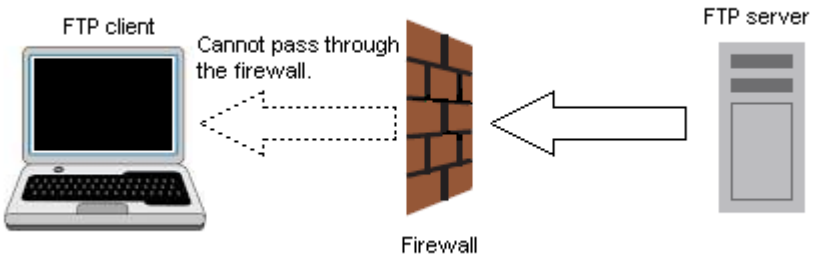
9.2.1 FTP Client Specifications

Item	Description
No. of simultaneous connections	1
No. of registered connections	3
Connection method	Select Active mode or Passive mode.
Encryption communication	FTPS (Explicit mode) * TLS1.1/1.2
File size	When uploading: Max. 4 Gbytes (per file) When downloading: Max. 4 Gbytes (per file)
Others	Automatic retry Automatic file delete when upload/download succeded Specification of wild card of file names (*, ?) Overwrite transfer Rename transfer

9.2.2 Connection Method

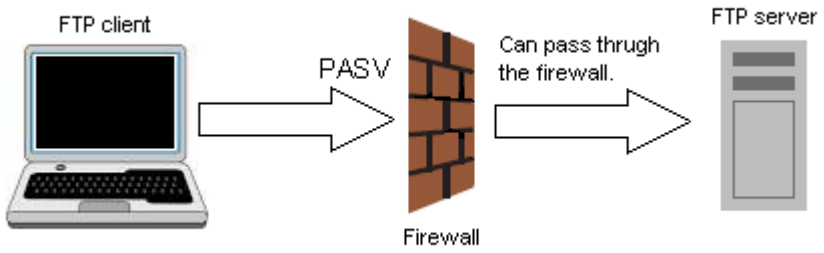
■ Active mode

For the FTP connection in Active mode, a request for connection is sent to the client from the server to establish the data transfer connection. Therefore, the connection from the outside (server) to the inside (client) may be rejected by the firewall on the client side.



■ Passive mode

For the FTP connection in Passive mode, a request for connection is sent to the server from the client to establish the data transfer connection. Therefore, the connection is possible even when the client is located inside of firewall.


FTP client
PASV
Firewall
Can pass thrugh
the firewall.
FTP server

9.3 Details of FTP Client Function

9.3.1 Basic Setup

■ FTP Server Settings

Up to 3 FTP servers can be set.。

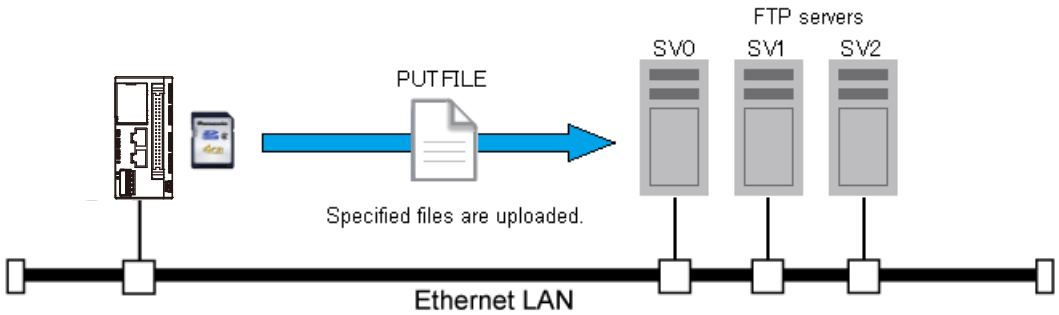
9.3.2 File Transfer Setting

- Data and files are transferred from PLC to FTP servers or from FTP servers to PLC.
- A maximum of 4 transfer settings can be registered.
- The settings are configured with the tool software or instructions, and the file transfer is executed with the instruction.

Item	Setting with tool software	Setting with instruction
FTP server setting	Basic Setup	FTPcSV
File transfer setting	FTP File Transfer Settings	FTPcSET
Transfer execution	Transfer request by FTPcREQ instruction	Transfer request by FTPcREQ instruction

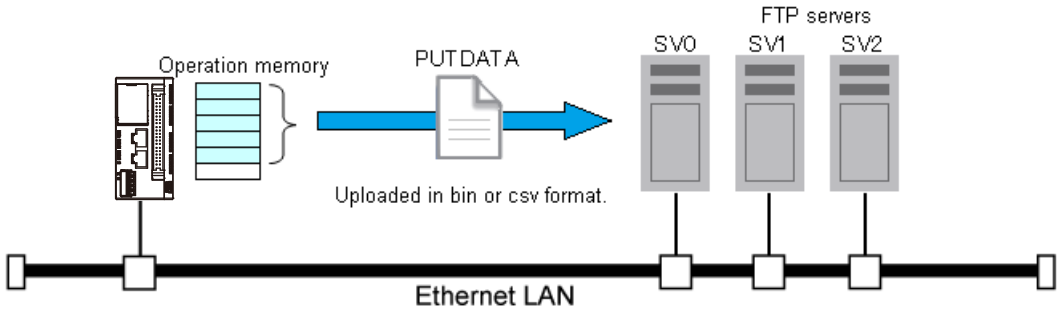
■ File transfer (PUTFILE)

Files in a specified SD memory card are transferred to FTP servers.



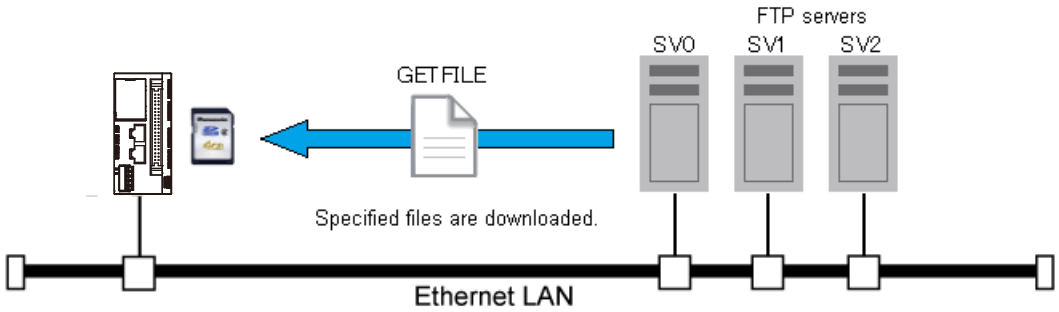
■ Data transfer (PUTDATA)

The operation memory in the PLC is filed and transferred to FTP servers. The file format is bin or csv only.



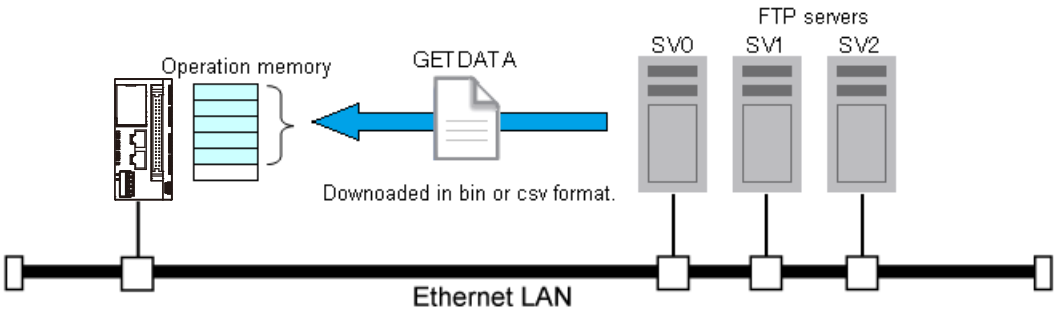
■ **File transfer (GETFILE)**

Files in FTP servers are transferred to an SD memory card in the PLC.



■ **Data transfer (GETDATA)**

Files in FTP servers are transferred to the operation memory in the PLC. The file format is bin or csv only.



9.3.3 Logging/Trace Transfer Settings

■ **Logging/Trace transfer settings**

- Log files are transferred to FTP servers by the logging/trace transfer settings when the files are determined.
- A maximum of 4 transfer settings can be registered.

- The settings are configured with the tool software or instructions, and the transfer is automatically executed.

Item	Setting with tool software	Setting with instruction
FTP server setting	Basic Setup	F470（FTPcSV）
Logging/Trace transfer setting	Logging/Trace Transfer Settings	F472（FTPcLOG）
Transfer execution	Automatically execute when files are determined.	Automatically execute when files are determined.

9.3.4 Overwrite Method and Rename Method

The overwrite method (default) or rename method can be selected for file transfer (PUTFILE or PUTDATA).

■ Operation of overwrite method

- Files are written with specified file names.
- When writing is interrupted for some reasons (such as troubles in network or servers), the partially written file remains.
- It is not possible to judge on the server side whether files have been transferred successfully or not without checking the file size or the contents.

■ Operation of rename method

- Specified data or files are transferred with tentative file names, and they are renamed to specified file names after the successful completion of transfer.
- The successful completion of file transfer can be confirmed by checking the specified file names on the server side.
- The processing time is longer than that of the overwrite method.

■ Tentative file name

- FP0H_MAC address (Hexadecimal 12 characters).tmp (Extension tmp)
- If a file already exists when renaming files, that file is deleted before renaming.
- When retrying the transfer of multiple files, this situation may occur.

Info.

- For transferring files to FTP servers, the overwrite method or rename method is selectable. As tentative file names are renamed after the completion of the transfer in the rename method, it is possible to confirm that the files have reached to FTP servers successfully.

9.3.5 FTP Client

The FTP client provides FTPS functions according to the following SSL/TLS specifications.

■ SSL/TLS specifications for FTP clients

Item	Description
Protocol	TLS1.1/1.2
Cipher suite	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 TLS_RSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 TLS_DHE_RSA_WITH_AES_128_CBC_SHA256 TLS_DHE_RSA_WITH_AES_256_CBC_SHA TLS_RSA_WITH_AES_256_CBC_SHA256 TLS_RSA_WITH_AES_128_CBC_SHA256 TLS_RSA_WITH_AES_256_CBC_SHA
Certificate checking	Unchecked
Connection method	Explicit connection. * Implicit connection is not supported.
Session resumption	Handshake reduction is possible using the session ID. * Session ID life time: 6,000 seconds

Note

- In the SSL/TLS communication of the FTP client, validation of the server certificate is not checked. Therefore, attention must be paid to the fact that it cannot be used for preventing spoofing.

9.4 File Transfer Settings

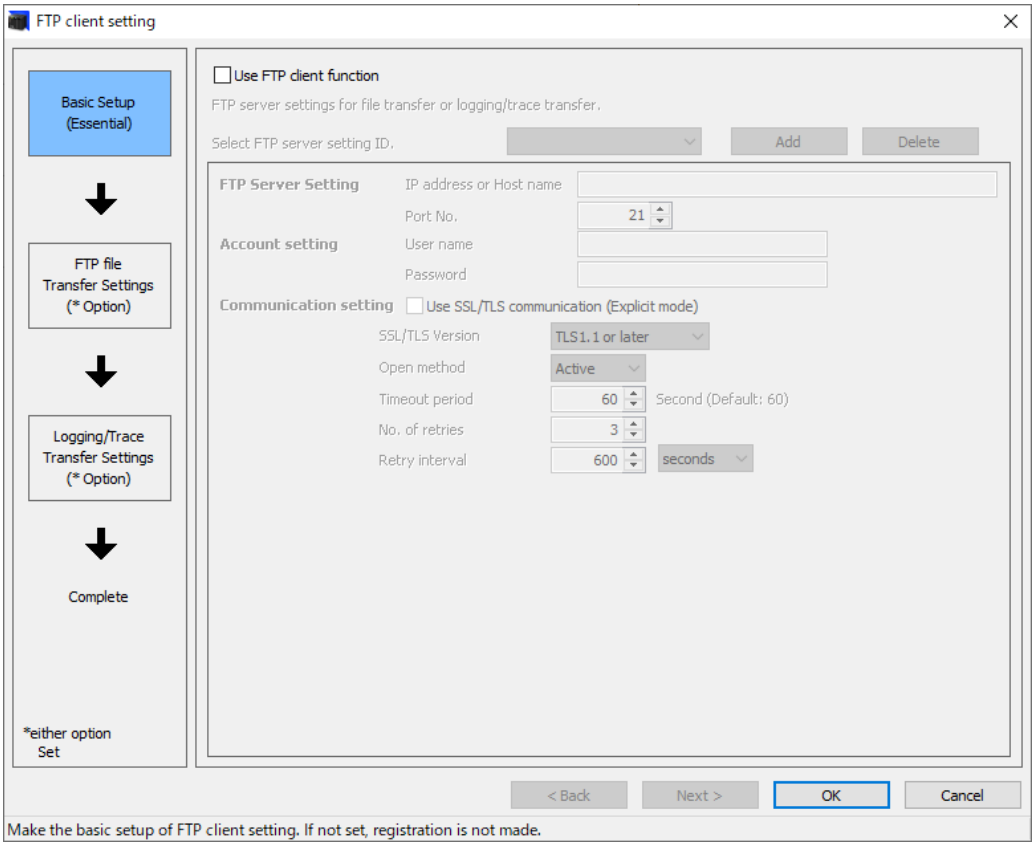
- Use the programming tool software "FPWIN GR7" to make the transfer settings.
- They can be also set with dedicated instructions. Refer to "9.4.6 Setting with Instructions".

9.4.1 Basic Setup

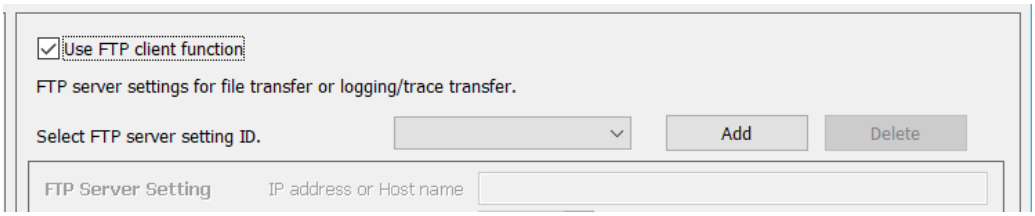
Configure the settings for a FTP server to be connected.

Procedure

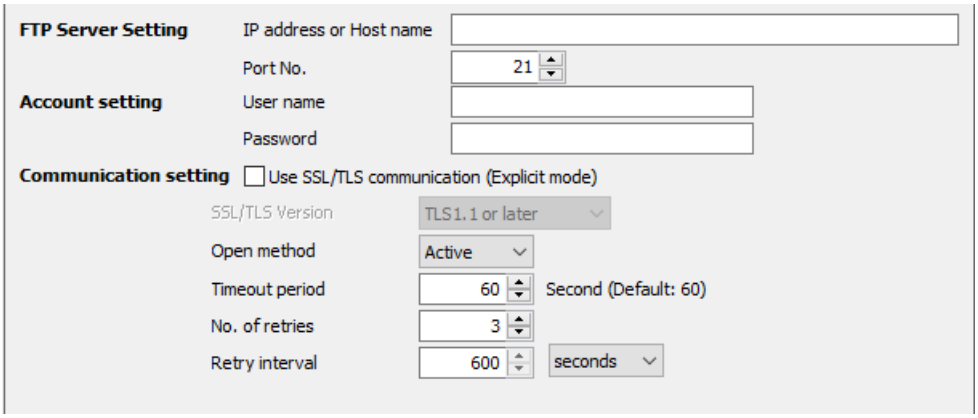
1. Select **Options**>**FTP client setting** from the menu bar.
   The "FTP client setting" screen is displayed.



2. Check the box of [Use FTP client function] in Basic Setup (Essential).
   The setting field of FTP server setting ID is enabled.



3. Click the [Add] button to add the FTP server setting.
The following settings become available by adding the FTP server setting.



4. Set each item.

Item		Default	Description
FTP server settings	IP address or host name	-	Set the IP address or host name of the FTP server Input range: 0.0.0.1 to 255.255.255.254
	Port No.	21	Set the port number for the FTP server. Setting range (1 to 65535)
Account settings	User name	-	Set the user name for the FTP server. Max. 32 characters
	Password	-	Set the password for the FTP server. Max. 32 characters
Communication settings	Use SSL/TLS communication (Explicit mode)	Invalid	Set whether to use SSL/TLS communication (Explicit mode) under encrypted connection in the FTP server communication. For the unit firmware Ver. 1.8 or later, the SSL/TLS version can be selected from "TLS1.1 or later" or "TLS1.2 or later".(Note 1) (Note 2)
	Open method	Active	Set the open method. (Active or Passive)
	Timeout period	60 seconds	Set the timeout period for the FTP server. Setting range (30 to 300 seconds)
	No. of retries	3	Set the number of retries for the FTP server. Setting range (0 to 3 times)

Item		Default	Description
	Retry interval	600 seconds	Set the retry interval for the FTP server (10 to 86400 seconds / 1 to 1440 minutes / 1 to 24 hours)

(Note 1) The SSL/TLS communication cannot be used by both the FTP server function and FTP client function at the same time. When setting, "clear" the checkbox "Use SSL/TLS communication (Explicit mode)" of the FTP server function.

(Note 2) Since SSL3.0 is not supported, no alert is returned for a request to authenticate the client.

5. Click the [Next] button to go to the FTP file transfer settings.

Info.

- When changing the basic setup, select "FTP server setting ID:X".

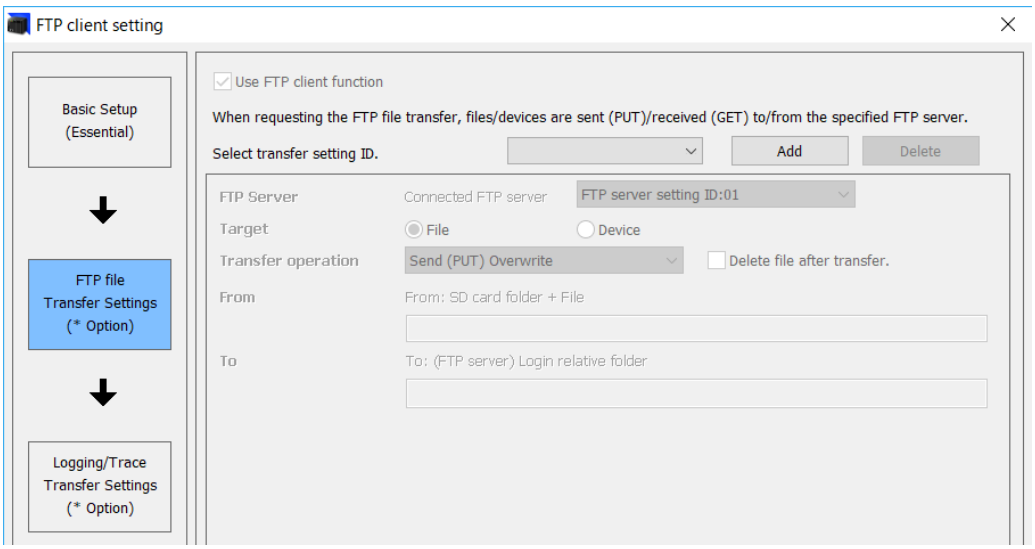
9.4.2 FTP File Transfer Settings (Sending Files)

Configure the file transfer settings. The following description is made with an assumption that "9.4.1 Basic Setup" has been completed.

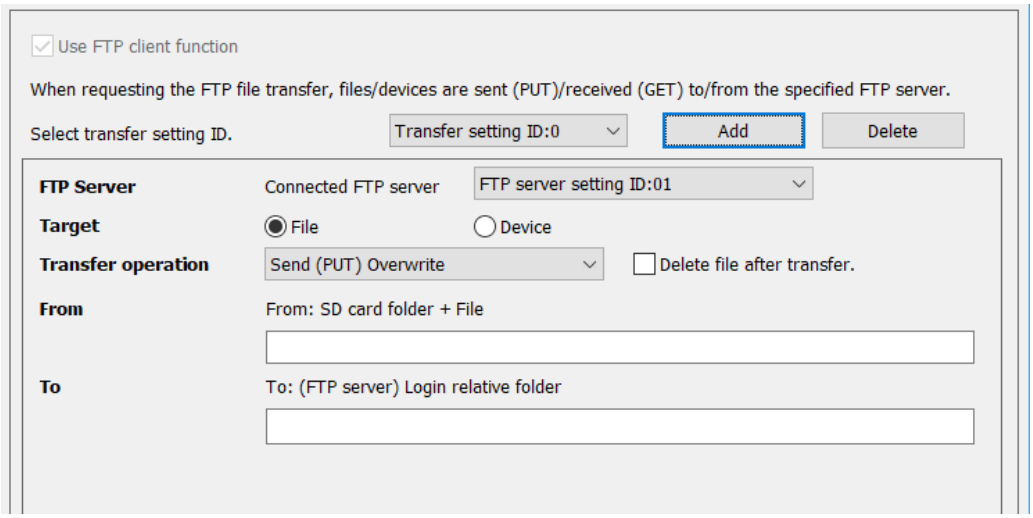
This setting is not required when only performing the logging / trace transfer. Click the [Next] button to go to "Logging / Trace Transfer Settings".

Procedure

1. Complete the basic setup and click the [Next] button.
The "FTP File Transfer Settings" screen is displayed.



2. Click the [Add] button to add the transfer setting.
The following items become available by adding the transfer setting.



3. Set each item.

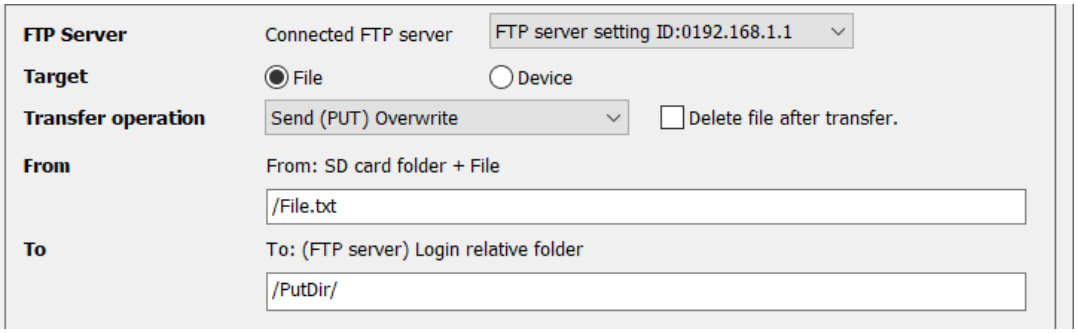
Item	Description
FTP server	Select a destination FTP server from the list. The servers registered in Basic Setup are listed.
Target	Select target "file" to be transferred.
Transfer operation	Select "Send (PUT) Overwrite" / "Send (PUT) Rename". To delete files after transfer, check [Delete file after transfer].
From	Specify an SD card file (folder name and file name). Max. 256 characters
To	Specify a (FTP server) login relative folder. Max. 256 characters For specifying the home directory,"""" specify </> or <\> only.

4. Press the [OK] button.
The settings are registered in the project.

Setting example

Item	Example 1 (Transfer to overwrite the file)	Example 2 (Transfer to rename the file)
Transfer operation	Send (PUT) Overwrite	Send (PUT) Rename
From	/File.txt	/SubDir/RFile.txt
To	/PutDir/	/

Example 1



Info.

- When changing the basic setup after the setting has been completed, select "Transfer setting ID:X".
- For the details of the overwrite method and rename method, refer to "9.3.4 Overwrite Method and Rename Method".

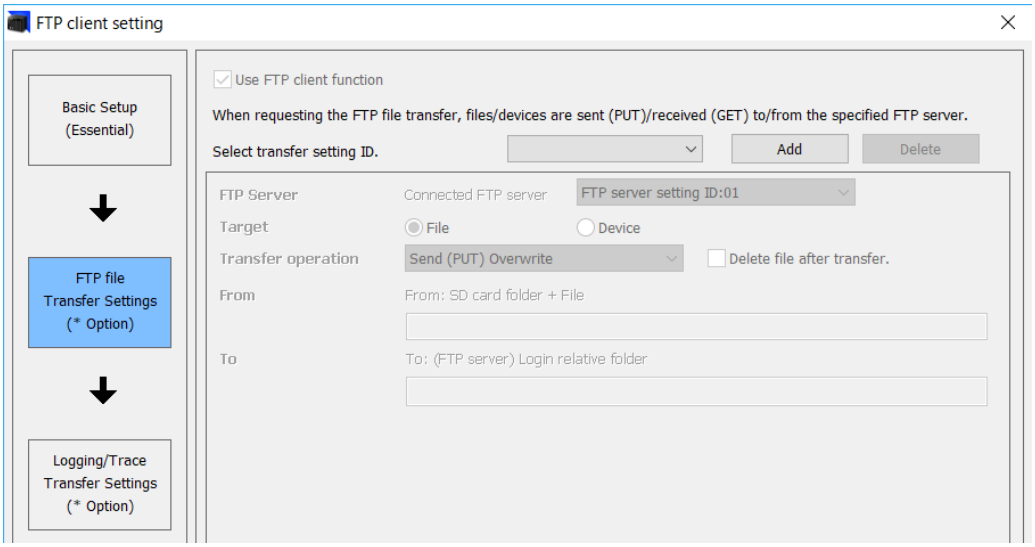
9.4.3 FTP File Transfer Settings (Getting Files)

Configure the setting for getting files. The following description is made with an assumption that "9.4.1 Basic Setup" has been completed.

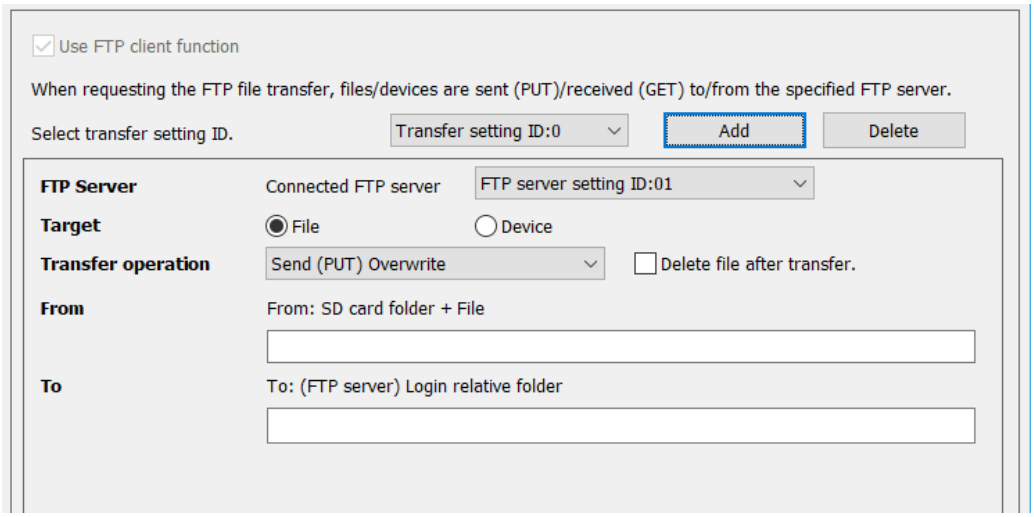
This setting is not required when only performing the logging / trace transfer. Click the [Next] button to go to "Logging / Trace Transfer Settings".

Procedure

1. Complete the basic setup and click the [Next] button.
   The "FTP File Transfer Settings" screen is displayed.



2. Click the [Add] button to add the transfer setting.
The following items become available by adding the transfer setting.



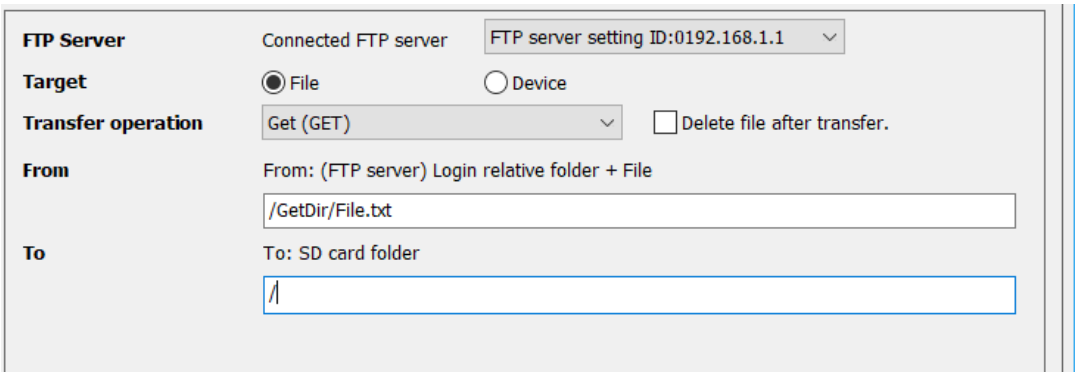
3. Set each item.

Item	Description
FTP server	Select a destination FTP server from the list. The servers registered in Basic Setup are listed.
Target	Select target "file" to be transferred.
Transfer operation	Select "Get (GET)". To delete files after transfer, check [Delete file after transfer].
From	Specify a destination (FTP server) login relative folder + file. Max. 256 characters For specifying the home directory,"""" specify </> or <\> only.
To	Specify an SD card folder (folder name). Max. 256 characters

4. Press the [OK] button.
   The settings are registered in the project.

Setting example

Item	Example
Transfer operation	Get (GET)
From	/GetDir/File.txt
To	/



Info.

- When changing the file transfer settings after the settings have been completed, select "Transfer setting ID:X".

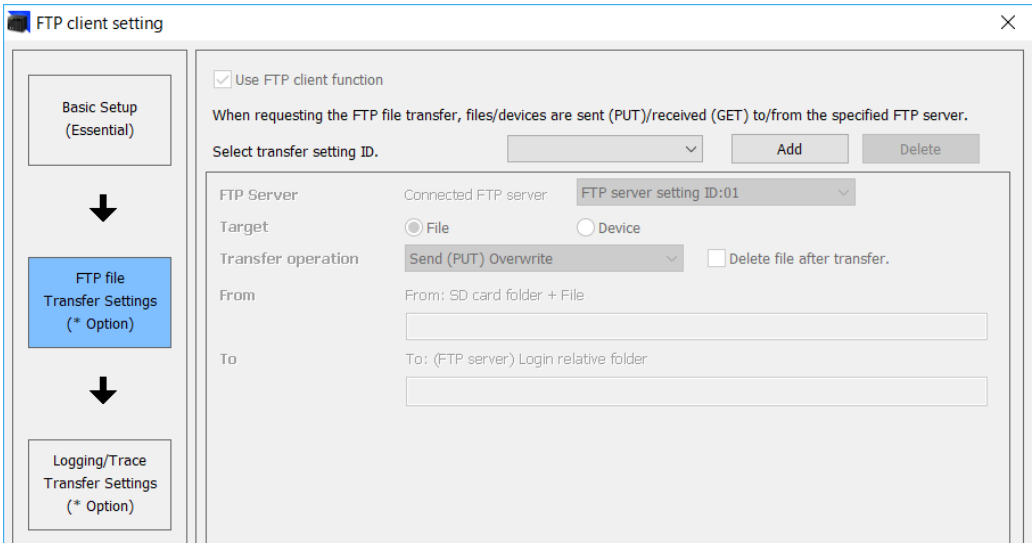
9.4.4 FTP File Transfer Settings (Sending Device)

Configure the device sending settings. The following description is made with an assumption that "9.4.1 Basic Setup" has been completed.

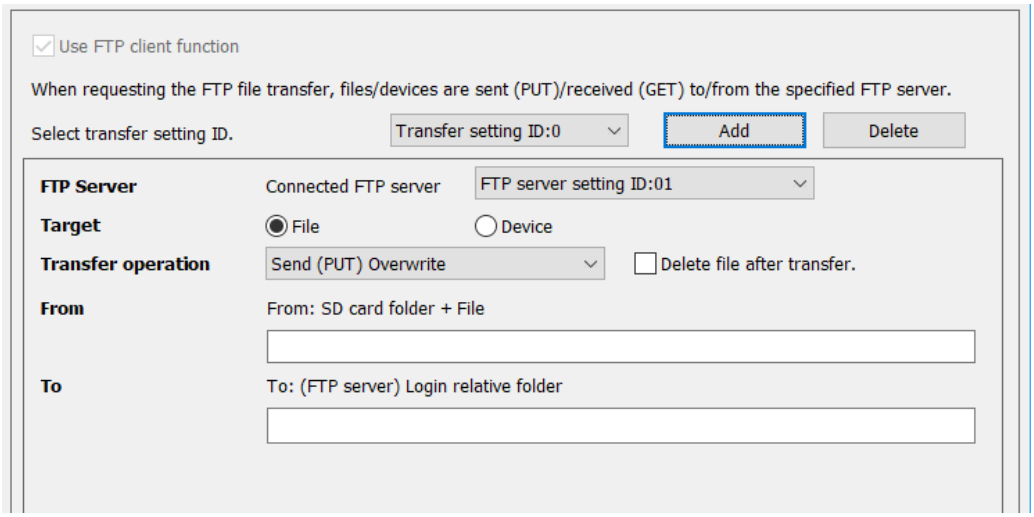
This setting is not required when only performing the logging / trace transfer. Click the [Next] button to go to "Logging / Trace Transfer Settings".

Procedure

1. Complete the basic setup and click the [Next] button.
   The "FTP File Transfer Settings" screen is displayed.



2. Click the [Add] button to add the transfer setting.
The following items become available by adding the transfer setting.



3. Set each item.

Item	Description
FTP server	Select a destination FTP server from the list. The servers registered in Basic Setup are listed.
Target	Select a transfer target "device".
Transfer operation	Select "Send (PUT) Overwrite" / "Send (PUT) Rename". To delete files after transfer, check [Delete file after transfer].
From Device setting	Select a device code from the following: (WX, WY, WR, WL, DT, LD, I, SV, EV) Select the device number, number of transferred data, and conversion method. Select the line feed position. (Setting range: 0 to 255)

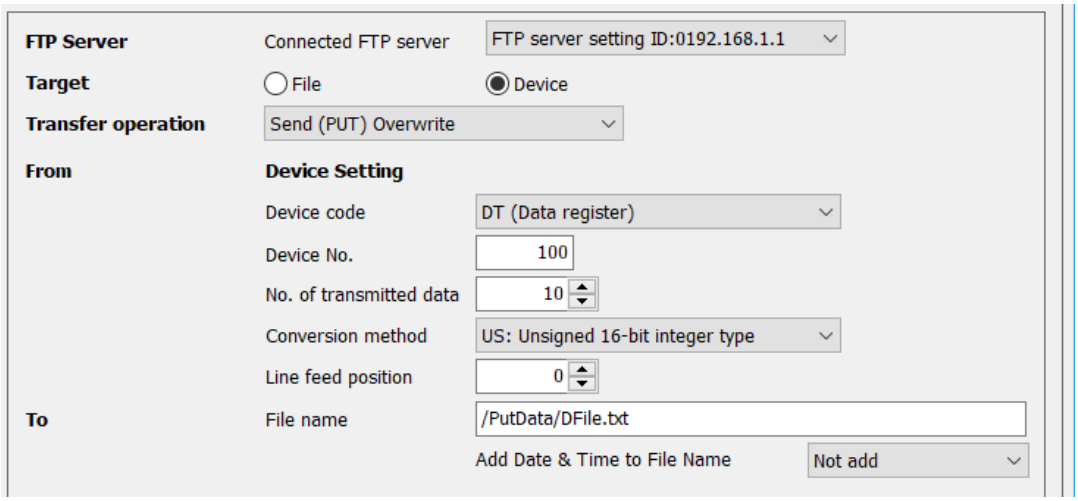
Item	Description
To	Specify a destination file name with (FTP server) login relative folder + file name. Max. 256 characters For specifying the home directory,"""" specify </> or <\> only. Select whether or not to add date and time to the file name. [Not add / Add (Postposing) / Add (Preposing)]

4. Press the [OK] button.
The settings are registered in the project.

Setting example

Item		Example 1 (Data overwrite transfer)	Example 2 (Data rename transfer)
Transfer operation		Send (PUT) Overwrite	Send (PUT) Rename
From		Transfer 10 words in US format from the DT100.	Transfer 20 words in binary format from the LD50.
	Device code	DT (Data register)	LD (Link register)
	Device No.	100	50
	No. of transferred data	10	20
	Conversion method	US: Unsigned 16-bit integer type	BIN1w: Unconverted 16-bit binary
	Line feed position	0	0
To		/PutData/DFile.txt	/RDFile.bin

Example 1



Info.

- When changing the file transfer settings after the settings have been completed, select "Transfer setting ID:X".
- For the details of the overwrite method and rename method, refer to "9.3.4 Overwrite Method and Rename Method"

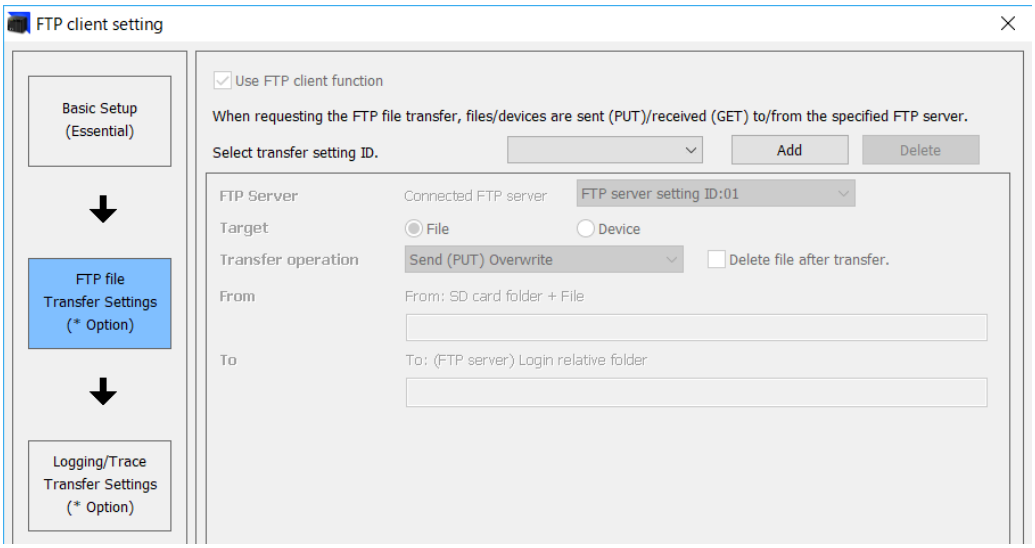
9.4.5 FTP File Transfer Settings (Getting Device)

Configure the setting for getting devices. The following description is made with an assumption that "9.4.1 Basic Setup" has been completed.

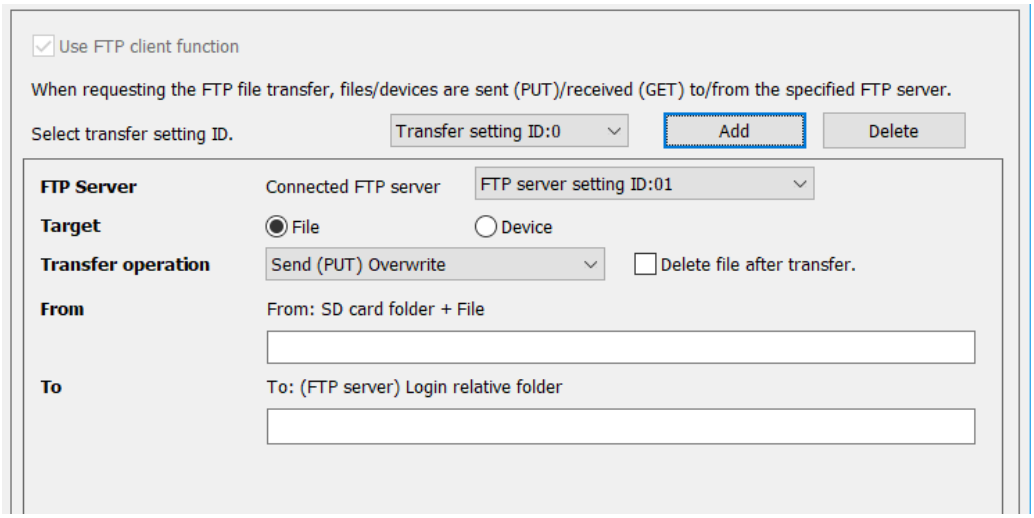
This setting is not required when only performing the logging/trace transfer. Click the [Next] button to go to "Logging / Trace Transfer Settings".

Procedure

1. Complete the basic setup and click the [Next] button.
   The "FTP File Transfer Settings" screen is displayed.



2. Click the [Add] button to add the transfer setting.
   The following items become available by adding the transfer setting.



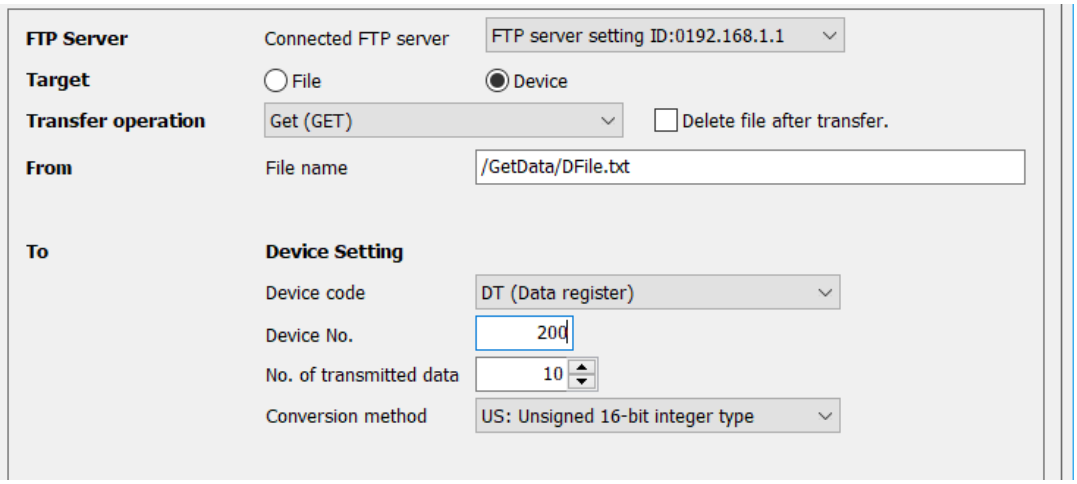
3. Set each item.

Item	Description
FTP server	Select a destination FTP server from the list. The servers registered in Basic Setup are listed.
Target	Select a transfer target "device".
Transfer operation	Select "Get (GET)". To delete files after transfer, check [Delete file after transfer].
From	Specify a source file name with (FTP server) login relative folder + file name. For specifying the home directory,"""" specify </> or <\> only. Max. 256 characters
To Device setting	Select a device code from the following: (WX, WY, WR, WL, DT, LD, I, SV, EV) Select the device number, number of transferred data, and conversion method.

4. Press the [OK] button.
The settings are registered in the project.

Setting example

Item		Example
Transfer operation		Get (GET)
From		/GetData/DFile.txt
To		Transfer 10 words in US format to the DT200.
	Device code	DT (Data register)
	Device No.	200
	No. of transferred data	10
	Conversion method	US: Unsigned 16-bit integer type



Info.

- When changing the file transfer settings after the settings have been completed, select "Transfer setting ID:X".

9.4.6 Setting with Instructions

The destination server setting and file transfer setting are specified with instructions.

■ List of instructions

Instruction	Application
F470（FTPcSV）	Destination FTP server setting Refer to "10.4.12 F470 FTPcSV (FTP Client Connected Server Setting)".
F471（FTPcSET）	File transfer setting Refer to "10.4.13 F471 FTPcSET (FTP Client Transfer Setting)".

9.4.7 Executing File Transfer with Instructions

Executes file transfer according to the settings with the setting tool software or instructions.

■ List of executed instructions

Instruction	Application
F473（FTPcREQ）	Transfer request Refer to "10.4.15 F473 FTPcREQ (FTP Client Transfer Request)".
F474（FTPcCTL）	Controlling transfer Refer to "10.4.16 F474 FTPcCTL (FTP Client Transfer Control)".

9.5 How to Set Logging / Trace Transfer

Use the programming tool software "FPWIN GR7" to make the transfer settings.

9.5.1 Basic Setup

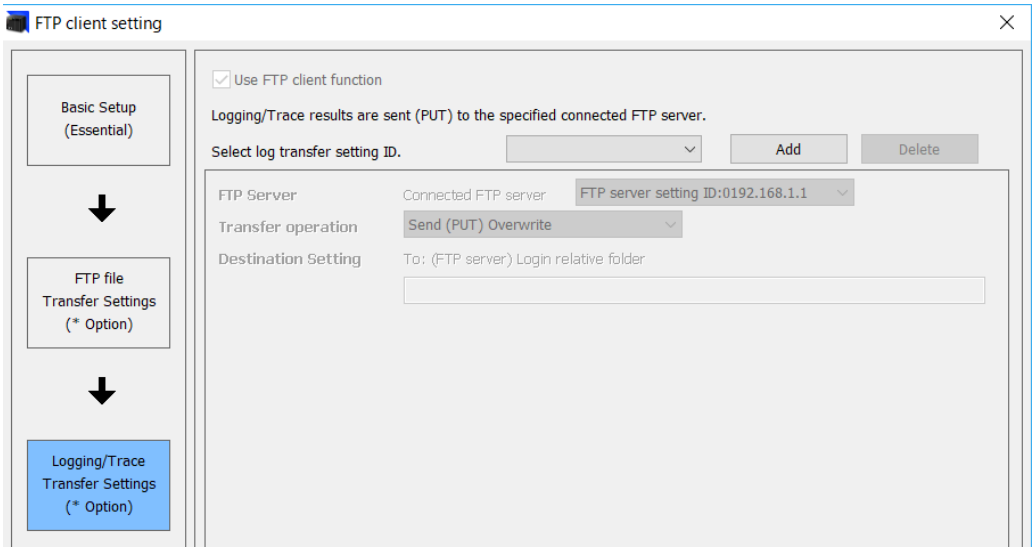
For details of Basic Setup, Refer to "9.4.1 Basic Setup".

9.5.2 Logging / Trace Transfer Settings

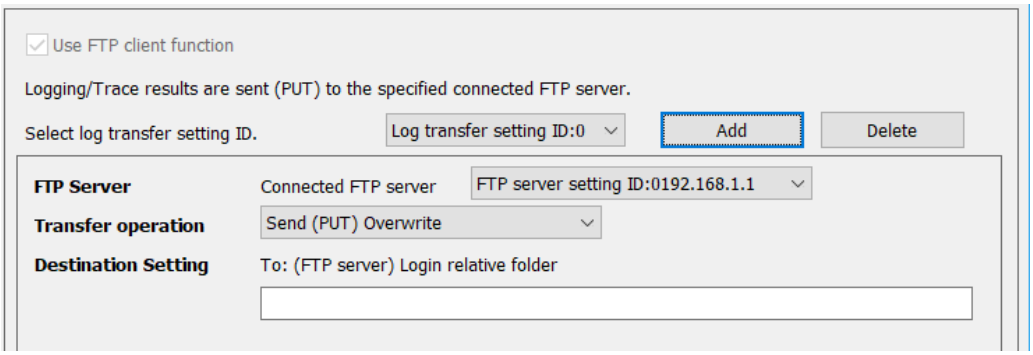
Specifies the logging / trace transfer settings. The following description is made with an assumption that "9.5.1 Basic Setup" has been completed.

Procedure

1. Complete the basic setup and click the [Next] button.
   The "FTP File Transfer Settings" screen is displayed. For using the logging / trace transfer settings, the FTP file transfer settings are not required.
2. Press the [Next] button.
   The "Logging / Trace Transfer Settings" screen is displayed.



3. Click the [Add] button to add the log transfer setting.
   The following items become available by adding the log transfer setting.



4. Set each item.

Item	Default	Description
FTP server	-	Select a destination FTP server from the list. The servers registered in Basic Setup are listed.
Transfer operation	Send (PUT) Overwrite	Select "Send (PUT) Overwrite" / "Send (PUT) Rename".
Destination setting	-	Destination: Specify a (FTP server) login relative folder. Max. 256 characters

5. Press the [OK] button.
The settings are registered in the project.

Info.

- When changing the file transfer settings after the settings have been completed, select "Log transfer setting ID:X".
- For the details of the overwrite method and rename method, refer to "9.3.4 Overwrite Method and Rename Method".

9.5.3 Setting with Instructions

The destination server setting and logging / trace transfer setting are specified with instructions.

■ List of instructions

Instruction	Application
F470（FTPcSV）	Destination FTP server setting Refer to "10.4.12 F470 FTPcSV (FTP Client Connected Server Setting)".
F471（FTPcSET）	Transfer Settings Refer to "10.4.13 F471 FTPcSET (FTP Client Transfer Setting)".
F472（FTPcLOG）	Logging / Trace transfer settings Refer to "10.4.14 F472 FTPcLOG (Logging / Trace Transfer Setting)".

9.5.4 Confirming the Execution of Transfer with Instructions

- The transfer is automatically performed when logging / trace files are determined.
- The status of transferring logging / trace files can be confirmed by reading a desired operation device with F465 (ETSTAT) instruction.

Instruction	Application
F465（ETSTAT）	Obtaining information of the Ethernet unit. Refer to "10.4.6 F465 ETSTAT (EtherNet Information Acquisition)".

9.6 Precautions When Using FTP Client

9.6.1 Precautions for FTP Client Operation

■ When specifying a non-existent folder

- If a folder specified when uploading a file does not exist, folders are automatically created up to eight hierarchies.
- When no folder is created, an error occurs and the process is terminated.

■ When specifying a file with the same name

- If a file with the same name exists in a folder specified when downloading a file, the file is overwritten.
- The operation when a file with the same name exists in a folder of a specified FTP server for uploading a file varies according to the specifications of the FTP server.

■ When using a wild card (* or ?) in file names

- When an error occurs in the middle of uploading / downloading one file, the uploading / downloading continues up to the last file.
- If there is a file which could not be transferred after the completion, an error occurs. When an error occurs in the middle of uploading / downloading one file, retry is to re-execute the transfer with the same wild card. Therefore, files created from the failure of transfer till the execution of retry are also transferred.
- When using the function which deletes files on successful completion of uploading / downloading, files are deleted on successful completion of uploading/downloading file by file.
- When a download is specified, an error occurs if the number of files that match the wild card is 101 or more.

9.6.2 Precautions When Setting FTP Client

■ Folder delimiter

- Use <(/ slash)> or <(\ backslash)> as delimiters for folders.

■ Characters that cannot be used for file and folder names

- The following characters cannot be used as one-byte characters; < \ >, < space >, < , >, < " >, < : >, < ; >, < < >, < > >, < = >, < + >, < | >

■ Restrictions on destination FTP servers

- Characters that cannot be used for folder and file names vary depending on destination FTP servers. Specify folder and files names according to the specifications of FTP servers used.

9.6.3 Number of Transferable Data and Processing Time

■ Number of specified transferred data and approximate processing time depending on the conversion method

This data is a guide only for the time required for the transfer instruction. (The scan time should be counted considering the processing times of other instructions in practice.)

<Transfer data for PUT data>

Conversion method	No. of characters by conversion method	Max. No. of settable data	Processing timer per 100 data (Note 1)	Max. No. of actual transferable data		Transfer data
				No. of data	File size	
binary	2-byte	65,533	0.039ms	65,533	131,066 bytes	HFFFF
US	6-byte	65,533	0.613ms	65,533	393,199 bytes	65,535
SS	7-byte	65,533	0.572ms	65,533	458,732 bytes	-00001
UL	11-byte	32,766	0.944ms	32,766	360,427 bytes	4,294,967,295
SL	12-byte	32,766	0.801ms	32,766	393,193 bytes	-0000000001
SF	14-byte	32,766	1.420ms	32,766	458,725 bytes	0.001
HEX1	5-byte	65,533	0.564ms	65,533	327,666 bytes	HFFFF
HEX2	9-byte	32,766	1.030ms	32,766	249,895 bytes	HFFFFFFFF

(Note 1) The approximate processing time of 100 data.

Transfer data for GET data

Conversion method	No. of characters by conversion method	Max. No. of settable data	Processing timer per 100 data (Note 1)	Max. No. of actual transferable data		Transfer data
				No. of data	File size	
binary	2-byte	65,533	0.020ms	65,533	131,066 bytes	HFFFF
US	6-byte	65,533	0.236ms	65,533	393,199 bytes	65,535
SS	7-byte	65,533	0.910ms	65,533	458,732 bytes	-00001
UL	11-byte	32,766	1.554ms	32,766	360,427 bytes	4,294,967,295
SL	12-byte	32,766	1.135ms	32,766	393,193 bytes	-0000000001
SF	14-byte	32,766	1.419ms	32,766	458,725 bytes	00000000.001
HEX1	5-byte	65,533	0.283ms	65,533	327,666 bytes	HFFFF
HEX2	9-byte	32,766	1.024ms	32,766	249,895 bytes	HFFFFFFFF

(Note 1) The approximate processing time of 100 data.

■ Number of transferable data for PUT data and GET data

- 1 Mbyte communication buffer is allocated for accessing data with PUT and GET.

- The communication buffer is equally divided by the number of registered transmissions and allocated. The number of transferable data for each transfer setting is in the range of the data allocated to each transfer setting.

No. of transfer settings	No. of transferable data for one transfer setting		
	No. of bytes	Number of words	Max. number of transmissions
1	1048576	524288	524288
2	524288	262144	262144
3	349524	174762	174762
4	262144	131072	131072

(Note 1) It is divided by the number of registrations for PUT and GET data, and the settings for PUT and GET files are not included.

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10.1 List of Instructions Used for Ethernet Communication

Instruction	Overview of functions	On page:
Communication instruction		
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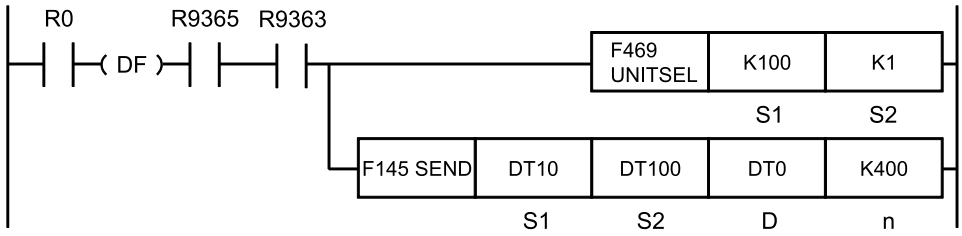
F146 RECV	Data reception instruction MEWTOCOL master	"P.10-5"
F145 SEND	Data send instruction MODBUS master (Function code specification)	"P.10-8"
F146 RECV	Data reception instruction MODBUS master (Function code specification)	"P.10-10"
F145 SEND	Data send instruction MODBUS master	"P.10-11"
F146 RECV	Data reception instruction MODBUS master	"P.10-14"
F145 SEND	Data send instruction MC protocol master	"P.10-16"
F146 RECV	Data reception instruction MC protocol master	"P.10-18"
F159 MTRN	General-purpose communication instruction	"P.10-21"
Character string instructions		
F253 SSET	Character constant → ASCII code conversion (with storage area size)	"P.10-26"
Ethernet instructions		
F460 IPv4SET	Ipv4 address setting	"P.10-30"
F461 CONSET	Connection setting	"P.10-34"
F462 OPEN	Connection open	"P.10-41"
F463 CLOSE	Connection close	"P.10-43"
F464 RDET	Ethernet status read	"P.10-44"
F465 ETSTAT	Acquire Ethernet information	"P.10-50"
P466 NTPcREQ	Time adjustment request instruction	"P.10-56"
F467 NTPcSV	NTP destination server setting instruction	"P.10-61"
P468 PINGREQ	PING request instruction	"P.10-66"
F469 UNITSEL	Specify communication unit slot port	"P.10-70"
F470 FTPcSV	FTP client connected server setting	"P.10-72"
F471 FTPcSET	FTP client transfer setting	"P.10-78"
F472 FTPcLOG	Logging / Trace transfer setting	"P.10-86"
F473 FTPcREQ	FTP client transfer request	"P.10-89"
F474 FTPcCTL	FTP client transfer control	"P.10-92"

10.2 Communication instruction

10.2.1 F145 SEND [Data Send Instruction (MEWTOCOL Master)]

■ **Instruction format**



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ **Operands**

Items	Settings
S1	Specify the starting address of the area that stores control data.
S2	Specify the starting address of the source data area.
D	Specify the destination data area of a partner unit. (Device No. is fixed to “0”)
n	Specify the starting address of the destination device in the partner unit.

■ **Devices that can be specified (indicated by ●)**

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●					●	
S2	●	●	●	●	●	●	●	●		●	●					●	
D		●	●	●	●	●	●	●									
n		●	●	●	●	●	●	●				●	●			●	

■ **Outline of operation**

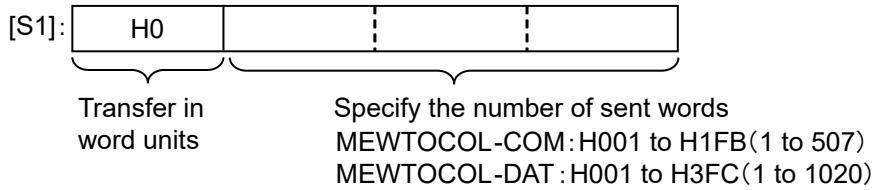
- Commands are sent from the communication port of the unit to perform data transmission / reception with external devices. Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- The data specified by [S2] in the master unit is written to the area specified by [D] and [n] in the partner unit in accordance with the specification of two-word data stored in the control data starting at the area specified by [S1].

■ Specifying the control data [S1], [S1+1]

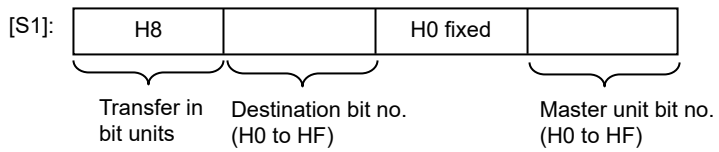
- [S1]: Specify the transfer unit and method

  Specify data quantity in the case of transmission in word units, and specify the location of target bits in the case of transmission in bit units.

Transfer in word units

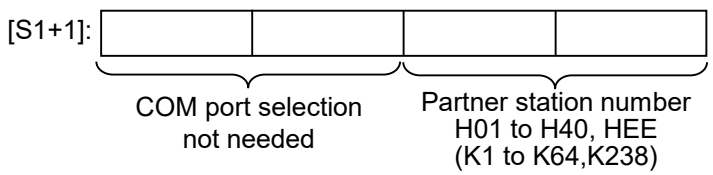


Transfer in bit units



- [S1+1]: Specify the partner station number

  Specify the destination unit number. COM port selection is not required in Ethernet communication.



(Note 1) Communication is made possible for the main unit firmware Ver. 1.8 or later regardless of the unit No. of the partner unit since the specification of HEE (K238) is added to partner station numbers.

■ Specify the area of the partner unit for storing by using [D] and [n]

Specify "0" for the [D] device No.

Specify the memory area of a partner unit that stores sent data, combining type [D] and address [n].

Example 1) [D]: DT0, [n]: K100

↓

DT100

Example 2) [D]: DT0, [n]: HFFF0

↓

DT65520

■ **Flag operations**

MEWTOCOL-COM master mode

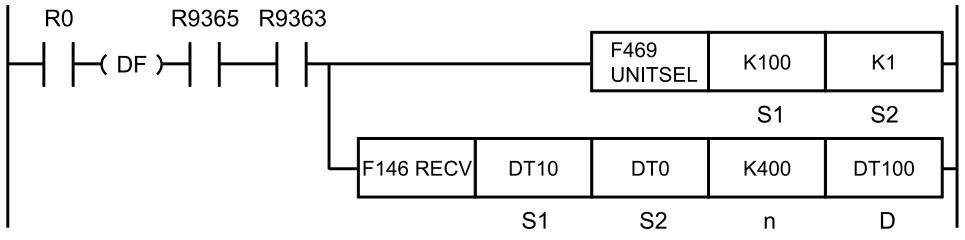
Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units
	When [D] + [n] exceeds the area of [D]
	When the device number of [D] is not 0
	Word unit ● When [n] is not in the range from 0 to 99999 when [D] is DT/LD ● When [n] is not in the range from 0 to 9999 when [D] is WY/WR/WL/SV/EV Bit unit ● When [D] is not WY/WR/WL ● When [n] is not between 0 and 999
	When the operation mode of the specified user connection is other than MEWTOCOL-COM

MEWTOCOL-DAT master mode

Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units
	When [D] + [n] exceeds the area of [D]
	When the device number of [D] is not 0
	Word unit ● When [n] is not between 0 and 0xFFFF Bit unit ● When [D] is not WX/WY/WR/WL ● When [n] is not between 0 and 0xFFFF
	When the operation mode of the specified user connection is other than MEWTOCOL-DAT

10.2.2 F146 RECV [Data Receive Instruction (MEWTOCOL Master)]

■ **Instruction format**



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings
S1	Specify the starting address of the area that stores control data.
S2	Specify the source data area of a partner unit. (Device No. is fixed to “0”)
n	Specify the starting address of the device in the source data area of a partner unit.
D	Specify the device starting address of the receive data storage area in the master unit.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●					●	
S2	●	●	●	●	●	●	●	●									
n		●	●	●	●	●	●	●				●	●			●	
D		●	●	●	●	●	●	●								●	

■ Outline of operation

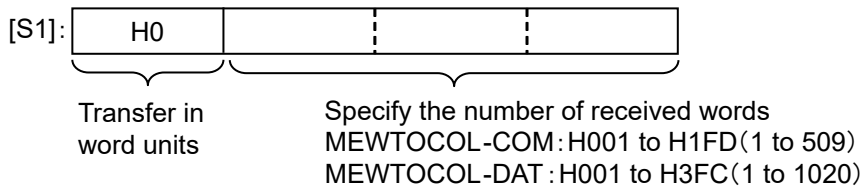
- Commands are sent from the Ethernet port of the unit to perform data transmission / reception with external devices.
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- In accordance with the specification of two-word data stored in the control data starting with an area specified in [S1], reading is performed from the area specified by [S2] and [n] in a partner unit, starting with the [D] area of the master unit.

■ Specification of control data [S1] [S1+1]

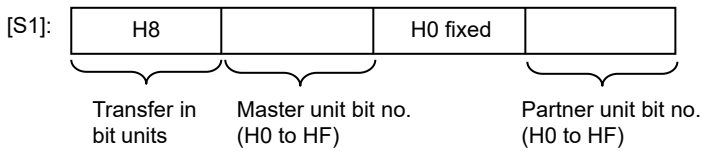
- [S1]: Specify the transfer unit and method

  Specify data quantity in the case of transmission in word units, and specify the location of target bits in the case of transmission in bit units.

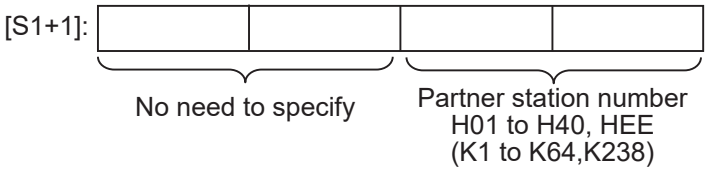
Transfer in word units



Transfer in bit units



- [S1+1]: Specify the partner station number
  Specify the destination unit number. COM port selection is not required in Ethernet communication.



(Note 1) Communication is made possible for the main unit firmware Ver. 1.8 or later regardless of the unit No. of the partner unit since the specification of HEE (K238) is added to partner station numbers.

■ Specify the starting address [S2] of the sender data area

Specify "0" for the device number of [S2]. Specify the memory area of the partner unit storing sent data, combining type [S2] and address [n].

Example 1) [S2]: DT0, [n]: K100

↓

DT100

Example 2) [S2]: DT0, [n]: HFFF0

↓

DT65520

■ Flag operations

MEWTOCOL-COM master mode

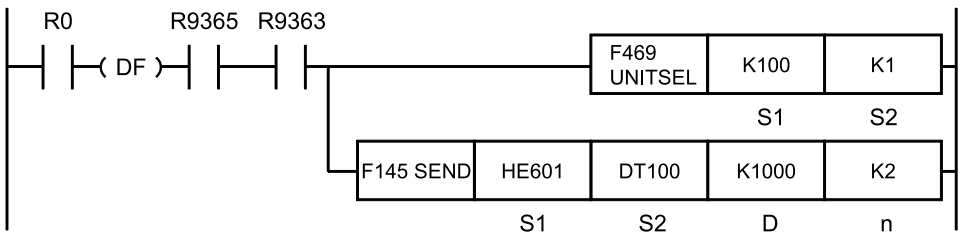
Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units
	When [S2]+[n] exceeds the [S2] area
	When the [S2] device number is not 0
	Word unit ● If [S2] is DT/LD, when [n] is not between 0 and 99999 ● If [S2] is WX/WY/WR/WL/SV/EV, when [n] is not between 0 and 9999 Bit unit ● When [S2] is not WX/WY/WR/WL ● When [n] is not between 0 and 999
	When the operation mode of the specified user connection is other than MEWTOCOL-COM

MEWTOCOL-DAT master mode

Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units
	When [S2]+[n] exceeds the [S2] area
	When the [S2] device number is not 0
	Word unit ● When [n] is not between 0 and 0xFFFF Bit unit ● When [S2] is not WX/WY/WR/WL ● When [n] is not between 0 and 0xFFFF
	When the operation mode of the specified user connection is other than MEWTOCOL-DAT

10.2.3 F145 SEND [Data Send Instruction (MODBUS Master: Function Code Specification)]

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings	Setting range
S1	Specify the MODBUS function code to be used and the unit No. of a partner unit.	-
S2	Specify the starting address of the source data area of the master unit.	-
D	Specify the MODBUS address of the destination data area of a partner unit.	H0 to HFFFF
n	Specify the number of send data.	1 to 127 words 1 to 2040 bits

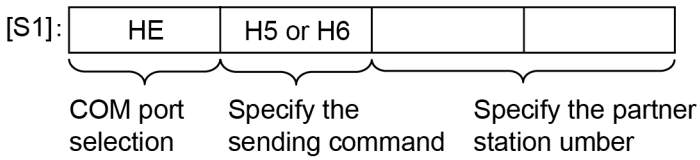
■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●	●	●			●	
S2	●	●	●	●	●	●	●	●		●	●					●	
D		●	●	●	●	●	●	●				●	●				
n		●	●	●	●	●	●	●				●	●			●	

■ Outline of operation

- MODBUS commands are sent from the communication port of the unit to perform data transmission / reception with external devices.
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- Specify the sending port, MODBUS function code (5 or 6), and partner unit No. with [S1].
- Send data specified by [S2] is sent to the MODBUS address specified by [D], using a MODBUS command. (MODBUS function code 05, 06)

■ [S1]: Specify the port number/sending command/partner unit



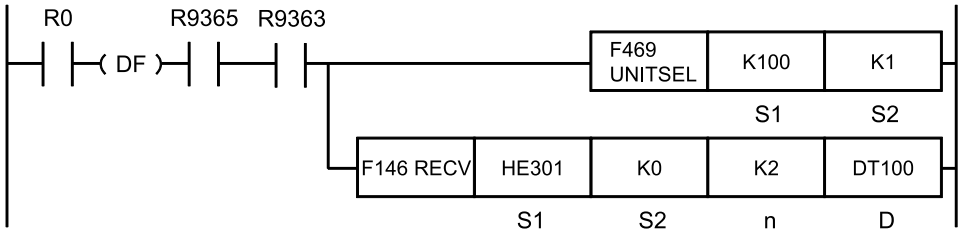
- Specify a COM port
  As a LAN port, specify Ethernet communication (HE).
- Set a sending command
  H5: Send bit data
  H6: Send word data
- Specify the partner station number
  Possible to specify from H00 to HFF (K0 to K255). If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. range is from H01 to HF7 (K1 to K247).

■ Flag operations

Name	Description
R9007 R9008 (ER)	When the [S1] control data value is outside the specified range
	When the number of send data [n] is 0
	When the number of send data [n] exceeds the area of operation memory specified in [S2]
	When the number of send data [n] exceeds limitation in MODBUS specification
	When the operation mode of the specified user connection is other than MODBUS-TCP

10.2.4 F146 RECV [Data Receive Instruction (MODBUS Master: Function Code Specification)]

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings	Setting range
S1	Specify the MODBUS function code to be used and the unit No. of a partner unit.	-
S2	Specify the source MODBUS address of a partner unit.	H0 to HFFFF
n	Specify the number of receive data.	1 to 127 words 1 to 2040 bits
D	Specify the device starting address of the receive data storage area in the master unit.	-

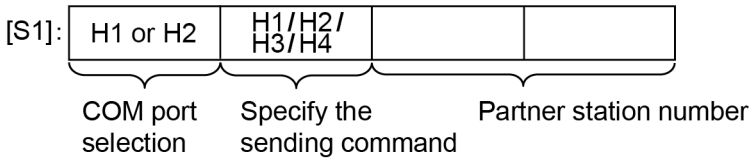
■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●	●	●			●	
S2	●	●	●	●			●	●				●	●				
n		●	●	●	●	●	●	●				●	●			●	
D		●	●	●	●	●	●	●								●	

■ Outline of operation

- MODBUS commands are sent from the communication port of the unit to perform data transmission / reception with external devices.
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- In [S1], specify the sending port, MODBUS function code (H1 to H4), and partner unit No.
- Receive data of a size specified by [n] from the MODBUS address specified by [S2].
- Received data is stored in the operation memory specified by [D].

■ **[S1]: Specify the port number/sending command/partner unit**



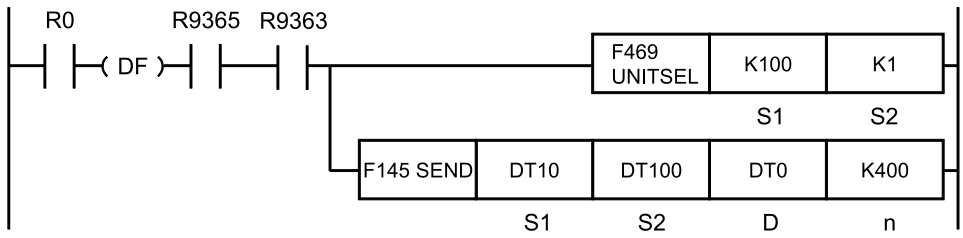
- Specify a COM port
  As a LAN port, specify HE (Ethernet communication).
- Set a sending command
  H1, H2, H3 or H4 can be specified.
  H1: Read coil state (01)
  H2: Read input state (02)
  H3: Read hold register (03)
  H4: Read input register (04)
- Specify the partner station number
  Possible to specify from H01 to HFF (K1 to K255).If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. range is from H01 to HF7 (K1 to K247).

■ **Flag operations**

Name	Description
R9007 R9008 (ER)	When the [S1] control data value is outside the specified range
	When the operation mode of the specified user connection is other than MODBUS-TCP
	When the number of received data [n] is 0
	When the area of operation memory specified by [D] is exceeded, if the number of received data [n] is received
	When the number of received data [n] exceeds limitations in the MODBUS specification

10.2.5 F145 SEND [Data Send Instruction (MODBUS Master: No Function Code Specification)]

■ **Instruction format**



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings
S1	Specify the starting address of the area that stores control data.
S2	Specify the starting address of the source data area.
D	Specify the source data area of a partner unit. (Device No. is fixed to “0”)
n	Specify the starting address of the destination device in the partner unit.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●					●	
S2	●	●	●	●	●	●	●	●		●	●					●	
D		●	●				●										
n		●	●	●	●	●	●	●				●	●			●	

■ Outline of operation

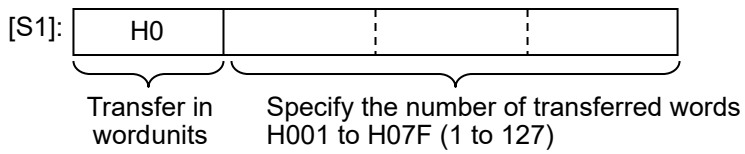
- Commands are sent from the communication port of the unit to perform data transmission / reception with external devices. Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- In accordance with the specification of 2-word data stored in the control data starting with the area specified in [S1], the data specified by [S2] in the master unit is written from the area specified by [D] and [n] in a partner unit.

■ Specification of control data [S1] [S1+1]

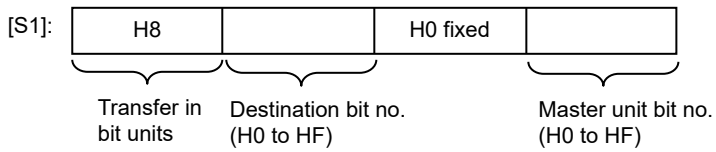
- [S1]: Specify the transfer unit and method

  Specify data quantity in the case of transmission in word units, and specify the location of target bits in the case of transmission in bit units.

Transfer in word units

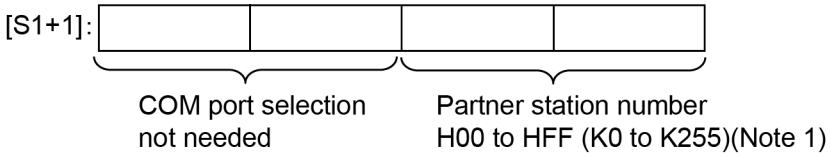


Transfer in bit units



- [S1+1] : Specify the partner station number

  Specify the unit No. of a partner unit. COM port selection is not required in Ethernet communication.



(Note 1) If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. range is from H01 to HF7 (K1 to K247).

■ Specifying a storage area of a partner unit using [D][n]

Specify "0" for the [D] device No.

Specify the memory area of a partner unit that stores sent data, combining type [D] and address [n].

Example 1) [D]: DT0, [n]: K100

↓

DT100

Example 2) [D]: DT0, [n]: HFFF0

↓

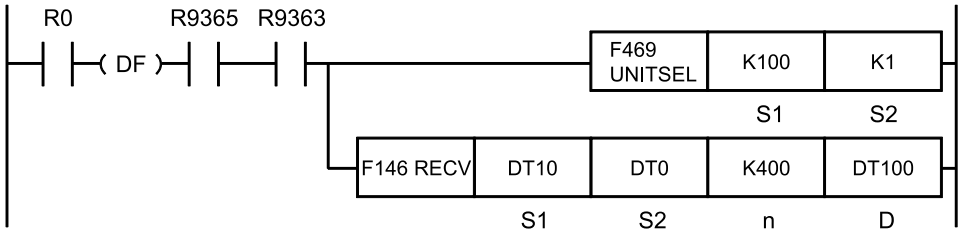
DT65520

■ Flag operations

Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [S2] area is exceeded if the number of words specified in [S1] is taken during transfer in word units
	When [D] + [n] exceeds the area of [D]
	When the device number of [D] is not 0
	When the [D] area is DT during transfer in bit units
	When the operation mode of the specified user connection is other than MODBUS-TCP

10.2.6 F146 RECV [Data Receive Instruction (MODBUS Master: No Function Code Specification)]

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings
S1	Specify the starting address of the area that stores control data.
S2	Specify the source data area of a partner unit. (Device No. is fixed to “0”)
n	Specify the starting address of the device in the source data area of a partner unit.
D	Specify the device starting address of the receive data storage area in the master unit.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●					●	
S2	●	●	●	●			●	●									
n		●	●	●	●	●	●	●				●	●			●	
D		●	●	●	●	●	●	●								●	

■ Outline of operation

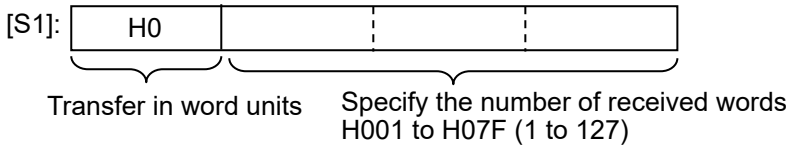
- Commands are sent from the Ethernet port of the unit to perform data transmission / reception with external devices.
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- In accordance with the specification of two-word data stored in the control data starting with an area specified in [S1], reading is performed from the area specified by [S2] and [n] in a partner unit, starting with the [D] area of the master unit.

■ Specification of control data [S1] [S1+1]

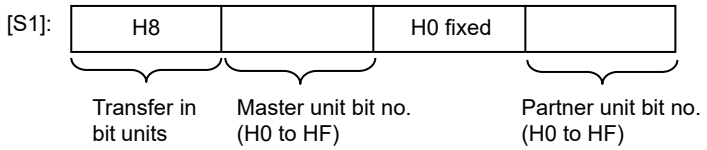
- [S1]: Specify the transfer unit and method

Specify data quantity in the case of transmission in word units, and specify the location of target bits in the case of transmission in bit units.

Transfer in word units

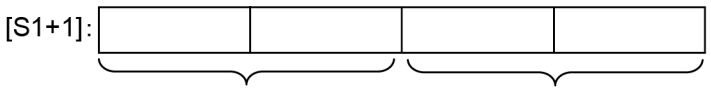


Transfer in bit units



- ［S1+1］：Specify the partner station number

  Specify the unit No. of a partner unit. COM port selection is not required in Ethernet communication.



(Note 1) If the firmware version of the main unit is earlier than Ver. 1.50, the unit No. range is from H01 to HF7 (K1 to K247).

■ Specify the starting address [S2] of the sender data area

Specify "0" for the device number of [S2]. Specify the memory area of the partner unit storing sent data, combining type [S2] and address [n].

Example 1) [S2]: DT0, [n]: K100

↓

DT100

Example 2) [S2]: DT0, [n]: HFFF0

↓

DT65520

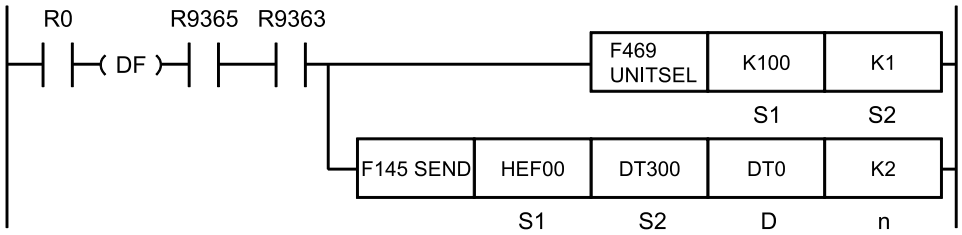
■ Flag operations

Name	Description
R9007 R9008 (ER)	When the [S1], [S1+1] control data value is outside the specified range
	When the [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units
	When [S2]+[n] exceeds the [S2] area
	When the [S2] device number is not 0

Name	Description
	When the [S2] area is DT/WL/LD during transfer in bit units
	When the operation mode of the specified user connection is other than MODBUS-TCP

10.2.7 F145 SEND [Data Send Instruction (MC Protocol Master)]

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings	Setting range
S1	Specify communication port settings and transfer methods.	-
S2	Specify the starting address of the source data area.	-
D	By combining [D] and [D+1], specify the partner unit receiver device type and the starting address of the receiver data area.	Refer to"Specifying [D] and [D+1]"
n	Specify the number of send data.	1 to 960 words 1 to 4054 bits

■ Devices that can be specified (indicated by ●)

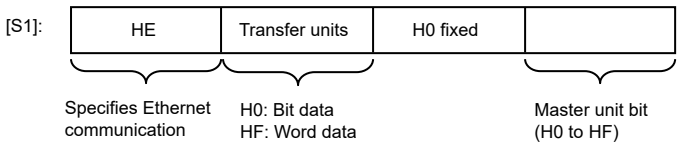
Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●	●	●			●	
S2	●	●	●	●	●	●	●	●		●	●					●	
D		●	●	●	●	●	●	●									
n		●	●	●	●	●	●	●				●	●			●	

■ Outline of operation

- Commands are sent from the communication port of the unit to perform data transmission / reception with devices that support"MC Protocol".
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.

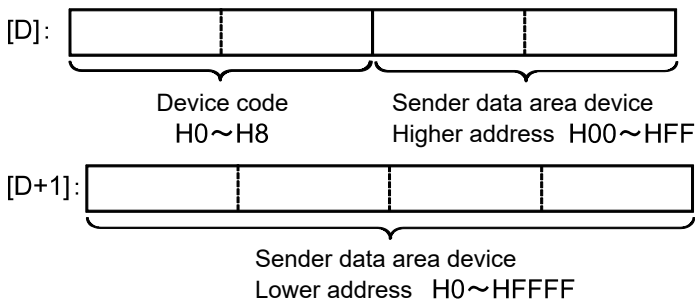
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- When the F145 SEND instruction is executed, [n] pieces of data starting from [S2] are read from a device in the master unit.
- The read data is stored in the data area specified by [D] and [D+1] in the partner unit.

■ Specifying [S1]



- For bit data transfer, it is necessary to specify the bit No. of the master unit.
- For word data transfer, it is not necessary to specify the bit No. of the master unit.

■ Specifying [D] and [D+1]



- For device codes, refer to the table below.

Unit	Device type			Device code
Bits	Input	X	Hexadecimal	H0
	Output	Y	Hexadecimal	H1
	Link relay	B	Hexadecimal	H2
	Internal relay	M	Decimal	H3
	Latch relay	L	Decimal	H4
Word	Data register	D	Decimal	H5
	File register	R	Decimal	H6
		ZR	Hexadecimal	H7
	Link register	W	Hexadecimal	H8

- The partner unit device address is specified by the combination of the low byte of [D] and the value of [D+1]. When the address is in the range of H0 to HFFFF, specify"H00"for the low byte of [D].

■ Exit codes when communication error occurs

When a wrong command is sent or an error occurs in the control unit, a different exit code is returned. Exit codes in an error state are as follows.

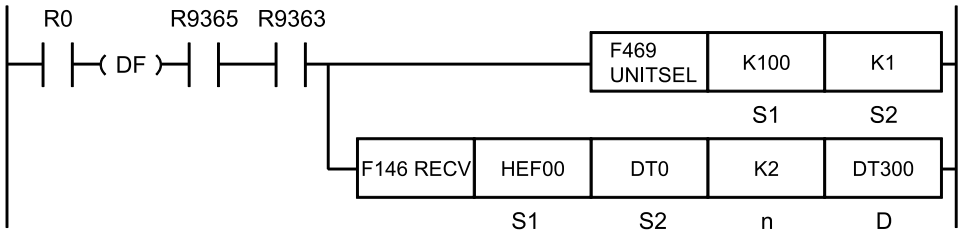
Code	Timing of occurrence
4031	Address is too long (Starting device + Number of written points)
C051	The number of devices is outside the specified range.
C056	The starting device is outside the specified range.
C059	Command search: There is no command that matches the receive data command in the MC protocol command table.
C059	The subcommand is outside the specified range.
C05B	The device code is outside the specified range.
C05C	Subcommand is in bit unit (0001) and device code indicates a word device.
C05F	Receive header content check:"Network No."check
C05F	Receive header content check:"PC No."check
C05F	Receive header content check:"Destination unit I/O No."check
C05F	Error in the number of received and written data
C060	Error in written contact data (except 0 / 1)
C061	Receive header content check: the number of receive data is smaller than the minimum received bytes that support header content check.
C061	The number of receive data is smaller than the minimum number of receive bytes.

■ Flag operations

Name	Description
R9007 R9008 (ER)	When the [S1] control data value is outside the specified range
	The number of sent data [n] is incorrect
	When the number of send data [n] exceeds the area of operation memory specified in [S2]
	When bit data is specified by [S1], but the specified device type of the partner unit is word
	If bit data is specified in [S1], when S2 is not WX/WY/WR/WL
	When the device code specified in [D] is out of range
	When the operation mode of the specified user connection is other than MC protocol

10.2.8 F146 RECV [Data Receive Instruction (MC Protocol Master)]

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings	Setting range
S1	Specify communication port settings and transfer methods.	-
S2	Combine [S2] and [S2+1] to specify the partner unit sender device type and the starting address of the sender data area.	Refer to "Specifying [S2] and [S2+1]"
n	Specify the number of receive data.	1 to 960 words 1 to 4054 bits
D	Specify the device starting address in the master unit that stores receive data.	-

Z

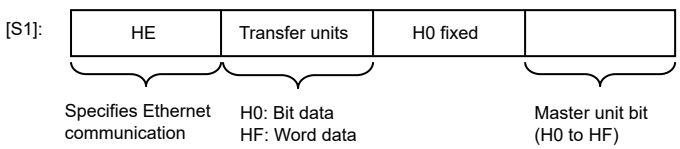
■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S1	●	●	●	●	●	●	●	●		●	●	●	●			●	
S2	●	●	●	●			●	●									
n		●	●	●	●	●	●	●				●	●			●	
D		●	●	●	●	●	●	●								●	

■ Outline of operation

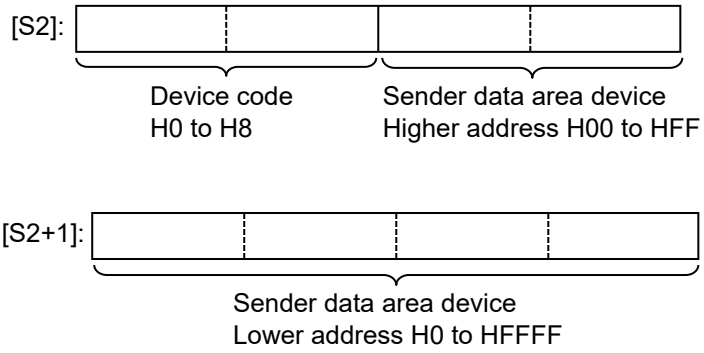
- Commands are sent from the communication port of the unit to perform data transmission / reception with devices that support"MC Protocol".
- Data can be read and written by specifying unit Nos. and memory addresses and executing SEND / RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select a communication mode in the configuration menu of the tool software FPWIN GR7.
- When the F146 RECV instruction is executed, [n] pieces of data are read from the address starting with [S2] lower address + [S2+1] in the partner unit.
- The read data is stored in an area starting from [D] in the master unit.

■ Specifying [S1]



- For bit data transfer, it is necessary to specify the bit No. of the master unit.
- For word data transfer, it is not necessary to specify the bit No. of the master unit.

■ Specifying [S2] and [S2+1]



- For device codes, refer to the table below.

Unit	Device type			Device code
Bits	Input	X	Hexadecimal	H0
	Output	Y	Hexadecimal	H1
	Link relay	B	Hexadecimal	H2
	Internal relay	M	Decimal	H3
	Latch relay	L	Decimal	H4
Word	Data register	D	Decimal	H5
	File register	R	Decimal	H6
		ZR	Hexadecimal	H7
	Link register	W	Hexadecimal	H8

- The partner unit device address is specified by the combination of the low byte of [S2] and the value of [S2+1]. When the address is in the range of H0 to HFFFF, specify"H00"for the low byte of [S2].
- The transfer method and the number of sent data specified by [n] vary according to the type of the device specified by the operand [D].

Device specified by [D]	Transfer method	Number of sent data [n]	Remarks
16-Bit device: WX, WY, WR, WL, DT, LD	Word transfer	1 to 960	
1-Bit device: X, Y, R, L	Bit transfer	1 to 4054	When the number of receive data is an odd number, a four-bit dummy code H0 is added.

■ Exit codes when communication error occurs

When a wrong command is sent or an error occurs in the control unit, a different exit code is returned. Exit codes in an error state are as follows.

Code	Timing of occurrence
4031	Address is too long (Starting device + Number of written points)

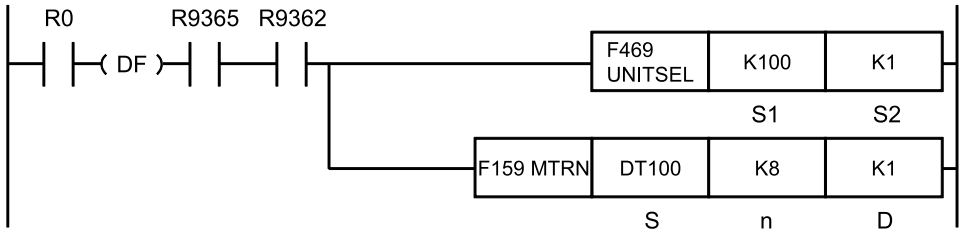
Code	Timing of occurrence
C051	The number of devices is outside the specified range.
C056	The starting device is outside the specified range.
C059	Command search: There is no command that matches the receive data command in the MC protocol command table.
C059	The subcommand is outside the specified range.
C05B	The device code is outside the specified range.
C05C	Subcommand is in bit unit (0001) and device code indicates a word device.
C05F	Receive header content check:"Network No."check
C05F	Receive header content check:"PC No."check
C05F	Receive header content check:"Destination unit I/O No."check
C05F	Error in the number of received and written data
C060	Error in written contact data (except 0 / 1)
C061	Receive header content check: the number of receive data is smaller than the minimum received bytes that support header content check.
C061	The number of receive data is smaller than the minimum number of receive bytes.

■ Flag operations

Name	Description
R9007 R9008 (ER)	When the [S1] control data value is outside the specified range
	The number of sent data [n] is incorrect
	When the number of sent data [n] exceeds the area of operation memory specified by [D]
	When bit data is specified by [S1], but the specified device type of the partner unit is word
	When bit data is specified by [S1], but [D] is not WX/WY/WR/WL
	When the device code specified by [S2] is out of range
	When the operation mode of the specified user connection is other than MC protocol

10.2.9 F159 MTRN (General-purpose Communication Instruction)

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

■ Operands

Items	Settings
S	Starting area (data register) of the data table
n	Area storing the number of bytes of data to be sent, or constant data
D	Invalid: The user connection No. specified by the F469 UNITSEL instruction determines a destination.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant				Index modifier	Integer Device
												K	H	M	f		
S							●									●	
n	●	●	●	●	●	●	●	●	●			●	●			●	
D												●					

■ Outline of operation

Data is sent to or received from an external device using the communication port and connection specified by the F469 UNITSEL instruction.

Items	Description
Transmission	[n] bytes of data from the starting address of the data register specified by [S] are sent to an external device via Ethernet communication port.
Receive	Reception is controlled by the ON/OFF state of the general-purpose communication received flag. When the general-purpose communication received flag is OFF, reception is enabled at any time. The F159 MTRN instruction is used to turn OFF the general-purpose communication received flag (enabling reception). Data sent to Ethernet communication port is stored in the receive buffer (data register DT) specified by the Ethernet setting (user connection setting). Receive data is extracted in the data register (DT), in accordance with the specified"receive buffer starting number in general-purpose communication"and"receive buffer capacity in general-purpose communication".

■ Ethernet Settings

- It is necessary to set the operation mode setting to"General-Purpose Communication"in user connection settings.
- It is necessary to match the port No. and IP address with the connecting external device in user connection settings.
- To secure an area in the data register (DT) to store received data, it is necessary to set the"receive buffer starting address"and"receive buffer capacity"in user connection settings.

■ Related Flags and Ethernet Settings

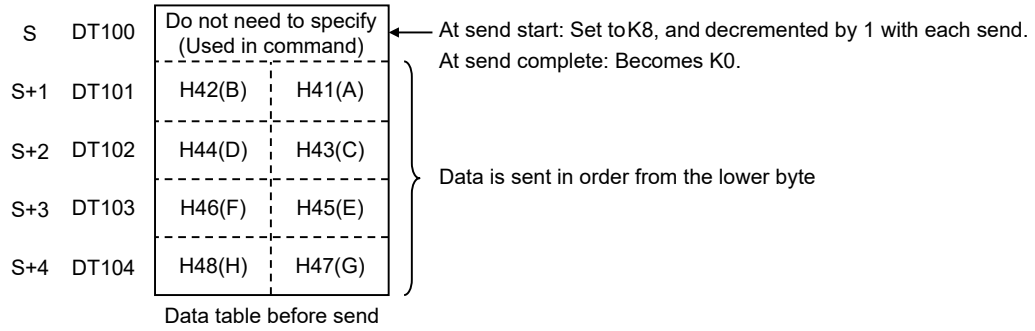
Name	Operation	User Connection								
		1	2	3	4	5	6	7	8	9
Communication error flag	0: Normal 1: Error	R9360	R9368	R9370	R9378	R9380	R9388	R9390	R9398	R9400
Received flag for	0: Receptio	R9361	R9369	R9371	R9379	R9381	R9389	R9391	R9399	R9401

Name	Operation	User Connection								
		1	2	3	4	5	6	7	8	9
general-purpose communication	n possible 1: Reception impossible (reception done)									
Sent flag for general-purpose communication	0: Sending 1: Sending completed (clear to send)	R9362	R936A	R9372	R937A	R9382	R938A	R9392	R939A	R9402
SEND / RECV / MTRN done code	0000h: Successful completion FFFFh: Disconnection	DT90840	DT90841	DT90842	DT90843	DT90844	DT90845	DT90846	DT90847	DT90848
Connection establishment state flag	0: No connection 1: Connected	R9365	R936D	R9375	R937D	R9385	R938D	R9395	R939D	R9405
Receive buffer starting address	Specify the starting number of data register used for the receive buffer of general-purpose communication. (The settable range varies based on the set value for system register No. 0.)									
Receive buffer capacity	Specify the receive buffer size of general-purpose communication. (Setting value × 1 word)									

■ Creation of send data table [S]

Send data is stored as follows in a given memory area (e.g. data register DT). The number of send data bytes [n] is automatically added to the starting word. Sent data should be stored in [S +1] and after.

e.g. When 8-byte data"ABCDEFGH"is sent with [S] set to DT100



(Note 1) No header or terminator is added to sent data. Depending on the protocol of an external device, if a header and a terminator need to be sent, store them as part of send data.

(Note 2) The maximum number of transmission bytes is 2048.

■ Precautions for programming

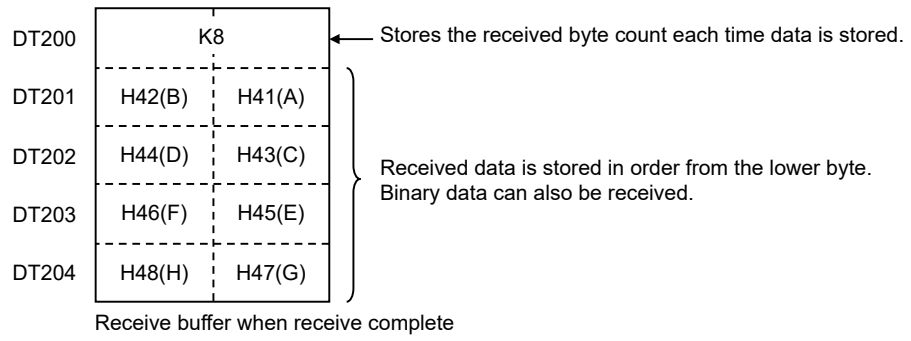
- To perform communication, setup is required in the configuration menu of the tool software.
- Include a F469 UNITSEL instruction before the F159 MTRN instruction to specify the target unit and communication port or connection.
- Confirm that the general-purpose communication sent flag and connection status flag have turned ON for the target Ethernet communication port and connection, then execute the F159 MTRN instruction.
- General-purpose communication can use user connections 1 to 9. System connection cannot be used.
- No header or terminator is added to data to be sent. Store the start code and end code as part of the send data if they need to be sent to match the external device protocol.
- The maximum data that can be sent in a single session is 2,048 bytes.

■ Structure of receive data

Receive data is stored in the receive buffer (data register DT) specified in the system register. The number of receive data bytes is stored in the starting word.

Example: When 8-byte data"ABCDEFGH"is received

Specify 200 for the receive buffer starting number, and 5 for the receive buffer capacity.



(Note 1) Depending on the communication format of an external device, if a header and a terminator are contained, they are stored in the operation memory as part of receive data. When necessary, insert a program to extract data content.

(Note 2) The maximum number of received bytes is 4096.

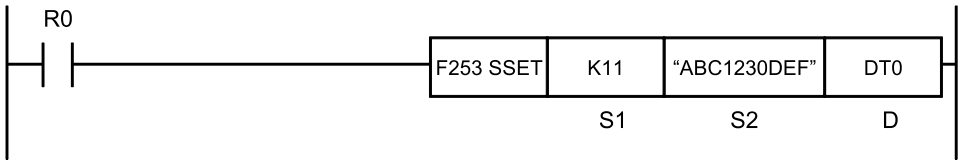
■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when the range is exceeded during indirect access (index modification).
	Set when the connection specified by F469 (UNITSEL) is closed (other than "Connect").
	Set when the communication mode of the communication port specified by F469 (UNITSEL) is not "General-purpose communication".
	When the data device specified by [S] exceeds the area
	When the number of sent data specified by [n] is 0. When the maximum value is exceeded
	When the number of sent data specified by [n] exceeds the data area
	Set when executed in an interrupt program.

10.3 Character String Instructions

10.3.1 F253 SSET (Character Constant → ASCII Code Conversion: with Storage Area Size)

■ **Instruction format**



■ **Operands**

Items	Settings
S1	Storage area size (permissible range: K1 to K32767, H8000)
S2	Character constant to be converted (permissible range: 0 to 256 characters)
D	Starting device address of the destination

■ **Devices that can be specified (indicated by ●)**

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●			●	●		●
S2														●	
D		●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ **Outline of operation**

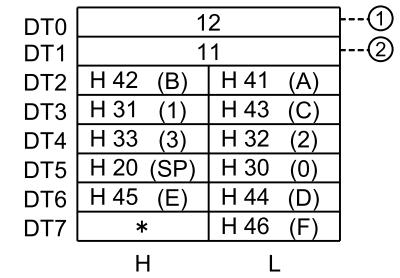
- When **S1** (storage area size) is K1 to K32767:
  The storage area size specified in **S1** is stored in **D**.
  The character constant specified by **S2** is converted into ASCII code. The number of characters (1 word) is stored in **D+1**, and ASCII converted character data is stored in **D+2** and the subsequent area, in ascending order from lower bytes.
- When **S1** (storage area size) is H8000:
  The character constant specified by **S2** is converted into ASCII code. The number of characters (1 word) is stored in **D**, and ASCII converted character data is stored in **D+1** and the subsequent area, in ascending order from lower bytes.
- A character constant is bracketed in “” (double quotation marks).
- Character constants can be set from 0 to 256 characters.
- A string that consists of “” (double quotation marks) only is regarded as NULL characters.
- NULL(00) is not added to the end of characters during setting.

■ Processing

Example 1) When a string "ABC1230 DEF" (11 characters including a space) is to be converted

S1...K12 **S2**... "ABC1230 DEF" **D**...DT0

[S2]
"ABC1230 DEF"



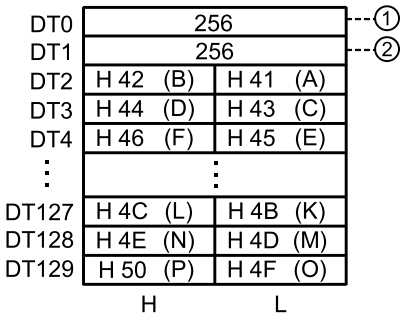
(Note 1) Data outside the range in the destination (*) (bytes higher than DT7) does not change.

(1)	Storage area size	(2)	Number of characters

Example 2) With the 16 characters from A to P as one set, when 16 sets (256 characters in total) are to be repeatedly converted

S1...K256 **S2**... "ABCDEF…KLMNOP" **D**...DT0

[S2]
"ABCDEF…KLMNOP"

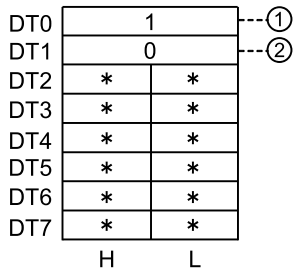


(1)	Storage area size	(2)	Number of characters

Example 3) A string of zero character bracketed by "" (i.e. double quotation marks in sequel) is converted

S1...K1 **S2**... "" **D**...DT0

[S2]
""



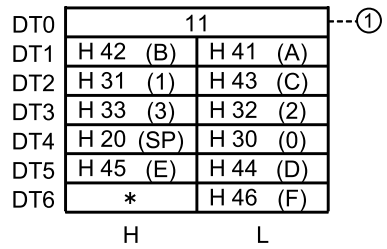
(Note 1) Data outside the range in the destination (*) (DT2 to DT7) does not change.

(1)	Storage area size	(2)	Number of characters

Example 4) When a string “ABC1230 DEF” (11 characters including a space) is to be converted

S1...H8000 **S2**... “ABC1230 DEF” **D**...DT0

[S2]
“ABC1230 DEF”



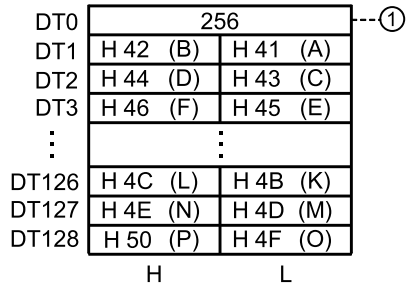
(Note 1) Data outside the range in the destination (*) (bytes higher than DT6) does not change.

(1)	No. of characters

Example 5) With the 16 characters from A to P as one set, when 16 sets (256 characters in total) are to be repeatedly converted

S1...H8000 **S2**... “ABCDEF・・・KLMNOP” **D**...DT0

[S2]
“ABCDEF…KLMNOP”

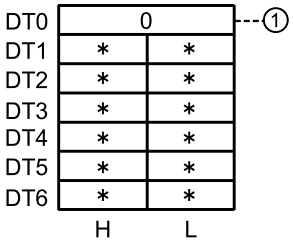


(1)	No. of characters

Example 6) A string of zero character bracketed by “” (i.e. double quotation marks in sequel) is to be converted

S1...H8000 **S2**... “” **D**...DT0

[S2]
“”



(Note 1) Data outside the range in the destination (*) (DT1 to DT6) does not change.

(1)	No. of characters

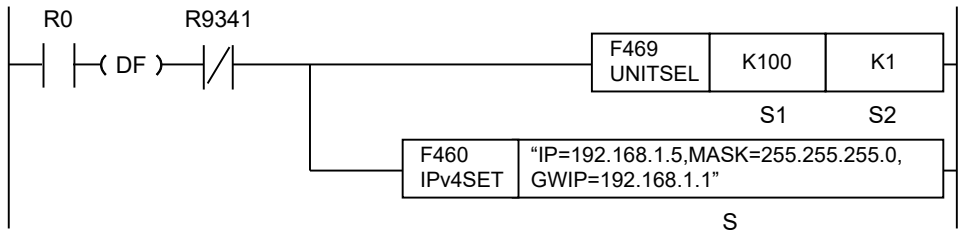
■ Flag operations

Name	Description
R9007 R9008 (ER)	Turns ON when the area is exceeded in index modification.
	Turns ON when the accessible range is exceeded if the storage area size starting with **D** is secured.
	Turns ON when a value outside the permissible range is specified for **S1**.
	Turns ON when the number of characters is larger than the storage area size.

10.4 Ethernet Instructions

10.4.1 F460 IPv4SET (Ipv4 Address Setting)

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

(Note 2) By copying & pasting the the following text into the instruction list box of FPWIN GR7, the operand section of the program example above can be entered.

IPv4SET “IP=192.168.1.5, MASK=255.255.255.0, GWIP=192.168.1.1”

■ Operands

Items	Settings
S	The starting address of a device that stores string data representing the parameter to be set, or a character constant

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Outline of operation

Perform the setting of IP address (IPv4).

■ Processing

- Store the IPv4 setting parameter specified by **S** into an operation work area, and initialize the built-in Ethernet IP address (essential), subnet mask mask (optional), and gateway (optional). Values specified by tool software are applied to items that are not modified by instructions.
- Communication is not available while Ethernet initialization is in progress.
- The establishment of IPv4 address, cable disconnection, etc. can be checked using a special relay (R9340 to R9342).

R9340	Ethernet cable disconnection detection"1: Disconnected / 0: Connected"

R9341	Ethernet initialization in progress"1: Initialization in progress / 0: Initialization complete"
R9342	IP address established"1: Established / 0: Not established"

- If this instruction is executed when IP address is outside the permissible range, a special relay R9009 (carry flag CY) is set, and no operation is performed. Check"List of usable IP addresses".
- This instruction can be executed when the Ethernet initialization in progress flag (R9341) is OFF. As execution conditions for the instruction, insert a program to check the flag state. If this instruction is executed when the flag is ON, a special relay R9009 (carry flag CY) is set, and no operation is performed.
- When the instruction is completed successfully, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared.
- Settings by this instruction is not retained when power failure occurs or when the unit is switched to the PROG. mode. When the unit is switched back from PROG. mode to RUN mode, the configuration information set by the tool software will be preset.

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication) and connection No.
- If the IP address setting is changed during communication, the process in progress will fail.
- Execute this instruction only once at the startup of PLC. Do not execute it repeatedly.
- It takes three seconds or longer to complete initialization following setting. Communication is disconnected until the completion of the initialization. All connections using the Ethernet function are disconnected during execution.
- This instruction is not available in an interrupt program.

■ OperandSsetting

- Specify the starting address of a device that stores string data representing the parameter to be set, or a character constant.
- Upper and lower case characters can be used."Abcd","ABCD"and"abcd"are all synonymous.
- When specifying a device for an operand, set string data using F253 (SSET) instruction in advance.
- When specifying string data, the number of characters should not exceed 256.
- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
- When omitting the part before a specified keyword, omit only"keyword"without omitting<,>.
- When omitting the part after a specified keyword, omit both<,>and"keyword".
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Items	Settings	
S	IPv4 address	Specify an IP address (IPv4). Specify the keyword “IP=” at the beginning. IP=111.122.133.144 (Default: 192.168.1.5)
	Subnet mask	Specify a subnet mask. Specify the keyword “MASK=” at the beginning. MASK=255.255.255.0 (Default: 255.255.255.0)
	Default gateway	Specify an IP address for default gateway. Specify the keyword “GWIP=” at the beginning. GWIP=111.122.133.4 (Default: 192.168.1.1) Specify"0"when default gateway is not to be used.

(Note 1) Setting parameters should be entered with each setting parameter separated by a comma “,”.

(Note 2) Both upper and lower cases can be used for specifying keywords.

(Note 3) Specify keywords in the order indicated in the table above.

Setting example

Example 1	S	“IP=192.168.1.5, MASK=255.255.255.0, GWIP=192.168.1.1”
Settings		IP address = 192.168.1.5; Subnet mask = 255.255.255.0; Default gateway = 192.168.1.1
Example 2	S	“IP=192.168.1.5, MASK=255.255.255.0, GWIP=0”
Settings		IP address = 192.168.1.5; Subnet mask = 255.255.255.0; Default gateway = Not used

- When an invalid address is specified for the parameter, the special relay R9009 (carry flag CY) turns ON, and 1(IP address error) to 4(Default gateway error) is set to the special data register DDT90527 (Ethernet communication error code), and the process is terminated.
- For more details of permissible address setting range, refer to"4.1.7 IP Address Setting Specification".

■ Setting status when parameters are omitted

- IPv4 address is essential. It must be indicated.
- "Subnet mask"and"Default gateway"can be omitted. Omitted parameters are not changed.

Parameter			How to specify	Result reflected in parameters		
IP	MASK	GWIP		IP address	Subnet mask	Default gateway
Essential	Omitted	Setting	“IP=○○○○, GWIP=○○○○”	Changed	Not changed	Changed
Essential	Setting	Omitted	“IP=○○○○, MASK=○○○○”	Changed	Changed	Not changed
Essential	Omitted	Omitted	“IP=○○○○”	Changed	Not changed	Not changed

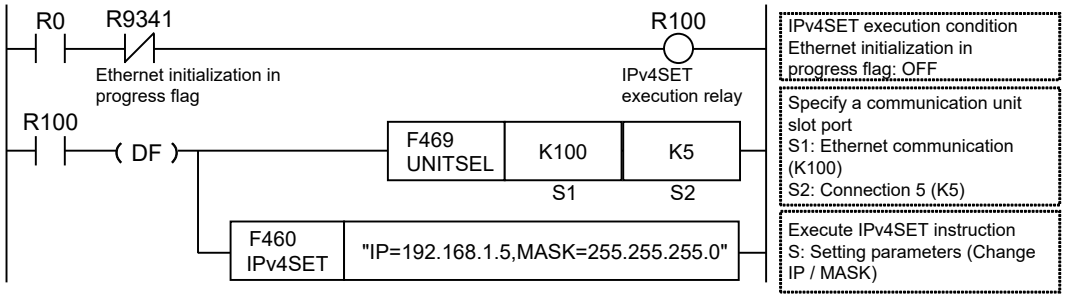
Setting example

Example 1	S	“IP=192.168.1.5, GWIP=192.168.1.1”
Settings		IP address = 192.168.1.5; Subnet mask = Not changed; Default gateway = 192.168.1.1
Example 2	S	“IP=192.168.1.5, MASK=255.255.255.0”
Settings		IP address: 192.168.1.5; Subnet mask: 255.255.255.0; Default gateway: not changed
Example 3	S	“IP=192.168.1.5”
Settings		IP address: 192.168.1.5; Subnet mask: not changed; Default gateway: not changed

■ Program example

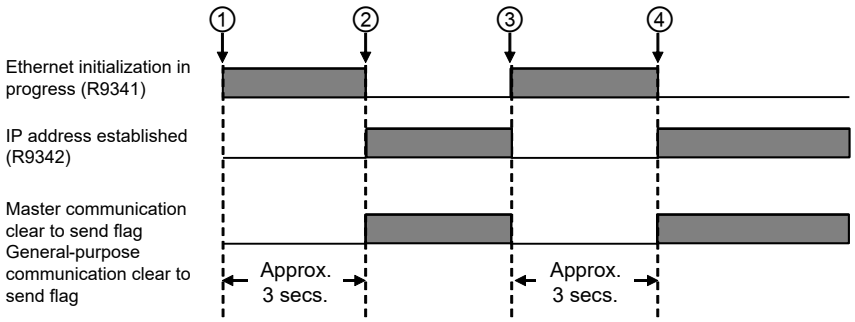
- Confirm that the Ethernet initialization in progress flag (R9341) is off, and execute the instruction.
- Using F469 (UNITSEL) instruction, specify the slot number (LAN port: K100) and the connection No. (K1 to K9).

- Once the instruction is executed, the IPv4 setting parameter will be written into the system work area, and initialization will be requested to the unit.
- Once initialization is requested, the unit will close all connections and disconnect communication.
- The unit turns OFF the IP address established flag (R9342) and initializes the Ethernet unit with the value specified in the system work area.
- The unit starts auto negotiation at the time of initialization.
- The IP address established flag (R9342) turns ON upon the completion of initialization. It takes about three seconds to complete initialization.
- Each communication task such as FTPc starts up according to the settings. It is possible to confirm those states with the ready flag for each operation.
- Each connection that is set to automatic connection is established, and the clear to send flag turns ON when connection is complete.



■ Timing chart

The following figure shows the case for executing F460 (IPv4SET) instruction.



(1)	PROG > RUN (Power ON)	(3)	IP address setting (execute F460 to IPv4SET IPv4SET instruction)
(2)	Ethernet initialization complete Connection established	(4)	Ethernet initialization complete Connection established

■ Flag operations

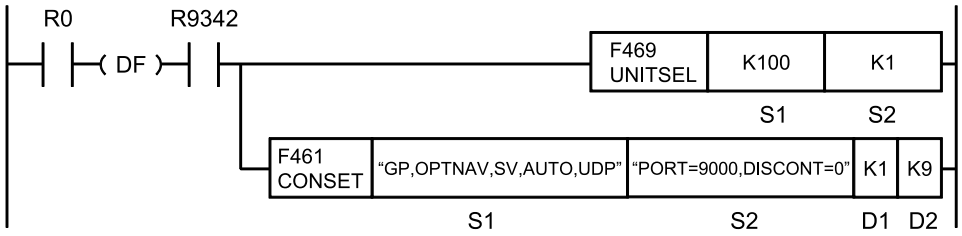
Name	Description
R9007 R9008 (ER)	Set when a value outside the range is specified for the parameter.
	Set when the same keyword is specified redundantly.
	Set when the slot No. specified by F469 (UNITSEL) is not**S1**=100 (Ethernet communication).

Name	Description
	To be set when the setting is other than IPv4.
	To be set when executed in an interrupt program.
	Set when the number of characters for operand specifying character constant exceeds 256.
R9009 (CY)	Set in the case of execution while IP address is incorrect. The detailed code to be set in DT90529 is"1: Incorrect IP address specification".
	Set in the case of execution while subnet mask is incorrect. The detailed code to be set in DT90529 is"2: Incorrect subnet mask specification mask specified".
	Set in the case of execution while default gateway is incorrect. The detailed code to be set in DT90529 is"3: Incorrect default gateway specified".
	Set in the case of execution while IP address combination is incorrect. The detailed code to be set in DT90529 is"4: Incorrect IP address combination".
	To be set in the case of execution during Ethernet initialization. The detailed code to be set in DT90529 is"11: Ethernet initialization in progress".

(Note 1) For error codes stored in the special data register R90529, refer to.

10.4.2 F461 CONSET (Connection Setting)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

(Note 2) By copying & pasting the following text into the instruction list box of FPWIN GR7, the operand section of the program example above can be entered.

CONSET “GP,OPTNAV,SV,AUTO,UDP” “PORT=9000,DISCONT=0” K1 K9

■ Operands

Items	Settings
S1	Either the starting address of a device that stores string data representing the parameter for operation setting, or a character constant
S2	Either the starting address of a device that stores string data representing the parameter for port setting, or a character constant
D1	Either the device address storing a setting start connection number, or a constant
D2	Either the device address storing a setting end connection number, or a constant

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
D1	●	●	●	●	●	●	●	●	●	●	●	●	●		●
D2	●	●	●	●	●	●	●	●	●	●	●	●	●		●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Set connection setting parameters specified by**S1**and**S2**to the connection in the range specified by**D1**and**D2**.

■ Processing

- Set connection setting parameters specified by**S1**and**S2**to the connection in the range specified by**D1**and**D2**.
- If the connection within the range specified by**D1**and**D2**includes the connection of a multi-connection server, an operation error occurs.
- If an incorrect IP address is specified, a special relay R9009 (carry flag CY) is set, and no operation is performed.
- This instruction can be executed when the IP address established flag (R9342) is ON. As execution conditions for the instruction, insert a program to check the flag (R9342) state. If this instruction is executed when the flag (R9342) is OFF, a special relay R9009 (carry flag CY) is set, and no operation is performed.
- When the instruction is completed successfully, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared.

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication). Specifying the connection number with the operand**S2**of F469 (UNITSEL) instruction is invalid with this instruction.
- In**S1**and**S2**, specify either the starting address of a device that stores string data representing the parameter to be set, or a character constant. When specifying a device for an operand, set string data using F253 (SSET) instruction in advance. Both upper case and lower case can be used."Abcd","ABCD"and"abcd"are all synonymous.
- Specify values so that**D1**is equal to or smaller than**D2**.
- The maximum number for**D1**and**D2**settable connection Nos. should be the"Number of user connection information settings"in the Ethernet unit configuration data.
- When the open method is set to Client connection, perform setting by incrementing the destination IP address by one from the setting start connection to the setting end connection.
- When the open method is set to server connection, perform setting by incrementing the master unit port No. by one from the setting start connection number to the setting end connection.
- Specify**D1**and**D2**so that the destination unit IP address or the master unit port does not exceed the settable range.

- If the target connection is already accepting a setting request or F145 (SEND) / F146 (RECV), an operation error results. Note that, when multiple connections are set, the settings for the connections before the connection in which an operation error occurs will be changed. The settings for connections after the connection in which an operation error occurs will not be changed.
- Settings by this instruction is not retained when power failure occurs or when the unit is switched to the PROG. mode. When the unit is switched back from PROG. mode to RUN mode, the configuration information set by the tool software will be preset.
- This instruction is not available in an interrupt program.

■ OperandS1setting

- Specify either the starting address of a device that stores string data representing the operation setting parameter, or a character constant.
- When “INITIAL” is specified without specifying parameters, the unit performs operation according to the table of special keywords.

<table>
<tr><th>Items</th><th colspan="2">Settings</th></tr>
<tr><td rowspan="5">S1</td><td>Operation Mode Setting
(Essential)</td><td>Specify an operation mode.
MEWCOM : Specify MEWTOCOL-COM.
MODBUS : Specify MODBUS-TCP.
MEWDAT : Specify MEWTOCOL-DAT.
MC3EBIN : Specify MC Protocol (3E BINARY).
GP : Specify general-purpose communication.</td></tr>
<tr><td>Option setting
(Essential)</td><td>Specify protocol options. Available options differ according to operation modes.
OPTAV: Option available; OPTNAV: Option not available
<table>
<tr><th>Operation mode selection</th><th>Option is available.</th><th>Option is not available.</th></tr>
<tr><td>MEWTOCOL-COM</td><td>Connect with FP2 ET-LAN</td><td>No connection</td></tr>
<tr><td>MODBUS-TCP</td><td>Invalid</td><td>-</td></tr>
<tr><td>MEWTOCOL-DAT</td><td>Connect with FP2 ET-LAN</td><td>No connection</td></tr>
<tr><td>MC Protocol (3E BINARY)</td><td>Invalid</td><td></td></tr>
<tr><td>General-purpose communication</td><td>Not append a special header</td><td>Append a special header</td></tr>
</table></td></tr>
<tr><td>Open method setting
Server / Client
(Essential)</td><td>Specify an open method (Server / Client).
CL: Client connection; SV: Server connection (any destination unit)</td></tr>
<tr><td>Open method setting
Automatic / Manual
(Essential)</td><td>Specify an open method (Automatic / Manual). Select an open method (Automatically Open/ Manually Open).
AUTO: Automatic, MANU: Manual</td></tr>
<tr><td>Communication method setting
(Essential)</td><td>Specify a communication method (TCP / UDP). When the server is specified for the open method, only TCP/IP setting can be specified.
TCP: TCP/IP setting; UDP: UDP/IP setting</td></tr>
</table>

(Note 1) Operation setting should be entered with each setting parameter separated by a comma ",".

(Note 2) Both upper and lower cases can be used for specifying keywords.

(Note 3) Operation setting parameters may not be omitted, and should be specified in order indicated in the table above.

(Note 4) There is a difference as follows between high-level instructions and configuration data when UDP is specified for the communication method. Although the open method (Server / Client) setting is not available for configuration data, a server or client needs to be specified in high-level instructions. Specify "SV" for use in slave connection, and "CL" for use in master connection.

Setting example

Example 1	S1	"MEWCOM,OPTAV,CL,AUTO,UDP"
Settings		Operation mode setting: MEWCOM, Option setting: Option available, Open method (Server / Client): Client, Open method (Automatic / Manual): Open automatically, Communication type: UDP/IP
Example 2	S1	"MODBUS,OPTNAV,SV,AUTO,TCP"
Settings		Operation mode setting: MODBUS, Option setting: Option not available, Open method (Server / Client): Server (any destination unit), Open method (Automatic / Manual): Open automatically, Communication type: TCP/IP
Example 3	S1	"GP,OPTNAV,SV,AUTO,TCP"
Settings		Operation mode setting: GP, Option setting: Option not available, Open method (Server / Client): Server (any destination unit), Open method (Automatic / Manual): Open automatically, Communication type: TCP/IP

■ Special keywords for operandS1

Special keyword	Description
"INITIAL"	Set initial values for the following items. Operation mode setting: MEWCOL-COM, Option setting: Option not available, Open method (Server / Client): Client, Open method (Automatic / Manual): Open automatically, Communication type: TCP/IP

■ OperandS2setting

- Specify either the starting address of a device that stores string data representing the port setting parameter, or a character constant.

  Setting items differ between Client specification and Server specification. It is prohibited to specify the same setting parameter redundantly. An error is caused in the case of redundant specification.

< When specifying Client >

- Perform setting by incrementing the destination IP address by one from the setting start connection number to the setting end connection number. The increment range is the lower one block only.
- Destination unit port Nos. and unused connection disconnect time are not incremented.
- An error occurs when the IPv4 address value exceeds 255 when incremented.

- When specifying for each connection, change the destination unit IP address and destination unit port number to those of other connection specified by the client. If the setting is duplicated, an operation error occurs. For the master unit port number, “0” is set automatically.
- When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer can be set.

  Perform setting by adding a general-purpose receive buffer size to the general-purpose receive buffer starting address, from the setting start connection number to the setting end connection number.

  When the range of DT (data register) is exceeded while adding a buffer size, an error will result.
- When the general-purpose receive buffer size is omitted, the general-purpose receive buffer starting address is set by adding a general-purpose receive buffer size of each connection that has already been specified.

  [(When none is specified, the general-purpose receive buffer size is set to “0” (default value).]

Items	Settings	
S2	Destination unit IP address (Essential)	Specify the destination unit IP address of the setting start connection. Specify the keyword “IPv4=” at the beginning. ● In the case of IPv4 address, IPv4=111.122.133.144 * When specifying IPv4, 000.000.000.000 (0.0.0.0) cannot be specified. * When specified, CY flag (R9009) turns ON and “1” (IP address error) is set to DT90529, and the process is terminated. * An operation error does not occur. The setting is not made.
	Destination unit port No. (Essential)	Specify the port No. (1 to 65535) of a destination unit. Specify the keyword “PORT=” at the beginning. PORT=xxxx
	Unused connection disconnect time (Essential)	Specify unused connection disconnect time (0 to 4294967295, by 10 ms). When 0 is specified, automatic disconnection is not performed. Specify the keyword “DISCONT=” at the beginning. DISCONT=xxxx
	General-purpose receive buffer starting address (Can be omitted)	When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer starting address (DT0 to DT at maximum) can be set. Specify the keyword “BUFTOP=” at the beginning. BUFTOP = xxxx
	General-purpose receive buffer size (Can be omitted)	When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer size (0 to 2048) can be set. Specify the keyword “BUFSIZE=” at the beginning. BUFSIZE = xxxx

(Note 1) Both upper and lower cases can be used for specifying keywords.

Setting example

Example 1	S2	“IPv4=192.255.2.10, PORT=9000, DISCONT=0”
Settings		Destination unit IP address: 192.155.2.10, Destination port No.: 9000, Unused connection disconnect time: 0
Example 2	S2	“IPv4=192.255.100.11, PORT=2500, DISCONT=50”
Settings		Destination unit IP address: 192.155.2.11, Destination port No.: 2500, Unused connection disconnect time: 50
Example 3	S2	“IPv4=192.168.1.5, PORT=4000, DISCONT=100, BUFTOP=DT4, BUFSIZE=256”
Settings		Destination unit IP address: 192.168.1.5; Destination port No.: 4000; Unused connection disconnect time: 100; General-purpose receive buffer starting address: DT4; General-purpose receive buffer size: 256

< When specifying Server >

- Perform setting by incrementing the master unit port No. by one from the setting start connection number to the setting end connection number. Unused connection disconnect time is not incremented.
- An error occurs when the port No. exceeds 65535 when incremented.
- When specifying for each connection, change the master unit port number to the one of other connection specified by the server. If the setting is duplicated, an operation error occurs.
- When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer can be set.

  Perform setting by adding a general-purpose receive buffer size to the general-purpose receive buffer starting address, from the setting start connection number to the setting end connection number.

  When the range of DT (data register) is exceeded while adding a buffer size, an error will result.
- When the general-purpose receive buffer size is omitted, the general-purpose receive buffer starting address is set by adding a general-purpose receive buffer size of each connection that has already been specified.

  [(When none is specified, the general-purpose receive buffer size is set to “0” (default value).]

Items	Settings	
S2	Master unit port No. (Essential)	Specify the master unit port No. (1 to 65535) of the setting start connection. Specify the keyword “PORT=” at the beginning. PORT=xxxx
	Unused connection disconnect time (Essential)	Specify unused connection disconnect time (0 to 2147483647, by 10 ms). When 0 is specified, automatic disconnection is not performed. Specify the keyword “DISCONT=” at the beginning. DISCONT=xxxx
	General-purpose receive buffer starting address (Can be omitted)	When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer starting address (DT0 to DT at maximum) can be set. Specify the keyword “BUFTOP=” at the beginning. BUFTOP = xxxx
	General-purpose receive buffer size	When the operation mode of S1 is set to general-purpose communication, a general-purpose receive buffer size (0 to 2048) can be set.

Items	Settings	
	(Can be omitted)	Specify the keyword “BUFSIZE=” at the beginning. BUFSIZE = xxxx

Setting example

Example 1	S2	“PORT=9000, DISCONT=0”
Settings		Master unit port No.: 9000; Unused connection disconnect time: 0
Example 2	S2	“PORT=10000, DISCONT=30000”
Settings		Master unit port No.: 10000; Unused connection disconnect time: 30000
Example 3	S2	“PORT=10000, DISCONT=70”
Settings		Master unit port No.: 10000; Unused connection disconnect time: 70
Example 4	S2	“PORT=4000, DISCONT=1000, BUFTOP=DT4, BUFSIZE=256”
Settings		Master unit port No.: 4000; Unused connection disconnect time: 100; General-purpose receive buffer starting address: DT4; General-purpose receive buffer size: 256

■ OperandD1setting

- Specify either the device address storing a setting start connection number, or a constant.

Items	Settings		Setting range
D1	Setting start connection No.	Specify a setting start connection No.	1 to max. 9

■ OperandD2setting

- Specify either the device address storing a setting end connection number, or a constant.

Items	Settings		Setting range
D2	Setting end connection No.	Specify a setting end connection No.	1 to max. 9

■ Flag operations

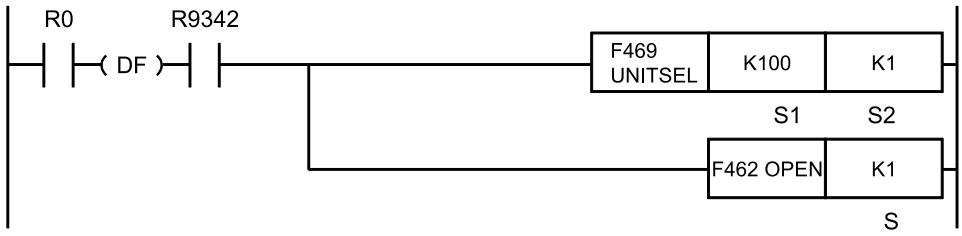
Name	Description
R9007 R9008 (ER)	To be set when**D1**is larger than**D2**.
	Set when**D1**and**D2**exceed the number of user connection information settings.
	Set when the connection within the range specified by**D1**and**D2**includes the connection of a multi-connection server.
	Set when a value outside the range is specified for the parameter.
	Set when the same keyword is specified redundantly.
	Set when the unit specified with F469 UNITSEL is not Ethernet communication.
	Set when the lower one block of IP address exceeds the settable range when incremented.
	Set when the master unit port No. exceeds the settable range when incremented.
	Set when the settable range of the general-purpose receive buffer is exceeded.

Name	Description
	To be set when executed in an interrupt program.
	Set when the number of characters for operand specifying character constant exceeds 256.
	Set when the target connection is already receiving a setting request.
	Set when the same number as the master unit port number is used for other connection specified by the server during server connection setting.
	Set when the same numbers as the master unit port number, destination unit IP address, and destination unit port number are used for other connection specified by the client during client connection setting.
R9009 (CY)	Set in the case of execution while IP address is incorrect. The detailed code to be set in DT90529 is"1: Incorrect IP address specification".
	To be set in the case of execution while IP address is unestablished. The detailed code to be set in DT90529 is"12: IP address unestablished".

(Note 1) For error codes stored in the special data register DT90529, refer to.

10.4.3 F462 OPEN (Connection Open)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operand

Items	Settings
S	Either the device address storing a connection number to be opened, or a constant.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S	●	●	●	●	●	●	●	●	●	●	●	●	●		●

(Note 1) A character constant cannot be specified.

■ Outline of operation

● A communication line for connection specified by **S** is opened.

- When it is already open, no operation is performed.
- If connection use setting is set to "Not use", it is changed to "Use".
- The completion of open operation can be confirmed by the status (ON) of the clear to send flag for master communication or general-purpose communication.
- This instruction can be executed when the IP address established flag (R9342) is ON. As execution conditions for the instruction, insert a program to check the flag (R9342) state. If this instruction is executed when the flag (R9342) is OFF, a special relay R9009 (carry flag CY) is set, and no operation is performed.
- When the instruction is completed successfully, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared.
- When connection processing is in progress, the special relay R9009 (carry flag CY) is set, and no operation is performed.
- To open the connection of a multi-connection server, specify the starting connection. If this instruction is executed for non-starting connection, an operation error occurs.

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication) and connection No.
- This instruction is not available in interrupt programs.

■ Operand S setting

Specify either the device address storing a connection number to be opened, or a constant.

Items	Settings		Setting range
S	Connection No.	Specify a connection No.	1 to 9

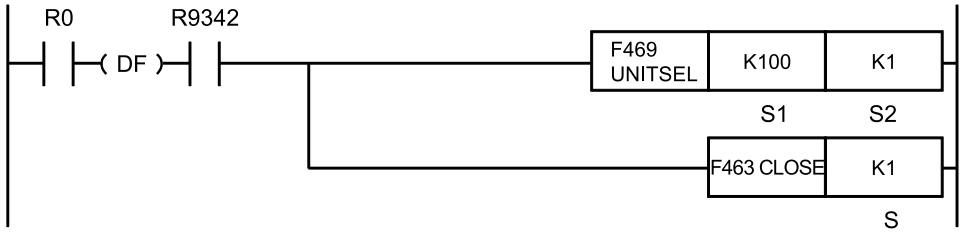
■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when a value outside the range is specified for the parameter.
	Set when the unit specified with F469 UNITSEL is not Ethernet communication.
	Set when executed in an interrupt program.
	Set in the case of execution for connections other than the starting connection in a multi-connection server.
R9009 (CY)	To be set in the case of execution while IP address is unestablished. The detailed code to be set in DT90529 is "12: IP address unestablished".
	To be set in the case of execution during connection processing. The detailed code to be set in DT90529 is "14: Connection processing".

(Note 1) For error codes stored in the special data register DT90529, refer to .

10.4.4 F463 CLOSE (Connection Close)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operand

Items	Settings
S	Either the device address storing a connection number to be closed, or a constant.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S	●	●	●	●	●	●	●	●	●	●	●	●	●		●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Close a specified connection.

■ Processing

- A communication line for connection specified by **S** is closed.
- When it is already closed, no operation is performed.
- If connection use setting is set to "Use", it is changed to "Not use".
- The completion of close operation can be confirmed by the status (OFF) of the clear to send flag for master communication or general-purpose communication.
- This instruction can be executed when the IP address established flag (R9342) is ON. As execution conditions for the instruction, insert a program to check the flag (R9342) state. If this instruction is executed when the flag (R9342) is OFF, a special relay R9009 (carry flag CY) is set, and no operation is performed.
- When the instruction is completed successfully, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared.
- To close the connection of a multi-connection server, specify the starting connection. If this instruction is executed for non-starting connection, an operation error occurs.

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication) and connection No.
- This instruction is not available in interrupt programs.

■ Operand S setting

Specify either the device address storing a connection number to be closed, or a constant.

Items	Settings		Setting range
S	Connection No.	Specify a connection No.	1 to 9

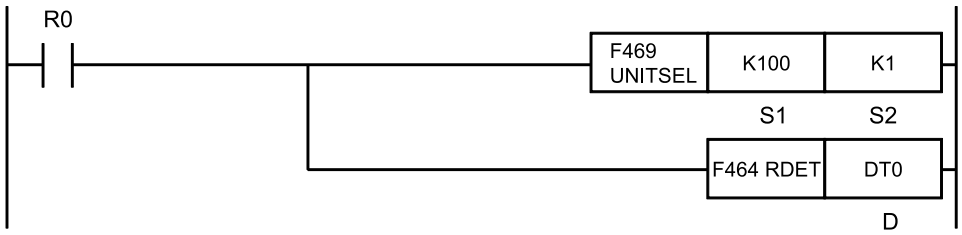
■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when a value outside the range is specified for the parameter.
	Set when the unit specified with F469 (UNITSEL) is not Ethernet communication. Set when executed in an interrupt program.
	Set in the case of execution for connections other than the starting connection in a multi-connection server.
R9009 (CY)	To be set in the case of execution while IP address is unestablished. The detailed code to be set in DT90529 is "12: IP address unestablished".
	To be set in the case of execution while connection is occupied. The detailed code to be set in DT90529 is "15: Connection occupied".

(Note 1) For error codes stored in the special data register DT90529, refer to .

10.4.5 F464 RDET (Ethernet Status Read)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operand

Items	Settings
D	Stored in the starting 7-word area (**D** to **D+6**) that stores status information.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
D		●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Acquire a status summary indicating the states of all Ethernet connections.
- Immediately before F464 (RDET) instruction, write F469 (UNITSEL) instruction to specify the target Ethernet port. Specify a given value as Connection No. in a range from 1 to 9.
- Acquired information is converted into a hexadecimal integer value according to allocation, and stored in a 7-word area starting with **D**.

■ Precautions for programming

- Based on F469 (UNITSEL) instruction, it is required to specify the slot No. and connection No. of the communication target Ethernet.

■ Ethernet status information

- Connection status of each connection
- OPEN status
- OPEN error status
- Number of connections while the FTP server is connected

■ Ethernet status information

Operands	Data name		Stored data	
D	Connection status summary	Lower word	0: Other than "Connected" 1: Connected	The data is stored in the corresponding bit allocated in the table below. S1: System connection K1 to K9: User connection
D+1		Higher word		
D+2	OPEN status summary	Lower word	0: Close 1: Open	
D+3		Higher word		
D+4	OPEN error status summary	Lower word	0: Normal 1: Error	
D+5		Higher word		
D+6	Number of connections while the FTP server is connected		Stores the number of connections while the FTP server is connected.	

(Note 1) Bit correspondence with connections in Connection status summary, OPEN status summary, OPEN error status summary

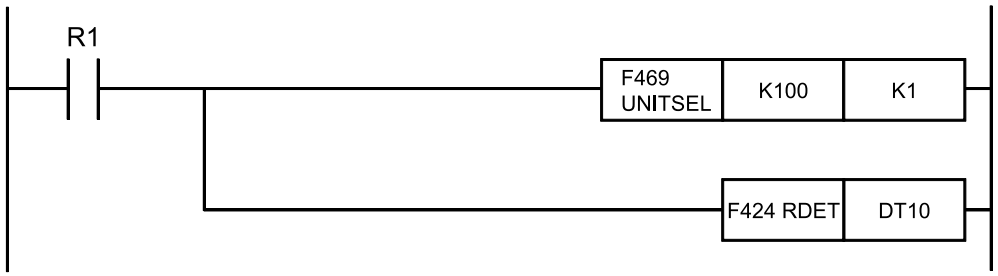
Lower word															
b15	**b14**	**b13**	**b12**	**b11**	**b10**	**b9**	**b8**	**b7**	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
-	-	-	K9	K8	K7	K6	K5	K4	K3	K2	K1	-	-	-	S1

Higher word															
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
-	-	-	-	-	-	-	FTP-S	-	-	-	-	-	-	-	-

(Note 1) S1: System connection
Kn: User connection
FTP-S : FTP server

■ Program example

Acquire all connection summaries for Ethernet communication, and store them in a 7-word area starting with [DT10].

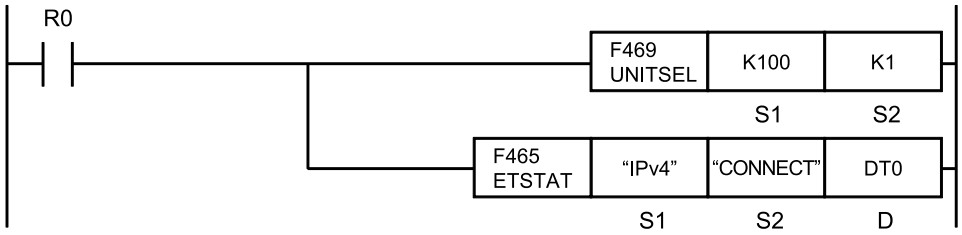


■ Flag operations

Name	Description
R9007 R9008 (ER)	To be set when the range is exceeded during indirect access (index modification).
	To be set when the destination range is outside the accessible range.
	When connection specified by F469 (UNITSEL) does not exist, or the value is outside the range
	The device to store parameters specified by **D** is incorrect.

10.4.6 F465 ETSTAT (EtherNet Information Acquisition)

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using F469 (UNITSEL) instruction.

(Note 2) By copying & pasting the the following text into the instruction list box of FPWIN GR7, the operand section of the program example above can be entered.

ETSTAT “IPv4” “CONNECT” DT0

■ Operands

Items	Settings
S1	Either the starting address of a device that stores string data representing the read type, or a character constant
S2	Either the starting address of a device that stores string data representing the read target, or a character constant
D	Starting address of read destination device

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
D		●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Reads information of the Ethernet unit.

■ Processing

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

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication) and connection No.
- In**S1**and**S2**, specify either the starting address of a device that stores string data representing information to be read, or a character constant. When specifying a device for an operand, set string data using F253 (SSET) instruction in advance. Both upper case and lower case can be used."Abcd","ABCD"and"abcd"are all synonymous.
- When specifying string data, the number of characters should not exceed 256.
- This instruction is not available in an interrupt program.

■ OperandsS1/S2setting

Items	Settings		
S1	Read type	When specifying reading IPv4 address	Specify “IPv4”
S2	Read target	When specifying reading MAC address	Specify “MAC”

Items	Settings		
		When specifying reading destination IP address	Specify “CONNECT”
		When specifying reading destination IP address and port number	Specify “CONNECT1”
		When specifying reading IP address and port number of the destination unit currently connected	Specify “CONNECT2”
D	Read destination	Specify the destination device address into which the status should be read.	

■ Restrictions on the combination of operandsS1andS2

When **S1** is IPv4, **S2** can be specified as one of the following. An operation error occurs when other combinations are specified.

- MAC
- CONNECT
- CONNECT1
- CONNECT2

■ Data and number of words to be read

Data and number of words to be read vary depending on the combination of**S1**and**S2**.

S1S2	Storage destination	Name	Number of words	Form at	Description
S1: “IPv4” **S2**: “MAC”	**D**to**D+3**	Master unit IP address (IPv4)	4	Deci mal	Master unit IPv4 address
	D+4to**D+7**	Subnet mask (IPv4)	4	Deci mal	Subnet mask
	D+8to**D+11**	Default gateway (IPv4)	4	Deci mal	Default gateway
	D+12to**D+14**	Master unit MAC address	3	Hexa decim al	Master unit MAC address
	Total number of words		15		-
S1: “IPv4” **S2**: “CONNECT”	**D**to**D+3**	Master unit IP address (IPv4)	4	Deci mal	Master unit IPv4 address
	D+4to**D+7**	Subnet mask (IPv4)	4	Deci mal	Subnet mask
	D+8to**D+11**	Default gateway (IPv4)	4	Deci mal	Default gateway
	D+12	Destination IP address type	1	Deci mal	0: IPv4
	D+13to**D+16**	Destination IP address	4	Deci mal	Destination IP address (in the case of IPv4)
	Subtotal number of words		17		-

(Note 1) In the case of IPv4, a decimal value is stored in each storage area.

Example) When the master unit IP address is 192.168.1.5, the value is stored as follows.

D = K192,**D+1** = K168,**D+2** = K1,**D+3** = K5

■ Example of execution

Example1) When specifying IPv4 address and MAC address

Stored in a 15-word area starting with**D**

S1... “IPv4” **S2**... “MAC” **D**...DT0

	Value	Description
DT0	H00C0 (K192)	The master unit IPv4 address is stored. Example) In the case of 192.168.5.30:
DT1	H00A8 (K168)	
DT2	H0005 (K5)	
DT3	H001E (K30)	
DT4	H00FF (K255)	The subnet mask is stored. Example) In the case of 255.255.255.0:
DT5	H00FF (K255)	
DT6	H00FF (K255)	
DT7	H0000 (K0)	
DT8	H00C0 (K192)	Default gateway Example) In the case of 192.168.5.1:
DT9	H00A8 (K168)	
DT10	H0005 (K5)	
DT11	H0001 (K1)	
DT12	H0918	The master unit MAC address is stored. Example) In the case of 00-C0-8F-64-09-18:
DT13	H8F64	
DT14	H00C0	

Example 2) When specifying IPv4 address and the destination IP address of a specified connection

Stored in a 17-word area starting with**D**

S1... “IPv4” **S2**... “CONNECT” **D**...DT0

	Value	Description
DT0	H00C0 (K192)	The master unit IPv4 address is stored. Example) In the case of 192.168.5.30:
DT1	H00A8 (K168)	
DT2	H0005 (K5)	
DT3	H001E (K30)	
DT4	H00FF (K255)	The subnet mask is stored. Example) In the case of 255.255.255.0:
DT5	H00FF (K255)	
DT6	H00FF (K255)	
DT7	H0000 (K0)	
DT8	H00C0 (K192)	Default gateway Example) In the case of 192.168.5.1:
DT9	H00A8 (K168)	
DT10	H0005 (K5)	
DT11	H0001 (K1)	

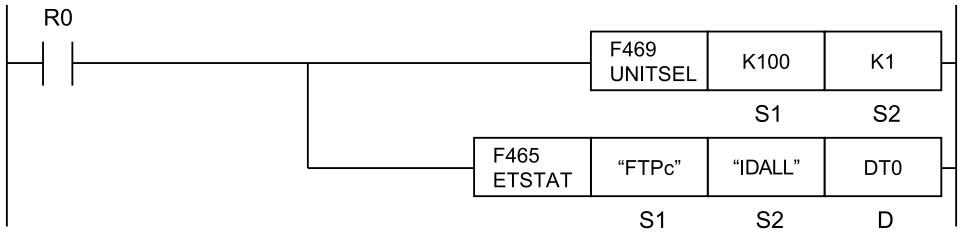
	Value	Description
DT12	H0000	Indicates an IP address type. The value becomes “0” in the case of IPv4.
DT13	H00C0 (K192)	The destination IPv4 address is stored. Example) In the case of 192.168.5.1:
DT14	H00A8 (K168)	
DT15	H0005 (K5)	
DT16	H000B (K11)	

■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when the read area is outside the range.
	Set when other than “IPv4” is specified for the read type (S1).
	Set when other than “MAC” or “CONNECT”, “CONNECT1”, “CONNECT2” is specified for the read target (S2).
	Set when the unit specified with F469 (UNITSEL) is not Ethernet communication.
	Set when executed in an interrupt program.

10.4.7 F465 ETSTAT (Acquire Ethernet Unit Information: FTP)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

(Note 2) By copying & pasting the following text into the instruction list box of FPWIN GR7, the operand section of the program example above can be entered.

ETSTAT “FTPc” “IDALL” DT0

■ Operands

Items	Settings
S1	Either the starting address of a device that stores string data representing the read type, or a character constant
S2	Either the starting address of a device that stores string data representing the read target, or a character constant
D	Starting address of read destination device

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
D		●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Reads information of the Ethernet unit.

■ Processing

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

■ Precautions for programming

- Immediately before this instruction, insert F469 (UNITSEL) instruction, and specify the unit (Ethernet communication) and connection No.
- In **S1** and **S2**, specify either the starting address of a device that stores string data representing information to be read, or a character constant. When specifying a device for an operand, set string data using F253 (SSET) instruction in advance. Both upper case and lower case can be used. "Abcd", "ABCD" and "abcd" are all synonymous.
- When specifying string data, the number of characters should not exceed 256.
- This instruction is not available in an interrupt program.

■ Operands S1 / S2 setting

Items	Settings		
S1	Read type	When specifying FTP client	Specify “FTPc”.
S2	Read target	When specifying transfer numbers individually	Specify 0 to 3 for x with “IDx”.
		When specifying logging individually	Specify 0 to 3 for x with “LOGx”.
		When specifying all transfer numbers	Specify “IDALL”.
		When specifying all loggings	Specify “LOGALL”.
D	Read destination	Specify the destination device address into which the status should be read.	

■ Restrictions on the combination of operands S1 and S2

When **S1** is FTPc, **S2** can be specified as one of the following. If any other combination is specified, an operation error will occur.

- IDx
- LOGx

- IDALL
- LOGALL

■ Data and number of words to be read

Data and number of words to be read vary depending on the combination of **S1** and **S2**.

S1S2	Storage destination	Name	Number of words	Format
S1 : "FTPc" **S2** : "IDALL" "LOGALL" (Note 1)(Note 2)	**D**	Transferring ID No.	1	0 to 3 Transfer setting ID or log setting ID (for FTP)
	D+1	Transferring data type	1	0: FTP file transfer 1: Logging / Trace transfer
	D+2	Transfer status	1	Higher byte: H0: Other than rewriting, H1: Rewriting
				Lower byte: H00: No request, H01: Waiting for transfer, H02: Being logged in, H03: Send transferring, H04: Receive transferring, H05: Transfer completed
	D+3	Transfer result	1	0: Transfer succeeded, 1: Login error, 2: Transfer error, 3: Transfer canceled
	D+4 to **D+9**	Latest transfer success time	6	Year, month, day, hour, minute and second when the last transfer succeeded
	D+10 to **D+15**	Latest transfer failure time	6	Year, month, day, hour, minute and second when the last transfer failed
	D+16 to **D+17**	No. of transfer successes (Whole)	2	Number of times that transfer succeeded
	D+18 to **D+19**	No. of transfer failures (Whole)	2	Number of times that transfer failed
	Total number of words		20	—
S1 : "FTPc" **S2** : "IDx"	**D**	Control relay (Note 3)	1	FTPc control relay
	D+1	Execution done code (Note 4)	1	0: Successful, If unsuccessful, the error code is stored here.
	D+2	Transfer done code	1	FTP response code (Note 5)
	D+3 to **D+4**	No. of successful executions (individual)	2	Number of times that transfer succeeded
	D+5 to **D+6**	No. of failed executions (individual)	2	Number of times that transfer failed
	Subtotal number of words		7	—
S1 : "FTPc" **S2** : "LOGx"	**D**	Control relay (Note 3)	1	FTPc logging control relay
	D+1	Execution done code (Note 4)	1	0: Successful, If unsuccessful, the error code is stored here.
	D+2	Transfer done code	1	FTP response code (Note 5)
	D+3 to **D+4**	No. of successful executions (individual)	2	Number of times that transfer succeeded

S1S2	Storage destination	Name	Number of words	Format
	D+5 to **D+6**	No. of failed executions (individual)	2	Number of times that transfer failed
	Total number of words		7	—

(Note 1) When “IDALL” is specified, overall status (20 words) and individual status (7 words) of the registered ID multiplied by the number of registered items are read.

(Note 2) When “LOGAL” is specified, overall status (20 words) and individual status (7 words) of the registered LOG multiplied by the number of registered items are read.

(Note 3) For the control relay, the relay status is read every time ID or LOG is set. Refer to "Control relay".

(Note 4) For the execution done code for unsuccessful termination, refer to "List of execution done codes".

(Note 5) For the FTP response code, refer to "List of FTP error codes".

■ Example of execution

Example 1) When specifying a transfer number

The status that corresponds to the transfer number specified by **S2** is read in 7 words.

S1... “FTPc” **S2**... “ID3” **D**...DT0

DT0	Control relay
DT1	Execution done code
DT2	Transfer done code
DT3 to DT4	No. of successful transmissions (individual)
DT5 to DT6	No. of failed transmissions (individual)

Example 2) When specifying “IDALL” (all ID numbers)

The status of all transfer IDs and the status of an individual set ID are read.

S1... “FTPc” **S2**... “IDALL” **D**...DT0

DT0	Transferring ID No.	-
DT1	Transferring data type	
DT2	Transfer status	
DT3	Transfer result	
DT4 to DT9	Latest transfer success time	
DT10 to DT15	Latest transfer failure time	
DT16-DT17	No. of transfer successes (Whole)	
DT18 to DT19	No. of transfer failures (Whole)	
DT20	ID transfer setting	Only the bit that corresponds to the set ID number is turned ON.
DT21 to DT27	Status of ID0	The status data (7 words) that corresponds to each ID is read for the maximum of 4 IDs.

DT28 to DT34	Status of ID1	
DT35 to DT41	Status of ID2	
DT42 to DT48	Status of ID3	

Example 3) When specifying “LOGALL” (all LOG numbers)

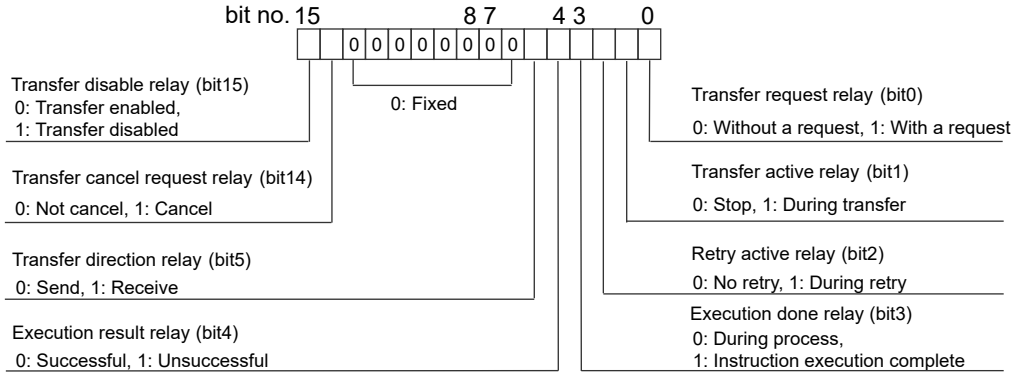
The status of the whole logging trace and the status of an individual ID set to logging trace are read.

S1... “FTPc” S2... “LOGALL” D...DT0

DT0	Transferring ID No.	-
DT1	Transferring data type	
DT2	Transfer status	
DT3	Transfer result	
DT4 to DT9	Latest transfer success time	
DT10 to DT15	Latest transfer failure time	
DT16 to DT17	No. of transfer successes (Whole)	
DT18 to DT19	No. of transfer failures (Whole)	
DT20	LOG transfer setting	Only the bit that corresponds to the set ID number is turned ON.
DT21 to DT27	Status of LOG0	The status data (7 words) that corresponds to each ID is read for the maximum of 4 IDs.
DT28 to DT34	Status of LOG1	
DT35 to DT41	Status of LOG2	
DT42 to DT48	Status of LOG3	

■ Control relay

Each bit is allocated to the control relay (1 word).



(Note 1) The transfer direction relay (bit 5) becomes 0 for logging.

■ List of execution done codes

Code	Name	Description
0	Normal end	Set when processing of the transfer request instruction has completed successfully.
1	Transfer server unset error	Set when setting of the server that is accessed when transfer request instruction is executed has not been completed.
2	Transfer setting unset error	Set when transfer setting for the transfer number specified when transfer request instruction is executed has not been completed.
4	Client registration error	Set when registration of process request to the client has failed.
5	Transfer disabled error	Set when the transfer disable relay for the transfer number specified when transfer request instruction is executed has been set to "1: transfer disabled".
6	Transfer canceled error	Set when the transfer cancel request relay has been set to "0>1=Cancel request" (at the rising edge from OFF to ON)
7	Transfer failed error	Set when the transfer done relay is set to "1=Transfer done" and the transfer failed relay is set to "1=Transfer failed".
8	Data decompression error (Write)	Set when an error occurs while decompressing data to register to the client.
9	Data decompression error (Read)	Set when an error occurs while acquiring data from the client.

■ List of FTP error codes

The following error codes can be confirmed with F465 (ETSTAT) instruction.

Error code	Description
250	Normal end
421	It is not possible to provide services. Ends control connection. At the time of the shutdown of server.
425	It is not possible to open data connection.
426	Connection was closed and data transfer was canceled for some reason.
450	It is not possible to execute the request for any reason of access authority or file system.
451	Processing was canceled due to a local error.

Error code	Description
452	It is not possible to execute due to any problem in disk capacity.
500	Syntax error of commands
501	Syntax error of arguments or parameters
502	Command is not implemented.
503	The order of using commands is wrong.
504	Arguments or parameters are not implemented.
530	User could not log in.
532	Charging information must be confirmed with ACCT command for file transmission.
550	It is not possible to execute the request for any reason of access authority or file system.
551	It is not possible to execute because of a problem in the type of page structure.
552	It is not possible to execute due to any problem in disk capacity.
553	It is not possible to execute due to an incorrect file name.
1XXX	File delete error

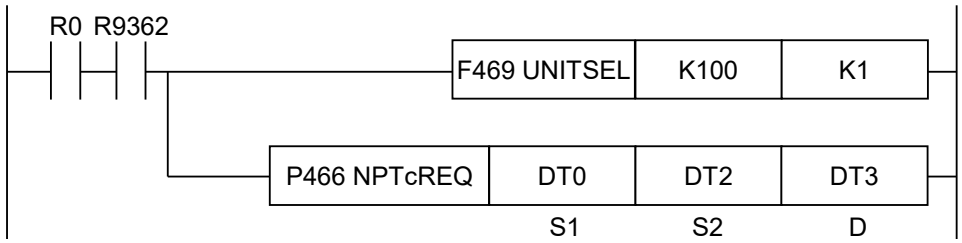
■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when the read area is outside the range.
	Set when other than “FTPc” is specified for the read type (S1).
	Set when any items other than “IDx” or “LOGx” or "IDALL" or “LOGALL” are specified for the read target (S2). (Possible to set 0 to 3 for “x”.)
	Set when an unset transfer setting is specified.
	Set when the unit specified with F469 UNITSEL is not Ethernet communication.
	Set when executed in an interrupt program.

10.4.8 P466 NTPcREQ (Time Adjustment Request)

The P466 NTPcREQ instruction can be used with the unit firmware Ver. 1.80 or later.

■ Instruction format



(Note 1) The figure above shows the case of specifying K1=U100 (Ethernet communication) and S2=K1 (connection No. 1) using the UNITSEL instruction.

■ Operand

Items	Settings
S1	Specify the number of times of request processing. (Settable range: 0 to 20 times)
S2	Specify the interval of request processing. (Settable range: 16 to 600 seconds)
D	Specify the starting address storing the execution result of time adjustment. HFFFF: In progress, H0: Normal termination, H1: Request error, H2: Communication error, H3: Response error

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●			●	●		●
S2	●	●	●	●	●	●	●	●	●			●	●		●
D	●	●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ Outline of operation

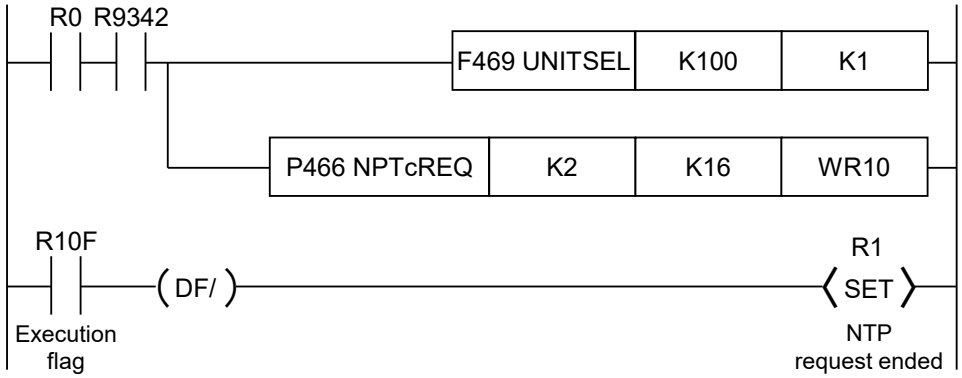
- Requests a time adjustment.

■ Processing

- Set the number of processing times for time adjustment in**S1**.
  If the time adjustment timeout is predicted, add the number of times of retransmission.
- Cannot be used while obtaining the NTP time.
- For canceling the time adjustment retransmission, set the number of processing times to 0.
  If the retransmission is canceled while no time adjustment is made, the result is not stored in the execution result**D**.
- Set the time adjustment processing interval for time adjustment in**S2**.
- Store the execution result of the time adjustment in the area starting with**D**.
- Set the time adjustment timeout using**F467 NTPcSV instruction or Ethernet setting**>**SNTP**>**Timeout period**.
  If the number of processing times is set to more than one, the next request is started after an elapse of the timeout period + processing interval**S2**seconds.
- The total time adjustment timeout period is**S1*** timeout + (**S2***(**S1**-1)) seconds. (Note that**S1**must be larger than 0.)

■ Program example

- In this example, a request for time adjustment is made to user connection No. 1.
- The most significant bit of the execution result code can be used as an active flag



■ Precautions for programming

- Use the F469 (UNITSEL) instruction to specify the unit.
- Before executing this instruction, it is necessary to set"SNTP server address"by selecting**Ethernet setting**>**SNTP**. Note that the instruction is not influenced by the following setting items.
  - Automatic retrieval from the SNTP server
  - No. of retries
  - Retry interval
- If an Ethernet task is initialized (R9341 ON) while a time adjustment request is made, 0s are entered in the result storage destination**D**.
- If a time adjustment is made continuously, further access may be prohibited by the server. So, be careful not to make the adjustment continuously.
- If this instruction is executed while the SNTP request is executed according to the settings made by**Ethernet setting**>**SNTP**>**Time acquisition timing**, a new request is started from the time when the instruction is executed.
- If the elapsed time has reached the time set by**Ethernet setting**>**SNTP**>**Time acquisition timing**while this instruction is executed, execution of this instruction has higher priority.
- The SNTP request made by**Ethernet setting**>**SNTP**>**Automatic retrieval from the SNTP server**can be aborted by canceling the time adjustment retransmission of this instruction.
- Even when the number of processing times = 0, assess if the processing interval set value is in a normal range. Set a value within a normal range.
- The NTP time adjustment process performed by executing this instruction continues even after the PLC mode changes from RUN to PROG.

■ Execution result codeD

- In the case of a request error (10 to 15), the time adjustment request set when the instruction is executed is aborted.
- The communication error (20) occurs when no response is returned from the server after time adjustment is requested.

  (“No response” here means that no response is returned even when the request is repeated for the specified number of processing times.)
- The response error (30) occurs when no response is returned from the Ethernet task (from the communication CPU side).

Code	Execution result	
H0	Normal end	
H10	Double startup error	The time adjustment request instruction is already in progress.(Note 1)
H11	SNTP server address setting error	Ethernet setting SNTP server address setting = "0.0.0.0"
H12	Disconnection error	Ethernet is in a disconnected state. (R9340 ON)
H13	Ethernet initialization in progress error	Ethernet initialization is in progress. (R9341 ON)
H14	Number of processing times setting error	The specified number of processing times is out of the range.
H15	Processing interval setting error	The specified processing interval is out of the range.
H20	Response timeout error	The time adjustment response exceeds the specified time.(Note 2)
H30	Ethernet task response timeout	This error occurs when no response is returned from the Ethernet task (from the communication CPU side).

(Note 1) The instruction with the number of processing times set to 0 to cancel the time adjustment request instruction does not cause a double startup error.

Note, however, that the instruction will cause a double startup error if the execution result storage destination does not match.

(Note 2) This error also occurs if the NTP IP address is unresolved.

■ Example of processing

Example 1) Time adjustment request → Time is being adjusted. → Time adjustment retrieval is normally ended.

[S1]...K1 [S2]...K16 [D]...DT10

When instruction is executed

	Value
DT9	
DT10	HFFFF
DT11	

Time is being adjusted.

	Value
DT9	
DT10	HFFFF
DT11	

Time adjustment is completed.

	Value
DT9	
DT10	0
DT11	

Example 2) When a response timeout has occurred in the time adjustment

[S1]...K3 [S2]...K16 [D]...DT10 timeout period...3 seconds

When instruction is executed

	Value
DT9	
DT10	HFFFF
DT11	

Time is being adjusted.

	Value
DT9	
DT10	HFFFF
DT11	

Time adjustment response timeout

	Value
DT9	
DT10	20
DT11	

Timeout in 41 seconds**S1***3+(**S2***(**S1**-1)) seconds

- Total timeout period = 3 seconds × 3
- Processing interval = 16 seconds × (3-1)

Example 3) When the time adjustment request ends abnormally (Ethernet initialization in progress error)

[S1]...K2 [S2]...K16 [D]...DT10

When instruction is executed

	Value
DT9	
DT10	13
DT11	

Example 4) When the time adjustment request ends abnormally (Number of processing times setting error)

[S1]...K21 [S2]...K16 [D]...DT10

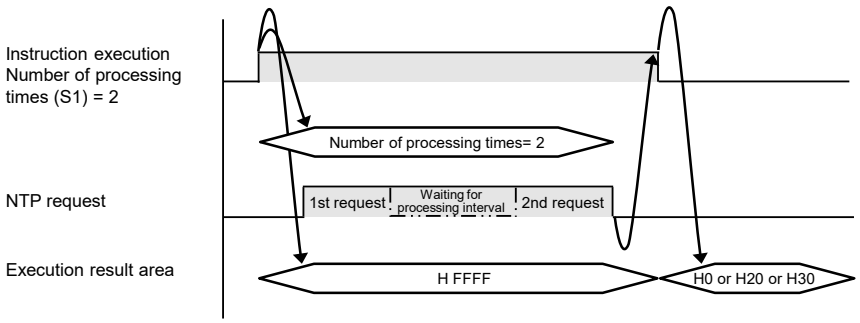
When instruction is executed

	Value
DT9	
DT10	14
DT11	

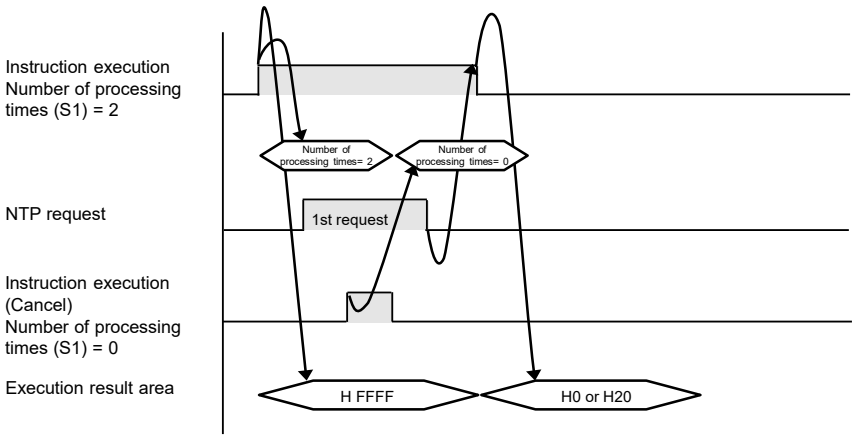
■ Cancellation of the time adjustment request

- When the number of processing times is set to zero and the time adjustment request instruction is executed, the request during the execution of the time adjustment request is canceled.
- The request is immediately canceled even while data is being acquired from the NTP.
- This process cancellation applies only to canceling the request process. This process cancellation does not cancel the response waiting (timeout period) state to the NTP request.
- The following section explains an example where the time adjustment request instruction is executed with the number of processing times (**S1**) set to 2.

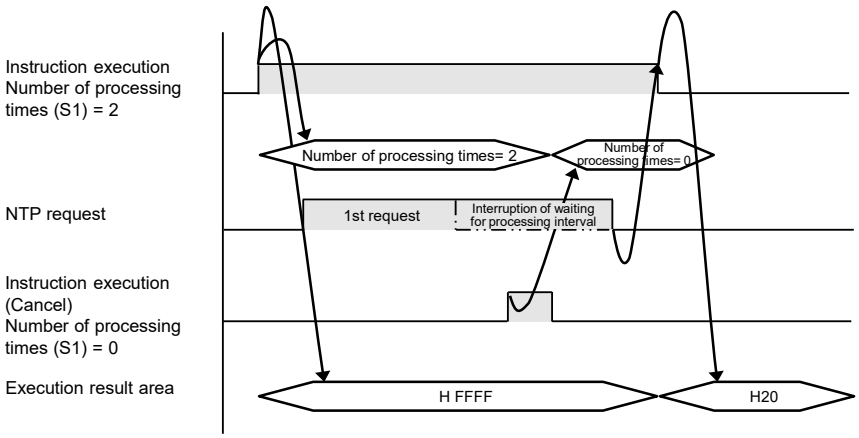
1) Normal execution



2) Process cancellation while the NTP request is being made



3) Process cancellation while waiting for the processing interval within the NTP request



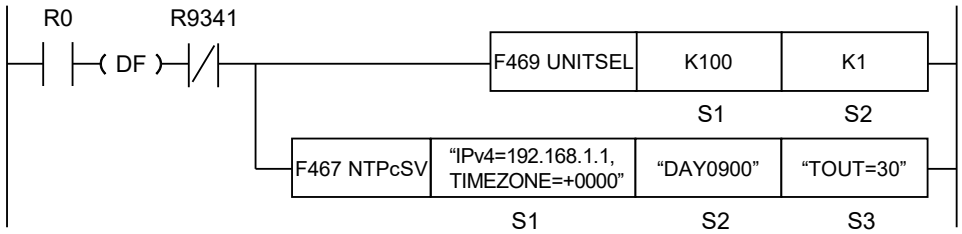
■ Flag operations

Name	Description
R9007	Turns ON when the area is exceeded in index modification.
R9008	Set when the unit specified by F469 UNITSEL is not the built-in Ethernet unit.
(ER)	Set when executed in an interrupt program.

10.4.9 F467 NTPcSV (NTP Destination Server Setting)

The F467 NTPcSV instruction can be used with the unit firmware Ver. 1.80 or later.

■ Instruction format



(Note 1) The figure above shows the case of specifying S1=K100 (Ethernet communication) and S2=K1 (connection No. 1) using the UNITSEL instruction.

■ Operand

Items	Settings
S1	Specify the starting address of the device storing the server specification parameter or a character constant.
S2	Specify the starting address storing the time acquisition timing setting parameter or a character constant.
S3	Specify the starting address of the device storing the detailed setting parameter or a character constant.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
S3	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Processing

- Sets the destination NTP server and time zone to send the time adjustment request.
- Sets the NTP server address and the time zone according to**S1**.
  * The Ethernet configuration data will never be rewritten.
- It is executable when the Ethernet initialization in progress (R9341) is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.
- Sets the time acquisition request timing according to**S2**.
- Sets the detailed settings according to**S3**.
- If the settings have already been made by the Ethernet configuration data, the data becomes invalid. The NTP time acquisition request is executed at the timing specified by this instruction.
- The settings remain valid until the power is turned OFF.

  Even when the settings are changed by the following operation, they remain valid until the mode is changed from the PROG mode to the RUN mode.

- Downloading project
- Writing Ethernet configuration data
- Releasing the upload-protection by compulsion
- Executing “Forcibly disable security”

● The settings will not be lost even when the IPv4SET instruction is executed.

■ Setting of operandS1

Specify the starting address of the device storing the server specification parameter or a character constant.

● A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
● When omitting the part before a specified keyword, omit only"keyword"without omitting commas (",").
● When omitting the part after a specified keyword, omit both commas (",") and"keyword".
● It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Description
IP address or host name of NTP server (Can be omitted)	Specify IP address or host name. For the IP address, specify the keyword “IPv4=” at the beginning. For the host name, specify “HOST=”. * Be careful that the number of characters including the keyword ("IPv4=” or "HOST=") does not exceed 68. ● For IPv4: IPv4 = 111.122.133.144 ● For the host name: "HOST=ntp.pidsx.com"
Time zone setting (Can be omitted)	Specify the time zone in the following format: "dHHMM” (d: "+” or "-", HH: hours "00 to 24", MM: minutes "00 to 59") Specify the keyword "TIMEZONE=" at the beginning. ● For GMT+09:00 (Osaka, Sapporo, Tokyo): "TIMEZONE=+0900" ● For GMT-10:00 (Hawaii): "TIMEZONE=-1000" ● For GMT 00:00 (Greenwich Mean Time): "TIMEZONE=+0000"

(Note 1) Separate"NTP server IP address or host name"and"time zone setting"with""(commas) to input them.

(Note 2) Specify the parameters for specifying servers in the order of the above table. Both upper and lower cases can be used for specifying keywords.

Setting example

Example 1	S1	"IPv4=111.122.133.144,TIMEZONE=+0900"
	Settings	NTP server (Ipv4): 111.122.133.144, Time zone: GMT+09:00
Example 2	S1	"HOST=ntp.pidsx.com"
	Settings	NTP server (host name): ntp.pidsx.com, Time zone: Not change
Example 3	S1	",TIMEZONE=+0900"
	Settings	NTP server (Ipv4): Not change, Time zone: GMT+09:00
Example 4	S1	""
	Settings	NTP server (Ipv4): Not change, Time zone: Not change

■ Setting of operandS2

Specify the starting address storing the time acquisition timing setting parameter or a character constant.

- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
- When omitting the part before a specified keyword, omit only"keyword"without omitting commas (",").
- When omitting the part after a specified keyword, omit both commas (",") and"keyword".
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Settings
Specified time once a day (Can be omitted)	Time data acquisition timing: Once a day at a specified time. DAY=DISABLE: Not set DAY=HHMM: Set HH: hours "00 to 23", MM: minutes "00 to 59"
Specified day of the week once a week (Can be omitted)	Time data acquisition timing: Once a week at a specified day of the week and time. WEEK=DISABLE: Not set WEEK=HHMM: Set W: 0 (Sunday) to 6 (Saturday), HH: hours "00 to 23", MM: minutes "00 to 59"
Specified date and time once a month (Can be omitted)	Time data acquisition timing: Once a month at a specified date and time. MONTH=DISABLE: Not set MONTH=DDHHMM: Set DD: "01 to 28", HH: hours "00 to 23", MM: minutes "00 to 59"

(Note 1) Separate"Specified time once a day","Specified day of the week once a week","Specified date and time once a month"with","(commas) to input them.

(Note 2) The time data acquisition timing cannot be set"when power is turned ON".

(Note 3) Specify the parameters in the order of the above table. Both upper and lower cases can be used for specifying keywords.

(Note 4) After this instruction is executed:

If one of the settings"Specified time once a day","Specified day of the week once a week", and"Specified date and time once a month"is set to"Set", set to"Use automatic retrieval from the SNTP server as a method to acquire time data".

If one of the settings"Specified time once a day","Specified day of the week once a week", and"Specified date and time once a month"is set to"Set", set to"Do not use automatic retrieval from the SNTP server as a method to acquire time data".

Setting example

Example 1	S2	"DAY=1234,WEEK=62345,MONTH=010010"
	Settings	Specified time once a day: Once a day at 12:34 once , Specified day of the week once a week: Once a week on Saturday at 23:45, Specified date and time once a month: Once a month on the first day at 0:10
Example 2	S2	“DAY=1234”
	Settings	Specified time once a day: Once a day at 12:34 once , Specified day of the week once a week: Not changed, Specified date and time once a month: Not changed
Example 3	S2	",WEEK=01234"

	Settings	Specified time once a day: Not change, Specified day of the week once a week: Once a week on Sunday at 12:34, Specified date and time once a month: Not change
Example 4	S2	",,MONTH=112233"
	Settings	Specified time once a day: Not change, Specified day of the week once a week: Not change, Specified date and time once a month: Once a month on the 11th day at 22:33
Example 5	S2	"DAY=DISABLE,WEEK=DISABLE,MONTH=282356"
	Settings	Specified time once a day: Not changed (Setting disabled) , Specified day of the week once a week: Not changed (Setting disabled), Specified date and time once a month: Once a month on the 28th day at 23:56
Example 6	S2	""
	Settings	Specified time once a day: Not changed , Specified day of the week once a week: Not changed, Specified date and time once a month: Not changed

■ Setting of operandS3

Specify the starting address storing the detailed setting parameter or a character constant.

- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially. When omitting all the parameters after the specified parameter, omit both","and"keyword".
- When omitting the part before a specified keyword, omit only"keyword"without omitting commas (",").
- When omitting the part after a specified keyword, omit both commas (",") and"keyword".
- When specifying “INITIAL” or “KEEP” without specifying parameters, the unit operates according to the table of special keywords.
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Description	Default
Timeout period (Can be omitted)	Specify a timeout period. (30 to 300) × 100 ms TOUT=: Time setting	60 (6 seconds)
No. of retries (Can be omitted)	Specify the number of retries. (0 to 3) RTRY=: No. of retries	3 (times)
Retry interval (Can be omitted)	Specify the retry interval. (1 to 8640) × 10 seconds RTTM=: Retry interval	60 (600 seconds)

(Note 1) Separate"timeout period","number of retries", and"retry interval"with","(commas) to input them.

(Note 2) Specify the detailed setting parameters in the order of the above table. Both upper and lower cases can be used for specifying keywords.

Setting example

Example 1	S3	“TOUT=30,RTRY=2,RTTM=50”
	Settings	Timeout period: 3 seconds, No. of retries: 2, Retry interval: 500 seconds
Example 2	S3	“TOUT=270,RTRY=0,RTTM=490”
	Settings	Timeout period: 27 seconds, No. of retries: 0 (Not retry), Retry interval: 4900 seconds
Example 3	S3	“TOUT=12,RTRY=3”

	Settings	Timeout period: 1.2 seconds, No. of retries: 3, Retry interval: Not change
Example 4	S3	“,RTRY=3,RTTM=300”
	Settings	Timeout period: Not change, No. of retries: 3, Retry interval: 3000 seconds

■ Special keywords for operandS3

Special keyword	Description
“INITIAL”	Set an initial value.
“KEEP”	The current setting is not changed.

Setting example

Example 1	S3	“INITIAL”
	Settings	Timeout period: 6 seconds, No. of retries: 3, Retry interval: 600 seconds
Example 2	S3	“KEEP”
	Settings	Timeout period: Not change, No. of retries: Not change, Retry interval: Not change

■ Precautions for programming

- This instruction is not available in interrupt programs.
- Cannot be used while obtaining the NTP time.
- When specifying a device for an operand which can specify character constants, set string data using F253 (SSET) instruction in advance.
- Upper and lower case characters can be used for operands where character constant can be specified.
- A target unit for the instruction is specified with F469 (UNITSEL) beforehand.

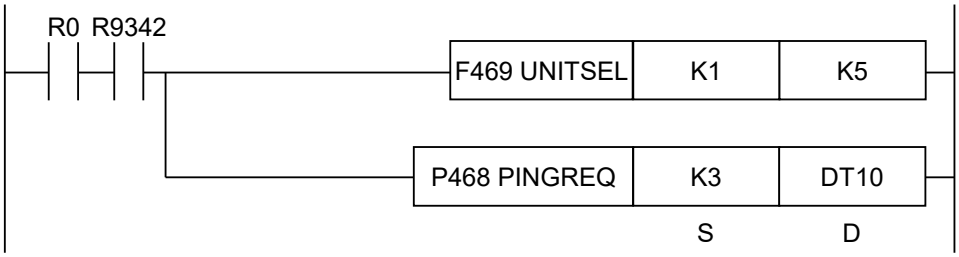
■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when a value outside the range is specified for the parameter.
	Set when the unit specified by F469 (UNITSEL) is not the built-in Ethernet unit.
	Set when executed in an interrupt program.
	To be set while acquiring the time of NTP.
R9009 (CY)	Set when the instruction is the initialization of Ethernet. The detailed code to be set in DT90529 is"11: Ethernet initialization in progress".

10.4.10 P468 PINGREQ (PING Send Request)

The P468 PINGREQ instruction can be used with the unit firmware Ver. 1.80 or later.

■ Instruction format



(Note 1) The figure above shows the case of specifying K1=U100 (Ethernet communication) and S2=K5 (connection No. 5) using the UNITSEL instruction.

■ Operand

Items	Settings
S	Specify the number of PING send requests. (Settable range: 1 to 10 times)
D	Specify the starting address of the storage device address for PING request results.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S	●	●	●	●	●	●	●	●	●			●	●		●
D	●	●	●	●	●	●	●	●	●						●

(Note 1) A character constant cannot be specified.

■ Outline of operation

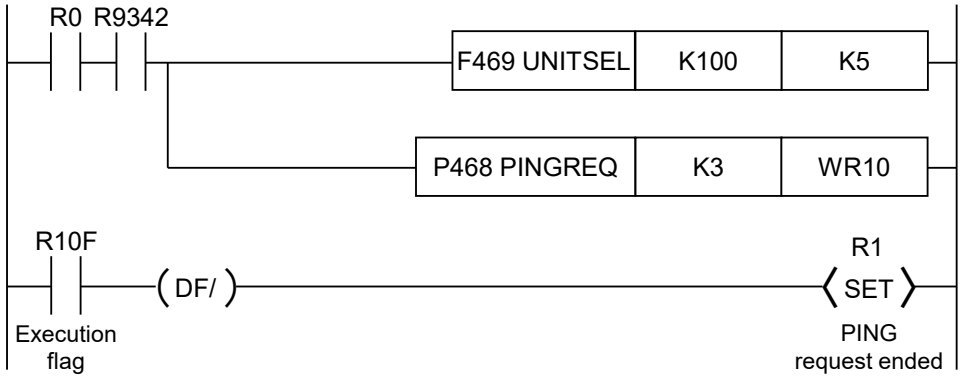
- Requests to send PING for the number of times specified by**S**to the destination unit IP address of the specified connection.

■ Processing

- Stores the request result of the PING in the area starting with**D**.
- The timeout period of the PING response per time is one second (fixed).
- The transmission data size is fixed to 56 bytes.
- If an Ethernet task is initialized (R9341 ON) while a PING request is made, 0s are entered in the result storage destination**D**.

■ Program example

- In the following example, a PING request is made three times to user connection No. 5.
- The most significant bit of the execution result code can be used as an active flag



■ Precautions for programming

- Use the F469 (UNITSEL) instruction to specify the connection.
- If the destination unit IP address is not set, an error occurs.
- Use the F465 (ETSTAT) instruction to check the IP address of the PING request destination.
- The PING send process performed by executing this instruction continues even after the PLC mode changes from RUN to PROG.

■ Execution result storage area [D] to [D+5]

Request result storage area	Execution result	Description
D	Execution result code	0xffff: In progress, 0: Normal termination, 1x: Request error, 2x: Response error
D+1	No. of transmissions	
D+2	No. of responses	
D+3	Response time (ms) max.	0 to 1000 (ms) The"Response time (ms) max."and"Response time (ms) min."are in 10 ms units and 0 is displayed for values smaller than 10 ms.
D+4	Response time (ms) min.	
D+5	Response time (ms) average	

■ Execution result codeD

- In the case of a request error (10 to 15), the PING request set when the instruction is executed is aborted.
- The response error (20) occurs when no response is returned from the Ethernet unit.

Code	Execution result	
H0	Normal end	
H10	Double startup error	PING request instruction is being executed.
H11	Number of requests to send error	The number of requests to send is not within the settable range (1 to 10).
H12	Ethernet unit unselected error	The unit selected by F469 UNITSEL is not the built-in Ethernet .

Code	Execution result	
H14	Disconnection error	Ethernet is in a disconnected state. (R9340 ON)
H15	Ethernet initialization in progress error	Ethernet initialization is in progress. (R9341 ON)
H20	Ethernet task response timeout	This error occurs when no response is returned from the Ethernet task (from the communication CPU side).

■ Example of processing

Example 1) For when the number of requests to send was 1, a PING request was made. → Sent. → Response ended normally (with the response time of 10 ms).

[S]...K1 [D]...DT10

When instruction is executed

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING is being transmitted.

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING response is completed.

	Value
DT9	
DT10	0
DT11	1
DT12	1
DT13	10
DT14	10
DT15	10
DT16	

Example 2) For when the number of requests to send was 3, PING requests were made. → Sent. → Response ended normally (with the response time of 0, 10 and 20 ms for the respective request).

[S]...K3 [D]...DT10

When instruction is executed

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING is being transmitted.

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING response is completed.

	Value
DT9	
DT10	0
DT11	3
DT12	3
DT13	20
DT14	0
DT15	10
DT16	

Example 3) For when the number of requests to send was 3, PING requests were made and one timeout occurred (with the response time of 10 and 20 ms for the respective request).

[S]...K3 [D]...DT10

When instruction is executed

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING is being transmitted.

	Value
DT9	
DT10	0xffff
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

PING response timed out.

	Value
DT9	
DT10	0
DT11	3
DT12	2
DT13	20
DT14	10
DT15	15
DT16	

Example 4) For the number of requests to send of 1, the PING request ended abnormally (when disconnection was detected).

[S]...K1 [D]...DT10

When instruction is executed

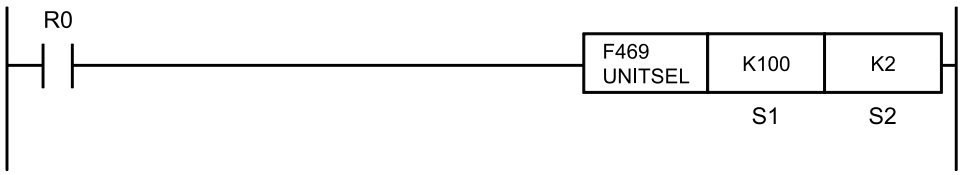
	Value
DT9	
DT10	13
DT11	0
DT12	0
DT13	0
DT14	0
DT15	0
DT16	

■ Flag operations

Name	Description
R9007 R9008 (ER)	Set when the range (D to D+5) is outside the accessible range.
	Turns ON when the area is exceeded in index modification.
	Set when executed in an interrupt program.

10.4.11 F469 UNITSEL (Specify Communication Unit Slot Port)

■ Instruction format



■ Operands

Items	Settings
S1	Unit slot No.

Items	Settings
S2	COM port No. or user connection No.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SWR	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●	●	●	●	●		●
S2	●	●	●	●	●	●	●	●	●	●	●	●	●		●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Write and specify the target of each instruction immediately before the following Ethernet communication instructions.

  F145 SEND, F146 RECV, F159 MTRN, F460 IPv4SET, F461 CONSET, F462 OPEN, F463 CLOSE, F464 RDET, F465 ESTART, F470 FTPcSV, F471 FTPcSET, F472 FTPcLOG, F473 FTPcREQ, F474 FTPcCTL
- In the case of Ethernet communication, specify a slot No. (K100: LAN port) in **S1** and a connection No. in **S2**.
- Acquire the slot model specified in **S1**, and check that the communication port No. specified in **S2** falls within the settable range. When it does not, an error will result.

■ Specify S1 and S2

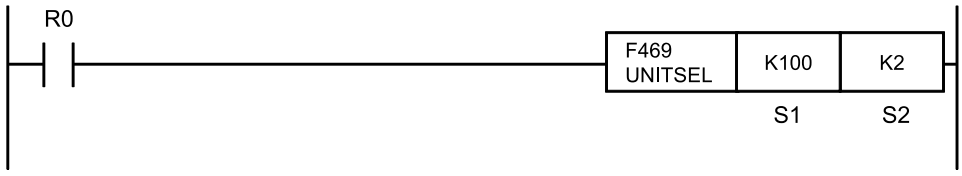
- Specify the unit slot No. for **S1**. The setting value of **S1** is stored in the special data register DT90890.
- Specify the communication port for **S2**. (In the case of Ethernet communication: Connection No.) The setting value of **S2** is stored in the special data register DT90891.

Unit type	S1 Slot No.	S2 COM port No. User connection No.
Serial communication	K0	K0 to K2 (Note 1)
Ethernet communication	K100	K1 to K9

(Note 1) For serial communication, specify the COM port (COM0 to COM2).

■ Program example

Example) User connection 2 is specified in Ethernet communication

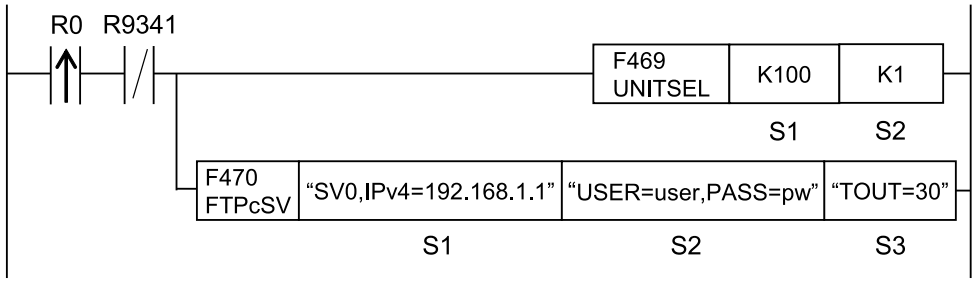


■ Flag operations

Name	Description
R9007 R9008 (ER)	To be set when the range is exceeded during indirect access (index modification).
	When the slot specified by **S1** does not exist (slot No. is outside the range)
	When the connection specified by **S2** does not exist (connection No. is outside the range)

10.4.12 F470 FTPcSV (FTP Client Connected Server Setting)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operands

Items	Settings
S1	Specify the starting address storing the server specification parameter or a character constant.
S2	Specify the starting address storing the login setting parameter or a character constant.
S3	Specify the starting address storing the detailed setting parameter or a character constant.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
S3	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Sets the server to which the FTP client is connected.
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0. (They are set when an incorrect IP address is specified or Ethernet is initialized.)

- Confirm that "R9341: Ethernet initialization in progress" is OFF before executing the instruction.

■ Processing

- The setting for the server connected to the FTP client is specified in the built-in Ethernet according to specified parameters.
- It is executable when all the send request relays of the FTPc control relay and FTPc logging / trace control relay are 0: No request. (In the case other than the above, an operation error is occurred.)
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0. (Set when a specified IP address is out of range.)
- The initial value is set with the instruction when the server setting is not specified.
- The unit configuration data of Ethernet will never be rewritten. When the configuration data has been already set, it is overwritten and the data becomes invalid.
- When an incorrect IP address is specified, an error is set to CY flag and no operation is performed.
- It is executable when the "Ethernet initialization in progress (R9341)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.

■ Precautions on programming

- When specifying a device for an operand specifying a character constant, set string data using F253 (SSET) instruction in advance.
- When specifying string data, the number of characters should not exceed 256.
- Upper and lower case characters can be used for an operand specifying a character constant.
  ("Abcd", "ABCD" and "abcd" are synonymous, however, the file names are differentiated.)
- A target unit for the instruction is specified with F469 (UNITSEL) beforehand.
- This instruction is not available in an interrupt program.

■ Operand S1 setting

- The starting address storing the server specification parameter or a character constant is specified.
- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
- When omitting the part before a specified keyword, omit only "keyword" without omitting <,>.
- When omitting the part after a specified keyword, omit both <,> and "keyword".
- Specify the FTP server setting from SV0 in order. When the right order is skipped, an error occurs. It is possible to specify when the setting has been already registered.
- Only one server can be specified at the same time.
- Specify an FTP server number, IP address or host name of FTP server, port number, and open method within 256 characters in total.
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Settings	
S1	FTP server number	Specify FTP servers. Specify the following keywords. SV0: Server 0, SV1: Server 1, SV2: Server 2,

Setting item	Settings	
	(Essential)	
	IP address or host name of FTP server (Essential)	Specify IP address or host name. For the IP address, specify the keyword “IPv4=” at the beginning. For the host name, specify “HOST=”. ● For IPv4: IPv4 = 111.122.133.144 For details on the addressable range of IPv4 address, refer to "4.1.7 IP Address Setting Specification". ● For the host name HOST = ftp.pidsx.com
	Port number (Can be omitted)	Specify the port number. Port number range: 1 to 65535 PORT =: Port number (Default = 21)
	Open method (Can be omitted)	Specify the open method. Active ＝ act / Passive ＝ pasv OPEN =: Open method (Default = act)
	SSL/TLS authentication (Can be omitted)	Specify whether or not to use SSL/TSL authentication. SSL0: Use SSL/TLS. NON: Not use

(Note 1) Input the FTP server number, IP address or host name of FTP server, port number, open method, and SSL/TLS authentication separated by ","(commas).

(Note 2) Both upper and lower cases can be used for specifying keywords.

(Note 3) Specify the parameters for specifying servers in the order of the above table.

(Note 4) The SSL/TLS communication cannot be used by both the FTP server and FTP client at the same time. Therefore, this instruction will not be able to set SSL/TLS communication valid when it is enabled in FTP sever.

Setting example

Example 1	S1	“SV0,IPv4=192.255.2.10,PORT=21,OPEN=act,SSL0"
Settings		FTP server No.: 0, IP address: 192.255.2.10, Port No.: 21, Open method: Active, SSL/TLS authentication: Use (No client certificate alert)
Example 2	S1	“SV2,HOST=ftp.pidsx.com,PORT=28,OPEN =pasv,NON"
Settings		FTP server No.: 2, Host name: FTP.pidsx.com, Port No.: 28, Open method: Passive, SSL/TLS authentication: Not use

■ Operand S2 setting

- Specify the starting address storing the login setting parameter or a character constant.
- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
- When omitting the part before a specified keyword, omit only "keyword" without omitting <,>.
- When omitting the part after a specified keyword, omit both <,> and "keyword".
- When specifying “INITIAL” or “KEEP” without specifying parameters, the unit operates according to the table of special keywords.
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Settings		Setting range
S2	User name (Can be omitted)	Specify a user name. Specify the keyword “USER=” at the beginning. USER=XXX (Default: root)	Max. 32 characters
	Password (Can be omitted)	Specify a password. Specify the keyword “PASS=” at the beginning. PASS=XXX (Default: Pana3755)	Max. 32 characters

(Note 1) Input a user name and password separated by a comma “,”.

(Note 2) Both upper and lower cases can be used for specifying keywords.

(Note 3) Specify the login setting parameters in the order of the above table.

Setting example

Example 1	S2	“USER=root,PASS=pidsx”
Settings		User name: root, Password: pidsx
Example 2	S2	“USER=PANASONIC,PASS=SUNX”
Settings		User name: PANASONIC, Password: SUNX

■ Settings for user name and password for operand S2

Patterns	How to specify
Specify user name: Delete password	“USER=xxx,PASS=“
Delete user name: Specify password	“USER=,PASS=xxx”
Delete user name: Delete password	“USER=,PASS=”
Specify user name: Not change password	“USER=xxx”
Not change user name: Specify password	“,PASS=xxx”

Setting example

Example 1	S2	“USER=root,PASS=”
Settings		User name: root, Password: Delete
Example 2	S2	“USER=,PASS=SUNX”
Settings		User name: Delete, Password: SUNX
Example 3	S2	“USER=,PASS=”
Settings		User name: Delete, Password: Delete
Example 4	S2	“USER=root”
Settings		User name: root, Password: Not change
Example 5	S2	“,PASS=SUNX”
Settings		User name: Not change, Password: SUNX

■ Special keywords for operand S2

Special keyword	Description
“INITIAL”	Set an initial value.
“KEEP”	The current setting is not changed.

Setting example

Example 1	S2	“INITIAL”
Settings		User name: root, Password: Pana3755
Example 2	S2	“KEEP”
Settings		User name: Not change, Password: Not change

■ Operand S3 setting

- Specify the starting address storing the detailed setting parameter or a character constant.
- A part of parameters can be omitted. The settings are not changed when parameters are omitted partially.
- When omitting the part before a specified keyword, omit only "keyword" without omitting <,>.
- When omitting the part after a specified keyword, omit both <,> and "keyword".
- When specifying “INITIAL” or “KEEP” without specifying parameters, the unit operates according to the table of special keywords.
- It is prohibited to specify the same keyword redundantly. An error is caused in the case of redundant specification.

Setting item	Settings		Setting range
S3	Timeout period (Can be omitted)	Specify a timeout period. TOUT=: Time setting (Default: 60 seconds)	30 to 300 seconds
	No. of retries (Can be omitted)	Specify the number of retries. RTRY=: No. of retries (Default: 3 times)	0 to 3
	Retry interval (Can be omitted)	Specify the retry interval. RTTM=: Retry interval (Default: 600 seconds) *4	10 to 86400 seconds

(Note 1) Input a timeout period, number of retries and retry interval separated by a comma “,”.

(Note 2) Both upper and lower cases can be used for specifying keywords.

(Note 3) Specify the detailed setting parameters in the order of the above table.

(Note 4) The retry interval can be specified by 10 seconds. It is rounded down to the nearest 10. (Example: When specifying 38 seconds, it becomes 30 seconds.)

Setting example

Example 1	S3	“TOUT=30,RTRY=2,RTTM=500”
Settings		Timeout period: 30 seconds, No. of retries: 2, Retry interval: 500 seconds
Example 2	S3	“TOUT=270,RTRY=0,RTTM=4900”
Settings		Timeout period: 270 seconds, No. of retries: 0 (Not retry), Retry interval: 4900 seconds

Example 3	S3	“TOUT=30,RTRY=25”
Settings		Timeout period: 30 seconds, No. of retries: 25, Retry interval: Not change
Example 4	S3	“,RTRY=25,RTTM=3000”
Settings		Timeout period: Not change, No. of retries: 25, Retry interval: 3000 seconds

■ Special keywords for operand S3

Special keyword	Description
“INITIAL”	Set an initial value.
“KEEP”	The current setting is not changed.

Setting example

Example 1	S3	“INITIAL”
Settings		Timeout period: 60 seconds, No. of retries: 3, Retry interval: 600 seconds
Example 2	S3	“KEEP”
Settings		Timeout period: Not change, No. of retries: Not change, Retry interval: Not change

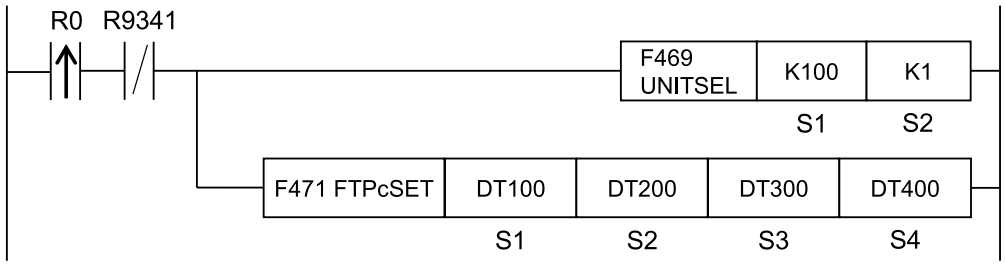
■ Flag operations

Name	Description
R9007 R9008 （ER）	Set when a value outside the range is specified for the parameter.
	Set when the same keyword is specified redundantly.
	Set when even one request active relay of FTPc control relay or FTPc logging / trace control relay is 1: Requesting.
	Set when server numbers are not specified in the right order.
	Set when the slot number specified by F469 (UNITSEL) is not **S1**=100 (Ethernet communication).
	Set when executed in an interrupt program.
	Set when the number of characters for an operand specifying a character constant exceeds 256.
R9009 （CY）	Set in the case of execution while IP address is incorrect. The detailed code to be set in DT90529 is "1: Incorrect IP address specification".
	Set when executed during the initialization of Ethernet. The detailed code to be set in DT90529 is "11: Ethernet initialization in progress".

(Note 1) For error codes stored in the system data DT90529, refer to .

10.4.13 F471 FTPcSET (FTP Client Transfer Setting)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operands

Item	Settings
S1	Specify the starting address storing the transfer setting number (string) or a character constant.
S2	Specify the starting address storing the operation setting parameter or a character constant.
S3	Specify the starting address storing the source file name or a character constant.
S4	Specify the starting address storing the destination folder name or a character constant.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
S3	●	●	●	●	●	●	●	●	●					●	●
S4	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Makes the FTP client transfer setting (0 to 3).
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0. (This is set when Ethernet is initialized.)
- Confirm that "R9341: Ethernet initialization in progress" is OFF before executing the instruction.
- It is necessary to specify the settings for destination servers before executing instructions using "10.4.12 F470 FTPcSV (FTP Client Connected Server Setting)" or "9.4.1 Basic Setup" with the tool software.

■ Processing

- Stores the FTP client transfer settings of S2 to S4 in the transfer setting area specified by S1.
- Executable when the transfer request relay for the specified transfer setting is 0: No Request.
- The Ethernet configuration data will never be rewritten. When the configuration data has been already set, it is overwritten and the data becomes invalid.
- Data is actually sent to files or obtained from files when the FTP transfer request (F473 FTPcREQ) instruction is executed after the completion of the FTP client transfer settings.
- It is executable when the "Ethernet initialization in progress (R9341)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.

■ Precautions on programming

- When specifying a device for an operand specifying a character constant, set string data using F253 (SSET) instruction in advance.
- When specifying string data, the number of characters should not exceed 256.
- Upper and lower case characters can be used for an operand specifying a character constant.
  ("Abcd", "ABCD" and "abcd" are synonymous, however, the file names are differentiated.)
- A target unit for the instruction is specified with F469 (UNITSEL) beforehand.
- This instruction is not available in an interrupt program.

■ Operand S1 setting

- Specify the starting address storing the transfer setting number or a character constant.

Setting item	Settings		Setting range
S1	Transfer setting No.	Specify a transfer setting number. ID=: Transfer setting number	0 to 3

(Note 1) Transfer setting numbers should be specified from number 0 in ascending order. An error occurs when transfer setting numbers are not specified in ascending order. If transfer settings have been already registered, this rule is not applied.

Setting example

Example 1	S1	“ID=1”
Settings		Transfer setting number: 1
Example 2	S1	“ID=3”
Settings		Transfer setting number: 3

■ Operand S2 setting

- Specify the starting address storing the operation setting parameter or a character constant.

Setting item	Settings	
S2	Specification of FTP server	Specify FTP servers. (Fixed to 3 digits) SV0: Server 0, SV1: Server 1, SV2: Server 2,

Setting item	Settings			
	Target and operation of transfer	Set the target for the transfer and operation.		
		Parameter string	Target	Transfer operation
		PUTFILE	File	Send to servers (Overwrite method)
		PUTFILE-OVW	File	Send to servers (Overwrite method)
		PUTFILE-REN	File	Send to servers (Rename method)
		GETFILE	File	Obtain from servers
		PUTDATA	Device	Send to servers (Overwrite method)
		PUTDATA-OVW	Device	Send to servers (Overwrite method)
		PUTDATA-REN	Device	Send to servers (Rename method)
		GETDATA	Device	Obtain from servers
	File after transfer	Setting for deleting source files after transfer. (Fixed to 3 digits) DEL: Delete, NON: Not delete		

(Note 1) Operation setting parameter should be entered with each setting parameter separated by a comma ",".

(Note 2) Operation setting parameters cannot be omitted, and should be specified in order indicated in the table above.

(Note 3) For details of the transfer operations (overwrite method and rename method), refer to "9.3.4 Overwrite Method and Rename Method".

Setting example

Example 1	S2	"SV2,PUTFILE,NON"
Settings		FTP server: 2, Target: File, Operation: Send (PUT) Overwrite method, File after transfer: Not delete
Example 21	S2	"SV1,PUTFILE-OVW,DEL"
Settings		FTP server: 1, Target: File, Operation: Send (PUT) Overwrite method, File after transfer: Delete
Example 3	S2	"SV0,PUTFILE-REN,DEL"
Settings		FTP server: 0, Target: File, Operation: Send (PUT) Rename method, File after transfer: Delete
Example 4	S2	"SV2,GETFILE,DEL"
Settings		FTP server: 2, Target: File, Operation: Get (GET), File after transfer: Delete
Example 5	S2	"SV1,GETFILE,NON"
Settings		FTP server: 1, Target: File, Operation: Get (GET), File after transfer: Not delete

■ Operand S3 setting (when transferring files)

Specify the starting address storing the source file name or a character constant.

Setting item	Settings	
S3	Source File Name	For PUT Specify a file name in an SD card with an absolute path.
		For GET Specify a file name from the home directory of a user which logs in FTP servers with a relative path.

(Note 1) Wild cards "*" and "?" are usable for file names.

(Note 2) An error occurs when the number of files that match the wild card during GET operation is 101 or more.

■ Operand S3 setting (when putting device)

Specify the starting address storing the source device setting or a character constant.

<table>
<tr><th>Setting item</th><th colspan="3">Settings</th><th>Setting range</th></tr>
<tr><td rowspan="4">S3</td><td>Source device</td><td colspan="2">● Device
Specify device code + device number.
Devices that can be specified<table><tr><th>Device</th></tr><tr><td>WX</td></tr><tr><td>WY</td></tr><tr><td>WR (Note 5)</td></tr><tr><td>WL</td></tr><tr><td>DT (Note 6)</td></tr><tr><td>LD</td></tr><tr><td>I</td></tr><tr><td>SV</td></tr><tr><td>EV</td></tr></table></td><td></td></tr>
<tr><td>No. of transferred data (No. of data)</td><td colspan="2">Specify the number of transferred data (number of data).
* The number of data that can be transferred simultaneously is 1MB for all 4 IDs. However, they are calculated with data after conversion.</td><td>1 to 65533
(64k points)</td></tr>
<tr><td>Conversion method</td><td colspan="2">Specify a conversion method.<table><tr><th colspan="2">Parameter</th><th>Extension (Saving format)</th></tr><tr><td>BIN1w</td><td>Unconverted 16-bit binary</td><td>.BIN (binary data)</td></tr><tr><td>US</td><td>16-bit unsigned decimal</td><td rowspan="6">.CSV
(comma-separated text)</td></tr><tr><td>SS</td><td>16-bit signed decimal</td></tr><tr><td>UL</td><td>32-bit unsigned decimal</td></tr><tr><td>SL</td><td>32-bit signed decimal</td></tr><tr><td>SF</td><td>32-bit single-precision floating point</td></tr></table></td><td></td></tr>
</table>

Setting item	Settings			Setting range
		Parameter	**Extension (Saving format)**	
		HEX1w: 16bitHEX		
		HEX2w: 32bitHEX		
		ASCII: ASCII character (Output enclosed with “”)		
	Line feed position	Specify line feed position. 0: Output the end of file only n: Output by n data		0 to 255

(Note 1) Source device setting should be entered with each setting parameter separated by a comma “,”.

(Note 2) Specify the operation setting parameters in the order of the above table.

(Note 3) When omitting "conversion method" and subsequent items, the conversion method is set to 16-bit binary and the line feed position is set to 0 (Output the end of file only).

(Note 4) When omitting "Line feed position", it is set to 0: Output the end of file only.

(Note 5) Possible to specify the special relay (starting from WR900).

(Note 6) Possible to specify the special data register (starting from DT90000).

Setting example

Example 1	S3	“WX16,32,BIN1w,0”
Settings		Device setting, Device code: WX, Device No.: 16, No. of transferred data: 32 points (32 words), Conversion method: Unconverted 16-bit binary, Line feed position: Output the end of file only
Example 2	S3	“DT12345,250,SS,10”
Settings		Device setting, Device code: DT, Device No.: 12345, No. of transferred data: 250 points (250 words), Conversion method: 16-bit signed decimal, Line feed position: Output by 10 data
Example 3	S3	“WR0,16,SF”
Settings		Device setting, Device code: WR, Device No.: 0, No. of transferred data: 16 points (32 words), Conversion method: 32-bit single-precision floating point, Line feed position: Output the end of file only
Example 4	S3	“WL10,64”
Settings		Device setting, Device code: WL, Device No.: 10, No. of transferred data: 64 points (64 words), Conversion method: Unconverted 16-bit binary, Line feed position: Output the end of file only

■ Operand S3 setting (when getting device)

Specify the starting address storing the destination device setting or a character constant.

Setting item	Settings		Setting range
S3	Destination device	• Device	

<table>
<tr><th>Setting item</th><th colspan="3">Settings</th><th>Setting range</th></tr>
<tr><td></td><td></td><td colspan="2">Specify device code + device number.
Devices that can be specified
<table>
<tr><th>Global device</th></tr>
<tr><td>WX</td></tr>
<tr><td>WY</td></tr>
<tr><td>WR(Note 5)</td></tr>
<tr><td>WL</td></tr>
<tr><td>DT(Note 6)</td></tr>
<tr><td>LD</td></tr>
<tr><td>I</td></tr>
<tr><td>SV</td></tr>
<tr><td>EV</td></tr>
</table></td><td></td></tr>
<tr><td></td><td>No. of transferred data
(No. of data)</td><td colspan="2">Specify the number of transferred data (number of data).
* The number of data that can be transferred simultaneously is 1MB for all 4 IDs. They are calculated with file size.</td><td>1 to 65533
(64k points)</td></tr>
<tr><td></td><td>Conversion method</td><td colspan="2">Specify a conversion method.
<table>
<tr><th colspan="2">Parameter</th><th>Extension (Saving format)</th></tr>
<tr><td>BIN1w</td><td>Unconverted 16-bit binary</td><td>.BIN (binary data)</td></tr>
<tr><td>US</td><td>16-bit unsigned decimal</td><td rowspan="8">.CSV
(comma-separated text)</td></tr>
<tr><td>SS</td><td>16-bit signed decimal</td></tr>
<tr><td>UL</td><td>32-bit unsigned decimal</td></tr>
<tr><td>SL</td><td>32-bit signed decimal</td></tr>
<tr><td>SF</td><td>32-bit single-precision floating point</td></tr>
<tr><td>HEX1w</td><td>16bitHEX</td></tr>
<tr><td>HEX2w</td><td>32bitHEX</td></tr>
<tr><td>ASCII</td><td>ASCII character (Output enclosed with “”)</td></tr>
</table></td><td></td></tr>
</table>

(Note 1) Source device setting should be entered with each setting parameter separated by a comma “,”.

(Note 2) Specify the operation setting parameters in the order of the above table.

(Note 3) When omitting "Conversion method", it is set to unconverted 16-bit binary.

(Note 4) The number of data that can be transferred simultaneously is 1MB for all 4 IDs. They are calculated with file size.

(Note 5) Not possible to specify the special relay (starting from WR900).

(Note 6) Not possible to specify the special data register (starting from DT90000).

Setting example

Example 1	S3	“WX16,32,BIN1w”
Settings		Device setting, Device code: WX, Device No.: 16, No. of transferred data: 32 points (32 words), Conversion method: Unconverted 16-bit binary
Example 2	S3	“DT12345,250,SS”
Settings		Device setting, Device code: DT, Device No.: 12345, No. of transferred data: 250 points (250 words), Conversion method: 16-bit signed decimal
Example 3	S3	“WR0,16,SF”
Settings		Device setting, Device code: WR, Device No.: 0, No. of transferred data: 16 points (32 words), Conversion method: 32-bit single-precision floating point
Example 4	S3	“WL10,64”
Settings		Device setting, Device division: Global, Device code: WL, Device No.: 10, No. of transferred data: 64 points (64 words), Conversion method: Unconverted 16-bit binary

■ Operand S4 setting (when transferring files)

Specify the starting address storing the destination folder name or a character constant.

Setting item	Settings	
S4	Destination file name	For PUT Specify a folder name from the home directory of a user which logs in FTP servers with a relative path. For specifying the home directory,<><> specify </> or <\> only. For GET Specify a storage folder name in an SD card with an absolute path.

(Note 1) When no destination folders exist, they are automatically created up to eight hierarchies.

■ Operand S4 setting (when putting device)

Specify the starting address storing the destination file setting or a character constant.

Setting item	Settings	
S4	Destination file name	Specify a destination file name. Specify a folder name and file name from the home directory of a user which logs in FTP servers with a relative path. * The string after the last “.” (period) is applied as an extension of file name.
	File name automatic addition position	Specify the position of the automatic additional data added to a file name. TOP: Automatic additional data is added before a file name. END: Automatic additional data is added after a file name. * Automatic additional data is given in year, month, day, hour, minute and second “(yymmdd_hhmmss)”.

(Note 1) Specify a destination file name within 240 characters.

(Note 2) When no destination folders exist, they are automatically created up to eight hierarchies.

(Note 3) Specify the operation setting parameters in the order of the above table.

(Note 4) When omitting "File name automatic addition position", automatic additional data is not added to a file name.

Setting example

Example 1	S4	“\ftp\PutData1.bin,TOP”
Settings		Destination file name: \ftp\PutDdata1.bin, Time data addition setting: Add year-month-day data, Automatic addition position: Add automatic additional data before file name
Example 2	S4	“\ftp\PutData2.bin,END”
Settings		Destination file name: \ftp\PutDdata2.bin, Time data addition setting: Add time data, Automatic addition position: Add automatic additional data after file name
Example 3	S4	“\ftp\PutData3.bin”
Settings		Destination file name: \ftp\PutDdata3.bin, Time data addition setting: Add year-month-day data and time data, Automatic addition position: Not add automatic additional data to file name

■ Operand S4 setting (when getting device)

Specify the starting address storing the source file name or a character constant.

Setting item	Settings	
S4	Source File Name	Specify the starting address storing the source file name or a character constant.

(Note 1) Specify a folder name and file name from the home directory of a user which logs in FTP servers with a relative path.

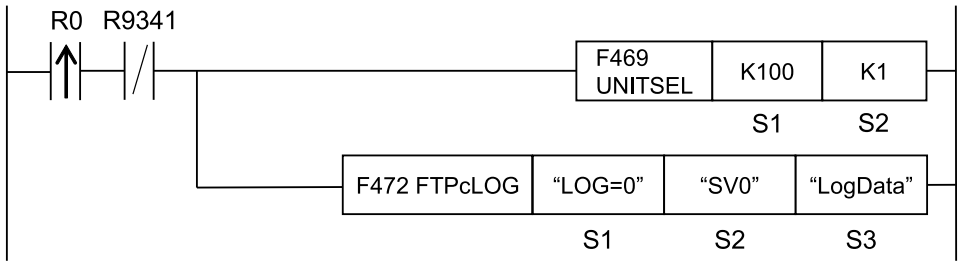
■ Flag operations

Name	Description
R9007 R9008 （ER）	Set when a value outside the range is specified for the parameter.
	Set when the slot number specified by F469 (UNITSEL) is not **S1**=100 (Ethernet communication).
	Set when transfer setting numbers are not specified in ascending order.
	Set when executed in an interrupt program.
	Set when the number of characters for an operand specifying a character constant exceeds 256.
	Set when an FTP server that has not been specified with the destination server setting instruction or the tool software is specified.
R9009 （CY）	To be set in the case of execution during Ethernet initialization. The detailed code to be set in DT90529 is "11: Ethernet initialization in progress".

(Note 1) For error codes stored in the system data DT90529, refer to .

10.4.14 F472 FTPcLOG (Logging / Trace Transfer Setting)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operands

Item	Settings
S1	Specify the starting address storing the logging / trace number (string) or a character constant.
S2	Specify the starting address storing the operation setting parameter or a character constant.
S3	Specify the starting address storing the destination folder name or a character constant.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●
S3	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Makes the logging / trace transfer setting.
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0. (This is set when Ethernet is initialized.)
- Confirm that "R9341: Ethernet initialization in progress" is OFF before executing the instruction.

■ Processing

- Stores the logging / trace transfer settings of S2 to S3 in the logging / trace transfer setting area specified by S1.
- It is executable when the transfer request relay of the FTPc logging / trace control relay for a specified logging/trace is 0: No request. (When requested, an operation error occurs.)
- It is executable when the "Ethernet initialization in progress (R9341)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.

■ Precautions on programming

- When specifying a device for an operand specifying a character constant, set string data using F253 (SSET) instruction in advance.
- When specifying string data, the number of characters should not exceed 256.
- Upper and lower case characters can be used for an operand specifying a character constant.
  ("Abcd", "ABCD" and "abcd" are synonymous, however, the file names are differentiated.)
- A target unit for the instruction is specified with F469 (UNITSEL) beforehand.
- This instruction is not available in an interrupt program.

■ Operand S1 setting

- Specify the starting address storing the logging / trace number (string) or a character constant.

Setting item	Settings		Setting range
S1	LOG No.	Specify LOG number. LOG=: LOG number	0 to 3

■ Operand S2 setting

- Specify the starting address storing the operation setting parameter or a character constant.
- Only one server can be specified at the same time. Specify a FTP server number with one-byte three characters.

Setting item	Settings		Setting range
S2	Specification of FTP server (Essential)	Specify FTP servers. Specify the following keywords. SV0: Server 0 SV1: Server 1 SV2: Server 2	0 to 2
	Specification of transfer operation (Can be omitted)	Select the operation for transferring logging / trace files. Specify the operation after the keyword “MODE=”. MODE=xxxx	

(Note 1) Operation setting parameter should be entered with each setting parameter separated by a comma “,”.

(Note 2) Specify the operation setting parameters in the order of the above table. The order of keywords cannot be changed.

(Note 3) Upper and lower case characters can be used for specifying keywords.

■ Operand S2 transfer operation setting

Settings	Set value	Operation
Overwrite method (Default)	OVW	Performs transfer files with files names specified by the logging / trace setting. When the transfer is interrupted due to any trouble with network or servers, the files transferred partway remain in servers. Confirm if the transfer has succeeded with an instruction such as F465 (ETSTAT) instruction.

Settings	Set value	Operation
Rename method	REN	Performs transfer files with temporary file names, and renames them to specified file names after the success of the transfer. The successful completion of file transfer can be confirmed by checking the file names specified by the logging / trace setting. The processing time is longer than that of the overwrite method.

(Note 1) When either method is not specified, "Overwrite method" is applied.

Setting example

Example 1	S2	“SV0,MODE=OVW”
Settings		FTP server: 0, Transfer operation: Overwrite method
Example 2	S2	“SV3,MODE=REN”
Settings		FTP server: 2, Transfer operation: Rename method
Example 3	S2	“SV1”
Settings		FTP server: 1, Transfer operation: (Omitted)

■ Operand S3 setting

- Specify the starting address storing the destination folder name or a character constant.
- Specify a destination folder name within 256 characters.

Setting item	Settings		Setting range
S3	Destination folder name	Specify the starting address storing the destination folder name or a character constant.	Max. 256 characters

(Note 1) When no destination folders exist, they are automatically created up to eight hierarchies.

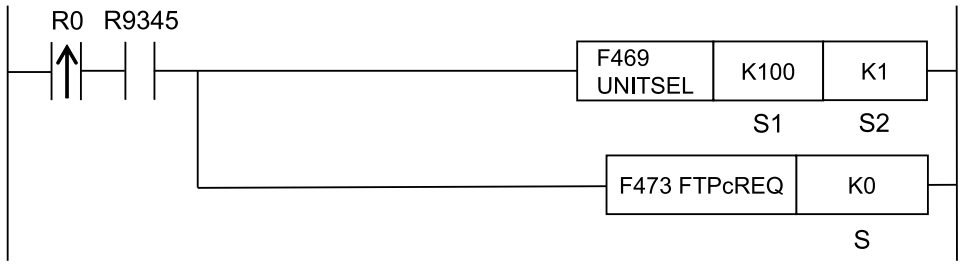
(Note 2) Specify a folder name from the home directory of a user which logs in FTP servers with a relative path.

■ Flag operations

Name	Description
R9007 R9008 （ER）	Set when the slot number specified by F469 (UNITSEL) is not **S1**=100 (Ethernet communication).
	Set when the request active relay of the FTPc logging / trace control relay for a specified number is 1: Requesting.
	Set when the logging / trace condition of a specified LOGn number is not registered.
	Set when a value outside the range is specified for the parameter.
	Set when executed in an interrupt program.
	Set when the number of characters for an operand specifying a character constant exceeds 256.
	Set when an unset FTP server is specified.
R9009 （CY）	Set when executed during the initialization of Ethernet. The detailed code to be set in DT90529 is "11: Ethernet initialization in progress".

10.4.15 F473 FTPcREQ (FTP Client Transfer Request)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operand

Item	Settings
S	Specify the device address storing the transfer number (0 to 3) or a constant.

■ Devices that can be specified (indicated by ●)

Operand	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S	●	●	●	●	●	●	●	●	●			●	●		●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Requests the transfer of FTP client.
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0. (Set when an Ethernet cable is disconnected or Ethernet is initialized.)
- Check if "R9345: FTP client preparation done" is ON before executing the instruction.
- It is necessary to specify the transfer settings before executing the instruction using "10.4.13 F471 FTPcSET (FTP Client Transfer Setting)" or "9.4.2 FTP File Transfer Settings (Sending Files)" to "9.4.5 FTP File Transfer Settings (Getting Device)" with the tool software.

■ Processing

- Turns ON the transfer request relay of the transfer number specified by [S].
- It can be executed when the "FTP client preparation done (R9345)" is ON. If it is OFF when executing the instruction, an operation error occurs.
- It is executable when the "Cable disconnection (R9340)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.
- It is executable when the "Ethernet initialization in progress (R9341)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.
- When it is executed under the following condition, an error code is set to the execution done code as a transfer error.

Status	Code	Status	Code
Destination server is not set.	1	Transfer canceled setting	6
Transfer setting is not set.	2	Transfer failed	7
Registering a process request failed.	4	Data decompression failed. (When accessing data with PUT)	8
Transfer prohibition setting	5	Data decompression failed. (When accessing data with GET)	9

■ Precautions on programming

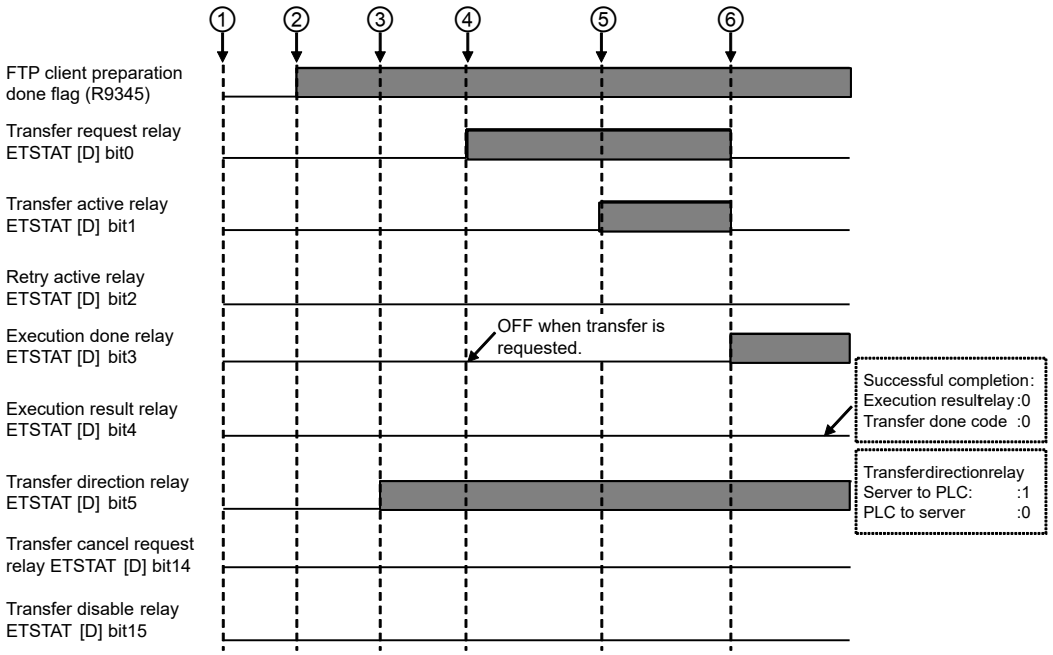
- This instruction is not available in an interrupt program.

■ Operand S setting

Setting item	Settings		Setting range
S	Transfer No.	Specify the device address storing a transfer number or a constant.	0 to 3

■ Timing chart

- It shows the process that a transfer request was executed and data was obtained successfully from a server to FP0H.
- The control relays (bit0 to bit15) can be monitored by reading arbitrary operation devices with F465 (ETSTAT) instruction.



(1)	RUN (Power ON)	(4)	Transfer request (Executes FTP c REQ instruction)
(2)	FTP client preparation done	(5)	FTP client login succeeded (Starts transfer)

(3)	Transfer setting (Executes FTPcSET instruction)	(6)	Transfer process done (Completes the execution of F473 (FTPcREQ) instruction)

■ Control relay

Name	Bit No.	Description
Transfer request relay	0	0: No request, 1: Request
Transfer active relay	1	0: Stop, 1: During transfer
Retry active relay	2	0: No retry, 1: During retry
Execution done relay	3	0: During process, 1: Instruction execution complete
Execution result relay	4	0: Normal 1: Failed
Transfer direction relay	5	0: Send, 1: Receive
Reserved for system	6 to 13	—
Transfer cancel request relay	14	0: Not cancel, 1: Cancel
Transfer disable relay	15	0: Transfer enabled, 1: Transfer disabled

(Note 1) The state of control relays can be read with F465 (ETSTAT) instruction.

■ Done codes

Name	Number of words	Description
Execution done code	1	Execution done code
Transfer done code	1	Response code of FTP client

(Note 1) The state of done codes can be read with F465 (ETSTAT) instruction.

■ Special relays

Name	Description
FTP client preparation done (R9345)	0: FTP client preparation incomplete, 1: FTP client preparation complete

■ Flag operations

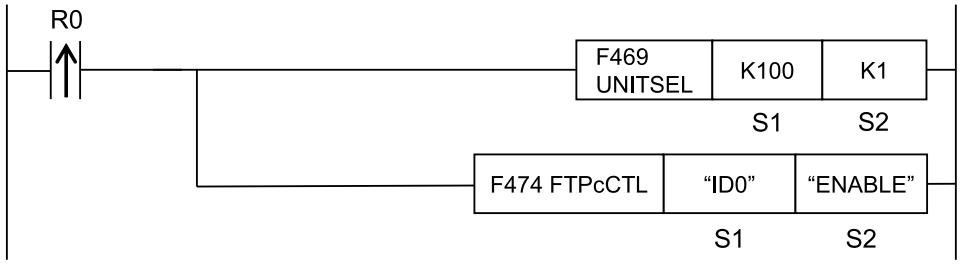
Name	Description
R9007 R9008 （ER）	Set when the slot number specified by F469 (UNITSEL) is not **S1**=100 (Ethernet communication).
	Set when the range is exceeded during indirect access (index modification).
	Set when the FTP client preparation done (R9345) is OFF at the time of the execution of instruction.
	Set when a value outside the range is specified for the parameter.
	Set when the transfer request relay of a specified ID is "Request".
	Set when executed in an interrupt program.
	Set when a file transfer that has not been specified with the transfer setting instruction or the tool software is specified.

Name	Description
R9009 (CY)	Set when executed while the Ethernet cable is disconnected. The detail code set in DT90529 is "10: Ethernet cable disconnected".
	To be set in the case of execution during Ethernet initialization. The detailed code to be set in DT90529 is "11: Ethernet initialization in progress".

(Note 1) For error codes stored in the system data DT90529, refer to .

10.4.16 F474 FTPcCTL (FTP Client Transfer Control)

■ Instruction format



(Note 1) Specify S1=K100 (Ethernet communication) in advance using F469 UNITSEL instruction.

■ Operands

Item	Settings
S1	Specify the target to be controlled with the starting address or a character constant.
S2	Specify the controlled contents (transfer enabled / disabled / canceled) with the starting address or a character constant.

■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	SW R	SDT	Constant			Index modifier (Note 1)
												K	H	M	
S1	●	●	●	●	●	●	●	●	●					●	●
S2	●	●	●	●	●	●	●	●	●					●	●

(Note 1) A character constant cannot be specified.

■ Outline of operation

- Sets to enable, disable or cancel the transfer of FTP client.
- When this instruction is executed, the special relay R9009 (carry flag CY) and the special data register DT90529 (Ethernet communication error code) are cleared to 0.
  (This is set when Ethernet is initialized.)
- It is necessary to specify the transfer settings before executing the instruction using "10.4.13 F471 FTPcSET (FTP Client Transfer Setting)" or "9.4.2 FTP File Transfer Settings

(Sending Files)" to "9.4.5 FTP File Transfer Settings (Getting Device)" with the tool software. (when control targets are specified with send numbers)

- It is necessary to specify the transfer settings before executing the instruction using "10.4.14 F472 FTPcLOG (Logging / Trace Transfer Setting)" or "9.5.2 Logging / Trace Transfer Settings" with the tool software. (when control targets are specified with LOG numbers)
- It takes some time to accept the processing of the transfer cancel request. Check the transfer status and check if the transfer stops after executing the instruction. For the method of transfer status checking, refer to "10.4.7 F465 ETSTAT (Acquire Ethernet Unit Information: FTP)".

■ Processing

- Controls to enable, disable or cancel the transfer for the target **S1** according to the specification of the control content **S2**.
- It is executable when the "Ethernet initialization in progress (R9341)" is OFF. If it is ON when executing the instruction, an error is set to CY flag and no operation is performed.

■ Details of setting parameters

Setting item	Settings		
S1	Control target	1) When specifying transfer numbers individually	Specify 0 to 3 for x with “IDx”.
		2) When specifying LOG numbers individually	Specify 0 to 3 for x with “LOGx”.
		3) When specifying all transfer numbers and LOG numbers	Specify “ALL”.
S2	Control content	1) When enabling transfer	Specify “ENABLE”.
		2) When disabling transfer	Specify “DISABLE”.
		3) When canceling transfer	Specify “CANCEL”.

■ Precautions on programming

- When specifying a device for an operand specifying a character constant, set string data using F253 (SSET) instruction in advance.
- When specifying string data, the number of characters should not exceed 256.
- Upper and lower case characters can be used for an operand specifying a character constant.
  ("Abcd", "ABCD" and "abcd" are synonymous, however, the file names are differentiated.)
- A target unit for the instruction is specified with F469 (UNITSEL) beforehand.
- This instruction is not available in an interrupt program.

■ Operation of FTPc control relay

Name	Transfer enabled	Transfer disabled	Transfer canceled
Transfer cancel relay	Not change	Not change	ON
Transfer disable relay	OFF	ON	Not change
Transfer request	Not change	Not change	Not change
Transfer active	Not change	Not change	Not change

Name	Transfer enabled	Transfer disabled	Transfer canceled
Transfer retry active	Not change	Not change	Not change
Transfer done	Not change	Not change	Not change
Transfer failed	Not change	Not change	Not change
Transfer direction	Not change	Not change	Not change

(Note 1) The state of control relays can be read with F465 (ETSTAT) instruction.

Setting example

<table>
<tr><th></th><th>Settings</th><th>S1</th><th>S2</th></tr>
<tr><td>Example 1</td><td>When enabling the sending of send No. 1</td><td>“ID1”</td><td>“ENABLE”</td></tr>
<tr><td>Example 2</td><td>When disabling all sending items</td><td>“ALL”</td><td>“DISABLE”</td></tr>
<tr><td>Example 3</td><td>When canceling the sending of LOG3</td><td>“LOG3”</td><td>“CANCEL”</td></tr>
<tr><td>Example 4</td><td>When enabling the sending of send No. 3 (Note)</td><td>DT0
<table><tr><th></th><th colspan="2">Value</th></tr><tr><td>DT0</td><td colspan="2">3 (No. of characters)</td></tr><tr><td>DT1</td><td>H44(D)</td><td>H49(I)</td></tr><tr><td>DT2</td><td></td><td>H33(3)</td></tr><tr><td>DT3</td><td></td><td></td></tr></table></td><td>DT10
<table><tr><th></th><th colspan="2">Value</th></tr><tr><td>DT10</td><td colspan="2">6 (No. of characters)</td></tr><tr><td>DT11</td><td>H4E(N)</td><td>H45(E)</td></tr><tr><td>DT12</td><td>H42(B)</td><td>H41(A)</td></tr><tr><td>DT13</td><td>H45(E)</td><td>H4C(L)</td></tr><tr><td>DT14</td><td></td><td></td></tr></table></td></tr>
</table>

(Note 1) For specifying a device for an operand specifying a character constant, store string data with F253 (SSET) instruction excluding a double quotation mark.

■ Flag operations

Name	Description
R9007 R9008 （ER）	Set when any items other than “IDx” or “LOGx” or “ALL” are specified for the control target (S1). (x: 0 to 3)
	Set when an unset transfer setting is specified.
	Set when an unset logging / trace transfer setting is specified.
	Set when any items other than “ENABLE”, “DISABLE” or “CANCEL” are specified for the control content (S2).
	Set when the slot number specified by F469 (UNITSEL) is not **S1**=100 (Ethernet communication).
	Set when executed in an interrupt program.
	Set when the number of characters for an operand specifying a character constant exceeds 256.
	Set when a file transfer that has not been specified with the transfer setting instruction or the tool software is specified.
	Set when a logging / trace transfer setting that has not been specified with the logging / trace transfer setting instruction or the tool software is specified.

Name	Description
R9009 （CY）	Set when executed during the initialization of Ethernet. The detailed code to be set in DT90529 is "11: Ethernet initialization in progress".

(Note 1) For error codes stored in the system data DT90529, refer to .

(MEMO)

11 Specifications

11.1 Communication Function Specifications for Control Unit LAN Ports. 11-2

11.2 Error Codes Table 11-3

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11.3.1 MEWTOCOL-DAT Command Format in LAN Communication 11-4

11.3.2 MEWTOCOL-DAT Command / Response Format..... 11-4

11.4 MEWTOCOL-COM Format 11-7

11.4.1 MEWTOCOL-COM Command Format in LAN Communication..... 11-7

11.4.2 MEWTOCOL-COM Command Format..... 11-8

11.4.3 MEWTOCOL-COM Response Format 11-9

11.1 Communication Function Specifications for Control Unit LAN Ports

■ LAN port

Items	Description
Interface	100BASE-TX / 10BASE-T
Baud rate	100Mbps / 10Mbps automatic negotiation (Note 1)
Cable total length	100 m (500 m when using a repeater) (Note 2)
Available simultaneous connections	User connections: 9
	System connections: 1 (Note 3)
Communication method	Full-duplex / half-duplex transmission
Communication protocol	TCP/IP, UDP
DNS	Supports name server
DHCP	Automatically acquire IP address
FTP server / client	Server function: File transmission, No. of users: 1 Client function: Data and file transmission FTPS(TLS1.1/1.2) (Note 4)
SNTP	Time setting function
General-purpose communication	4 K byte per connection (transmission: 2 K byte; reception: 4 K byte)
Communication function	MEWTOCOL-COM (Master / Slave) (Computer link) MODBUS TCP (Master / Slave) MEWTOCOL-DAT (Master / Slave), General-purpose communication MC protocol (Master / Slave) (Note 5)

(Note 1) Switching of speeds is done automatically by the auto negotiation function.

(Note 2) The standards cite 100 m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the user environment. Also, it is recommended to install a hub close to a control board, and use it at a distance of 10 m or less.

(Note 3) This is used when connecting tool software via LAN.

(Note 4) Only an explicit mode is supported.

(Note 5) MC protocol is an abbreviation for MELSEC Communication Protocol, and MELSEC is a registered trademark of Mitsubishi Electric Corporation.

Only QnA compatible 3E frame and binary (bulk read and bulk write) can be used.

11.2 Error Codes Table

■ Ethernet communication errors

If the CY flag (R9009) turns ON (1: Error), check the error content in the Ethernet communication error code (DT90529).

R9009	DT90529
0: Normal	0: Normal
1: Error	1: Incorrect IP address specification
	2: Incorrect subnet mask specification
	3: Incorrect default gateway specification
	4: Incorrect IP address combination
	10: Ethernet cable disconnected
	11: Ethernet initialization in progress
	12: IP address unestablished
	13: Client not started
	14: Connection processing in progress
	15: Connection occupied

■ Network errors

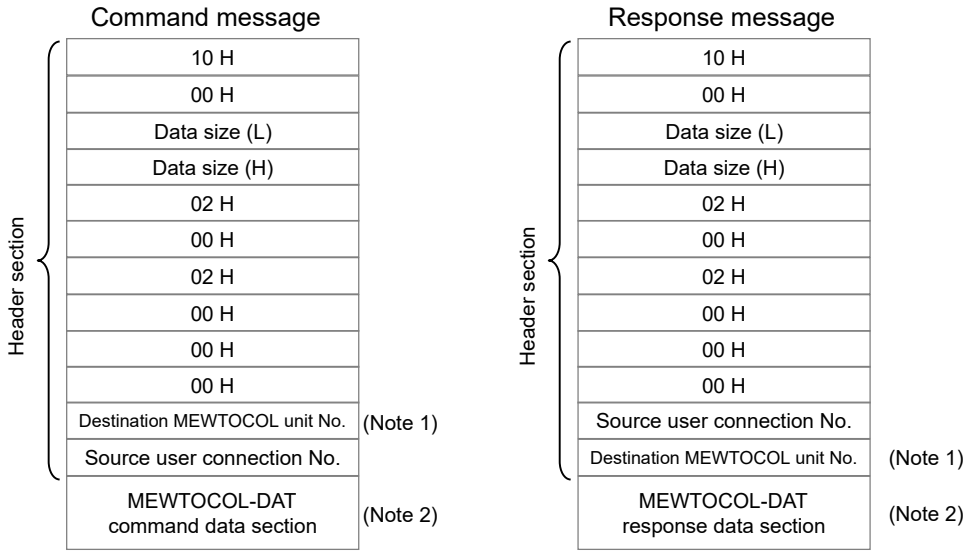
If a network error (E46) occurs, check the special data register No. DT90590 for “Details of network errors” to find the error contents.

Error code	Cause
0x0001	Hardware fault
0x0002	Memory usage fault
0x0003	Bus fault
0x0004	Use-method fault
0x1001	Startup initialization timeout
0x2001	SSL/TLS initialization failed (API)
0x2002	SSL/TLS initialization failed (FTP server)
0x2003	SSL/TLS session generation failed (FTP server)
0x2004	SSL/TLS certificate reading failed (FTP server)
0x2006	SSL/TLS initialization failed (FTP client)
0x2007	SSL/TLS session generation failed (FTP client)

11.3 MEWTOCOL-DAT Format

11.3.1 MEWTOCOL-DAT Command Format in LAN Communication

- Data for transmission / reception in LAN communication has a data structure with a header added as below, in the MEWTOCOL-DAT command data section or in the MEWTOCOL-DAT response data section.
- When PLC has the transmission right and performs transmission / reception, no writing in a user program is required, because PLC automatically assigns the relevant data when it executes F145 (SEND) / F146 (RECV) instruction.



(Note 1) The destination MEWTOCOL unit No. varies depending on setting in “User connection information: MEWTOCOL communication type”.

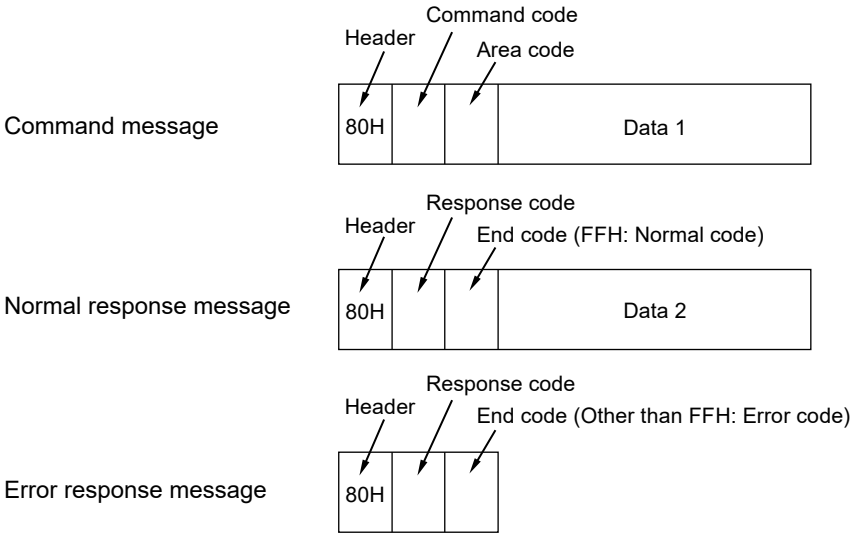
(Note 2) The maximum bytes in the command response data section varies depending on setting in “User connection information: MEWTOCOL communication type”.

MEWTOCOL communication type setting	Destination MEWTOCOL unit No.	Maximum bytes in the command data section / response data section
Not connect with FP2-ET-LAN	1	Max. 4084 bytes
Connect with FP2-ET-LAN	Unit No. specified in the operand of F145 (SEND) / F146 (RECV) instruction	Max. 2048 bytes

11.3.2 MEWTOCOL-DAT Command / Response Format

■ Command / response message format

This is a special procedure and conversational format using binary codes.



■ Data content

1. Header
   A message must always be headed by a "80H".
2. Command code / response code

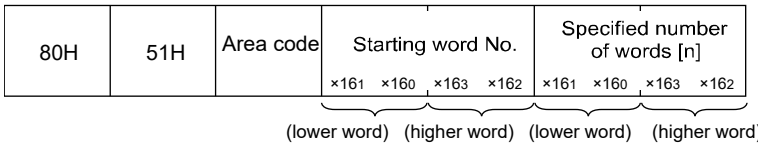
Type of instruction	Command code	Response code	Description
Write data area	50H	D0H	Writes data to a data area.
Read data area	51H	D1H	Reads the contents of a data area.
Write contact information	52H	D2H	Turns ON or OFF a 1-word contact in the specified area.
Read contact information	53H	D3H	Reads the ON / OFF state of a 1-word contact in the specified area.

- Data
  The content varies depending on the type of instruction. Write an instruction in accordance with its specified format.

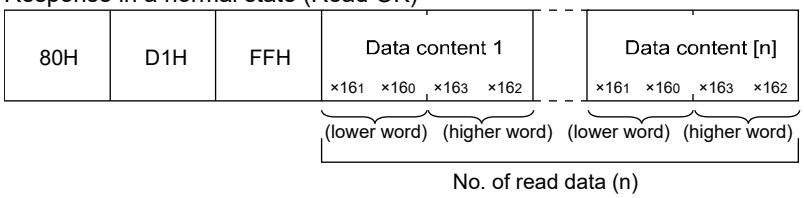
■ Example of command / response message

Example of data area read (command code 51H):

Command



Response in a normal state (Read OK)



Not connected with FP2 ET-LAN unit : n = 1 to 2038
Connected with FP2 ET-LAN unit : n = 1 to 1020

Error response (read error)

11.4 MEWTOCOL-COM Format

11.4.1 MEWTOCOL-COM Command Format in LAN Communication

■ **Command / response message format**

- Data for transmission / reception in LAN communication varies based on setting in “User connection information: MEWTOCOL communication type”.

MEWTOCOL communication type setting	Command / response format
Not connect with FP2-ET-LAN	Only the MEWTOCOL-COM command data section or the MEWTOCOL-COM response data section is sent, without adding a header.
Connect with FP2-ET-LAN	Data has a structure with a header added as below, in the MEWTOCOL-COM command data section or in the MEWTOCOL-COM response data section.

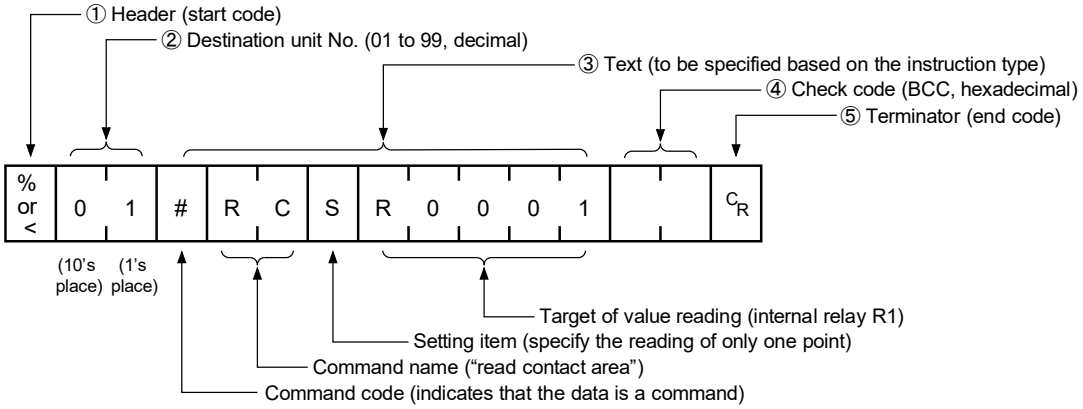
- When PLC has the transmission right and performs transmission / reception, no writing in a user program is required, because PLC automatically assigns the relevant data when it executes F145 (SEND) / F146 (RECV) instruction.

■ **Message format**

MEWTOCOL communication type setting	Message format
Not connect with FP2-ETLAN	Command message: No header / MEWTOCOL-COM command data section Response message: No header / MEWTOCOL-COM response data section
Connect with FP2-ETLAN	Command message: Header section (10 H, 00 H, Data size (L), Data size (H), 02 H, 00 H, 02 H, 00 H, 00 H, 00 H, Destination MEWTOCOL unit No., Source user connection No.) / MEWTOCOL-COM command data section Response message: Header section (10 H, 00 H, Data size (L), Data size (H), 02 H, 00 H, 02 H, 00 H, 00 H, 00 H, Source user connection No., Destination MEWTOCOL unit No.) / MEWTOCOL-COM command data section

11.4.2 MEWTOCOL-COM Command Format

■ Command message



(1) Header (start code)

Commands must always have a "%" (ASCII code: H25) or a "<" (ASCII code: H3C) at the beginning of a message.

(2) Unit No.

- The unit No. of PLC to which you want to send a command should be specified. The unit No. of PLC is set by the system register. In the case of FP0H control unit, setting should be performed in the configuration menu of FPWIN GR7.
- When the destination is FP0H, specify "01" (ASCII code H3031). The destination of connection is determined by IP address.

(3) Text

The content varies depending on the type of instruction. The content should be noted in all upper-case characters, in accordance with the specified format.

(4) Check code

- This is a BCC (block check code) for error detection using horizontal parity. The BCC should be created so that it targets all of the text data from the header (start code) to the last text character.
- BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with character text (ASCII code). It is normally part of calculation program and is created automatically.
- BCC can be skipped by entering "* *" (ASCII code: H2A2A) in place of BCC.

(5) Terminator (end code)

Messages must always end with a "CR" (ASCII code: H0D).

Note

- The method for writing text segments in a message varies depending on the type of command.
- If there are a large number of characters in a message to be sent, divide and send them in several commands.
- If there are a large number of characters in a message, they are divided into several responses.

Info.

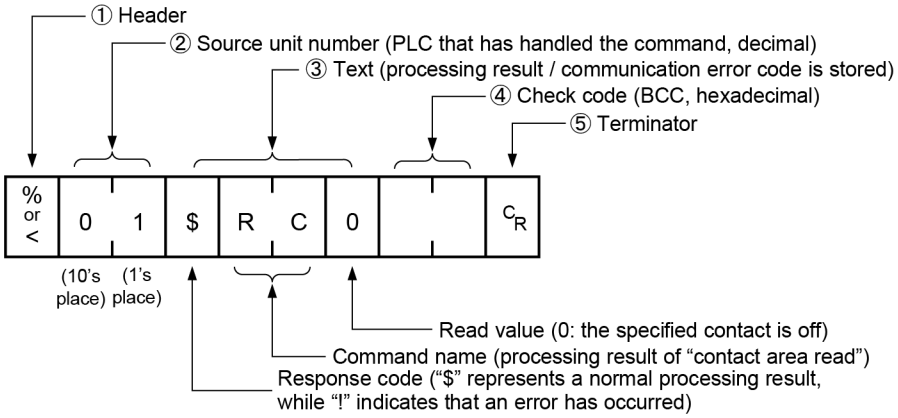
- An expansion header "<" is supported to send a single frame of up to 2048 characters, as well as general "%".

Type of header	Number of characters that can be sent in 1 frame
%	Max. 118 characters
<	Max. 2048 characters

11.4.3 MEWTOCOL-COM Response Format

■ Response message

The PLC that received the command returns the processing result.



(1) Header (start code)

- Commands must always have a "%" (ASCII code: H25) or a "<" (ASCII code: H3C) at the beginning of a message.
- The response must start with the same header that was at the beginning of the command.

(2) Unit number

- The unit number of the PLC that processed the command

(3) Text

- The content varies depending on the type of instruction. If the processing is not completed successfully, an error code will be stored here, so that the content of the error can be checked.

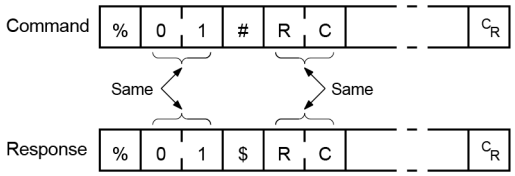
(4) Check code

- This is a BCC (block check code) for error detection using horizontal parity.
- BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with character text.

(5) Terminator (end code)

- Messages must always end with a "CR" (ASCII code: H0D).

- If no response is returned, the transmission format may not be correct, the command may not have arrived at the PLC, or the PLC may not be functioning. Check to make sure all of the communication specifications (e.g. baud rate, data length, parity) are aligned.
- If the response contains an “!” instead of a “$”, the command was not processed successfully. The response will contain a communication error code. Check the meaning of the error code.
- Unit number and command name are always identical in a command and its corresponding response, as indicated below. This makes correspondence between a command and a response clear.



Record of changes

Date	Manual No.	Record of Changes
Oct. 2017	WUME-FP0HET-01	1st Edition
Jun. 2017	WUME-FP0HET-02	2nd Edition Added notes on network security Added descriptions related to the functions Added descriptions related to the supported functions. ● FTP server and FTP client functions ● Multi-connection server function ● UDP destination unit optional communication function Errors corrected
Jan. 2019	WUME-FP0HET-03	3rd Edition Upgrading the firmware version of the main unit (Ver. 1.3) Addition of description about supported functions ● FTPS functions ● Addition of manual opening function
Jun. 2019	WUME-FP0HET-04	4th Edition ● Added descriptions related to the setting of basic communication information.
Apr. 2020	WUME-FP0HET-05	5th Edition ● Changed the manual format. Error correction
May 2020	WUME-FP0HET-06	6th Edition Upgraded the firmware version of the main unit (Ver. 1.50). ● Changed the unit number specification for MODBUS-TCP.
June 2021	WUME-FP0HET-07	7th Edition Upgrading the firmware version of the main unit (Ver. 1.80) Addition of specifying a partner unit for MEWTOCOL master communication Addition of three new Ethernet instructions ● Time adjustment request instruction ● NTP destination server setting instruction ● PING request instruction
January 2023	WUME-FP0HET-08	8th Edition "4.3 Special Data Registers Used for Communication"

Date	Manual No.	Record of Changes
		● Added descriptions of error operations for special data registers.
April 2024	WUME-FP0HET-09	9th Edition Change in Corporate name

Order Placement Recommendations and Considerations

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(3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
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