

Programmable controller

FP7 CPU Unit

User's Manual

LAN Port Communication

(MEMO)

Introduction

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

Types of Manual

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

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit User's Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit	FP7 CPU Unit Command Reference Manual	WUME-FP7CUPGR
	FP7 CPU Unit User's Manual (Logging Trace Function)	WUME-FP7CPULOG
	FP7 CPU Unit User's Manual (Security Function)	WUME-FP7CPUSEC
	Instructions for Built-in LAN Port	FP7 CPU Unit User's Manual (LAN Port Communication)
FP7 CPU Unit User's Manual (Ethernet Expansion Function)		WUME-FP7CPUETEX
FP7 CPU Unit User's Manual (EtherNet/IP Communication)		WUME-FP7CPUeIP
Web Server Function Manual		WUME-FP7WEB
Instructions for Built-in COM Port	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
FP7 Extension Cassette (Communication) (RS-232C / RS485 type)		
FP7 Extension Cassette (Communication) (Ethernet Type)	FP7 Series User's Manual (Communication Cassette Ethernet Type)	WUME-FP7CCET
FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette User's Manual	WUME-FP7FCA
FP7 Digital Input / Output Unit	FP7 Digital Input / Output Unit User's Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit User's Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit User's Manual	WUME-FP7AOH
FP7 Thermocouple Multi-analog Input Unit	FP7 Thermocouple Multi-analog Input Unit FP7 RTD Input Unit	WUME-FP7TCRTD
FP7 RTD Input Unit	User's Manual	
FP7 Multi Input / Output Unit	FP7 Multi Input / Output Unit User's Manual	WUME-FP7MXY
FP7 High-speed counter unit	FP7 High-speed Counter Unit User's Manual	WUME-FP7HSC

Unit name or purpose of use	Manual name	Manual code
FP7 Pulse Output Unit	FP7 Pulse Output Unit User's Manual	WUME-FP7PG
FP7 Positioning Unit	FP7 Positioning Unit User's Manual	WUME-FP7POSP
FP7 Serial Communication Unit	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
FP7 Multi-wire Link Unit	FP7 Multi-wire Link Unit User's Manual	WUME-FP7MW
FP7 Motion Control Unit	FP7 Motion Control Unit User's Manual	WUME-FP7MCEC
PHLS System	PHLS System User's Manual	WUME-PHLS
Programming Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

Safety Precautions

- In order to prevent injuries and accidents, always adhere to the following.
- Always read this manual thoroughly before performing installation, operation, maintenance, and inspection, and use the device correctly.
- Ensure you are familiar with all device knowledge, safety information, and other precautions before use.
- In this manual, safety precaution levels are classified into "warnings" and "cautions".

WARNING

Cases where dangerous situations are expected to arise whereby the user could die or suffer serious injury if handled incorrectly

- Implement safety measures externally from this product so that the entire system can operate safely even if a failure occurs due to a fault in this product or some external factor.
- Do not use in an environment containing flammable gases.
Doing so could cause explosions.
- Do not dispose of this product by placing it in fire.
This could cause rupture of batteries, electronic components, etc.
- Do not apply force, electrical charge, fire or heat to the lithium batteries.
It may lead to ignition and/or rupture.

CAUTION

Cases where dangerous situations are expected to arise whereby the user could suffer injury or physical damage could occur if handled incorrectly

- In order to prevent the product from generating abnormal heat or emitting smoke, use the product with some margin to the guaranteed characteristics and performance values.
- Do not disassemble or modify the product.
Doing so could cause abnormal heat generation or smoke.
- Do not touch electrical terminals while the power is on.
There is a risk of electrical shock.
- Construct external emergency stop and interlock circuits.
- Securely connect wires and connectors.
Poor connections can cause abnormal heat generation or smoke.
- The protective earthing (PE) terminals must be grounded with D class grounding.
Failure to ground may result in electric shock.
- Do not allow foreign materials such as liquids, combustibles, or metals, to enter inside the product.
Doing so could cause abnormal heat generation or smoke.
- Do not perform work (connection, disconnection, etc.) while the power is on.
There is a risk of electrical shock.
- If methods other than those specified by our company are used when operating this product, the protection functions of the unit may be lost.
- This product was developed and manufactured for use in industrial environments.

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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.

Handling Precautions

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






	Indicates an action that is prohibited or a matter that requires caution.
	Indicates an action that must be taken.
 Info.	Indicates supplemental information.
 Note	Indicates details about the subject in question or information useful to remember.
 Procedure	Indicates operation procedures.

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1 Communication Functions of CPU Unit

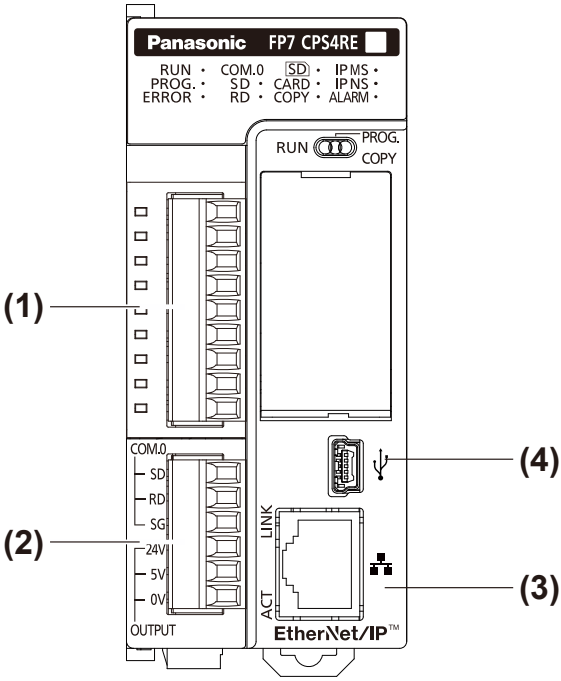
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1.1 Communication Ports of CPU Unit

1.1 Communication Ports of CPU Unit

1.1.1 Types and Purposes of Communication Ports

■ Communication ports of CPU unit



■ Functions of Ports

(1) COM1 and COM2 ports

Attach a separately sold communication cassette to use these ports. You can select from five types of communication cassettes.

(2) COM0 port

This is an RS-232C port that is equipped to a standard model of CPU unit. It is equipped with power supply terminals (5V DC and 24V DC) to which a GT series display can be connected.

(3) LAN port

This is equipped to a standard model of CPU unit. It is used for connection to Ethernet. It can also be connected with a programming tool. The MAC address is printed on the side of the unit.

It supports the Ethernet communication interfaces 100BASE-TX and 10BASE-T. 100BASE-TX and 10BASE-T are automatically switched by the auto negotiation function.

(4) USB port

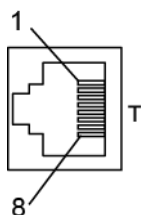
This is equipped to a standard model of CPU unit. This is used when connecting tool software.

i Info.

- For communication using the COM port, refer to the *CPU Unit User's Manual (COM Port Communication)*.

1.1.2 LAN Port Specifications**■ 100BASE-TX / 10BASE-T connector (RJ45)**

This connector connects the ET-LAN Unit and the Hub in Ethernet (100BASE-TX, 10BASE-T) and UTP Cable.



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

■ Functions of LED lamps**(1) LINK**

Turns on when connection is established between the FP7 CPU unit and a device on Ethernet.

(2) ACK

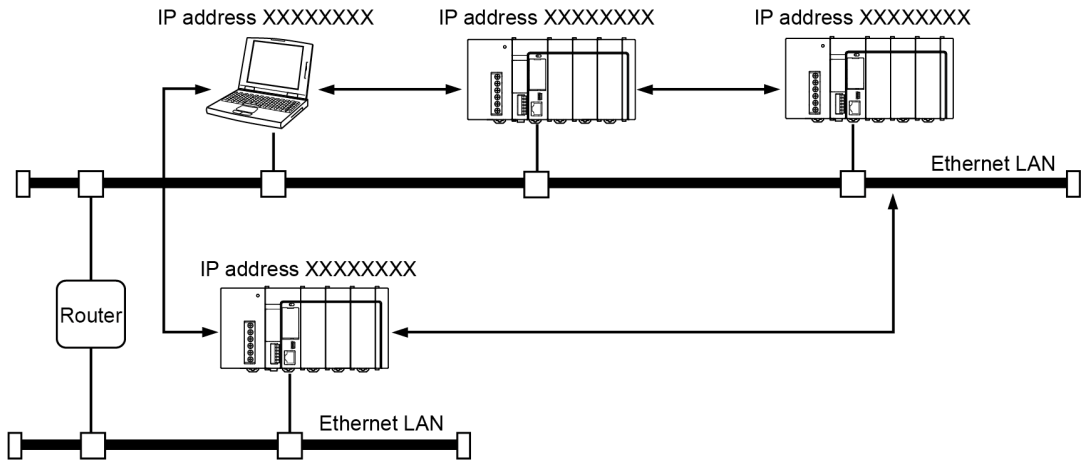
Flashes when some communication is in progress with a connected device (e.g. sending/receiving a command or response).

1.2 Functions of LAN Port

1.2 Functions of LAN Port

1.2.1 Communication functions of FP7 CPU Unit

■ Configuration chart



■ Communication functions of FP7 CPU Unit

- The FP7 CPU Unit can open a virtual communication line with an Ethernet-supporting device connected to LAN, and send/receive data.
- IP address of the FP7 CPU unit, protocol (TCP/UDP), connection method with devices, port numbers, etc. should be specified in the configuration menu of the programming tool FPWIN GR7.
- In master communication commands SEND/RECV, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing commands.
- Communication functions can be selected depending on the partner device to be connected.

1.2.2 System Connection

■ Functions of system connection

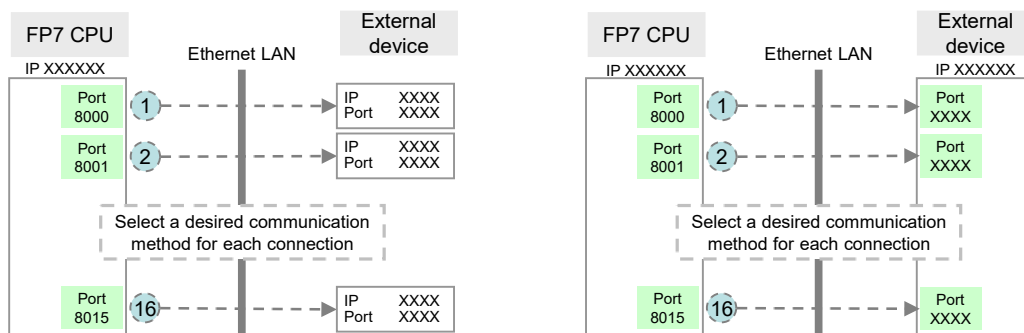
- System connection is used when using a programming tool via LAN port.
- Four connections are available per CPU unit.

1.2.3 User Connection

■ Functions of user connection

- The FP7 CPU Unit can open virtual communication lines for up to 16 connections with Ethernet-supporting devices connected to LAN, and send/receive data.

- It can open multiple connections between the FP7 CPU unit and multiple nodes or a single node, and execute communication.
- Operating mode, open type, protocol, etc. can be selected for each connection.



(Note 1) Circled numbers in the figure above indicate examples of allocation of connection numbers.

■ Connection operation

- Connection is opened from either the FP7 CPU unit side or the external device side.
- The open type should be selected from Server connection (any destination), Server connection (specific destination), and Client connection, in the configuration menu of FPWIN GR7.
- Once connection is established, communication by a user program becomes possible in accordance with the operation mode.

■ Supported operation mode

Communication port	MEWTOCOL-DAT		MEWTOCOL7-COM MEWTOCOL-COM		MODBUS-TCP		General-Purpose Communication
	Master	Slave	Master	Slave	Master	Slave	
LAN port	•	•	○(Note 1)	•	•	•	•

(Note 1) MEWTOCOL7-COM does not support master functions.

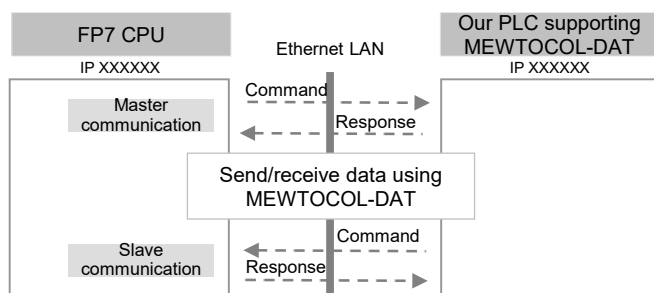
1.3 Overview of Communication Functions

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

■ Overview of function

- Execute communication using "MEWTOCOL-DAT", a communication protocol used by our PLC.
- One PLC has the sending right, and executes communication by sending commands to PLCs that support "MEWTOCOL-DAT", and receiving responses.
- The slave-side PLC responds automatically, so no program concerning communication is necessary.
- Also on the master-side PLC, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RCV commands.
- This is suitable for sending/receiving data between PLCs, because the data size that can be transmitted in a single communication is larger, and the transmission format is simpler and shorter, than the MEWTOCOL-COM communication (ASCII communication).
- The data size that can be sent or received in a single communication is up to 2038 words for register transmission and 1 bit for bit transmission.

(Note) In the case of connection with our PLC FP2 ET-LAN unit, the maximum size is 1020 words.



■ Purpose of MEWTOCOL-DAT communication

This is used for sending data via Ethernet between Panasonic PLCs that support "MEWTOCOL-DAT".

- Programmable controller FP series

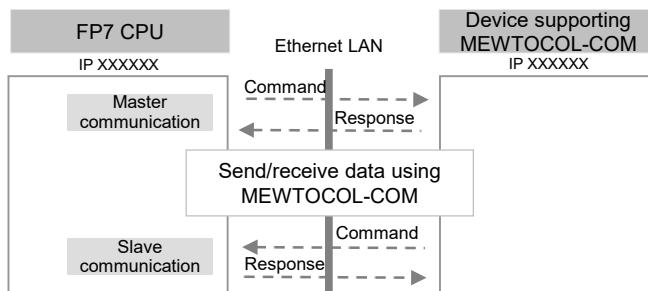
i Info.

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

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

■ Overview of function

- Execute communication using "MEWTOCOL-COM", a communication protocol used by our PLC.
- One device has the sending right, and executes communication by sending commands to devices that support "MEWTOCOL-COM", and receiving responses.
- The slave-side PLC responds automatically, so no program concerning communication is necessary.
- Also on the master-side PLC, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.
- Because MEWTOCOL-COM communication is on an ASCII basis, it is suitable for sending/receiving text data.
- The data size that can be sent or received in a single communication is up to 507 words for register transmission and 1 bit for bit transmission.



■ Applications of MEWTOCOL-COM communication

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

- Programmable controller FP series

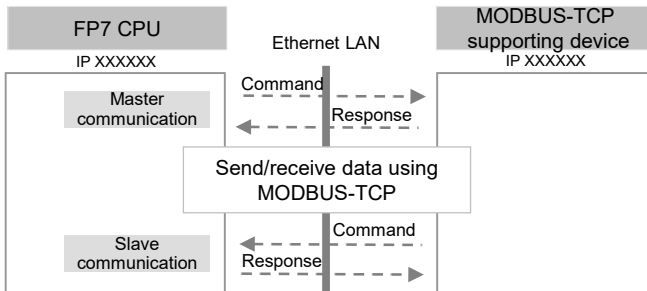
1.3.3 MODBUS TCP Master/Slave Communication

■ Overview of function

- This is used for communicating with other devices that support the MODBUS TCP protocol.
- In master communication, communication is performed when the master unit sends instructions (command messages) to slave units and the slave unit returns responses (response messages) according to the instructions. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.
- Slave communication is performed when the higher device connected to PLC has the sending right, and sends commands, and PLC returns responses. In slave communication, PLC responds automatically, so no program concerning communication is necessary on the PLC side.

1.3 Overview of Communication Functions

- The data size that can be sent or received in a single communication is up to 127 words for register transmission and 2040 bit for bit transmission.



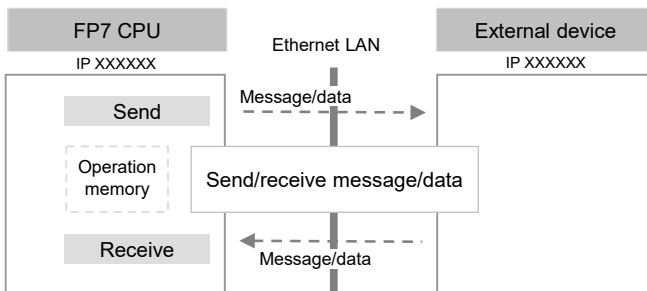
1.3.4 General-Purpose Communication

■ Overview of function

- General-purpose communication is used when PLC executes communication in accordance with the command specifications of the partner device.
- Formulation and sending of command messages to the partner device, and reception processing of responses from the partner device, are performed by the user program. Sending/receiving of data with an external device is executed via given operation memory (e.g. data register).
- Data are sent by setting message/data in a given data register in accordance with the partner device, and executing GPSEND command.
- Data received from the partner device are temporarily saved in the buffer. Based on the reception done flag, GPRECV command is executed and the received data are copied into a given operation memory. The received data can be converted into numerical data, etc. as necessary, by the user program.
- The data size that can be sent or received in a single communication is up to 16,372 bytes per connection.

(Note 1) When a dedicated header is not attached, the size is up to 16,384 bytes.

(Note 2) In the case of connection with our PLC FP2 ET-LAN unit, the maximum size is 8,192 bytes.



■ Applications of general-purpose communication

This is used for communication with devices made by differing manufacturers that have dedicated communication protocols.

1.4 Terms

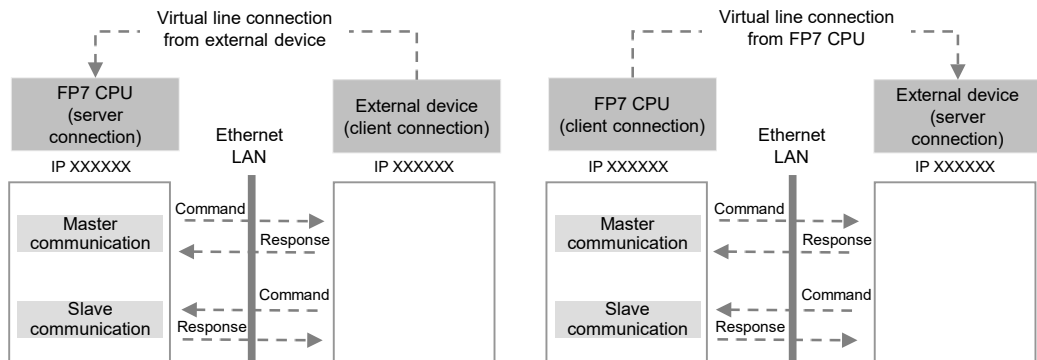
The following terms are used for settings on the software for connecting the FP7 CPU unit to Ethernet LAN, and in the Users Manuals.

■ Server connection and client connection

- These indicate methods for connecting a virtual communication line between FP7 and an external device.
- "Server connection" refers to a method to wait for connection from another client.
- "Client connection" refers to a method to connect a virtual communication line from the FP7 CPU unit to another external device port.

■ Master communication and slave communication

- These indicate methods for actually sending/receiving messages and data between FP7 and an external device.
- In master communication, PLC sends commands and receives responses.
- In slave communication, commands are received from an external device, and responses are returned.
- In a system using FP7, whether server connection or client connection is selected, once connection is opened and a virtual communication line is connected, commands and responses can be sent and received from both sides.



(MEMO)

2 Installation and Wiring

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2.1 Installation Environment and Wiring for LAN Ports

2.1 Installation Environment and Wiring for LAN Ports

2.1.1 Before Installation or Wiring

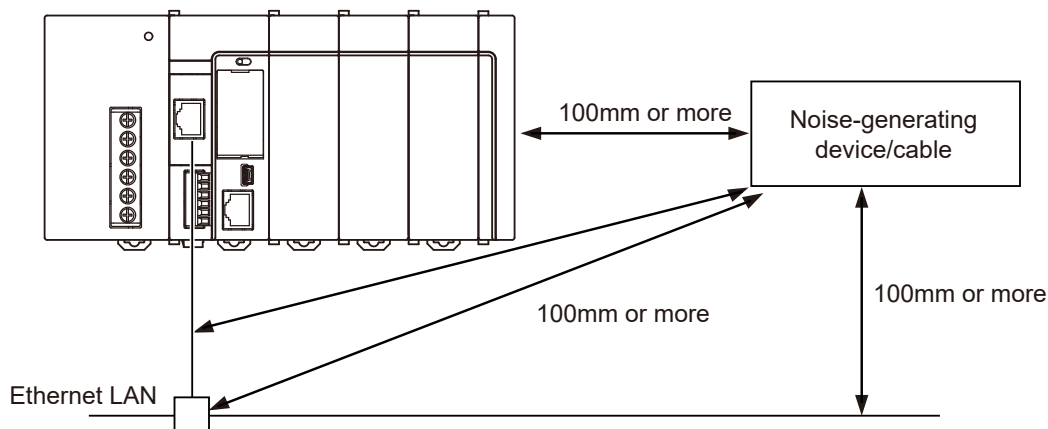
■ Noise suppression of Ethernet

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 the installation environment

- The CPU 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.



- If you have no choice but to install equipment or lay cables close to noise-generating equipment, take measures such as:
 - Install the programmable controller and hub in a metal panel
 - Install the communications cable in a metal duct
 - Install a ferrite core near the CPU unit of the communications cableEtc.
- 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. 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 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 the Application

Communication errors occurring in the unit can be minimized by taking the steps outlined below. Corrective measures should also be taken on the computer side, such as increasing the number of times that data is sent.

■ Increasing the timeout judgment time

When master communication instructions (SEND/RCV) are executed, select "CPU configuration" in the tool software FPWIN GR7, and increase the set value for "Time setting: Communications control instruction timeout time". Default value is set at 10 seconds (set value: 100).

Info.

- For configuration, refer to "[3.2.1 List of setting items](#)".

3 Configuration

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3.1 Procedure for Setting Communication Conditions

3.1 Procedure for Setting Communication Conditions

3.1.1 Setup Procedure

- To use communication functions based on the LAN port, communication conditions must be set.
- Settings should be performed by the programming tool FPWIN GR7.

1 2 Procedure

1. Select **Options>FP7 Configuration>Built-in ET-LAN** from the menu bar.
The "Built-in ET-LAN" dialog box appears.

Setting item	Setting description
Basic communications information	
Specify IPv4 or IPv6.	IPv4 only
IPv4 address automatic acquisition	No
Automaticacly acquire IPv6 address	No
Home IP address (IPv4)	192 . 168 . 1 . 5
Subnet mask (IPv4)	255 . 255 . 255 . 0
Default gateway (IPv4)	192 . 168 . 1 . 1
Subnet prefix length (IPv6)	64
Local IP address (IPv6)	fe80:1234:5678:1234:5678
Default gateway (IPv6)	fe80:1
TCP zero window timer value	5
TCP resend timer value	5
IP assembly timer value	3
TCP terminator detection timer value	20
DNS server IP address	Set manually.
Specify DNS server IP	IPv4
Priority DNS server	0 . 0 . 0 . 0
Alternate DNS server	0 . 0 . 0 . 0
Add-on	
Add-on	Not use.
Web Server function	Not use.
EtherNet/IP Function	Not use.
No. of User Connections	16
Routing setting	
Routing setting	Not use.
Route 1 Destination network 1	0 . 0 . 0 . 0
Destination subnet mask 1	0 . 0 . 0 . 0
Router IP address 1	0 . 0 . 0 . 0

2. Set conditions for each item, and press the [OK] button.
The settings are registered in the project.
3. Select **Project>Save As** from the menu bar.

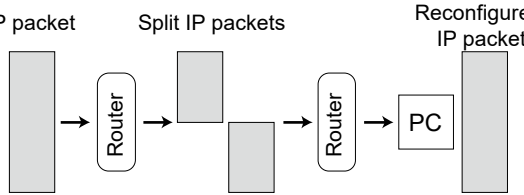
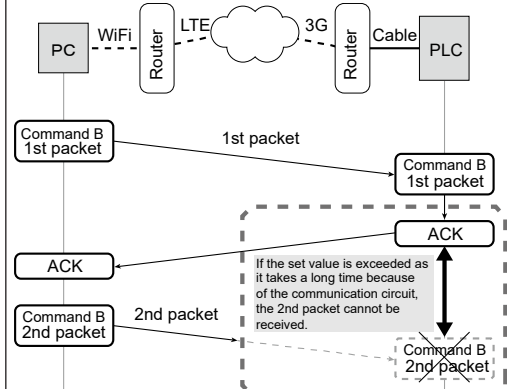
3.2 Setting Basic Communication Information

3.2.1 List of setting items

■ List of setting items (Basic communication information)

Setting item	Default	Remark
IPv4 address automatic acquisition	No	When the IP address is to be acquired automatically, change the value to "Yes".
Home IP address (IPv4)	192.168.1.5	Specify the IP address and subnet mask of the master unit.
Subnet mask (IPv4)	255.255.255.0	
Default gateway (IPv4)	192.168.1.1	<ul style="list-style-type: none"> 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.
TCP zero window timer value	5	Setting range: 0001 to 65535 (by 100 ms) With TCP, this sets the time until the receive window size check packet is re-sent when the receive window size of the other node becomes 0.
TCP resend timer value	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 partner 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. The maximum number of resent attempts is 12.
IP assembly timer value	3	Setting range: 0001 to 65535 (by 100 ms)

3.2 Setting Basic Communication Information

Setting item	Default	Remark
		<p>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.</p>  <p>IP packet → Router → Split IP packets → Router → Reconfigured IP packet → PC</p>
TCP terminator detection timer value	20	<p>Setting range: 0001 to 65535 (by 1 ms)</p> <p>This specifies time for monitoring the arrival of the next segment, when a split TCP segment is received. TCP reception is regarded as completed if no data are received after the time as specified above has passed.</p> <p>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.</p> 
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	

(Note 1) As for setting ranges for master unit IP address, subnet mask and default gateway, refer to "4.1.6 IP Address Setting Specifications".

3.3 Settings for SNTP server

These settings are required when the time is synchronized by SNTP while the calendar timer function is being used.

■ List of setting items (SNTP server)

Setting item	Default	Setting method
SNTP Address setting method	Use IPv4.	Select the setting for SNTP server (Use IPv4 / Use IPv6 / Specify by name).
SNTP IP address (Name)	0.0.0.0	Specify the setting for SNTP server (IP address / host name).
Time zone	+0000	Setting unit: ± HHMM (HH: hour, MM: minute) Setting range: +9999 to -9999 Specify a standard time zone in each region based on GMT.

The time data acquisition method can be changed from **Options>FP7 Configuration>CPU configuration**.

■ List of setting items (Time data acquisition method)

Setting item	Default	Explanation
Acquire automatically from SNTP server	No	Set whether to automatically acquire time data from SNTP server or not.
Slot number of unit to acquire	0	Set the slot number of a unit to acquire time data.

■ List of setting items (Time acquisition timing)

Setting item	Default	Explanation
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.
Automatically acquire time data every day		
Daily 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 week		
Weekly time: Day of the week	0	Set a day of the week for acquisition. Setting range: 0 to 6 The corresponding values and day of the week vary according to the content of "Set PLC Date/Time".
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 range: 1 to 28

3.3 Settings for SNTP server

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

3.4 Settings for FTP server

Select this to use the FTP server function.

■ List of setting items (FTP server)

Setting item	Default	Setting method
Specify FTP server to use	Not use	Select whether you will use the FTP server function.
Allow anonymous users	Not allow	If authentication by user account and password is not required, select "Allow".
FTP server disconnect time	3000	Setting unit: 100 ms Setting range: 3000 (0BB8H) to 429,496,729 (1999 9999 H) Input the no-communication monitoring time during FTP connection (unit: 100 ms). Connection is automatically cut off when FTP no-communication exceeds the specified time.
Username	root	
Password	****	

Note

- Please note the following when accessing the FTP server from other clients.
If a user fails to input the correct password more than the regulated number of times, access to the FTP server becomes impossible.
In that case, after a certain amount of time has lapsed, password input can be performed again.
 - The waiting time varies depending on the firmware version of the unit or the number of failures.

CPU unit firmware version	No. of failures (Total)	Wait
Up to Ver.4.42	3 or more times	60 minutes
Since Ver.4.43	5 times	10 minutes
	10 times	30 minutes
	15 or more times	60 minutes

- When access is successful or the power supply is turned on again, the number of failures will be reset to 0.

3.5 Setting of System Connection

3.5 Setting of System Connection

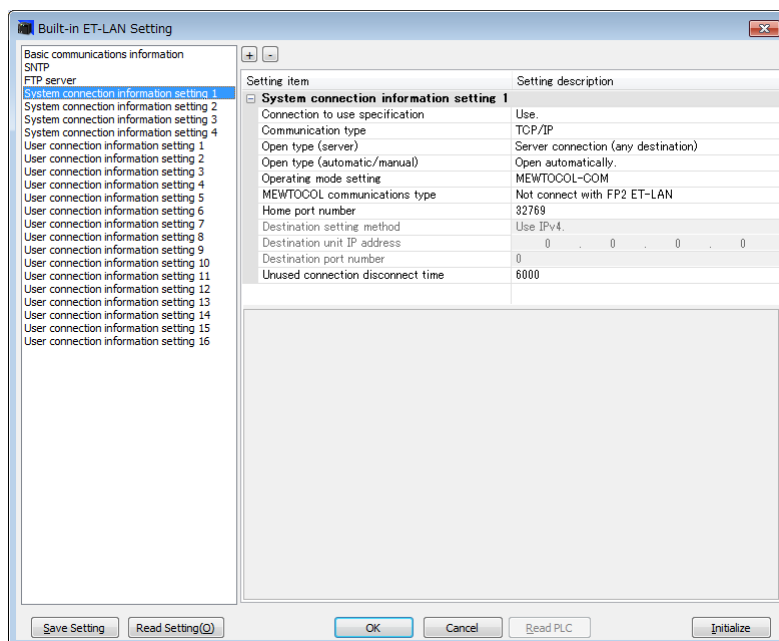
3.5.1 List of setting items

System connection is used when using a programming tool via LAN port.

■ List of setting items

Setting item	Default	System Connection - Setting method
Operating mode setting	MEWTOCOL-COM	Select the operation mode MEWTOCOL-COM.
Setting of application use	Specifying connection to use	Use Specify whether system connection is to be used.
	MEWTOCOL communication type	Not connect with FP2 ET-LAN Select "Not connect with FP2 ET-LAN".
	Open type (server)	Server connection (destination unit arbitrary) Select the open type (Server connection (any destination)).
	Open type (automatic/manual)	Open automatically Select the open type (automatic/manual). Select "Open automatically".
	Communication method	TCP / IP Select the communication protocol (TCP/IP).
Home port number	Connection 01: 32769 Connection 02: 32770 Connection 03: 32771 Connection 04: 32772	Specify the source node (sender) port number.
Destination port number	Connection 01: 32769 Connection 02: 32770 Connection 03: 32771 Connection 04: 32772	Specify the partner node (receiver) port number. This needs not to be set if the partner node is not specified.
Unused connection disconnect time	Connection 01: 6000 Connection 02: 360000 Connection 03: 360000 Connection 04: 360000	Setting unit: 10 ms Input the no-connection communication monitoring time. Connection is automatically cut off when no-connection communication exceeds the specified time.
Destination setting method	Use IPv4.	Select the setting for partner node (IP address). This needs not to be set if the partner node is not specified.
Destination unit IP address	0.0.0.0	Specify the setting for partner node (IP address). This needs not to be set if the partner node is not specified.

System connection information setting screen



Info.

- System connection is aimed at connecting a programming tool. Use this in default settings (MEWTOCOL-COM, Server connection (any destination), Open automatically, TCP/IP).

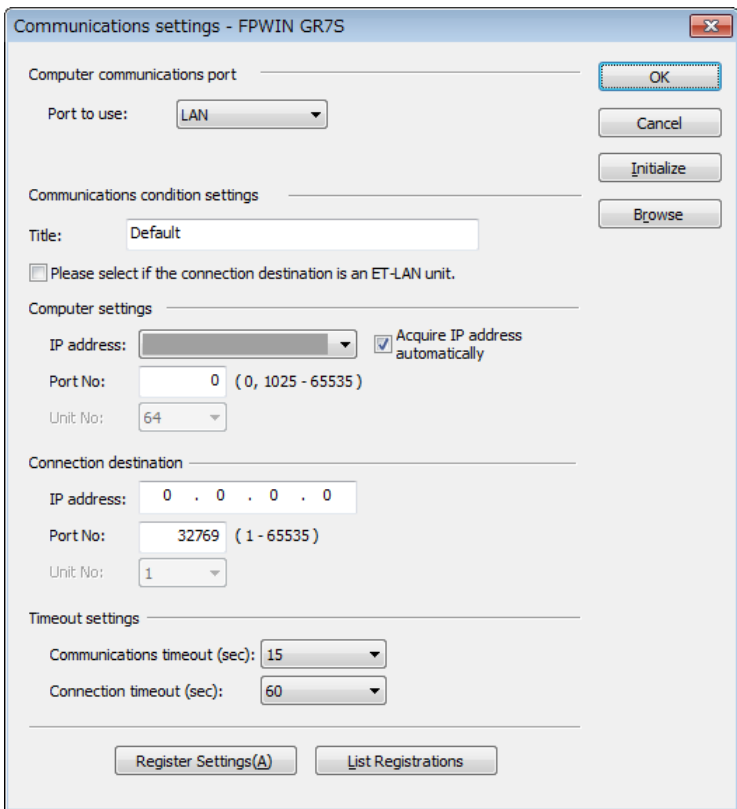
3.5.2 Setting on the Programming Tool Side

For using the system connection, communication settings should be performed on the programming tool FPWIN GR7 side.

1 2 Procedure

1. From the menu bar, select **Online>Communication Settings**.
The "Communications settings" dialog box is displayed.
2. Switch the port to be used to "LAN".
Setting items for LAN connection are displayed.

3.5 Setting of System Connection



- In the "Connection destination setting" field, input the "IP address" and "Port No".

Items	Settings
IP address	IP address set in Basic communication information
Port No.	Connection 01: 32769 Connection 02: 32770 Connection 03: 32771 Connection 04: 32772

- Press the [OK] button.

Note

- When the connection is restricted on the PC side, the system connection may not be established. In that case, confirm the communication settings on the PC side such as subnet mask.

3.6 Setting of User Connections

3.6.1 List of Setting Items

■ List of setting items

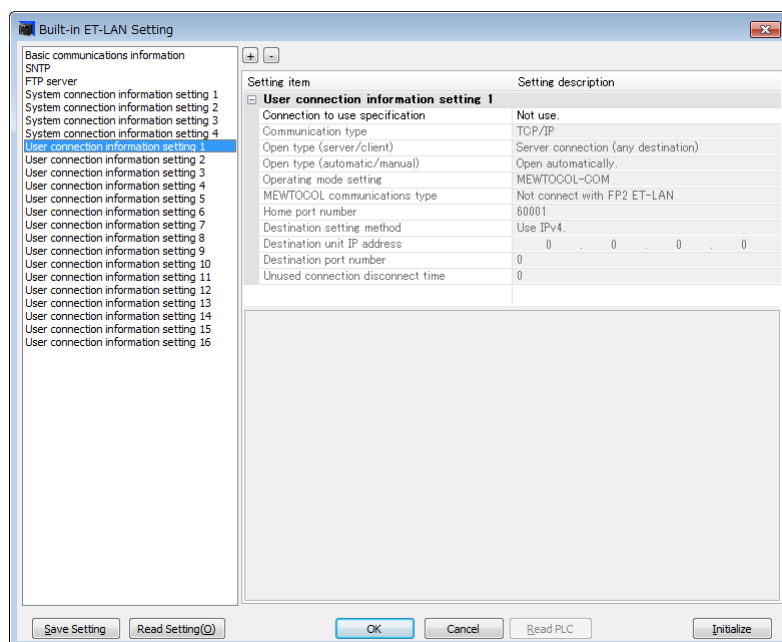
Setting item		Default	Setting method
Operating mode setting		MEWTOCOL-COM	Select an operating mode (MEWTOCOL-COM / MEWTOCOL7-COM / MODBUS-TCP / MEWTOCOL-DAT / General-purpose communication / MC protocol (QnA compatible 3E frame, binary)).
Set ting of app lica tion use	Specifying connection to use	Not use	Specify whether each connection is to be used.
	MEWTOCOL communication type		Conditions to be selected vary by the selected operating mode.
	MEWTOCOL-DAT MEWTOCOL-COM is selected	Not connect with FP2 ET-LAN	Not connect with FP2 ET-LAN When communication is to be performed with an FP2 ET-LAN unit, select "Connect with FP2 ET-LAN".
	When selecting general-purpose communication	Append a special header	When general-purpose communication is to be performed between FP7 units or with FPOH, reception completion can be determined quickly by selecting "Append a special header".
	Open method (Server / Client)	Client connection	Select the open type (Server connection (any destination) / Server connection (specific destination) / Client connection).
	Open type (automatic/manual)	Open automatically	Select the open type (automatic/manual). Select "Open automatically".
Communication method		TCP / IP	Select the communication protocol (TCP IP / UDP IP).
Home port number		0	Specify the source node (sender) port number.
Destination port number		0	Specify the partner node (receiver) port number.
Unused connection disconnect time		0	Input the no-connection 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, the operation varies depending on the open type. Server connection (any destination): 60 seconds is set Server connection (specified destination): Connection is not automatically cut off Client connection: Connection is not automatically cut off
Destination setting method		Use IPv4.	Select the setting for destination unit IP address (IPv4 / IPv6).
Destination unit IP address		0.0.0.0	Set the IP address for destination unit.

3.6 Setting of User Connections

i Info.

- Select a desired operation mode.
- In the case of client settings, when specifying the connection to use, only select "Use" for the connection to be used. If connection fails when "Use" is selected, a communication error occurs.
- The MEWTOCOL communication type is a function to maintain compatibility with the existing models of FP2 ET-LAN unit. For connection between FP7 units, default values should be used.
- For the open type, select "Open automatically". For server connection/client connection, refer to "4.1 Configuration Concerning Open Process".

User connection information setting screen



3.6.2 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	
		Multiple settings for source node port No., single setting for destination node port No.	•	-
		Single setting for source node port No. and destination node port No.	•	-
Connections with multiple nodes		Multiple settings for source node port No.	•	•
		Single setting for source node port No.	Cannot be set	

i 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.

(MEMO)

4 Setting and Operation of User Connection

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4.1 Configuration Concerning Open Process

4.1 Configuration Concerning Open Process

4.1.1 Connection of the FP7 CPU Unit

■ Operation of the FP7 CPU unit

- The FP7 CPU unit opens a virtual communication line with devices in accordance with user connection information (Open type, communication type, port number, destination unit IP address) in the configuration menu.
- One FP7 CPU unit can open virtual communication lines for up to 16 connections.
- Lines for each connection can be used in different connection methods (TCP or UDP), and in different operation modes (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, general-purpose communication).
- Once a line is connected, PLC and devices can communicate in the specified operation mode. The connection status can be confirmed using the operation device (X80 - X9F).

4.1.2 Specifying connection to use

- Among the 16 connections, set the setting items for the user connection to be used to "Use". By default, "Not use" is selected.
- In the case of client connection, if connection fails when "Use" is selected, a communication error occurs.

4.1.3 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.
Client connection	Connects with a destination port of server connection.

4.1.4 Open Method (Automatic/Manual)

Select an open method (Automatic/Manual).

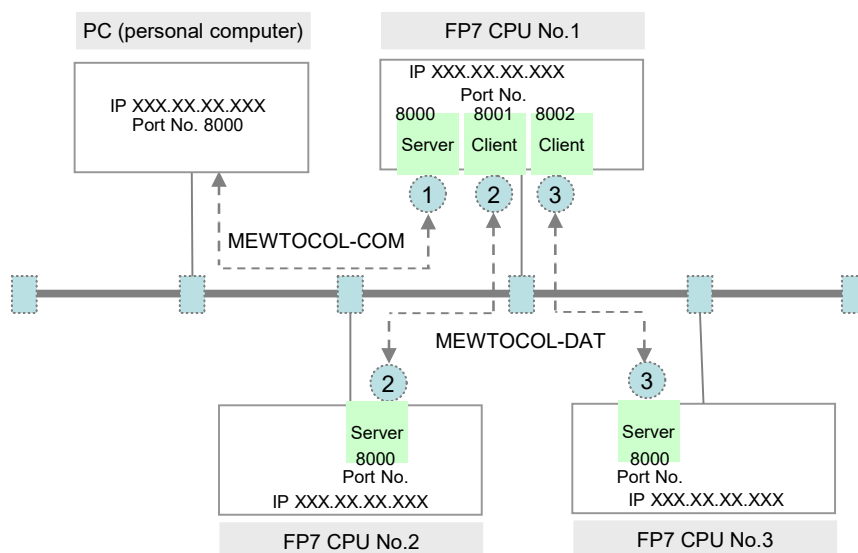
Settings	Operation
Opens automatically. (Automatic opening)	<ul style="list-style-type: none">• When powered ON, FP0H control unit automatically opens virtual communication lines with devices, based on user connection information specified in the configuration menu (open method, communication method, port No., destination unit IP address).

4.1 Configuration Concerning Open Process

Settings	Operation
	<ul style="list-style-type: none"> 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.

4.1.5 Instructions for Specifying Connection Conditions

- In Ethernet communication using the FP7 unit, different operation modes, open method, and communication methods can be specified for each connection.
- Specify the same conditions for operation mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS-TCP, general-purpose communication) and communication methods (TCP/IP, UDP/IP) for devices to be connected in each connection. Also specify the IP address and port number of each device.



(Note 1) Circled numbers in the figure above indicate examples of allocation of connection numbers.

■ Setting example

Node	Connection No.	Operating mode setting	Open method	Communication method	Remark
PC (personal computer)	-	MEWTOCOL-COM	Active Open	TCP / IP	Use applications that support MEWTOCOL-COM.
FP7 CPU No. 1	1	MEWTOCOL-COM	Server connection Open automatically	TCP / IP	

4.1 Configuration Concerning Open Process

Node	Connection No.	Operating mode setting	Open method	Communication method	Remark
	2	MEWTOCOL-DAT	Client connection Open automatically	TCP / IP	
	3	MEWTOCOL-DAT	Client connection Open automatically	TCP / IP	
FP7 CPU No. 2	2	MEWTOCOL-DAT	Server connection Open automatically	TCP / IP	
FP7 CPU No. 3	3	MEWTOCOL-DAT	Server connection Open automatically	TCP / IP	

(Note 1) When the destination is an FP2 ET-LAN unit, select "Connect with FP2 ET-LAN" for the MEWTOCOL communication type.

4.1.6 IP Address Setting Specifications

■ List of usable IP addresses

Address range	Remark
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 with instruction		Setting with 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	×	○	×	○	○
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 marks E1 to E2 and T1 to T3 in the above list indicate the combinations in the following table.

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

(Note 2) When an IP address that cannot be set is specified with an instruction, an operation error will not occur and the error codes of CY (R9009) and DT90529 will be set.

■ Netmask setting

Masked bits should be left-justified for netmask 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 netmask) ≠ (Default gateway address AND netmask)

■ Judgement using the combination of IP address and netmask

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



- The combination above may occur when masks are set to omission using IPv4SET instruction.
Example: When the netmask is 255.255.0.0, set the IP address = 0.0.255.255 using IPv4SET.
- The set values for IP address, netmask and default gateway are initialized when the communication process is performed using the combination above. The default values are as follows.
IP address = 192.168.1.5, Netmask = 255.255.255.0, Default gateway = 192.168.1.1

4.2 Communication Processing

4.2.1 Communication Operation

■ Operation following connection

- Once connection is established, PLC and devices can communicate in the respectively specified operation mode.
- By default, the FP7 CPU unit is set to enable slave communication.
- When master communication is to be performed from the FP7 CPU unit to devices, use the dedicated commands SEND/RECV. When general-purpose communication is to be performed, use GPSEND/GPRECV commands.
- In the case of master communication commands (SEND/RECV), PLC automatically generates communication formats that support the protocol for each communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP).
- When commands are sent from a higher device to the FP7 CPU unit, in communication formats that support the protocol for each communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP), data attached with the Ethernet header are sent as necessary (to be selected according to protocol or destination). Here, the FP7 CPU unit responds automatically, so no program concerning communication is necessary on the PLC side.

■ Confirm sending/reception of each communication

- When communication is performed from the FP7 CPU unit and devices, the operation devices (X, Y) allocated to built-in ET-LAN are used for confirming reception, reading data, and/or confirming sending completion.
- Relevant flags are allocated to Device No. X70 - X9F and Y70 - Y9F.

4.3 Input/Output Signals Used for Communication

4.3.1 I/O Allocation

■ Input signal

Input signal	Supported connection	Name	Description	Valid operation mode
X70	Connection 1	General-purpose communication reception done flag	<ul style="list-style-type: none"> Turns ON when a connection is established in general-purpose communication mode and data are received. Turns OFF when the general-purpose communication receive instruction (GPREC V) is executed and data are received. Turns OFF when the connection is MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP. 	General-Purpose Communication
X71	Connection 2			
---	---			
X79	Connection 10			
X7A	Connection 11			
X7B	Connection 12			
X7C	Connection 13			
X7D	Connection 14			
X7E	Connection 15			
X7F	Connection 16			
X80	Connection 1	Clear to send general-purpose communication flag	<ul style="list-style-type: none"> Turns ON when a connection is established in general-purpose communication mode. Turns OFF when a connection is not established. Turns OFF when the connection is MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP. 	General-Purpose Communication
X81	Connection 2			
---	---			
X89	Connection 10			
X8A	Connection 11			
X8B	Connection 12			
X8C	Connection 13			
X8D	Connection 14			
X8E	Connection 15			
X8F	Connection 16			
X90	Connection 1	Clear to send master communication flag	<ul style="list-style-type: none"> Turns ON when a connection is established in MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP. Turns OFF when a connection is not established. Turns ON when connection is general-purpose communication. The flag can be used for checking the establishment of connection regardless of master communication or slave communication. 	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP
X91	Connection 2			
---	---			
X99	Connection 10			
X9A	Connection 11			
X9B	Connection 12			
X9C	Connection 13			
X9D	Connection 14			
X9E	Connection 15			
X9F	Connection 16			

4.3 Input/Output Signals Used for Communication

■ Output signal

Output signal	Supported connection	Name	Description	Valid operation mode
Y70	Connection 1	Sending done result flag	<ul style="list-style-type: none"> • Reports completion result when execution of the general-purpose communication send instruction (GPSEND) or the master communication instructions (SEND/RECV) has completed. • Turns OFF when transmission has been completed normally, and turns ON when transmission has been completed abnormally. 	General-Purpose Communication MEWTOCOL-COM master MEWTOCOL-DAT master MODBUS TCP master
Y71	Connection 2			
---	---			
Y79	Connection 10			
Y7A	Connection 11			
Y7B	Connection 12			
Y7C	Connection 13			
Y7D	Connection 14			
Y7E	Connection 15			
Y7F	Connection 16			
Y80	Connection 1	Sending general-purpose communication flag	<ul style="list-style-type: none"> • Turns ON at the start of execution of the general-purpose communication send instruction (GPSEND), and turns OFF when sending has been completed. • Turns ON at the start of execution of the send instruction, and turns OFF when the instruction is executed once sending has been completed. 	General-Purpose Communication
Y81	Connection 2			
---	---			
Y89	Connection 10			
Y8A	Connection 11			
Y8B	Connection 12			
Y8C	Connection 13			
Y8D	Connection 14			
Y8E	Connection 15			
Y8F	Connection 16			
Y90	Connection 1	Sending master communication flag	<ul style="list-style-type: none"> • Turns ON at the start of execution of the master communication send instruction (SEND), and turns OFF when sending has been completed. • Turns ON at the start of execution of the send instruction, and turns OFF when the ED instruction is executed once the response has been received. 	MEWTOCOL-COM master MEWTOCOL-DAT master MODBUS TCP master
Y91	Connection 2			
---	---			
Y99	Connection 10			
Y9A	Connection 11			
Y9B	Connection 12			
Y9C	Connection 13			
Y9D	Connection 14			
Y9E	Connection 15			
Y9F	Connection 16			

Note

- Each contact in the table above is used for reading the operation status. Do not write over it with a user program.

5 MEWTOCOL Master/Slave Communication

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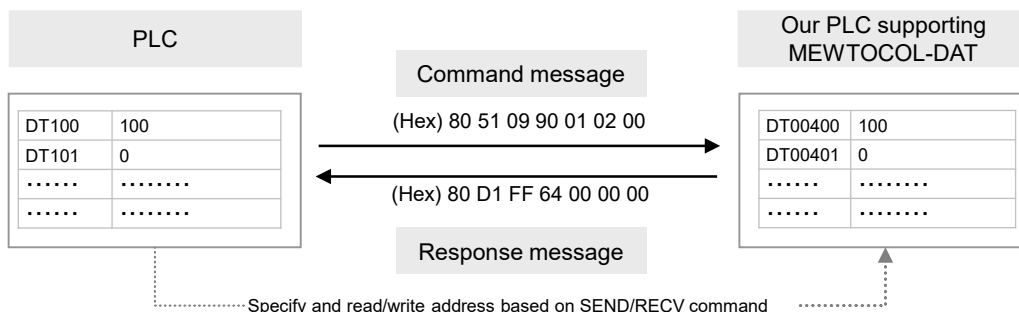
5.1 Types of MEWTOCOL Communication

5.1 Types of MEWTOCOL Communication

5.1.1 MEWTOCOL-DAT (Binary Communication)

■ Instructions

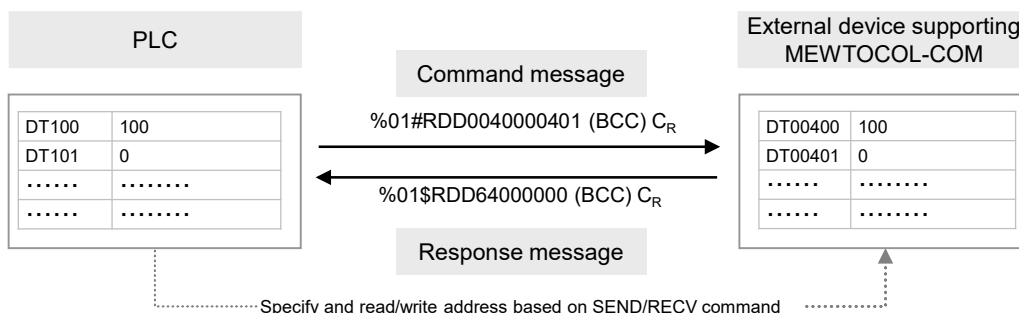
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL-DAT, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-DAT. In communication via LAN, a header including size information of the sent data is added.

5.1.2 MEWTOCOL-COM (ASCII Communication)

In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL-COM, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-COM. In communication via LAN, a header including size information of the sent data is added.

Note

- In MEWTOCOL-COM7, there is no master communication function.

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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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 ["8.3 MEWTOCOL-COM Format"](#).

5.2 List of MEWTOCOL Supported Commands

5.2.3 List of MEWTOCOL7 Commands

■ Commands to be used

Type of instruction	Code	Description
Read data area	MMRD	Reads the contents of a data area.
Write data area	MMWT	Writes data to a data area.

Info.

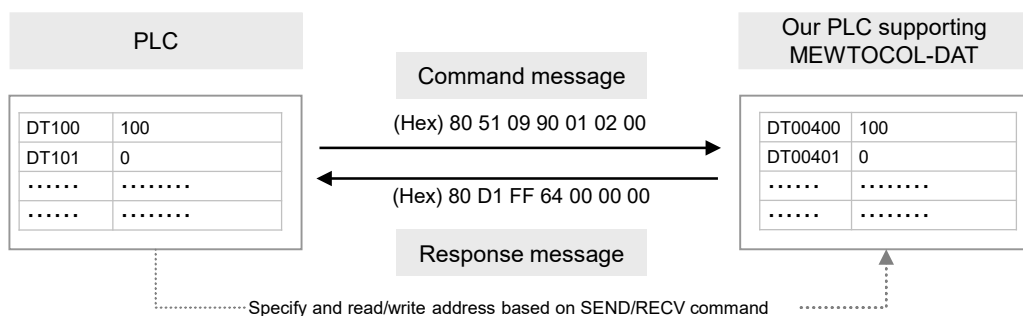
- For details of MEWTOCOL commands, please see "[8.4 MEWTOCOL7-COM Format](#)".

5.3 MEWTOCOL Master Communication (RECV)

5.3.1 Read Data from an External Device

■ Instructions

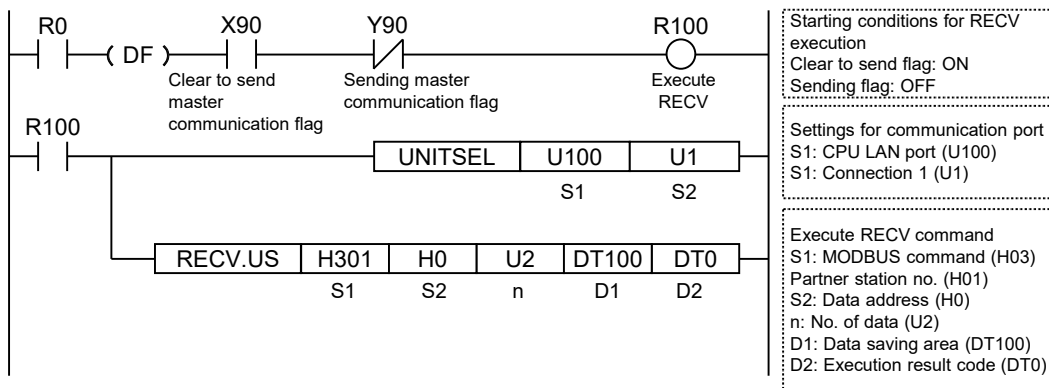
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-DAT. In communication via LAN, a header including size information of the sent data is added.

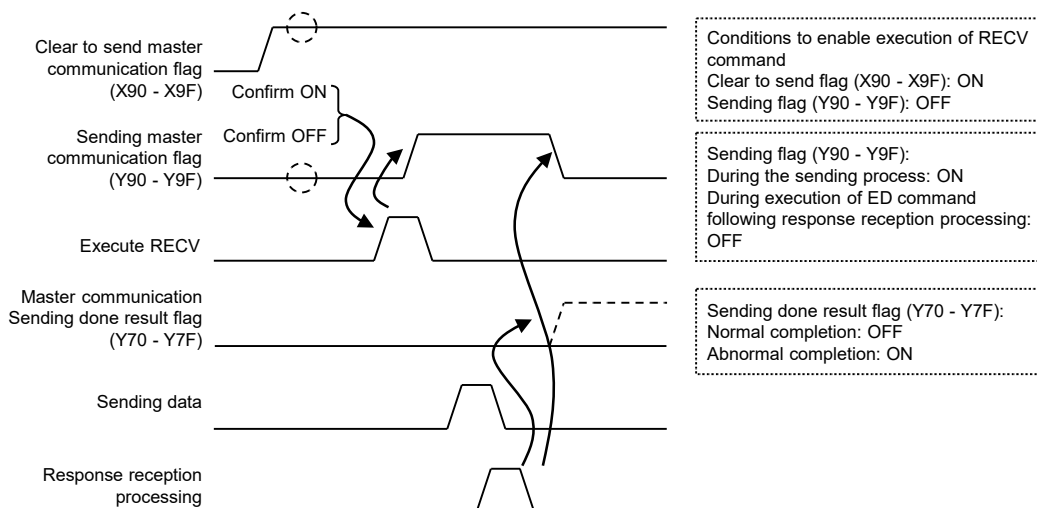
■ Sample program

- This program sends commands from the LAN port of the CPU unit. Data are read from the data areas DT400 to DT401 of the external device, and written into the data registers DT100 to DT101 of the PLC.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the RECV command, specify and execute the partner station no. (U1), initial address (DT400), No. of data (U2), and initial address on the PLC side to save data (DT100).



5.3 MEWTOCOL Master Communication (RECV)

■ Timing chart



■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	Turns ON when master communication is in a connected status.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on the SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

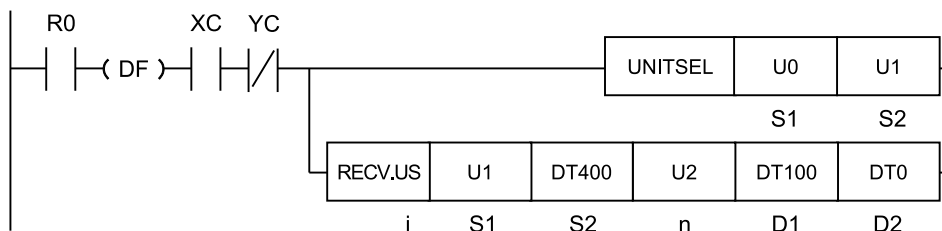
(Note 1) Each contact is used for reading the operation state. Do not write over it with a user program.

i Info.

- Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.
- Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flag" (X90 to X9F) is ON for the corresponding connection, and execute the SEND/RECV instruction.
- You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "master communication sending flag" (Y90 to Y9F) is OFF, and execute the command.
- You cannot execute SEND/RECV command for connection in slave communication.
- Up to 16 SEND/RECV commands can be executed simultaneously for different connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The destination is determined by an IP address.

5.3.2 RECV (MEWTOCOL Master / MODBUS Master)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Operand	Description
S1	Partner station number
S2	Starting address of the device in the sender data area of the partner unit
n	Number of received data
D1	Starting address of the device in the receiver data area of the master unit
D2	Starting address of the device area of the master unit that stores the execution result code (1 word)

■ Available word devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer		Real number		String	Index modifier	
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF			DF
S1	●	●	●	●			●	●								●	●				●
S2 ^(Note 1)	●	●	●	●			●	●													●
n	●	●	●	●			●	●								●	●				●
D1	●	●	●	●			●	●													●
D2	●	●	●	●			●	●													●

(Note 1) When the source unit is FP7, only global devices can be specified. (Local devices cannot be specified.)

5.3 MEWTOCOL Master Communication (RECV)

■ Available bit devices (●: Available)

Operand	Bit device											Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n	
S1														
S2 ^(Note 1)	●	●	●	(Note 2)								(Note 3)	(Note 3)	●
n														
D1	●	●	●	●								●	●	●
D2														

(Note 1) When the sender is FP7, only global devices can be specified. (A local device cannot be specified.)

(Note 2) In the case of MODBUS mode, a bit device cannot be specified.

(Note 3) In the case of MEWTOCOL-COM mode or MODBUS mode, a bit device cannot be specified.

■ Outline of operation

- Commands are sent from the communication port of the unit to perform the data transmission with external devices.
- Data can be read and written by specifying station numbers and memory addresses and executing the SEND and RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select **communication mode** in the **configuration** menu of the tool software FPWIN GR7.
- When the RECV instruction is executed, the data is read from the address that starts with [S2] in the partner station number [S1] and the data is stored in the area that starts with [D1] in the master unit.
- Depending on the type of device specified by [S2] and [D1], the transfer method (register transfer / bit transfer) varies.
- The amount of received data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D2].

■ Specification of partner unit station number [S1]

Communication Mode	When SCU is used	When ET-LAN is used
MEWTOCOL-COM	1 to 99, 238 (decimal) = EE (hexadecimal)	1 to 64, 238 (decimal) = EE (hexadecimal)
MEWTOCOL-DAT ^(Note 1)	Non-SCU-compliant	(Note 1)
MODBUS	1 to 255	1 to 255

(Note 1) For connection between FP7 and FP7, specify "1". Destination is determined by the IP address.

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

Transfer method	Communication Mode	Address range
Register transfer	MEWTOCOL-COM	0 to 99999
	MEWTOCOL-DAT	0 to 65535F

5.3 MEWTOCOL Master Communication (RECV)

Transfer method	Communication Mode	Address range
	MODBUS	0 to 65535 (H FFFF)
Bit transfer	MEWTOCOL-COM	0 to 999F
	MEWTOCOL-DAT	0 to 65535 (H FFFF)
	MODBUS	0 to 65535 (H FFFF)

(Note 1) When the receiver is the file register FL, specify a constant. Example) For FL100, specify U100. For the file register, only bank 0 can be specified.

■ Specification of the amount of received data [n]

Transfer method	Communication Mode	Types of communication port	Setting range
Register transfer (Note 1)	MEWTOCOL-COM	1 to 509 words	RCC command and RD command are used.
	MEWTOCOL-DAT	1 to 1020 words	Connection setting: Setting of the MEWTOCOL Communication type setting: Connect with FP2 ET-LAN
		1 to 2038 words	Connection setting: Setting of the MEWTOCOL Communication type setting: Do not connect with FP2 ET-LAN
	MODBUS	1 to 127 words	Command 1 is used for reading WY and WR. Command 2 is used for WX. Command 3 is used for reading DT Command 4 is used for reading WL and LD
Bit transfer (Note 2)	MEWTOCOL-COM	Fixed to 1 bit	During MEWTOCOL-COM, RCS command is used.
	MEWTOCOL-DAT	Fixed to 1 bit	During MEWTOCOL-DAT, read contact information 53H is used.
	MODBUS	1 to 2040 bits	Command 1 is used for reading Y and R. Command 2 is used for X.

(Note 1) When 16-bit devices are specified for sender [S] and receiver [D2]

(Note 2) When bit devices are specified for sender [S] and receiver [D2]

■ Execution result code [D2]

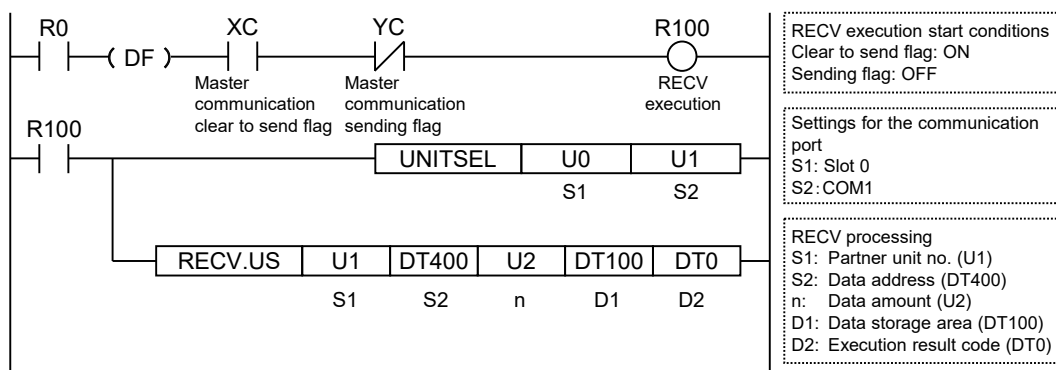
Code	Description	Code	Description
H0	Normal end	H7	I/O allocation shortage error ^(Note 2)
H1	The communication port is being used in the master communication.	H8	The send buffer is being used. ^(Note 3)
H2	The communication port is being used in the slave communication.	H41	Format error
H3	The number of master communication instructions simultaneously used is exceeded.	H60	Parameter error
H4	Transmission timeout	H61	Data error
H5	Response reception timeout	H91	Missing expansion slave unit error
H6	Reception error ^(Note 1)		

5.3 MEWTOCOL Master Communication (RECV)

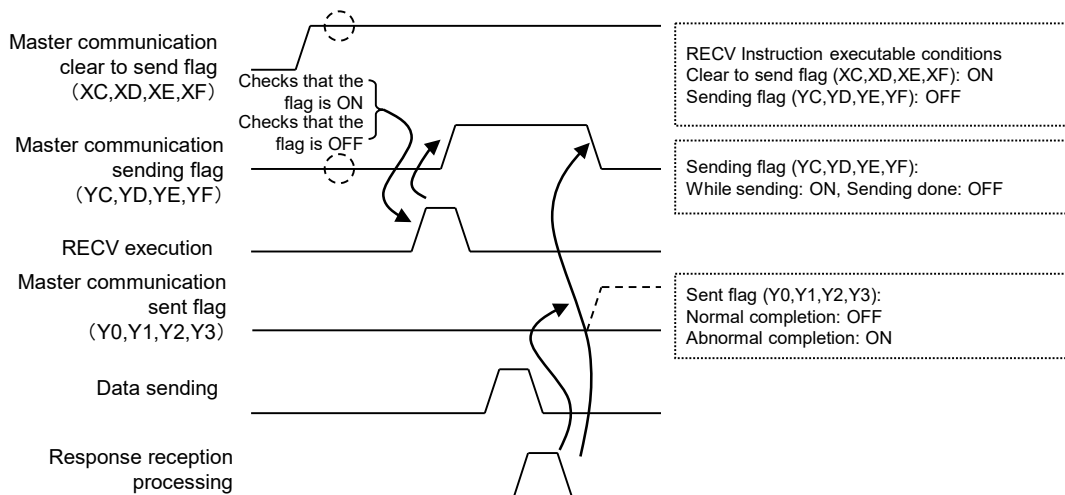
- (Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.
- (Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.
- (Note 3) Effective when the version is 4.57 or later.

■ Sample program (in the case of SCU)

- This program sends the command from the COM1 port of the CPU unit, reads the data from the data areas DT400 to DT401 of the external device (station number 1), and writes the data into the data registers DT100 to DT101 of the PLC.
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the RECV instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the RECV instruction, specify and execute the partner station number (U1), starting address (DT400), data amount (U2), and PLC's starting address to store the data (DT100).



■ Time chart (in the case of SCU)



Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. The communication cassette (Ethernet type) does not support MODBUS.

■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of SCU)

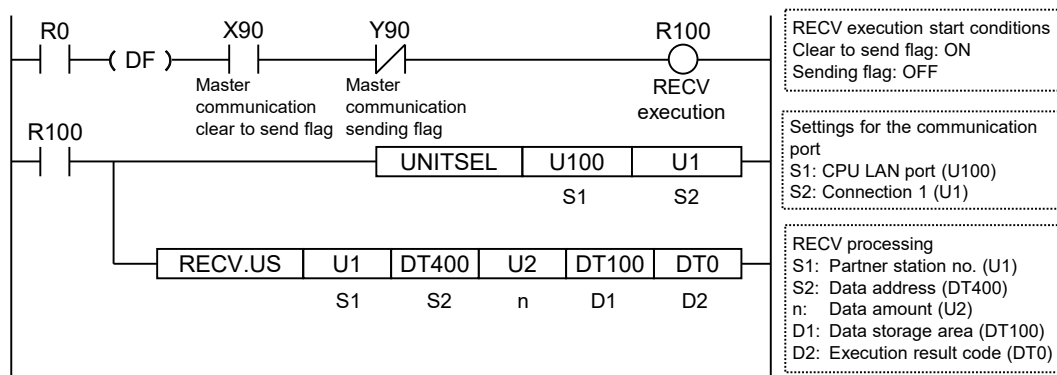
- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.

5.3 MEWTOCOL Master Communication (RECV)

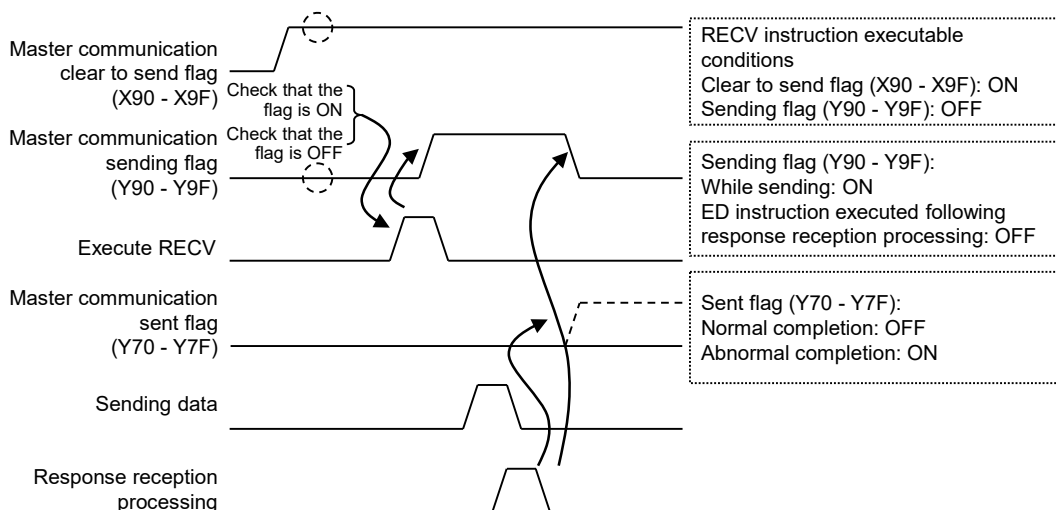
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.
- A SEND/RECV instruction cannot be executed for a port where slave communication is in progress.
- If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing COM ports.

■ Sample program (in the case of CPU with built-in ET-LAN)

- This program sends the command from the LAN port of the CPU unit, reads the data from the data areas DT400 to DT401 of the external device, and writes the data into the data registers DT100 to DT101 of the PLC.
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the RECV instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the RECV instruction, specify and execute the partner station number (U1), starting address (DT400), data amount (U2), and PLC's starting address to store the data (DT100).



■ Time chart (in the case of CPU with built-in ET-LAN)



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The receiver is determined by the IP address.

5.3 MEWTOCOL Master Communication (RECV)

Info.

- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. Refer to the section describing the case of SCU.

■ Flag operations

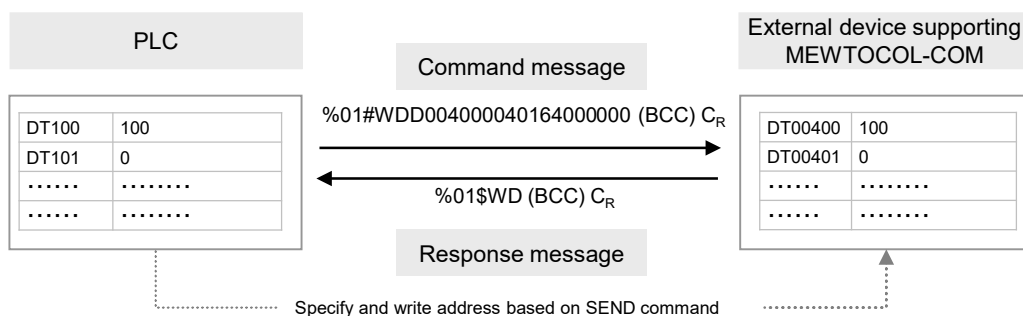
Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the destination range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Partner station number specified by [S1] is out of the range.
	Partner unit sender data device specified by [S2] is invalid.
	Sent data amount specified by [n] is invalid.
	Data device of the receiver data area in the master unit specified by [D1] is invalid, or exceeds the area.
	Result storage device specified by [D2] is invalid.
	Specified bit devices for [S2] and [D1], and/or specified 16-bit device, differ.
Integer specification for [S2] is only available for the MODBUS address direct specification type. It is invalid for other types.	

5.4 MEWTOCOL Master Communication (SEND)

5.4.1 Write Data into an External Device

■ Instructions

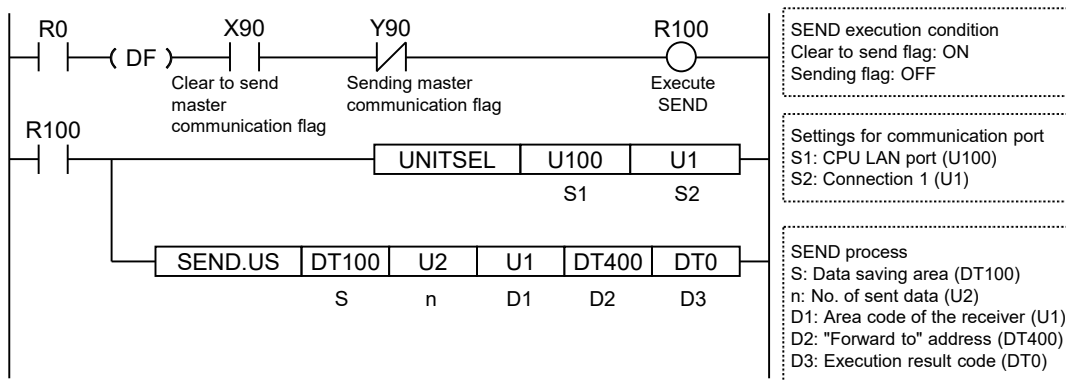
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing SEND commands.



Note: The above figure indicates the data part of MEWTOCOL-COM. In communication via LAN, a header including size information of the sent data is added.

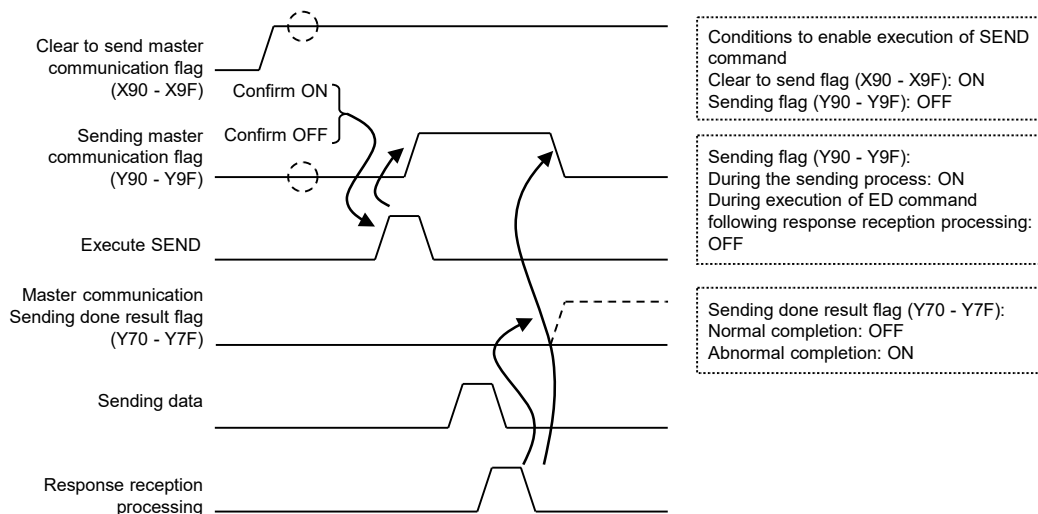
■ Sample program

- Send commands from the LAN port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device DT400 - DT401.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the SEND command, specify and execute the sender initial address (DT100), No. of data (U2), "Transmit to" station no. (U1), and initial address (DT400).



5.4 MEWTOCOL Master Communication (SEND)

■ Timing chart



■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	Turns ON when master communication is in a connected status.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on the SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

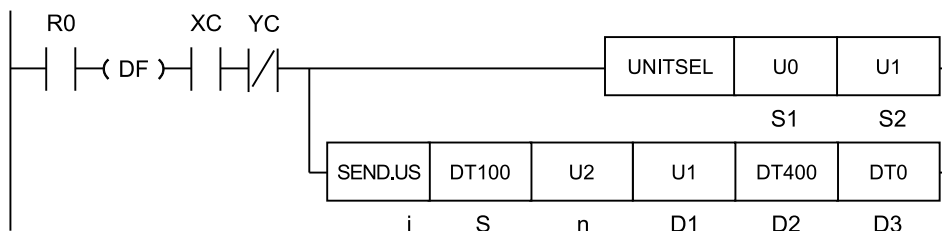
(Note 1) Each contact is used for reading the operation state. Do not write over it with a user program.

i Info.

- Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.
- Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flag" (X90 to X9F) is ON for the corresponding connection, and execute the SEND/RECV instruction.
- You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "master communication sending flag" (Y90 to Y9F) is OFF, and execute the command.
- You cannot execute SEND/RECV command for connection in slave communication.
- Up to 16 SEND/RECV commands can be executed simultaneously for different connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The destination is determined by an IP address.

5.4.2 SEND (MEWTOCOL Master / MODBUS Master)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Operand	Description
S	Starting address of the sender data area
n	Amount of sent data
D1	Partner station number
D2	Starting address of the device in the receiver data area of the partner unit
D3	Starting address of the device area of the master unit that stores the execution result code (1 word)

■ Available word devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		St ring	Index modifier	
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF			""
S	●	●	●	●			●	●														●
n	●	●	●	●			●	●								●	●					●
D1	●	●	●	●			●	●								●	●					●
D2 ^(Note 1)	(Note 2)	●	●	(Note 2)			●	(Note 2)														●
D3	●	●	●	●			●	●														●

5.4 MEWTOCOL Master Communication (SEND)

(Note 1) When the destination unit is FP7, only global devices can be specified. (Local devices cannot be specified.)

(Note 2) In the MODBUS mode, this cannot be specified as the receiver.

■ Available bit devices (●: Available)

Operand	Bit device											Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n	
S	●	●	●	●								●	●	●
n														
D1														
D2(●Note 1)	(Not ●e 2)	●	●	(Not ●e 2)										●
D3														

(Note 1) When the receiver is FP7, only global devices can be specified. (A local device cannot be specified.)

(Note 2) In the case of MODBUS and MEWTOCOL-COM, a bit device cannot be specified.

■ Outline of operation

- Commands are sent from the communication port of the unit to perform the data transmission with external devices. Message in accordance with the protocol is automatically formulated by PLC. The user program only has to specify the station number and the memory address, and execute the SEND/RCV instruction, to carry out reading and writing.
- Select **communication mode** in the configuration menu of the tool software FPWIN GR7.
- When the SEND instruction is executed, data are read from the device in the master unit, starting with [S], and stored in the address starting with [D2] of the partner unit.
- The transfer method (register transfer/bit transfer) varies according to the device types that are specified by [S] and [D2].
- The amount of sent data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D3].

■ Setting the amount of sent data [n]

Transfer method	Communication Mode	Amount of sent data n	Note
Register transfer	MEWTOCOL-COM	1 to 507 words	
	MEWTOCOL-DAT	1 to 1020 words	Connection setting: MEWTOCOL Communication type setting: Connect with FP2 ET-LAN
		1 to 2038 words	Connection setting: MEWTOCOL Communication type setting: Do not connect with FP2 ET-LAN
	MODBUS	1 to 127 words	Use MODBUS command 15 (to write to WY or WR) and command 16 (to write multiple words to DT).
Bit transfer	MEWTOCOL-COM	Fixed at 1 bit	During MEWTOCOL-COM, WCS command is used.

5.4 MEWTOCOL Master Communication (SEND)

Transfer method	Communication Mode	Amount of sent data n	Note
	MEWTOCOL-DAT	Fixed at 1 bit	During MEWTOCOL-DAT, contact information write 52H is used.
	MODBUS	1 to 2040	Use the force multiple coils command 15.

(Note 1) The transfer method varies according to the device type specified for operands [S] and [D2]. The register transfer is used for 16-bit devices and the bit transfer is used for 1-bit devices.

(Note 2) The amount of sent data is specified in words for the register transfer and in bits for the bit transfer.

■ Specification of partner unit station number [D1]

Communication Mode	When SCU is used	When ET-LAN is used
MEWTOCOL-COM	1 to 99, 238 (decimal) = EE (hexadecimal)	1 to 64, 238 (decimal) = EE (hexadecimal)
MEWTOCOL-DAT	Non-SCU-compliant	
MODBUS	0 to 255	0 to 255

(Note 1) In the case of SCU, when "0" is specified for the partner station number, global transfer is selected. In this case, there is no response message from the destination.

(Note 2) For connection between FP7 and FP7, specify "1". Destination is determined by the IP address.

■ Specification of destination address [D2]

Transfer method	Communication Mode	Address range
Register transfer	MEWTOCOL-COM	0 to 99999
	MEWTOCOL-DAT	0 to 65535F
	MODBUS	0 to 65535 (H FFFF)
Bit transfer	MEWTOCOL-COM	0 to 999F
	MEWTOCOL-DAT	0 to 65535 (H FFFF)
	MODBUS	0 to 65535 (H FFFF)

(Note 1) When the receiver is the file register FL, specify a constant. Example) For FL100, specify U100. For the file register, only bank 0 can be specified.

■ Execution result code [D3]

Code	Description	Code	Description
H0	Normal end	H7	I/O allocation shortage error ^(Note 2)
H1	The communication port is being used in the master communication.	H8	The send buffer is being used. ^(Note 3)
H2	The communication port is being used in the slave communication.	H41	Format error
H3	The number of master communication instructions simultaneously used is exceeded.	H60	Parameter error
H4	Transmission timeout	H61	Data error
H5	Response reception timeout	H91	Missing expansion slave unit error

5.4 MEWTOCOL Master Communication (SEND)

Code	Description	Code	Description
H6	Reception error ^(Note 1)		

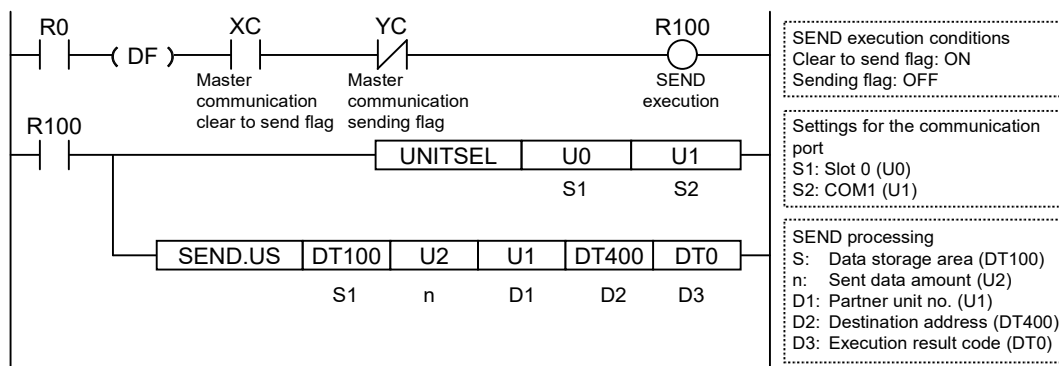
(Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.

(Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.

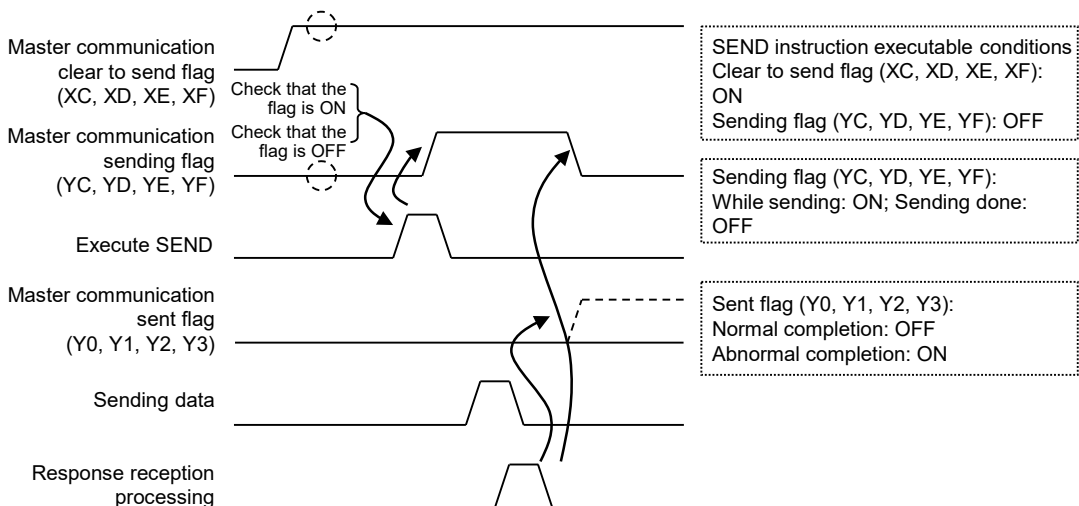
(Note 3) Effective when the version is 4.57 or later.

■ Sample program (in the case of SCU)

- This program sends the command from the COM1 port of the CPU unit to write the content of PLC's data registers DT100 to DT101 into the data areas DT400 to DT401 of the external device (station number 1).
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the SEND instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the SEND instruction, specify and execute the source's starting address (DT100) and data amount (U2), the destination's station number (U1) and starting address (DT400).



■ Time chart (in the case of SCU)



i Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. The communication cassette (Ethernet type) does not support MODBUS.

■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RCV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

5.4 MEWTOCOL Master Communication (SEND)

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

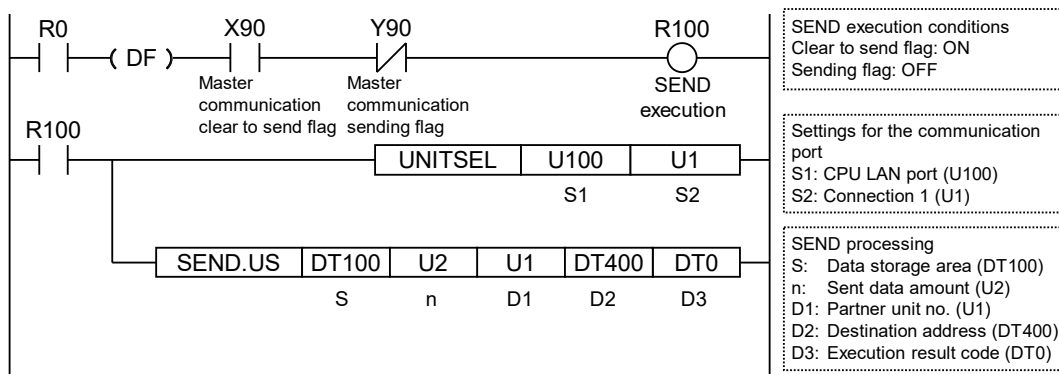
■ Precautions during programming (in the case of SCU)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.
- A SEND/RECV instruction cannot be executed for a port where slave communication is in progress.
- If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing COM ports.

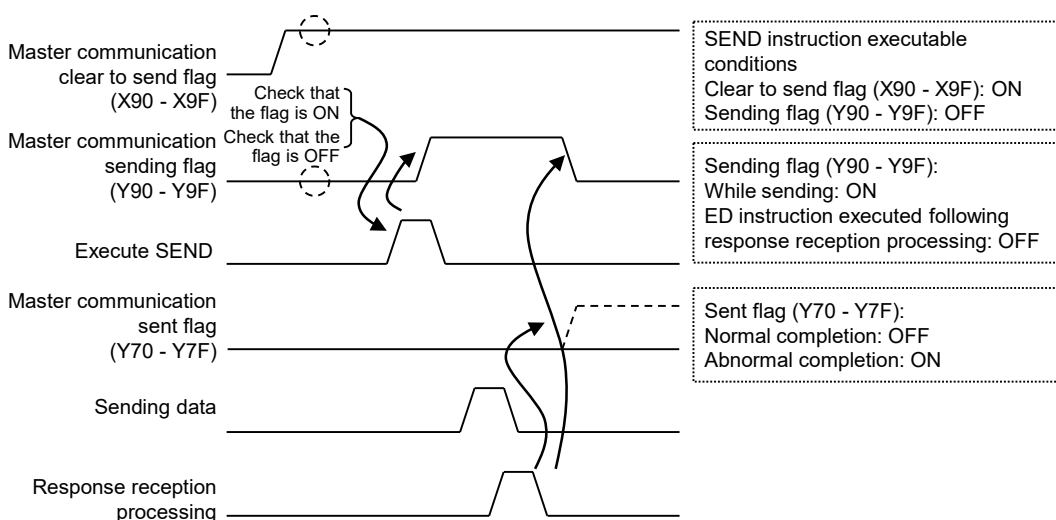
■ Sample program (in the case of CPU with built-in ET-LAN)

- This program sends the command from the LAN port of the CPU unit to write the content of PLC's data registers DT100 to DT101 into the data areas DT400 to DT401 of the external device.
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the SEND instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the SEND instruction, specify and execute the source's starting address (DT100) and data amount (U2), the destination's station number (U1) and starting address (DT400).

5.4 MEWTOCOL Master Communication (SEND)



■ Time chart (in the case of CPU with built-in ET-LAN)



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.

5.4 MEWTOCOL Master Communication (SEND)

- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The receiver is determined by the IP address.

Info.

- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. Refer to the section describing the case of SCU.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the source range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Data device specified by [S] is invalid, or exceeds the area.
	Sent data amount specified by [n] is invalid.
	Station number specified by [D1] is out of the range.
	Data device specified by [D2] is invalid, or exceeds the area.
	Result storage device specified by [D3] is invalid.
	Integer specification for [D2] is only available for the MODBUS direct address specification type. It is invalid for other types.
Specified bit devices for [S] and [D2], and/or specified 16-bit device, differ.	

6 MODBUS TCP Master/Slave Communication

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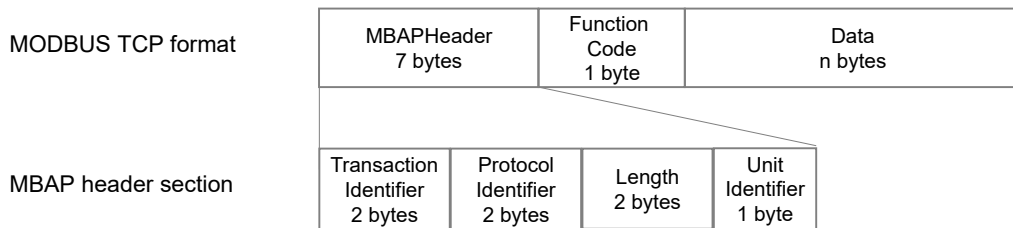
6.1 MODBUS TCP Format

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.



■ 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 List of MODBUS TCP Supported Commands

6.2.1 List of MODBUS Function Codes

■ Table of supported commands

Code	Name (MODBUS)	Name	Remarks (Reference no.)	FP7 supported functions
01	Read Coil Status	Read Y and R Coils	0X	●
02	Read Input Status	Read X Input	1X	●
03	Read Holding Registers	Read DT	4X	●
04	Read Input Registers	Read WL and LD	3X	●
05	Force Single Coil	Write Single Y and R	0X	●
06	Preset Single Register	Write DT 1 Word	4X	●
08	Diagnostics	Loopback Test	-	-
15	Force Multiple Coils	Write Multiple Y's and R's	0X	●
16	Preset Multiple Registers	Write DT Multiple Words	4X	●
22	Mask Write 4X Register	Write DT Mask	4X	-
23	Read/Write 4X Registers	Read/Write DT	4X	-

(Note 1) Types of MODBUS function codes vary by instructions to be used.

■ Table for MODBUS reference No. and device No.

MODBUS reference no.		Data on BUS (hexadecimal)	PLC device number
Coil	000001-002048	0000 to 07FF	Y0 to Y127F
	002049-034816	0800 to 87FF	R0 to R2047F
Input	100001-108192	0000 to 1FFF	X0 to X511F
Holding register	400001-465536	0000 to FFFF	DT0 to DT65535
Input register	300001-301024	0000 to 03FF	WL0 to WL1023
	302001-318384	07D0 to 47CF	LD0 to LD16383

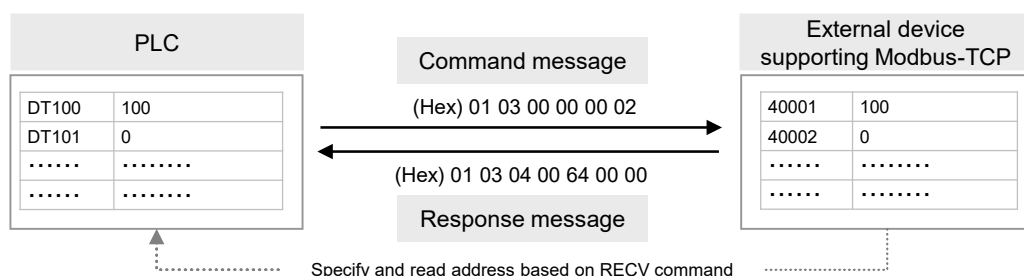
(Note 1) The table above indicates correspondence between the MODBUS reference numbers for accessing FP7 from a higher device using the MODBUS protocol, and the operation device numbers of FP7.

6.3 MODBUS TCP Master Communication (RECV)

6.3.1 Read Data from an External Device

■ Instructions

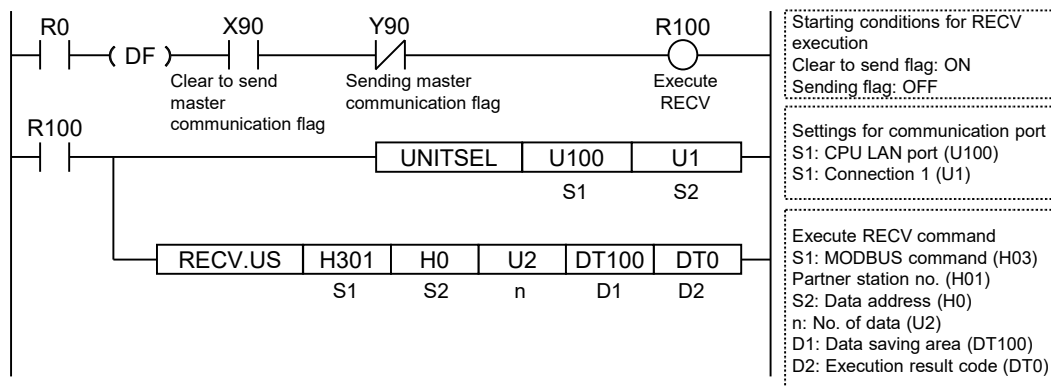
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MODBUS, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing RECV commands.



Note: The above figure indicates the data part of Modbus function. In communication via LAN, a header including size information of the sent data is added.

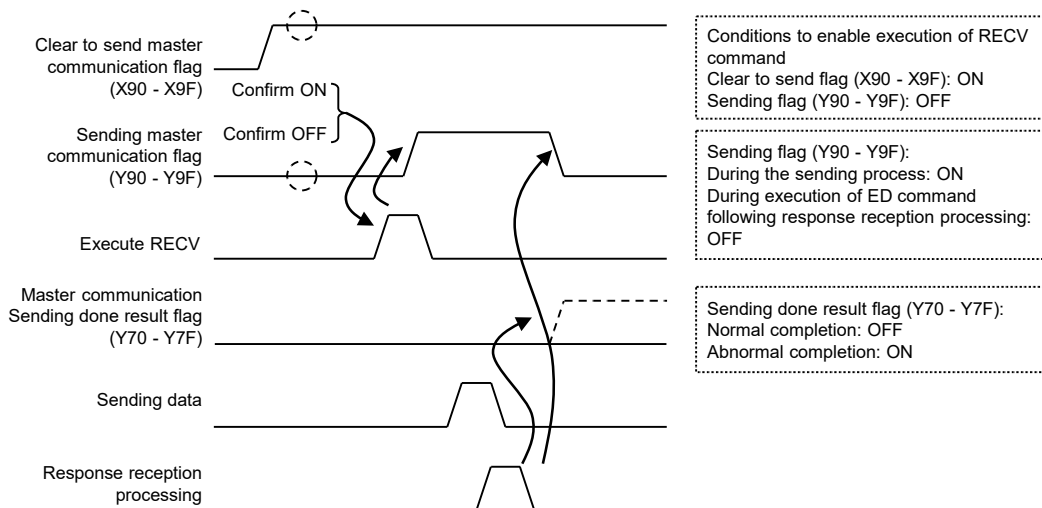
■ Sample program

- This program sends MODBUS commands (03) from the LAN port of the CPU unit. Data are read from data areas 40001 to 40002 (MODBUS addresses 0000H to 0001H) of the external device, and written into data registers DT100 to DT101 of the PLC.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the RECV command, specify and execute the types of MODBUS commands, as well as the partner station no. (H0301), initial address (H0), No. of data (U2), and initial address on the PLC side to save data (DT100). For the address of the partner device, please check operating instructions, etc. of the relevant device.



6.3 MODBUS TCP Master Communication (RECV)

■ Timing chart



■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	Turns ON when master communication is in a connected status.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on the SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

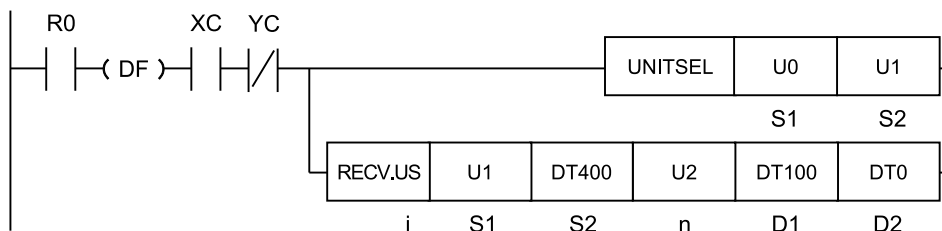
(Note 1) Each contact is used for reading the operation state. Do not write over it with a user program.

i Info.

- Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.
- Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flag" (X90 to X9F) is ON for the corresponding connection, and execute the SEND/RECV instruction.
- You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "master communication sending flag" (Y90 to Y9F) is OFF, and execute the command.
- You cannot execute SEND/RECV command for connection in slave communication.
- Up to 16 SEND/RECV commands can be executed simultaneously for different connections.
- In the MODBUS-TCP mode, specify the partner station no. for the operand of SEND/RECV command.

6.3.2 RECV (MEWTOCOL Master / MODBUS Master)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Operand	Description
S1	Partner station number
S2	Starting address of the device in the sender data area of the partner unit
n	Number of received data
D1	Starting address of the device in the receiver data area of the master unit
D2	Starting address of the device area of the master unit that stores the execution result code (1 word)

■ Available word devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer		Real number		St ring	Index modifier	
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF			DF
S1	●	●	●	●			●	●								●	●				●
S2 ^(Note 1)	●	●	●	●			●	●													●
n	●	●	●	●			●	●								●	●				●
D1	●	●	●	●			●	●													●
D2	●	●	●	●			●	●													●

(Note 1) When the source unit is FP7, only global devices can be specified. (Local devices cannot be specified.)

6.3 MODBUS TCP Master Communication (RECV)

■ Available bit devices (●: Available)

Operand	Bit device											Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n	
S1														
S2 ^(Note 1)	●	●	●	(Note 2)								(Note 3)	(Note 3)	●
n														
D1	●	●	●	●								●	●	●
D2														

(Note 1) When the sender is FP7, only global devices can be specified. (A local device cannot be specified.)

(Note 2) In the case of MODBUS mode, a bit device cannot be specified.

(Note 3) In the case of MEWTOCOL-COM mode or MODBUS mode, a bit device cannot be specified.

■ Outline of operation

- Commands are sent from the communication port of the unit to perform the data transmission with external devices.
- Data can be read and written by specifying station numbers and memory addresses and executing the SEND and RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Select **communication mode** in the **configuration** menu of the tool software FPWIN GR7.
- When the RECV instruction is executed, the data is read from the address that starts with [S2] in the partner station number [S1] and the data is stored in the area that starts with [D1] in the master unit.
- Depending on the type of device specified by [S2] and [D1], the transfer method (register transfer / bit transfer) varies.
- The amount of received data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D2].

■ Specification of partner unit station number [S1]

Communication Mode	When SCU is used	When ET-LAN is used
MEWTOCOL-COM	1 to 99, 238 (decimal) = EE (hexadecimal)	1 to 64, 238 (decimal) = EE (hexadecimal)
MEWTOCOL-DAT ^(Note 1)	Non-SCU-compliant	(Note 1)
MODBUS	1 to 255	1 to 255

(Note 1) For connection between FP7 and FP7, specify "1". Destination is determined by the IP address.

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

Transfer method	Communication Mode	Address range
Register transfer	MEWTOCOL-COM	0 to 99999
	MEWTOCOL-DAT	0 to 65535F

6.3 MODBUS TCP Master Communication (RECV)

Transfer method	Communication Mode	Address range
	MODBUS	0 to 65535 (H FFFF)
Bit transfer	MEWTOCOL-COM	0 to 999F
	MEWTOCOL-DAT	0 to 65535 (H FFFF)
	MODBUS	0 to 65535 (H FFFF)

(Note 1) When the receiver is the file register FL, specify a constant. Example) For FL100, specify U100. For the file register, only bank 0 can be specified.

■ Specification of the amount of received data [n]

Transfer method	Communication Mode	Types of communication port	Setting range
Register transfer (Note 1)	MEWTOCOL-COM	1 to 509 words	RCC command and RD command are used.
	MEWTOCOL-DAT	1 to 1020 words	Connection setting: Setting of the MEWTOCOL Communication type setting: Connect with FP2 ET-LAN
		1 to 2038 words	Connection setting: Setting of the MEWTOCOL Communication type setting: Do not connect with FP2 ET-LAN
	MODBUS	1 to 127 words	Command 1 is used for reading WY and WR. Command 2 is used for WX. Command 3 is used for reading DT Command 4 is used for reading WL and LD
Bit transfer (Note 2)	MEWTOCOL-COM	Fixed to 1 bit	During MEWTOCOL-COM, RCS command is used.
	MEWTOCOL-DAT	Fixed to 1 bit	During MEWTOCOL-DAT, read contact information 53H is used.
	MODBUS	1 to 2040 bits	Command 1 is used for reading Y and R. Command 2 is used for X.

(Note 1) When 16-bit devices are specified for sender [S] and receiver [D2]

(Note 2) When bit devices are specified for sender [S] and receiver [D2]

■ Execution result code [D2]

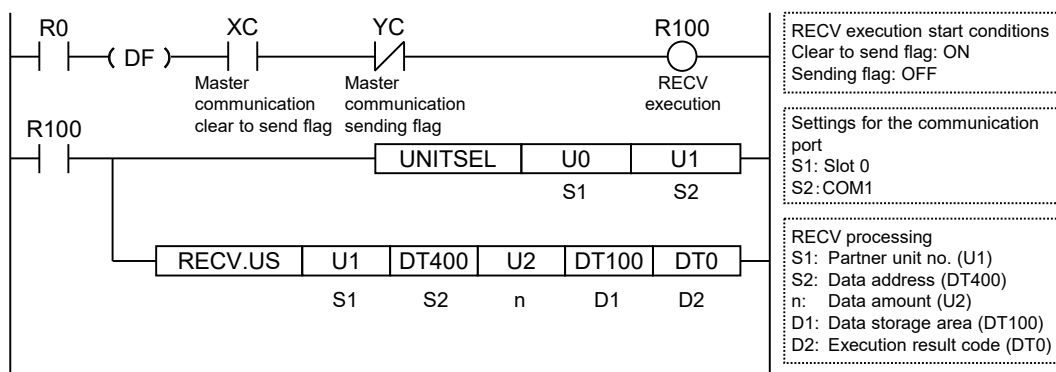
Code	Description	Code	Description
H0	Normal end	H7	I/O allocation shortage error ^(Note 2)
H1	The communication port is being used in the master communication.	H8	The send buffer is being used. ^(Note 3)
H2	The communication port is being used in the slave communication.	H41	Format error
H3	The number of master communication instructions simultaneously used is exceeded.	H60	Parameter error
H4	Transmission timeout	H61	Data error
H5	Response reception timeout	H91	Missing expansion slave unit error
H6	Reception error ^(Note 1)		

6.3 MODBUS TCP Master Communication (RECV)

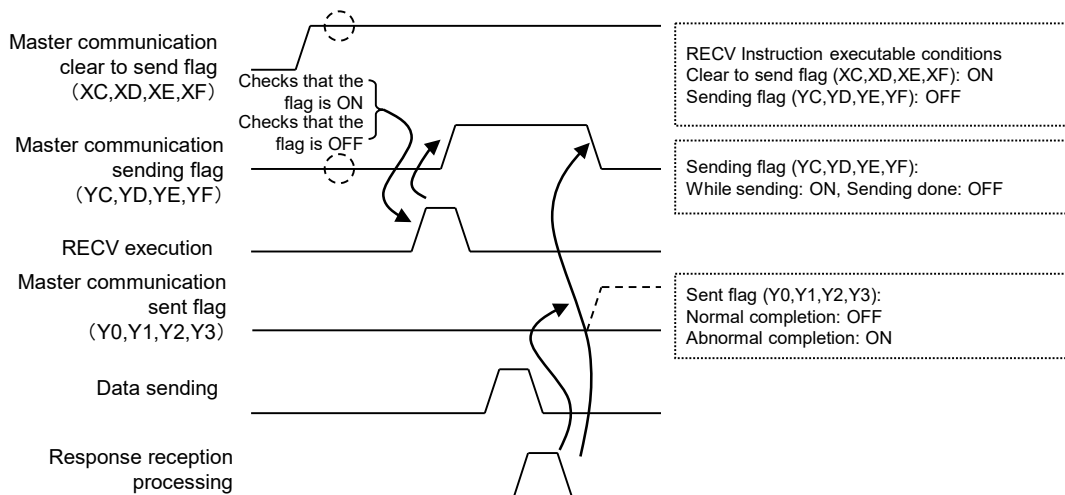
- (Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.
- (Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.
- (Note 3) Effective when the version is 4.57 or later.

■ Sample program (in the case of SCU)

- This program sends the command from the COM1 port of the CPU unit, reads the data from the data areas DT400 to DT401 of the external device (station number 1), and writes the data into the data registers DT100 to DT101 of the PLC.
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the RECV instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the RECV instruction, specify and execute the partner station number (U1), starting address (DT400), data amount (U2), and PLC's starting address to store the data (DT100).



■ Time chart (in the case of SCU)



Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. The communication cassette (Ethernet type) does not support MODBUS.

■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of SCU)

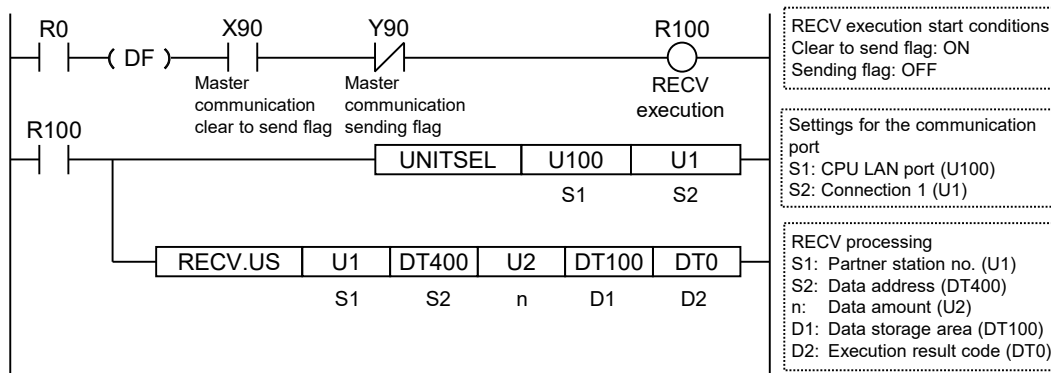
- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.

6.3 MODBUS TCP Master Communication (RECV)

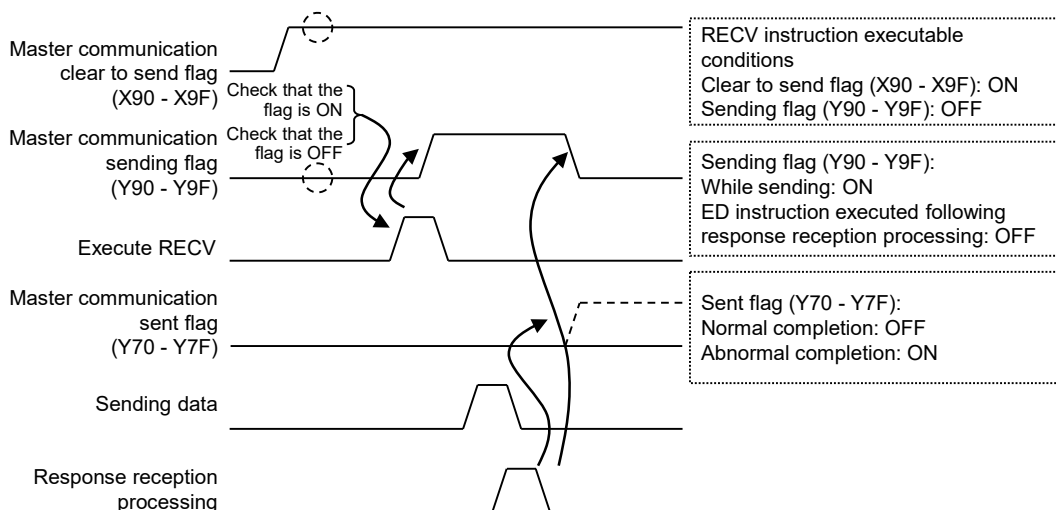
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.
- A SEND/RECV instruction cannot be executed for a port where slave communication is in progress.
- If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing COM ports.

■ **Sample program (in the case of CPU with built-in ET-LAN)**

- This program sends the command from the LAN port of the CPU unit, reads the data from the data areas DT400 to DT401 of the external device, and writes the data into the data registers DT100 to DT101 of the PLC.
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the RECV instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the RECV instruction, specify and execute the partner station number (U1), starting address (DT400), data amount (U2), and PLC's starting address to store the data (DT100).



■ Time chart (in the case of CPU with built-in ET-LAN)



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The receiver is determined by the IP address.

6.3 MODBUS TCP Master Communication (RECV)

i Info.

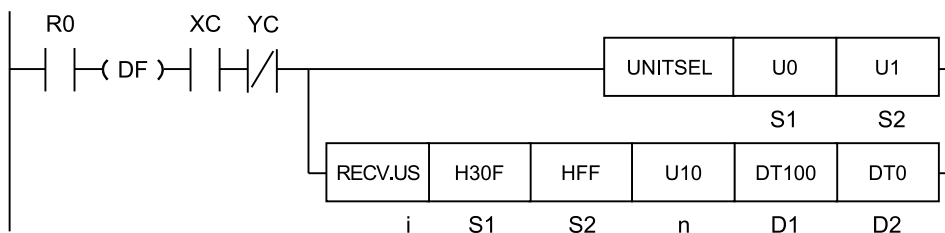
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. Refer to the section describing the case of SCU.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the destination range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Partner station number specified by [S1] is out of the range.
	Partner unit sender data device specified by [S2] is invalid.
	Sent data amount specified by [n] is invalid.
	Data device of the receiver data area in the master unit specified by [D1] is invalid, or exceeds the area.
	Result storage device specified by [D2] is invalid.
	Specified bit devices for [S2] and [D1], and/or specified 16-bit device, differ.
Integer specification for [S2] is only available for the MODBUS address direct specification type. It is invalid for other types.	

6.3.3 RECV (MODBUS Master: Function Code Specification)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

6.3 MODBUS TCP Master Communication (RECV)

■ List of operands

Items	Settings	Setting range	
S1	MODBUS function code to be used, and the partner station number		
	Higher byte	MODBUS function code (two hexadecimal digits)	H1 to H4 (1 to 4)
	Lower byte	Partner station number (two hexadecimal digits)	H1 to HFF (1 to 255)
S2	MODBUS starting address of the sender in the partner unit	H0 to HFFFF (0 to 65535)	
n	Number of received data	1 to 127 words 1 to 2040 bits	
D1	Device starting address of the receiver data area in the master unit	-	
D2	Starting address of the device area of the master unit that stores the execution result code (1 word)		

■ Available word devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	""	
S1	●	●	●	●			●	●								●	●				●
S2	●	●	●	●			●	●								●	(Note 1)				●
n	●	●	●	●			●	●								●	●				●
D1	●	●	●	●			●	●													●
D2	●	●	●	●			●	●													●

(Note 1) Only in the case of "direct address specification" (main instruction) in the MODBUS mode, an integer can be specified for the sender address.

■ Available bit devices (●: Available)

Operand	Bit device											Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n	
S1														
S2	●	●	●	●								●	●	●
n														
D1	●	●	●	●								●	●	●
D2														

6.3 MODBUS TCP Master Communication (RECV)

■ Outline of operation

- The MODBUS command is sent from the communication port of the unit to send/receive data to/from external devices.
- Data can be read and written by specifying station numbers and memory addresses and executing the SEND and RECV instructions in a user program, because PLC automatically creates messages according to the protocol.
- Specify the MODBUS command and the partner MODBUS address in a Hex format in [S1].
- When the RECV instruction is executed, data are read from the address starting with [S2] in the partner unit, and stored in the area starting with [D1] in the master unit.
- The transfer method (register transfer/bit transfer) and the MODBUS function code that can be used vary, depending on the type of device specified by [D1].
- The amount of received data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D2].

■ Specification of [S1] and [n]

- Operand [S1] is specified as a combination of a two-digit hexadecimal MODBUS function code and a two-digit hexadecimal partner station number.
Example: Specify "H030F" in the case of MODBUS function code 03 (read holding registers) and station number 15.
- The transfer method and the MODBUS function code that can be used vary, depending on the type of device specified by the operand [D1].

Device to be specified for [D1]	Transfer method	Value that can be specified for high bytes of [S1]
16-Bit device: WX, WY, WR, WL, DT, LD	Register transfer	H1: Read coil state (01) H2: Read input state (02) H3: Read hold register (03) H4: Read input register (04)
1-Bit device: X, Y, R, L, DT.n, LD.n	Bit transfer	H1: Read coil state (01) H2: Read input state (02)

- The amount of received data is specified in words for the register transfer, and in bits for the bit transfer.

■ Execution result code [D2]

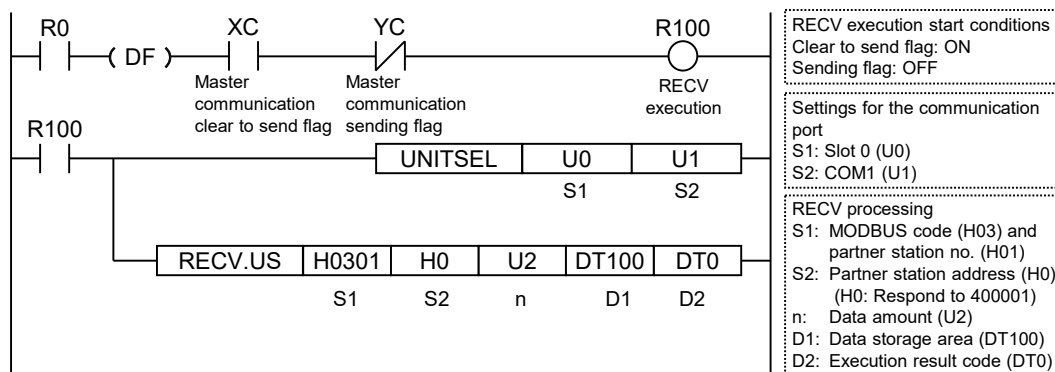
Code	Description	Code	Description
H0	Normal end	H6	Reception error ^(Note 1)
H1	The communication port is being used in the master communication.	H7	I/O allocation shortage error ^(Note 2)
H2	The communication port is being used in the slave communication.	H8	The send buffer is being used. ^(Note 3)
H3	The number of master communication instructions simultaneously used is exceeded.	H8001	Function code error
H4	Transmission timeout	H8002	Device number error (out of range)
H5	Response reception timeout	H8003	Device quantity error (out of range)

6.3 MODBUS TCP Master Communication (RECV)

- (Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.
- (Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.
- (Note 3) Effective when the version is 4.57 or later.

■ Sample program (in the case of SCU)

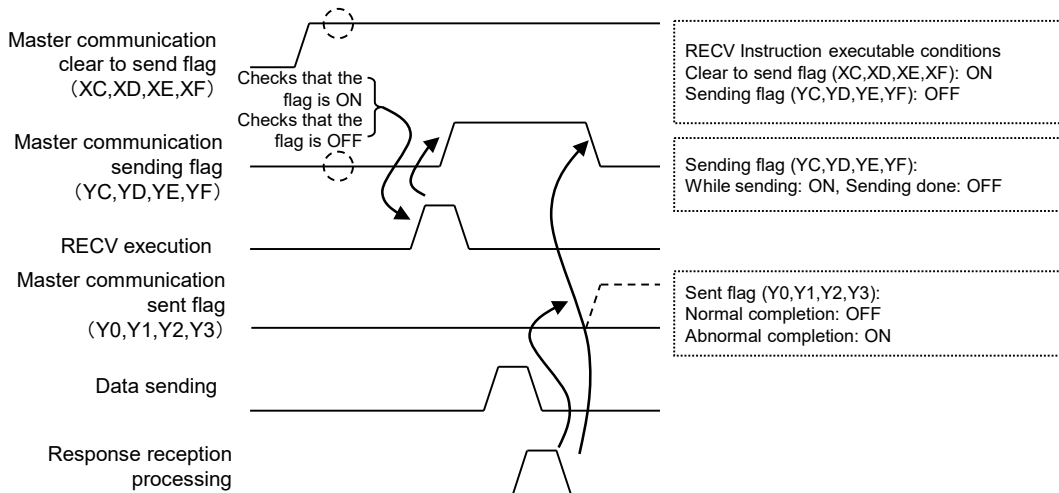
- This program sends the command from the COM1 port of the CPU unit, reads the data from the data areas 400001 to 400002 of the external device (station number 1), and writes the data into the data registers DT100 to DT101 of the PLC.
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the RECV instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the RECV instruction, specify and execute the partner station number (U1), MODBUS command to be used and partner station number (H0301), starting address (400001), data amount (U2), and PLC's starting address to store the data (DT100). Check addresses of connected devices in the instruction manuals of devices.



- (Note 1) Operand [S1] of RECV instruction is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner device station number.
- (Note 2) When the partner device is FP series PLC, Operand [S2] of RECV instruction can be specified using the device number.

6.3 MODBUS TCP Master Communication (RECV)

Time chart (in the case of SCU)



Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- The communication cassette (Ethernet type) does not support MODBUS.

I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.

6.3 MODBUS TCP Master Communication (RECV)

COM Port No.				Name	Description
1	2	3	4		
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

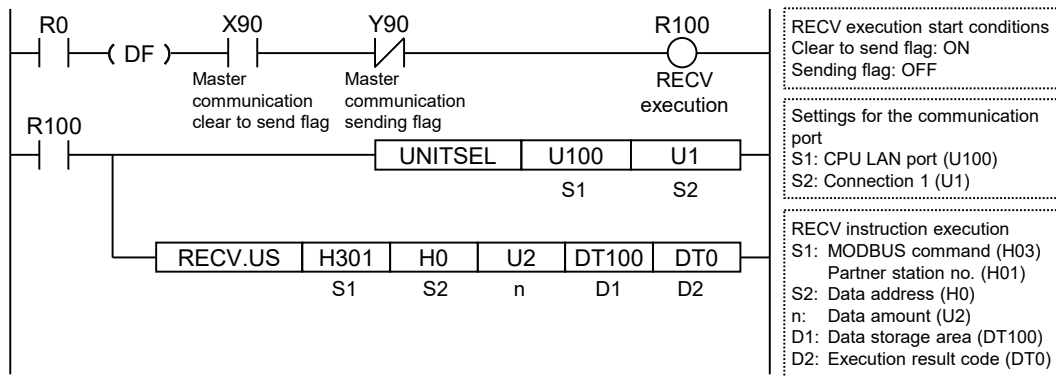
■ Precautions during programming (in the case of SCU)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.
- A SEND/RECV instruction cannot be executed for a port where slave communication is in progress. If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing COM ports.

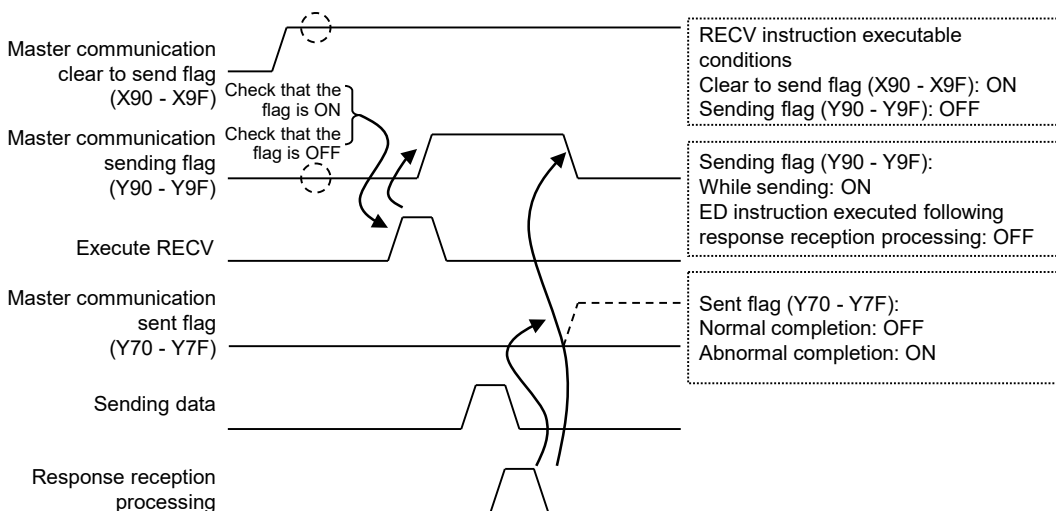
■ Sample program (in the case of CPU with built-in ET-LAN)

- This program sends MODBUS commands (03) from the LAN port of the CPU unit, reads the data from the data area of an external device 400001 to 400002 (MODBUS address 0000H to 0001H), and writes the content into PLC's data register DT100 to DT101.
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the RECV instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the RECV instruction, specify and execute the type of MODBUS command and partner station number (H0301), starting address (H0), data amount (U2), and PLC's starting address to store the data (DT100). Check addresses of connected devices in the instruction manuals of devices.

6.3 MODBUS TCP Master Communication (RECV)



■ Time chart (in the case of CPU with built-in ET-LAN)



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.

6.3 MODBUS TCP Master Communication (RECV)

- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- In the MODBUS-TCP mode, specify the partner station number as operand for the SEND/RECV instruction.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the destination range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Partner station number specified by [S1] is out of the range.
	Partner unit sender data device specified by [S2] is invalid.
	Sent data amount specified by [n] is invalid.
	Data device of the receiver data area in the master unit specified by [D1] is invalid, or exceeds the area.
	Result storage device specified by [D2] is invalid.
Integer specification for [S2] is only available for the MODBUS address direct specification type. It is invalid for other types.	

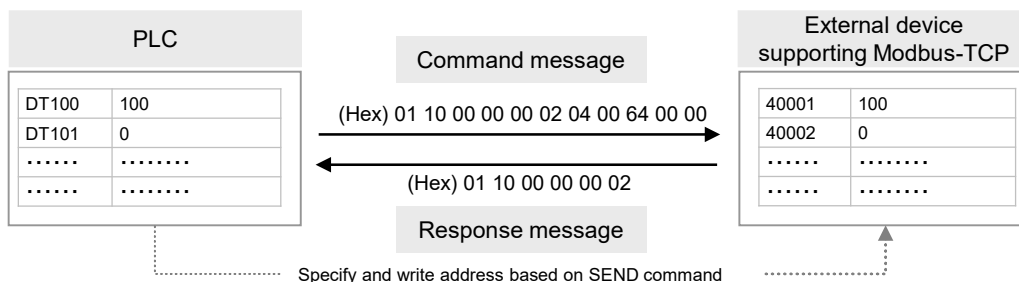
6.4 MODBUS TCP Master Communication (SEND)

6.4 MODBUS TCP Master Communication (SEND)

6.4.1 Write Data into an External Device

■ Instructions

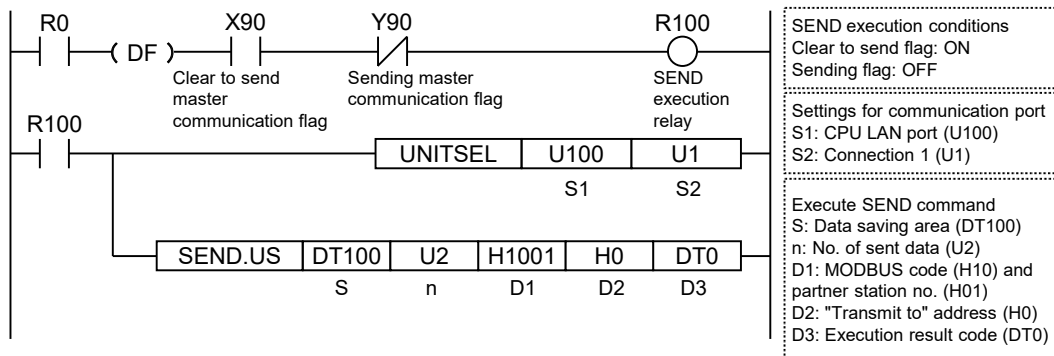
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MODBUS, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RCV commands.



Note: The above figure indicates the data part of Modbus function. In communication via LAN, a header including size information of the sent data is added.

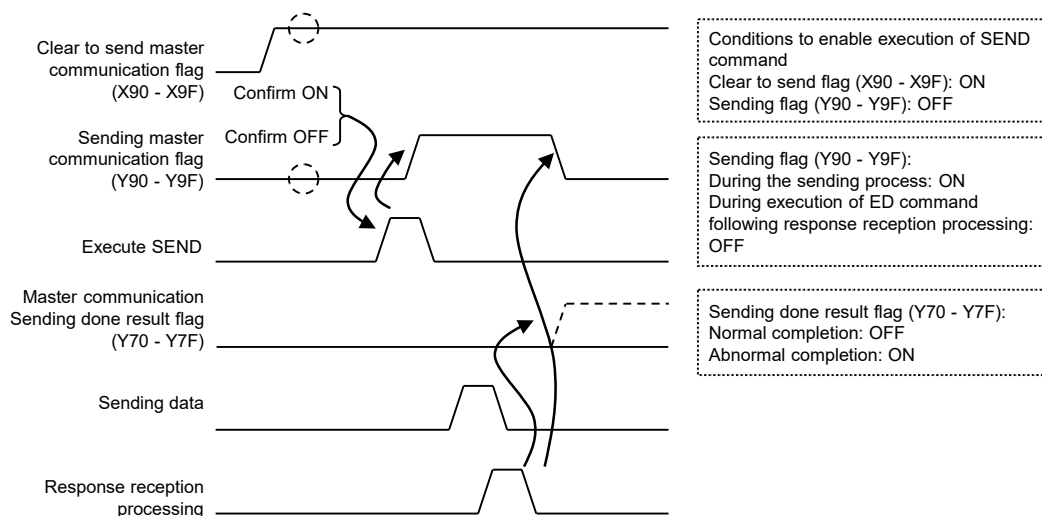
■ Sample program

- Send a MODBUS command (16) from the LAN port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device 40001 - 40002 (MODBUS address 0000H - 0001H).
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the SEND command, specify and execute the PLC initial address (DT100), No. of data (U2), MODBUS command (16 = H10), partner device station no. (H01), and initial address (H0). For the address of the partner device, please check operating instructions, etc. of the relevant device.



6.4 MODBUS TCP Master Communication (SEND)

■ Timing chart



■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	Turns ON when master communication is in a connected status.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on the SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

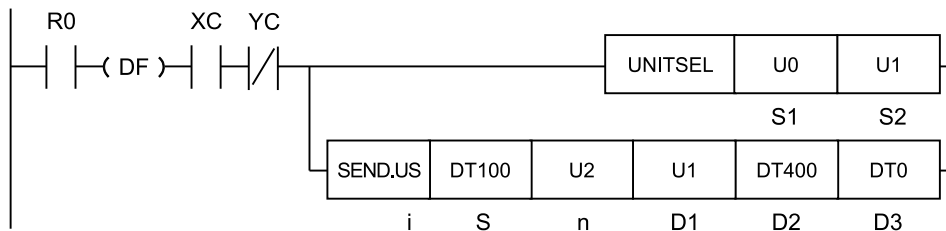
i Info.

- Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.
- Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flag" (X90 to X9F) is ON for the corresponding connection, and execute the SEND/RECV instruction.
- You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "master communication sending flag" (Y90 to Y9F) is OFF, and execute the command.
- You cannot execute SEND/RECV command for connection in slave communication.
- Up to 16 SEND/RECV commands can be executed simultaneously for different connections.
- In the MODBUS-TCP mode, specify the partner station no. for the operand of SEND/RECV command.

6.4 MODBUS TCP Master Communication (SEND)

6.4.2 SEND (MEWTOCOL Master / MODBUS Master)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Operand	Description
S	Starting address of the sender data area
n	Amount of sent data
D1	Partner station number
D2	Starting address of the device in the receiver data area of the partner unit
D3	Starting address of the device area of the master unit that stores the execution result code (1 word)

■ Available word devices (●: Available)

Operand	16-Bit device:												32-Bit device:			Integer			Real number		String	Index modifier
	WX	WY	WR	WL	WS	SD	DT	LD	UM	WI	WO	TSCS	TECE	IX	K	U	H	SF	DF	""		
S	●	●	●	●			●	●														●
n	●	●	●	●			●	●								●	●					●
D1	●	●	●	●			●	●								●	●					●
D2(Note 1)	(Note 2)	●	●	(Note 2)			●	(Note 2)														●
D3	●	●	●	●			●	●														●

6.4 MODBUS TCP Master Communication (SEND)

(Note 1) When the destination unit is FP7, only global devices can be specified. (Local devices cannot be specified.)

(Note 2) In the MODBUS mode, this cannot be specified as the receiver.

■ Available bit devices (●: Available)

Operand	Bit device											Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n	
S	●	●	●	●								●	●	●
n														
D1														
D2(Note 1)	(Not e 2)	●	●	(Not e 2)										●
D3														

(Note 1) When the receiver is FP7, only global devices can be specified. (A local device cannot be specified.)

(Note 2) In the case of MODBUS and MEWTOCOL-COM, a bit device cannot be specified.

■ Outline of operation

- Commands are sent from the communication port of the unit to perform the data transmission with external devices. Message in accordance with the protocol is automatically formulated by PLC. The user program only has to specify the station number and the memory address, and execute the SEND/RCV instruction, to carry out reading and writing.
- Select **acommunication mode** in the configuration menu of the tool software FPWIN GR7.
- When the SEND instruction is executed, data are read from the device in the master unit, starting with [S], and stored in the address starting with [D2] of the partner unit.
- The transfer method (register transfer/bit transfer) varies according to the device types that are specified by [S] and [D2].
- The amount of sent data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D3].

■ Setting the amount of sent data [n]

Transfer method	Communication Mode	Amount of sent data n	Note
Register transfer	MEWTOCOL-COM	1 to 507 words	
	MEWTOCOL-DAT	1 to 1020 words	Connection setting: MEWTOCOL Communication type setting: Connect with FP2 ET-LAN
		1 to 2038 words	Connection setting: MEWTOCOL Communication type setting: Do not connect with FP2 ET-LAN
	MODBUS	1 to 127 words	Use MODBUS command 15 (to write to WY or WR) and command 16 (to write multiple words to DT).
Bit transfer	MEWTOCOL-COM	Fixed at 1 bit	During MEWTOCOL-COM, WCS command is used.

6.4 MODBUS TCP Master Communication (SEND)

Transfer method	Communication Mode	Amount of sent data n	Note
	MEWTOCOL-DAT	Fixed at 1 bit	During MEWTOCOL-DAT, contact information write 52H is used.
	MODBUS	1 to 2040	Use the force multiple coils command 15.

(Note 1) The transfer method varies according to the device type specified for operands [S] and [D2]. The register transfer is used for 16-bit devices and the bit transfer is used for 1-bit devices.

(Note 2) The amount of sent data is specified in words for the register transfer and in bits for the bit transfer.

■ Specification of partner unit station number [D1]

Communication Mode	When SCU is used	When ET-LAN is used
MEWTOCOL-COM	1 to 99, 238 (decimal) = EE (hexadecimal)	1 to 64, 238 (decimal) = EE (hexadecimal)
MEWTOCOL-DAT	Non-SCU-compliant	
MODBUS	0 to 255	0 to 255

(Note 1) In the case of SCU, when "0" is specified for the partner station number, global transfer is selected. In this case, there is no response message from the destination.

(Note 2) For connection between FP7 and FP7, specify "1". Destination is determined by the IP address.

■ Specification of destination address [D2]

Transfer method	Communication Mode	Address range
Register transfer	MEWTOCOL-COM	0 to 99999
	MEWTOCOL-DAT	0 to 65535F
	MODBUS	0 to 65535 (H FFFF)
Bit transfer	MEWTOCOL-COM	0 to 999F
	MEWTOCOL-DAT	0 to 65535 (H FFFF)
	MODBUS	0 to 65535 (H FFFF)

(Note 1) When the receiver is the file register FL, specify a constant. Example) For FL100, specify U100. For the file register, only bank 0 can be specified.

■ Execution result code [D3]

Code	Description	Code	Description
H0	Normal end	H7	I/O allocation shortage error ^(Note 2)
H1	The communication port is being used in the master communication.	H8	The send buffer is being used. ^(Note 3)
H2	The communication port is being used in the slave communication.	H41	Format error
H3	The number of master communication instructions simultaneously used is exceeded.	H60	Parameter error
H4	Transmission timeout	H61	Data error
H5	Response reception timeout	H91	Missing expansion slave unit error

6.4 MODBUS TCP Master Communication (SEND)

Code	Description	Code	Description
H6	Reception error ^(Note 1)		

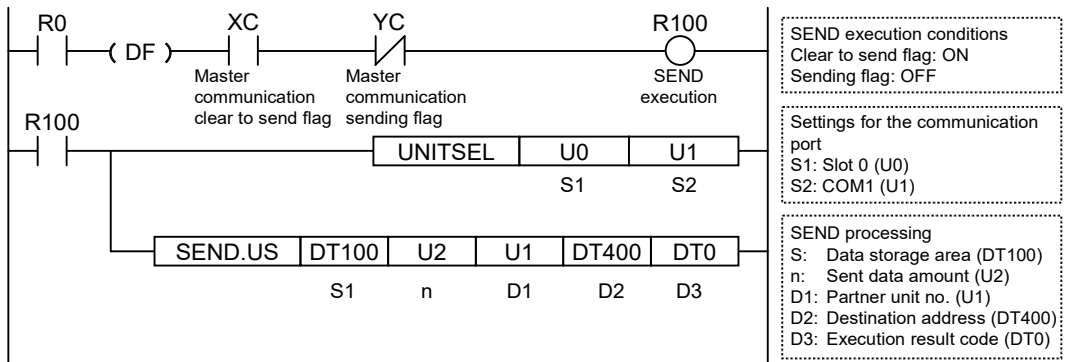
(Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.

(Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.

(Note 3) Effective when the version is 4.57 or later.

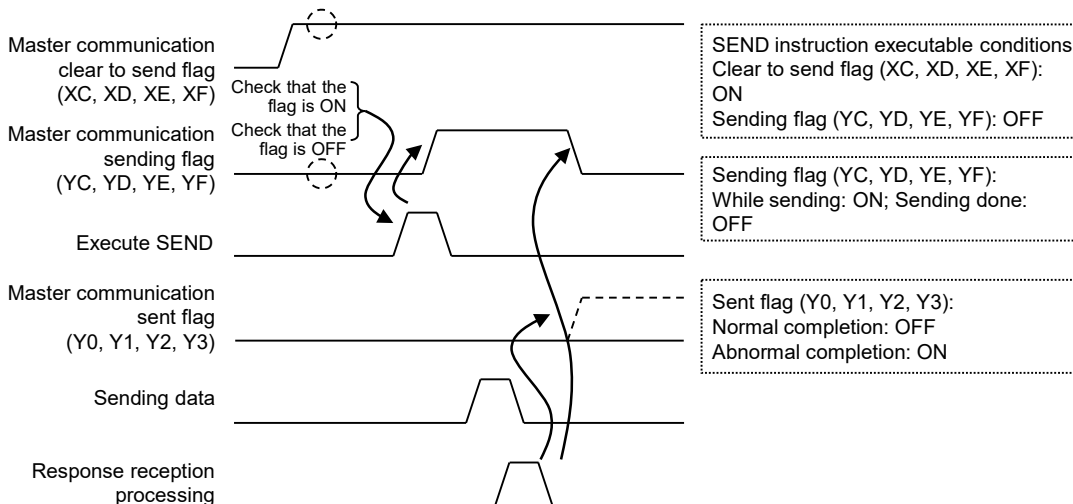
■ Sample program (in the case of SCU)

- This program sends the command from the COM1 port of the CPU unit to write the content of PLC's data registers DT100 to DT101 into the data areas DT400 to DT401 of the external device (station number 1).
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the SEND instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the SEND instruction, specify and execute the source's starting address (DT100) and data amount (U2), the destination's station number (U1) and starting address (DT400).



6.4 MODBUS TCP Master Communication (SEND)

Time chart (in the case of SCU)



Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. The communication cassette (Ethernet type) does not support MODBUS.

I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RCV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

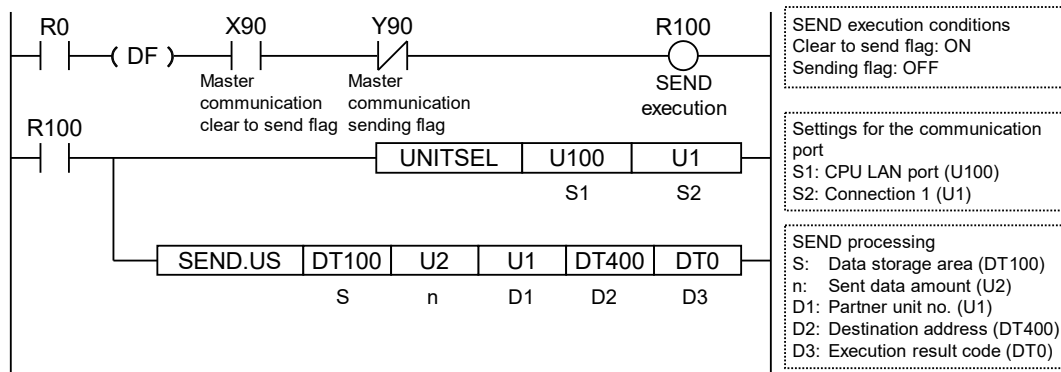
■ Precautions during programming (in the case of SCU)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.
- A SEND/RECV instruction cannot be executed for a port where slave communication is in progress.
- If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing COM ports.

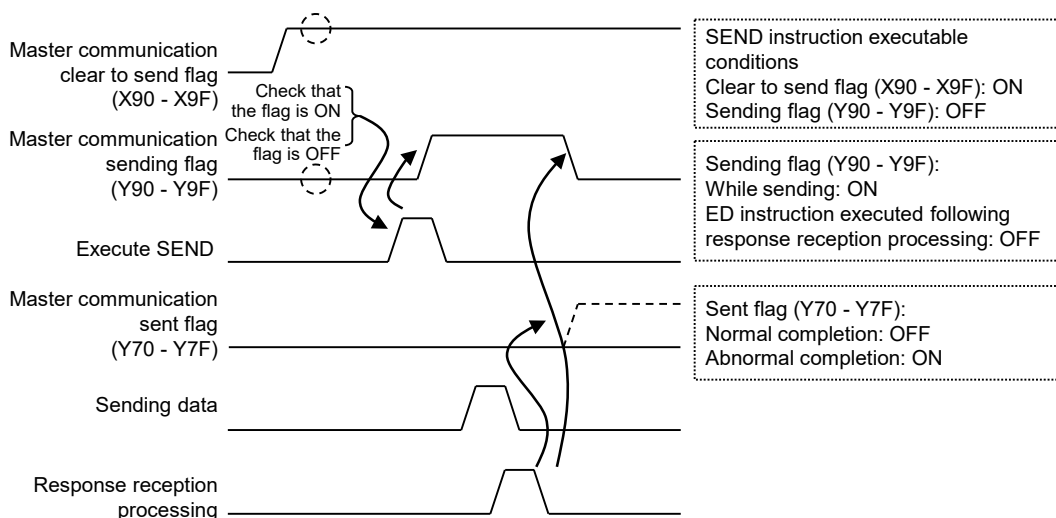
■ Sample program (in the case of CPU with built-in ET-LAN)

- This program sends the command from the LAN port of the CPU unit to write the content of PLC's data registers DT100 to DT101 into the data areas DT400 to DT401 of the external device.
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the SEND instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the SEND instruction, specify and execute the source's starting address (DT100) and data amount (U2), the destination's station number (U1) and starting address (DT400).

6.4 MODBUS TCP Master Communication (SEND)



Time chart (in the case of CPU with built-in ET-LAN)



I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.

6.4 MODBUS TCP Master Communication (SEND)

- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- For communication between LAN ports of FP7, specify "U1" for the partner station number. The receiver is determined by the IP address.

Info.

- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of the CPU with built-in SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. Refer to the section describing the case of SCU.

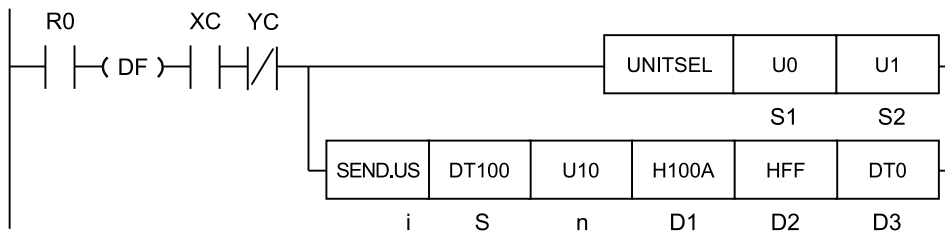
■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the source range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Data device specified by [S] is invalid, or exceeds the area.
	Sent data amount specified by [n] is invalid.
	Station number specified by [D1] is out of the range.
	Data device specified by [D2] is invalid, or exceeds the area.
	Result storage device specified by [D3] is invalid.
	Integer specification for [D2] is only available for the MODBUS direct address specification type. It is invalid for other types.
	Specified bit devices for [S] and [D2], and/or specified 16-bit device, differ.

6.4 MODBUS TCP Master Communication (SEND)

6.4.3 SEND (MODBUS Master: Function Code Specification)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Items	Settings	Setting range	
S	Starting address of the sender data area	-	
n	Amount of sent data	1 to 127 words 1 to 2040 bits	
D1	MODBUS command to be used, and the partner station number		
	Higher byte	MODBUS function code (two hexadecimal digits)	H5, H6, HF, H10
	Lower byte	Partner station number (two hexadecimal digits)	H0 to HFF (0 to 255)
D2	MODBUS starting address of the receiver data area of the partner unit	H0 to HFFFF (0 to 65535)	
D3	Starting address of the device area of the master unit that stores the execution result code (1 word)	-	

■ Available word devices (●: Available)

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

6.4 MODBUS TCP Master Communication (SEND)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier	
	W X	W Y	W R	W L	W S	S D	D T	L D	U M	W I	W O	T S	T E	C E	I X	K	U	H	S F	D F		" "
D2	•	•	•	•			•	•									•	(Note 1)				•
D3	•	•	•	•			•	•														•

(Note 1) When the destination unit is FP7, only global devices can be specified. (Local devices cannot be specified.)

■ Available bit devices (•: Available)

Operand	Bit device												Specification of bit of word device		Index modifier
	X	Y	R	L	T	C	P	E	SR	IN	OT	DT.n	LD.n		
S	•	•	•	•								•	•	•	
n															
D1															
D2															
D3															

■ Outline of operation

- The MODBUS command is sent from the communication port of the unit to perform the data transmission with external devices.
- Data can be read and written by specifying station numbers and memory addresses and executing the SEND and 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 MODBUS command to be used, and the partner MODBUS station number, in a Hex format in [D1].
- When the SEND instruction is executed, data are read from the device in the master unit, starting with [S], and stored in the address starting with [D2] of the partner unit.
- The transfer method (register transfer/bit transfer) and the type of MODBUS command that can be used vary, depending on the type of device specified by [S] and data amount specified by [n].
- The amount of sent data [n] is specified in words for the register transfer, and in the number of bits for the bit transfer.
- The execution result code is stored in the one-word area of the master unit that is specified by [D3].

■ Specification of [S], [n] and [D1]

- The transfer method and the MODBUS function code that can be used vary, depending on the type of device specified by the operand [S] and the sent data amount specified by [n].

6.4 MODBUS TCP Master Communication (SEND)

Types of device to be specified for [S]	Transfer method	Number of sent data [n]	Value that can be specified for high bytes of [D1]
16-Bit device: WX, WY, WR, WL, DT, LD	Register transfer	1	H6: Preset single register (06) HF: Force multiple coils (15) H10: Preset multiple registers (16)
		2 to 127	HF: Force multiple coils (15) H10: Preset multiple registers (16)
1-Bit device: X, Y, R, L, DT.n, LD.n	Bit transfer	1	H5: Force single coil (05) HF: Force multiple coils (15)
		2 to 2040	HF: Force multiple coils (15)

- The amount of sent data [n] is specified in words for the register transfer, and in bits for the bit transfer.
- Operand [D1] is specified as a combination of a two-digit hexadecimal MODBUS function code and a two-digit hexadecimal partner station number.
Example: Specify "H100A" in the case of MODBUS function code 16 (preset multiple registers) and station number 10.
- In the case of SCU, when "0" is specified for the partner station number, global transfer is selected. In this case, there is no response message from the destination.

■ Execution result code [D3]

Code	Description	Code	Description
H0	Normal end	H6	Reception error ^(Note 1)
H1	The communication port is being used in the master communication.	H7	I/O allocation shortage error ^(Note 2)
H2	The communication port is being used in the slave communication.	H8	The send buffer is being used. ^(Note 3)
H3	The number of master communication instructions simultaneously used is exceeded.	H8001	Function code error
H4	Transmission timeout	H8002	Device quantity error (out of range)
H5	Response reception timeout	H8003	Device quantity error (out of range)

(Note 1) It occurs when an abnormal telegram is received. When there is a format error in the header of an individual protocol, the communication discards the received data and a response reception timeout occurs.

(Note 2) It occurs when the communication control I/O relays corresponding to the communication port (master communication clear to send flag, master communication send active flag, master communication send done result relay) are not allocated as I/O words of the CPU unit in the I/O map. It occurs only when the number of user connections of ET-LAN is expanded and this instruction is executed specifying the expanded connections.

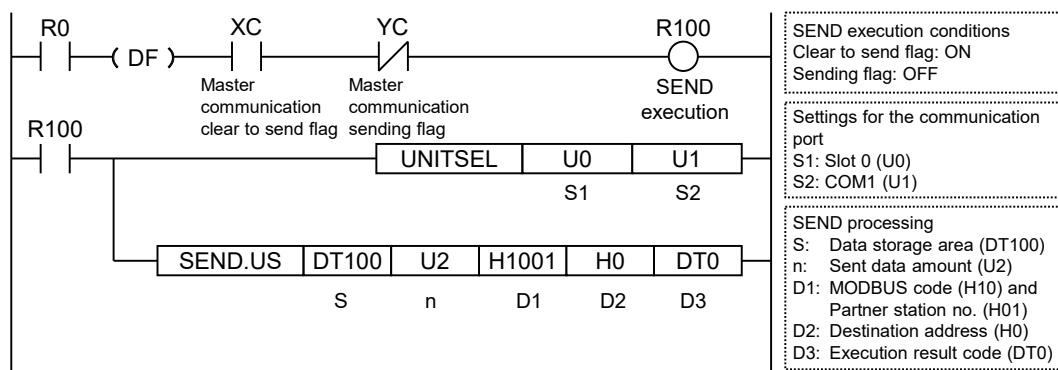
(Note 3) Effective when the version is 4.57 or later.

■ Sample program (in the case of SCU)

- This program sends the command from the COM1 port of the CPU unit, and then writes the content of PLC's data registers DT100 to DT101 into the data areas 400001 to 400002 of the external device (station number 1).

6.4 MODBUS TCP Master Communication (SEND)

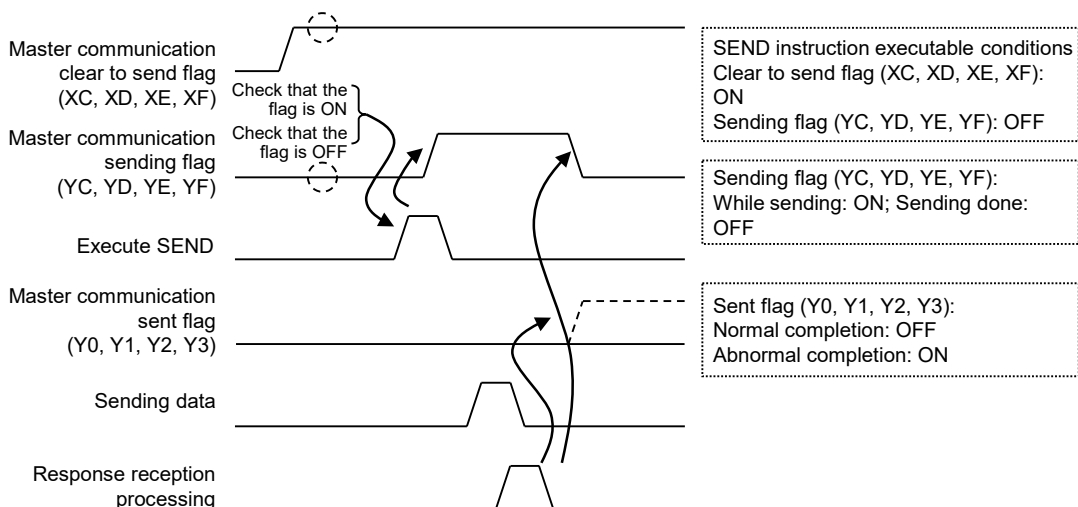
- This program checks that the master mode is on (XC) and that sending is not in progress in the same port (YC), and then starts up the SEND instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the SEND instruction, specify and execute PLC's starting address (DT100) and data amount (U2), MODBUS function code to be used (16: H10), and partner station number (H01) and starting address (H0). Check addresses of connected devices in the instruction manuals of devices.



(Note 1) Operand [D1] of SEND instruction is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner device station number. When the MODBUS function code is 16, [D1] H10 should be specified.

(Note 2) When the partner device is FP series PLC, Operand [D2] of SEND instruction can be specified using the device number.

■ Time chart (in the case of SCU)



6.4 MODBUS TCP Master Communication (SEND)

Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- The communication cassette (Ethernet type) does not support MODBUS.

■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
XC	XD	XE	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
XC	XD	XE	XF	Master communication clear to send flag	Turns ON when MEWTOCOL-COM, MEWTOCOL7, or MODBUS-RTU is set for the communication mode, and the unit is in the RUN mode.
YC	YD	YE	YF	Master communication sending flag	Turns ON during sending data based on SEND/RECV instruction. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of SCU)

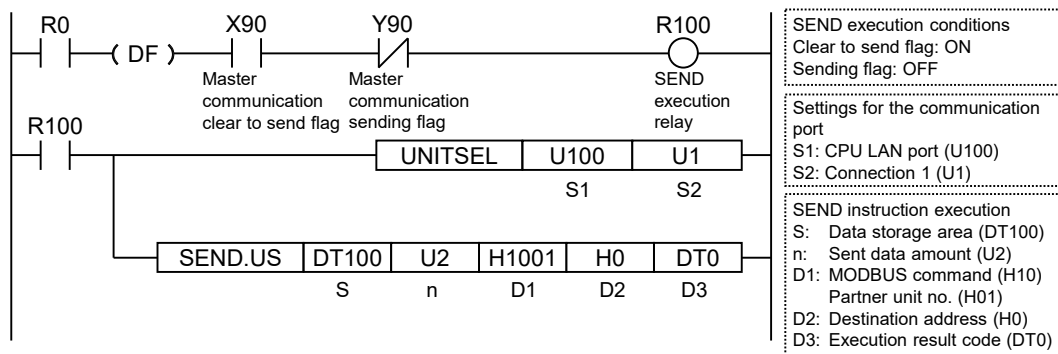
- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target port for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (XC to XF) are ON for the corresponding channel, and execute the SEND/RECV instruction.
- Another SEND/RECV instruction cannot be executed for a communication port where master communication is in progress. Confirm that the "master communication sending flags" (YC to YF) are OFF, and execute the instruction.

6.4 MODBUS TCP Master Communication (SEND)

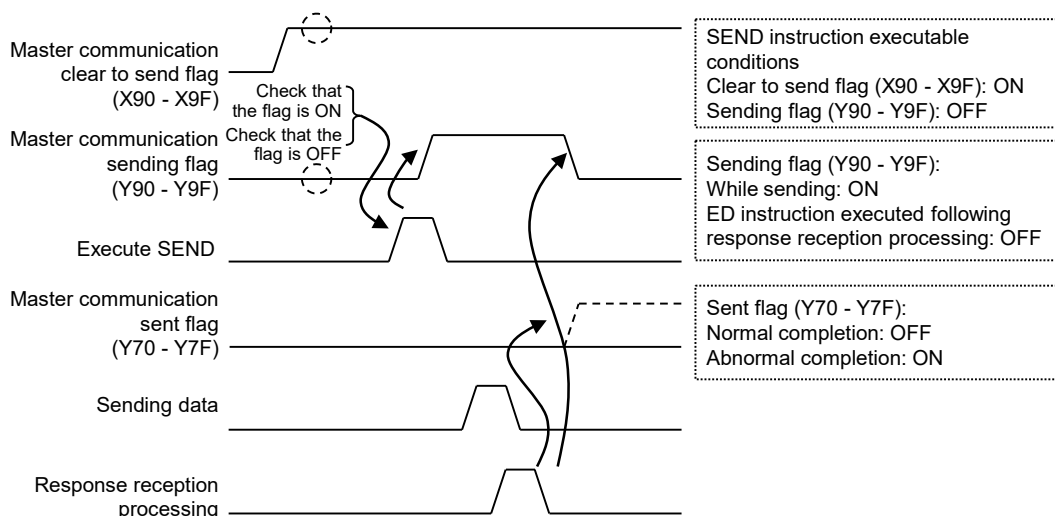
- A SEND/RCV instruction cannot be executed for a port where slave communication is in progress.
- If there is no response, the "master communication sending flags" (YC to YF) remain ON during the time-out period set in the CPU configuration.
- Up to 16 SEND/RCV instructions can be executed simultaneously for differing COM. ports.

■ Sample program (in the case of CPU with built-in ET-LAN)

- This program sends the MODBUS command (16) from the LAN port of the CPU unit, and then writes the content of PLC's data registers DT100 to DT101 into the data areas 400001 to 400002 of the external device (MODBUS addresses 0000H to 0001H).
- After it is confirmed that connection 1 is established in master mode (X90) and no transmissions are currently being executed for the same port (Y90), the SEND instruction is started.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the SEND instruction, specify and execute PLC's starting address (DT100) and data amount (U2), MODBUS command (16 = H10), and partner station number (H01) and starting address (H0). Check addresses of connected devices in the instruction manuals of devices.



■ Timing chart



6.4 MODBUS TCP Master Communication (SEND)

■ I/O allocations

I/O number	Name	Description
X90 to X9F	Master communication clear to send flag	Turns ON when a connection is established in the master communication.
Y90 to Y9F	Master communication sending flag	Turns ON during sending data based on the SEND/RECV instruction. Turns OFF when the ED instruction is executed after the completion of the response receive processing.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the SEND/RECV instruction to specify a target connection number for communication.
- Master communication is only enabled when MEWTOCOL or MODBUS is selected. Confirm that the "master communication clear to send flags" (X90 to X9F) are ON for the corresponding connection, and execute the SEND/RECV instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the master communication is in progress. Confirm that the "master communication sending flags" (Y90 to Y9F) are OFF, and execute the instruction.
- The SEND or RECV instruction cannot be executed for the connection for which the slave communication is in progress.
- Up to 16 SEND/RECV instructions can be executed simultaneously for differing connections.
- In the MODBUS-TCP mode, specify the partner station number as operand for the SEND/RECV instruction.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the source range is outside the accessible range.
	COM port or connection specified by UNITSEL does not exist, or communication is not possible in the specified connection.
	Data device specified by [S] is invalid, or exceeds the area.
	Sent data amount specified by [n] is invalid.
	MODBUS command and/or station number specified by [D1] is invalid.
	Data device specified by [D2] is invalid, or exceeds the area.
	Result storage device specified by [D3] is invalid.
	Integer specification for [D2] is only available for the MODBUS address direct specification type. It is invalid for other types.
Result storage device specified by [D3] is invalid.	

7 General-Purpose Communication

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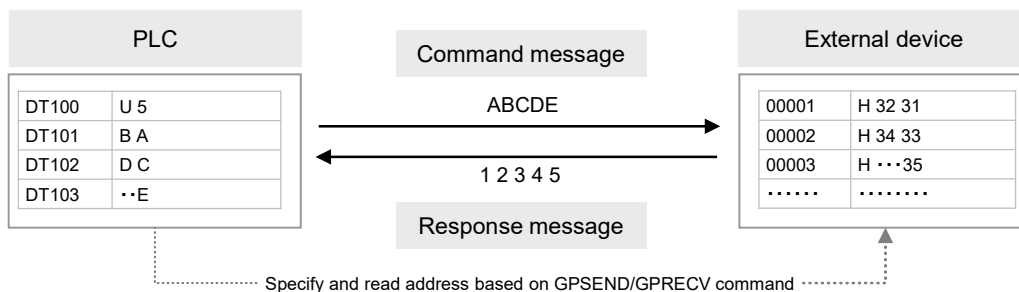
7.1 Operation of General-Purpose Communication

7.1 Operation of General-Purpose Communication

7.1.1 Read Data from an External Device

■ Read data from a partner device

In general-purpose communication, communication is executed by sending commands that suit the partner device, and receiving responses. Command messages are sent by formulating a data table for message in accordance with the protocol, on the given data register, and subsequently executing GPSEND command.

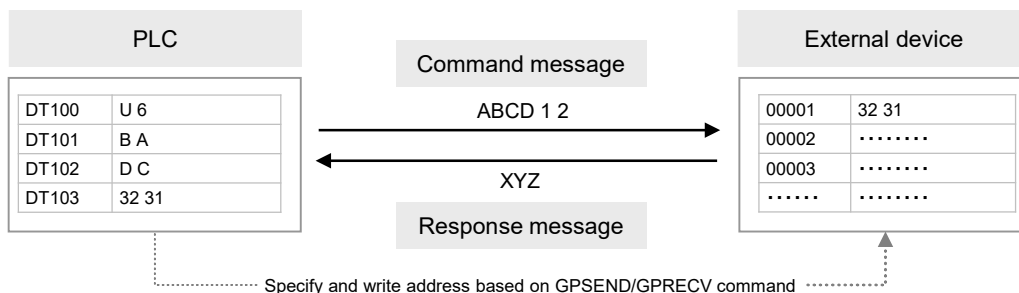


Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

7.1.2 Write Data into an External Device

■ Write data into a partner device

In general-purpose communication, communication is executed by sending commands that suit the partner device, and receiving responses. Command messages are sent by formulating a data table for message in accordance with the protocol, on the given data register, and subsequently executing GPSEND command.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

i Info.

- There is no relevance between the operation of transmission by GPSEND command and the operation of reception by GPRECV command.

7.1.3 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	<p>Do not add a header to a message. Only send data is sent.</p> <div style="border: 1px dashed gray; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> <p>(No header)</p> </div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Send data section</p> </div>	<p>A header is added to a message before sending. The header contains send data size information.</p> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 10px;">Header section</div> <div style="border: 1px solid gray; padding: 5px;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">10 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">Data size (L)</td></tr> <tr><td style="text-align: center;">Data size (H)</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">00 H</td></tr> <tr><td style="text-align: center;">01H</td></tr> <tr><td style="text-align: center;">01H</td></tr> </table> </div> </div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Send data section</p> </div>	10 H	00 H	Data size (L)	Data size (H)	00 H	00 H	00 H	00 H	00 H	00 H	01H	01H
10 H														
00 H														
Data size (L)														
Data size (H)														
00 H														
00 H														
00 H														
00 H														
00 H														
00 H														
01H														
01H														
Receiving operation	<p>When no data is received for TCP terminator detection timer value (default: 20 ms) or longer, reception is considered complete.</p>	<p>Reception is completed when data of the send data size contained in the header has been received.</p>												
How to select	<p>Usual communication based on protocol specified by another manufacturer</p>	<p>High-speed general-purpose communication with FP0H or FP7</p>												

i Info.

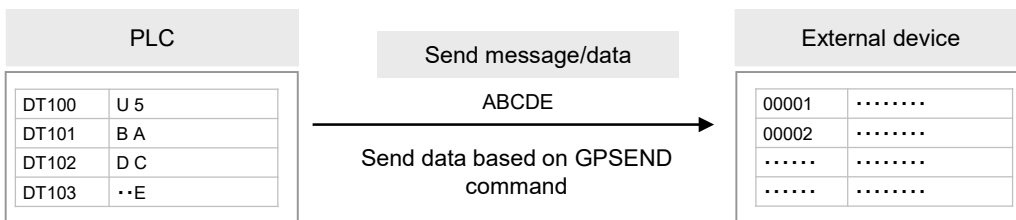
- For more details of communication type setting screen, refer to "[3.6 Setting of User Connections](#)".

7.2 Sending Operation

7.2 Sending Operation

7.2.1 Overview of Sending Operation

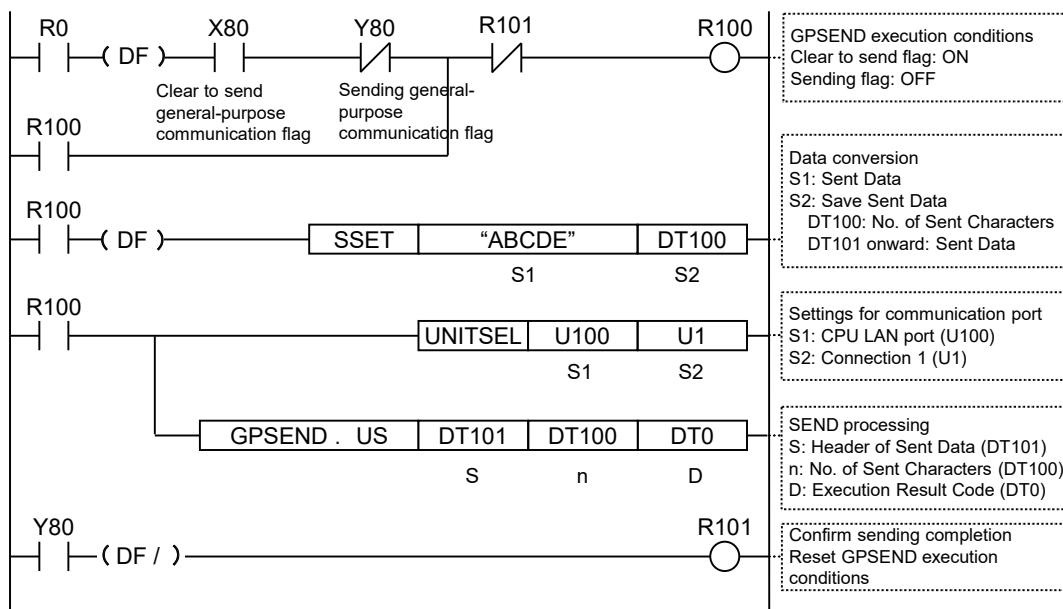
Sending in the general-purpose communication is performed by formulating a data table for sending on the given operation memory, and subsequently executing GPSEND command.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

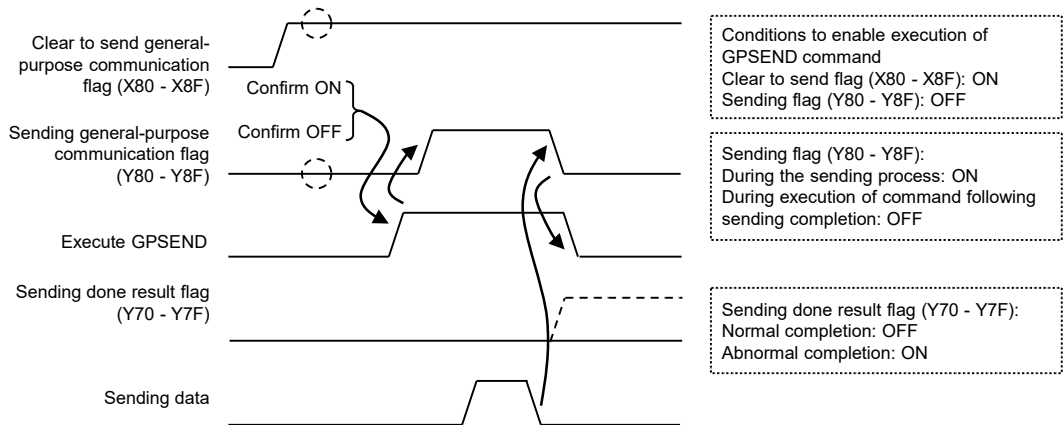
■ Sample program

- Confirm that Connection 1 is established in the general-purpose communication mode (X80), and that the general-purpose sending process is not in progress for the same port (Y80), and start up the sending program.
- In the SSET command, convert a given message into an ASCII text string, and specify the number of strings to be sent in the data register (DT100), and the message to be sent from the data register (DT101).
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the GPSEND command, specify and execute the header of the table where the message to be sent is saved (DT101) and the No. of characters (DT100).



■ Timing chart

- Data in the table specified by GPSEND command are sent, in ascending order from lower bytes.
- While data are being sent, the sending general-purpose communication flag for the relevant connection (Y80 - Y8F) turns ON. The flag is turned OFF when sending is completed.
- The sending result (0: normal completion, 1: abnormal completion) is saved in the general-purpose communication sending result flag (Y70 - Y7F).



■ I/O Allocation

I/O number	Name	Explanation
X80 - X8F	Clear to send general-purpose communication flag	Turns ON when general-purpose communication is in a connected status.
Y80 - Y8F	Sending general-purpose communication flag	Turns ON during sending data based on GPSEND command. Turns OFF when GPSEND command is executed for the next time following sending completion.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

i Info.

- Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.
- Maintain the ON conditions for GPSEND command until sending is completed and the sending general-purpose communication flag (Y80 - Y8F) turns OFF.

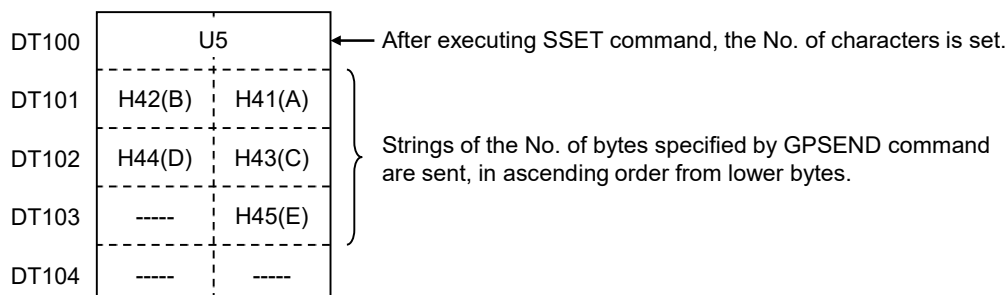
7.2.2 Contents of Sent Data

Strings data sent by the GPSEND command are converted into ASCII text and saved in a given data register.

7.2 Sending Operation

■ Sent data table

- Once the sent data are converted into strings data using the SSET command, the No. of characters is saved in the header area. The sent data are saved starting with lower bytes of the subsequent address.



i Info.

- No start code or end code are attached to data that are sent from the FP7 CPU unit. When it is necessary to send a start code and an end code in accordance with the protocol of an external device, save them as a part of sent data.
- The data size that can be sent in a single transmission based on GPSEND command from the LAN port of the FP7 CPU unit is up to 16,384 bytes.

7.2.3 GPSEND (General-Purpose Communication Sending Command)

■ Command format



Setting item	Settings	Setting range
i	Specify the operation unit.	US / SS ^(Note 1)
S	Specify the header of the source node data area.	^(Note 2)
n	Specify the No. of bytes of sent data.	1 to 16384 ^(Note 1) ^(Note 4)
D	Specify the device area in the source node to save the processing result code (one word).	^(Note 3)

(Note 1) When a K constant (integer with a symbol) is specified for the number of sent bytes [n], select SS for operation unit [i]. When a U constant (integer without a symbol) or an H constant (hexadecimal integer) is specified, select US for operation unit [i].

(Note 2) Devices that can be specified for [S] are: WX, WY, WR, WL, DT, LD.

(Note 3) Devices that can be specified for [D] are: WX, WY, WR, WL, DT, LD.

Once the sending process is completed, the sent bytes are saved. When an error occurs, "FFFFH" is saved.

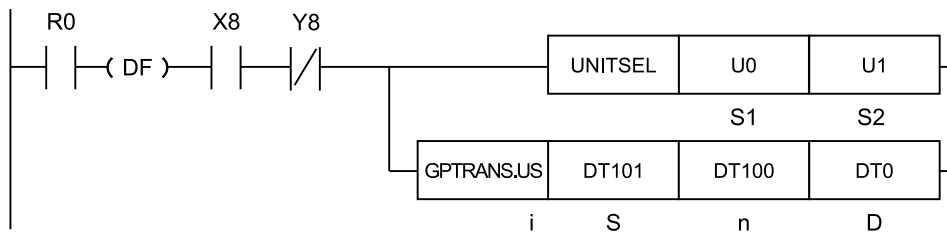
(Note 4) This indicates a case where the sending port is a LAN port. When a dedicated header is attached, the size is up to 16,372 bytes.

i Info.

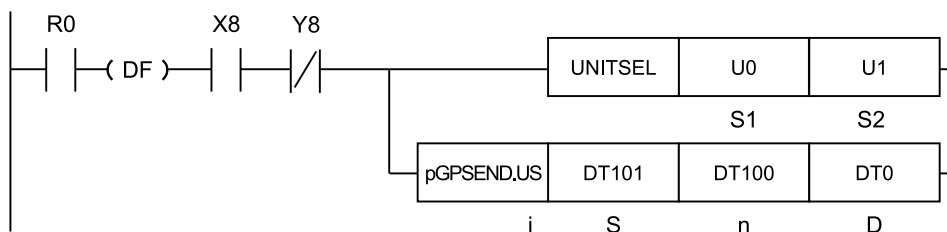
- Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.
- Maintain the ON conditions for GPSEND command until sending is completed and the sending general-purpose communication flag (Y80 - Y8F) turns OFF.
- When GPSEND command is executed for connection in progress, the sending flag and the sending result are updated.
- Confirm that the "clear to send general-purpose communication flag" (X80 - X8F) for the targeted connection has turned ON, and execute GPSEND command.
- GPSEND command cannot be used in an interrupt program.

7.2.4 GPTRNS / pGPSEND /GPSEND (General-Purpose Communication Send Instruction)

■ Ladder diagram (GPTRNS)

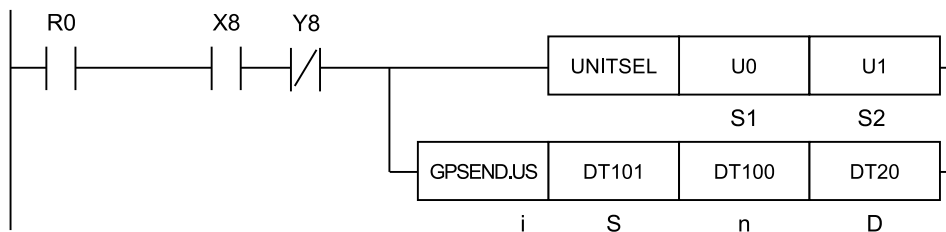


■ Ladder diagram (pGPSEND)



7.2 Sending Operation

■ Ladder diagram (GPSEND)



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

(Note 1) When a negative value is specified for operand [n], it is necessary to specify an SS operation unit.

■ List of operands

Operand	Description
S	Starting number for the device for storing the sent data
n	Number of bytes of the sent data, or starting number of the device where the amount of sent data is stored
D	Starting number of the device that stores the processing result (1 word)

■ Available devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		St ring	Index modifier
	W X	W Y	W R	W L	W S	S D	D T	L D	U M	W I	W O	T S	T E	I X	K	U	H	S F	D F		
S1	●	●	●	●			●	●													●
n(Note 1)	●	●	●	●			●	●							●	●	●				●
D (Note 1)	●	●	●	●			●	●													●

(Note 1) Always 16-bit data/device, regardless of the specification of operation units [i].

■ Outline of operation

- Data are sent from the communication port to external devices.
- Data of [n] bytes are sent from the unit / communication port set by the UNITSEL instruction, starting with the starting address (word address) of the sent data area specified by [S].
- Data to be sent are set by the user program, in the area starting with [S].

- The processing result is stored in the area specified by [D].

■ Processing

- The slot numbers and communication port numbers specified with UNITSEL instruction are obtained from the system data register (SD).
- This instruction confirms that the general-purpose communication clear to send flag of a specified communication port is ON and the general-purpose communication sending flag is OFF.
- When sending is enabled, sent data is transferred to the send buffer of a communication port and a request to send is executed.

Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- The case of ET-LAN shows the case that it is used in the following combination.
 - LAN port equipped in the CPU unit (Applicable models: CPU unit CPS4RE* and CPS3RE* only)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN.

■ Comparison of GPTRNS / pGPSEND / GPSEND instructions

Instruction	Characteristics	
GPTRNS pGPSEND (Note 1)	The data send confirmation process is performed on the completion of scan. (Note 2)	
	Advantage	Data is sent only once by turning on execution conditions at the time of data send.
	Disadvantage	Up to 16 send operations can be performed simultaneously to different COM ports and connections. (The total of simultaneous usage of SEND, RECV, GPTRNS, pGPSEND, and pPMSET instructions)
GPSEND	The data send confirmation process is performed in the operation processing for the GPSEND instruction. (Note 2)	
	Advantage	Data can be sent to different COM ports and connections simultaneously without limit.
	Disadvantage	It is necessary to turn ON the execution condition of the GPSEND instruction until the end of data sending, and turn OFF the execution condition at a scan in which the end of data transmission is confirmed.

(Note 1) As the result of executing an operation, the conditions under which an error is set for operand [D] will vary.

Condition in which errors occur	GPTRNS	pGPSEND	GPSEND
General-purpose communication clear to send flag is OFF.	(Note 2)	•	•

7.2 Sending Operation

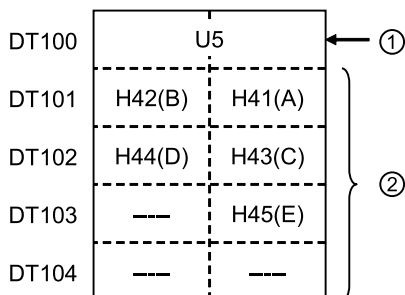
Condition in which errors occur	GPTRNS	pGPSEND D	GPSEND
16 or more SEND, RECV, GPTRNS, pGPSEND, and pPMSET instructions are used simultaneously.	•	•	-
Communication error	•	•	•

(Note 2) Even when the same port is specified and the GPTRNS instruction is executed during the execution of the general-purpose communication transmission, an error does not occur and the result is not updated.

(Note 3) The data sending confirmation process indicates if the sending flag is cleared, if the send results flag is set, and if the processing results are stored in [D].

■ Creation of send data table [S]

- Data to be sent is stored from the low byte of a given area specified by [S].
- The figure below shows the case where the string "ABCDE" is converted with the SSET instruction.



(1)	Once the SSET instruction is executed, the number of characters is set in the starting word. Then, the characters that are converted are stored in the following area.
(2)	DT101 is set for operand [S] of the GPTRNS / pGPSEND / GPSEND instruction, and when the instruction is executed the data is sent in ascending order from the low byte.

■ Setting the number of bytes in sent data [n]

Unit type	Set value	Description
SCU (Note 1)(Note 2)	1 to 4096	When the value is positive, an end code is automatically added according to the "Terminator setting" of COM settings.
	-1 to -4096	When the value is negative, an end code is not automatically added regardless of the "Terminator setting" of COM settings.
ET-LAN	1 to 16384	<ul style="list-style-type: none"> • When "Add no special header" is on (Default connection setting) (Note 3) • Send data and the end code are not distinguished. It is not automatically added.
	1 to 16372	<ul style="list-style-type: none"> • When specifying "Append a special header" (Note 3) • Send data and the end code are not distinguished. It is not automatically added.

(Note 1) For SCU, up to 4096 bytes can be sent, including a start code and an end code. The start code and end code are set from the configuration menu of the tool software or with the PMSET instruction. When "Start code STX" is set to "Enabled", the maximum amount of sent data that can be specified is decremented by one.

When "Terminator setting" is set to "ETX" or "CR", the maximum amount of sent data is decremented by one.

When "Terminator setting" is set to "CR+LF", the maximum amount of sent data is decremented by two.

When "Terminator setting" is set to "Time", the maximum amount of sent data is not decremented.

(Note 2) For specifying a negative value for [n] (signed integer K), specify SS for the operation units.

(Note 3) A "special header" is added when communicating with a conventional FP2 ET-LAN unit, and when communication is performed with MEWTOCOL. Normally, select "Add no special header" in the user connection setting.

■ Operand [D] settings

- Specify the device area of the master unit storing the processing result (1 word).
- The following values are stored depending on the state.

Status	Value that is set
When starting the transmission request	H0
When transmission is completed	Number of transmitted bytes
When an error occurs	HFFFF

■ Precautions for programming

- To perform communication, setup is required in the configuration menu of the tool software.
- For a CPU unit with a built-in SCU, select **General-purpose communication** in **FP7 Configuration>Built-in SCU>Communication mode**. For a Serial Communication Unit, also select "General-purpose communication" in "Communication mode".
- For a CPU unit with a built-in ET-LAN, use the FPWIN GR7 tool software to select "General-purpose communication" in **FP7 Configuration>Built-in ET-LAN>User connection information setting>Operation mode setting**.
- Before executing the GPTRNS instruction, pGPSEND instruction, or GPSEND instruction, describe the UNITSEL instruction and specify the target unit and communication port or connection.
- The GPTRNS, pGPSEND, and GPSEND instructions should be executed after confirming that the general-purpose communication clear to send flag for the target COM port and connection is ON and that the general-purpose communication sending flag is OFF.
- For the GPSEND instruction, be sure to keep the execution condition ON until the completion of the transmission that sets the general-purpose communication sending flag to OFF.
- The general-purpose communication sent flag in the WX area is used for confirming the completion of the transmission using the general-purpose communication.
- When data is sent to a communication port that is undergoing transmission, it results in no operation. No error occurs.
- Sending zero-byte data results in an error.
- For a GPTRNS instruction and a pGPSEND instruction, up to 16 instructions can be executed simultaneously for different COM ports and connections. (The total of simultaneous usage of SEND, RECV, GPTRNS, pGPSEND, and pPMSET instructions)
- The GPTRNS, pGPSEND, and GPSEND instructions are not available in interrupt programs.

7.2 Sending Operation

■ Precautions during programming (in the case of SCU)

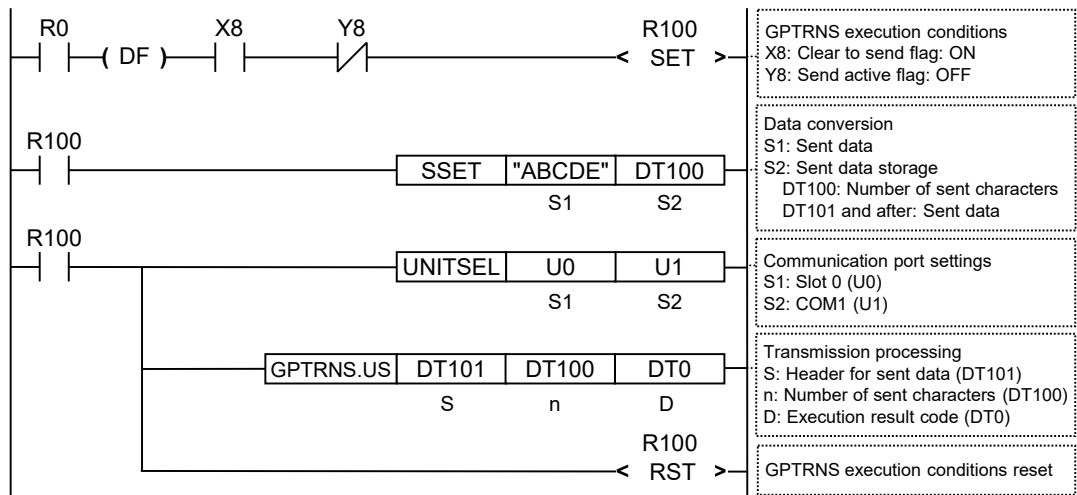
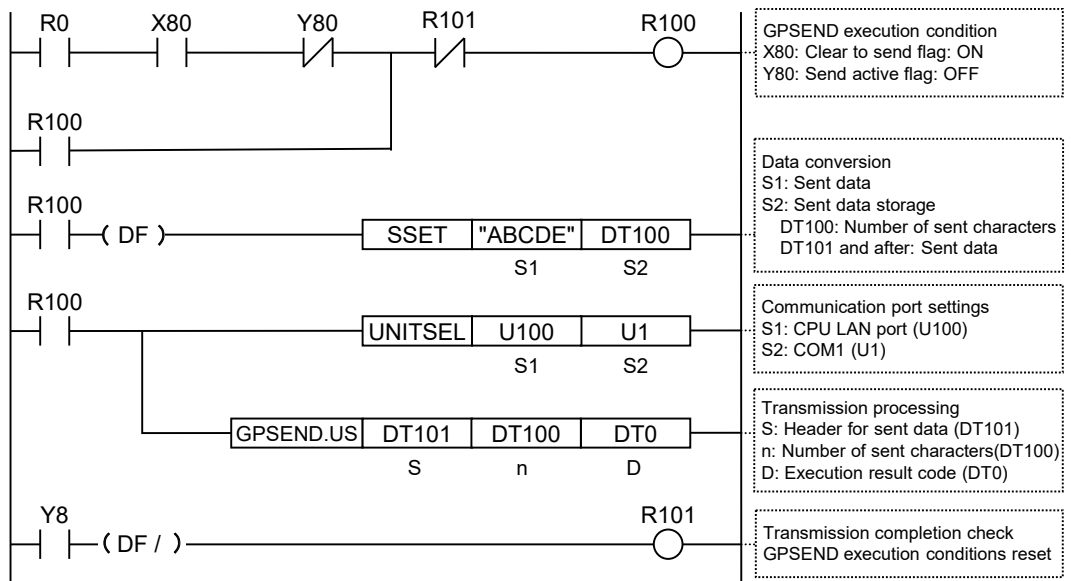
- If a positive number is specified for [n], the start code and end code that are specified in the configuration menu are automatically added to the data to be sent. Do not include a start code or an end code in the sent data.
- If an end code will not be added, specify a negative number for the amount of sent data [n]. In addition, select "SS" as the operation units.
- The maximum volume of data that can be sent with GPTRNS, pGPSEND, and GPSEND instructions is 4,096 bytes, including a start code and an end code.

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- General-purpose communication can use user connections 1 to 16. It cannot be used for the system connection and the expansion user connections 17 to 216.
- User connections should be in the "connected" state. We recommend using the FPWIN GR7 tool software to set "Open automatically" in **Built-in ET-LAN>User connection information setting>Open type**. The connections can also be connected with the OPEN instruction.
- 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 volume of data that can be sent in a single instance with GPTRNS, pGPSEND, and GPSEND instructions is 16,384 bytes.

■ Sample program (in the case of SCU)

- This program checks that the general-purpose communication mode is on (X8:ON) and that general-purpose sending is not in progress in the same port (Y8:OFF), and then starts up the sending program.
- Using the SSET instruction, convert any given message into an ASCII string. Set the number of sent characters to the data register DT100, and the sent message to the data register DT101.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the GPTRNS / pGPSEND / GPSEND instruction, specify and execute the start of the table that stores the message to be sent (DT101) and the number of characters in the data (DT100).

GPTRNS instruction**GPSEND instruction****Info.**

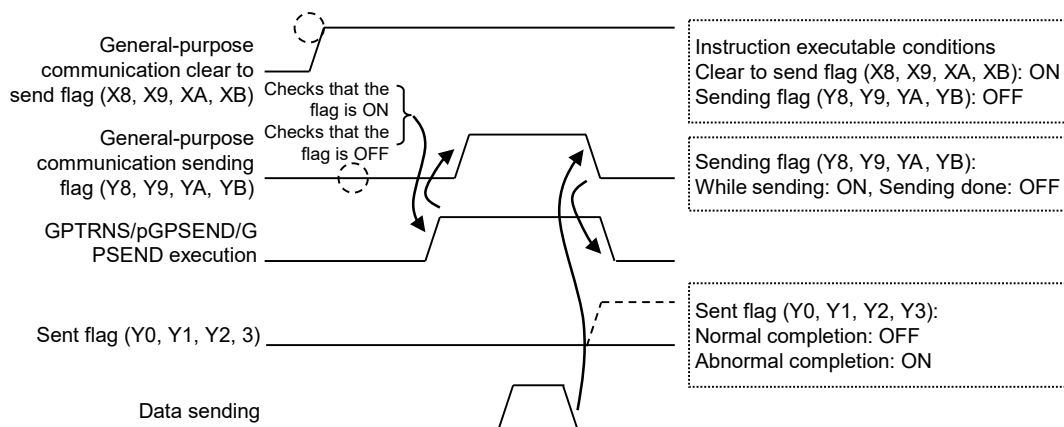
- For the GPSEND instruction, it is necessary to turn ON the execution condition until the end of data sending, and turn OFF the execution condition at a scan in which the end of data sending is confirmed.

Time chart (in the case of SCU)

- Data are sent in ascending order from low bytes of [S+1] in the table specified by the GPTRNS / pGPSEND / GPSEND instruction.
- During sending, the general-purpose communication sending flags (Y8, Y9, YA, YB) are turned ON. They turn OFF when sending is completed.

7.2 Sending Operation

- The sending result (0: normal completion; 1: abnormal completion) is stored in the general-purpose communication sent flags (Y0, Y1, Y2, Y3).



■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
X8	X9	XA	General-purpose communication clear to send flag	Turns ON when the unit is set to the general-purpose communication mode.
Y8	Y9	YA	General-purpose communication sending flag	Turns ON when sending with general-purpose communication mode. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

- (Note 1) Each contact is used for reading the operation state. Do not write over it with a user program.
- (Note 2) In the case of the GPTRNS and pGPSEND instructions, the sending flag and send results flag are updated after the scan is complete.
- (Note 3) In the case of the GPSEND instruction, the sending flag and send results flag are updated after sending is completed when the next GPSEND instruction is executed. If sending time is shorter than scan time, the general-purpose communication sending flags (Y8, Y9, YA, YB) are turned OFF when the GPSEND instruction is executed in the subsequent scan following completion of data sending. The flags remain ON for at least one scan time.

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
X8	X9	XA	XB	General-purpose communication clear to send flag	Turns ON when the unit is set to the general-purpose communication mode.
Y8	Y9	YA	YB	General-purpose communication sending flag	Turns ON when sending with general-purpose communication mode. Turns OFF when the sending process is completed.

COM Port No.				Name	Description
1	2	3	4		
Y0	Y1	Y2	Y3	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

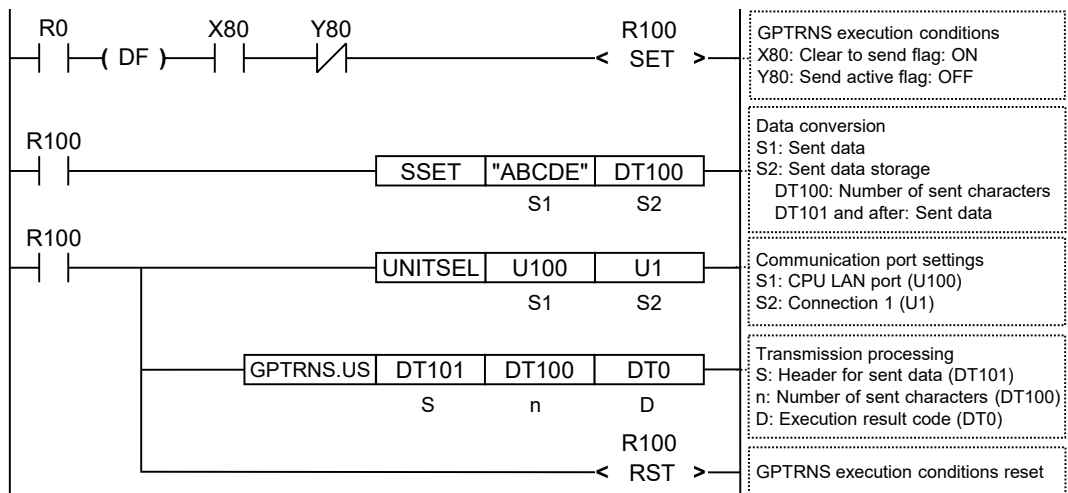
(Note 2) In the case of the GPTRNS and pGPSEND instructions, the sending flag and send results flag are updated after the scan is complete.

(Note 3) In the case of the GPSEND instruction, the sending flag and send results flag are updated after sending is completed when the next GPSEND instruction is executed. If sending time is shorter than scan time, the general-purpose communication sending flags (Y8, Y9, YA, YB) are turned OFF when the GPSEND instruction is executed in the subsequent scan following completion of data sending. The flags remain ON for at least one scan time.

■ **Sample program (in the case of CPU with built-in ET-LAN)**

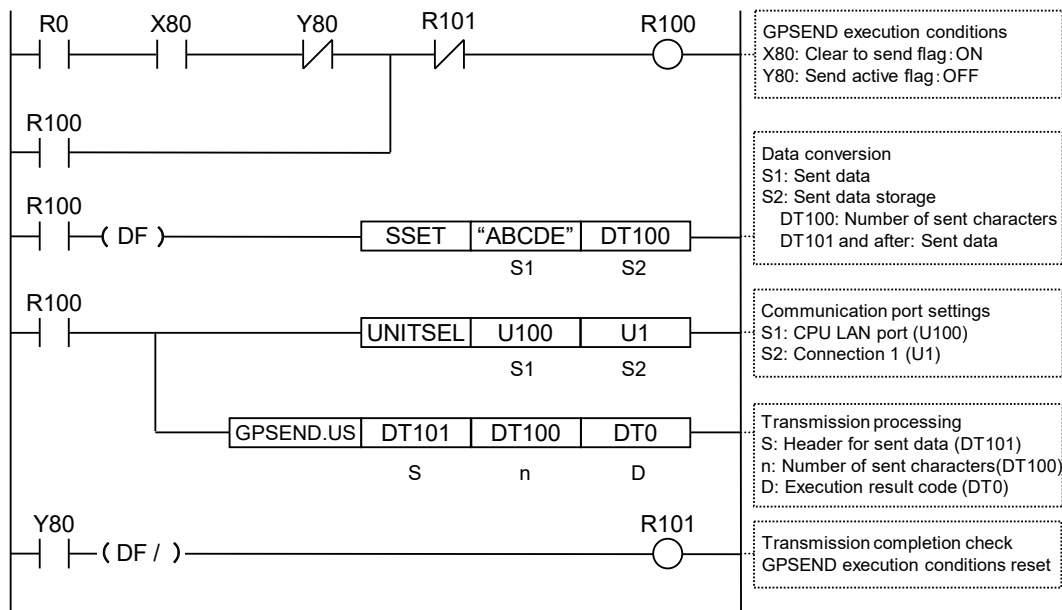
- This program checks that Connection 1 is established in the general-purpose communication mode (X80:ON) and that general-purpose sending is not in progress in the same port (Y80:OFF), and then starts up the sending program.
- Using the SSET instruction, convert any given message into an ASCII string. Set the number of sent characters to the data register DT100, and the sent message to the data register DT101.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the GPTRNS / pGPSEND / GPSEND instruction, specify and execute the start of the table that stores the message to be sent (DT101) and the number of characters in the data (DT100).

GPTRNS instruction



GPSEND instruction

7.2 Sending Operation

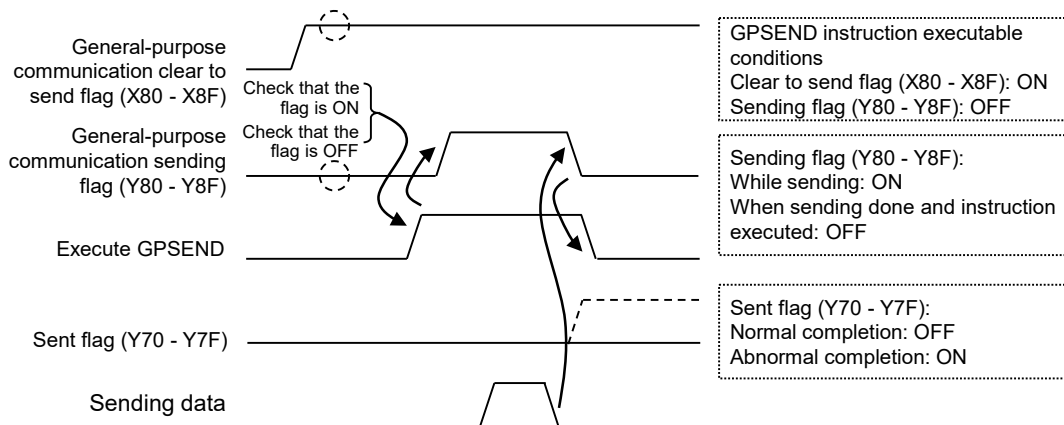


Info.

- For the GPSEND instruction, it is necessary to turn ON the execution condition until the end of data sending, and turn OFF the execution condition at a scan in which the end of data sending is confirmed.

Time chart (in the case of CPU with built-in ET-LAN)

- Data are sent in ascending order from low bytes of [S+1] in the table specified by the GPTRNS / pGPSEND / GPSEND instruction.
- During sending, the general-purpose communication sending flags that correspond to the connection (Y80 to Y8F) are turned ON. They turn OFF when sending is completed.
- The sending result (0: normal completion; 1: abnormal completion) is stored in the general-purpose communication sent flags (Y70 to Y7F).



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O number	Name	Description
X80 to X8F	General-purpose communication clear to send flag	Turns ON when general-purpose communication is in a connected status.
Y80 to Y8F	General-purpose communication sending flag	Turns ON when sending with general-purpose communication.
Y70 to Y7F	Sent flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

(Note 2) In the case of the GPTRNS and pGPSEND instructions, the sending flag and send results flag are updated after the scan is complete.

(Note 3) In the case of the GPSEND instruction, the sending flag and send results flag are updated after sending is completed when the next GPSEND instruction is executed.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	The connection specified with UNITSEL is closed (other than "Connect").
	The communication mode of the communication port specified with 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. The volume including a start code and an end code exceeds the specified maximum value.
	When the number of sent data specified by [n] exceeds the data area
	Either 0 or a negative value is set for [N] in the settings of sending to ET-LAN.
	Set when executed in an interrupt program.

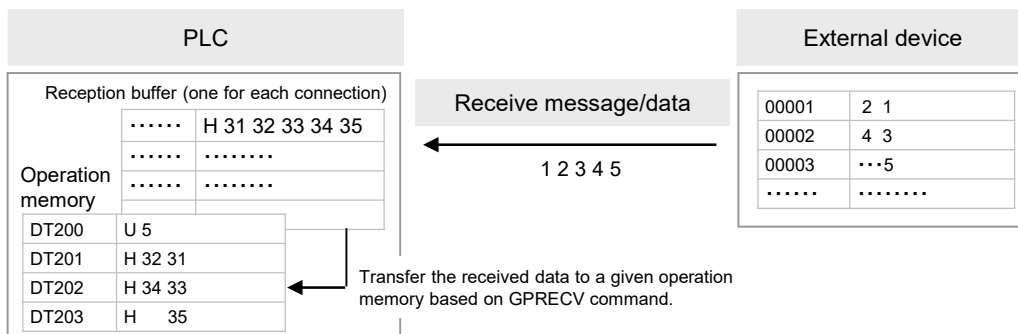
7.3 Receiving Operation

7.3 Receiving Operation

7.3.1 Overview of Receiving Operation

■ Procedures

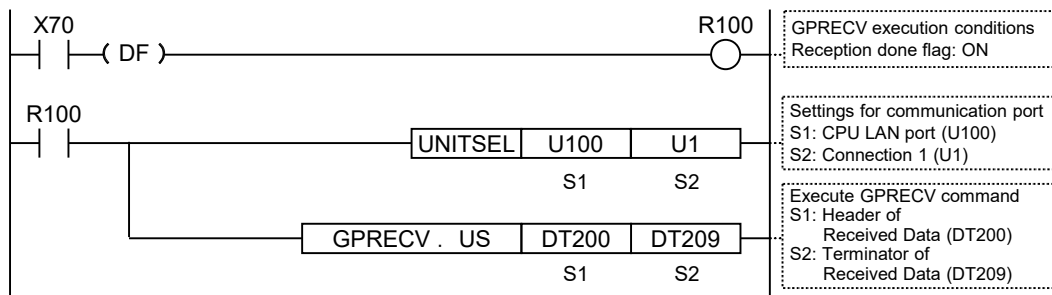
In the general-purpose communication mode, data received from the partner device are saved in the same reception buffer for each connection. When the GPRECV command is executed in a user program, data in the reception buffer can be copied into a given operation memory.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

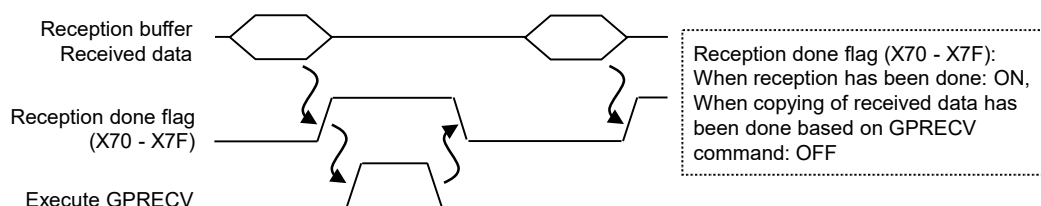
■ Sample program

- When the reception done flag (X70) for Connection 1 turns ON, the reception program is started up by the GPRECV command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the GPRECV command, specify and execute the header of the data table where the received message is saved (DT200) and the final address (DT209).



■ Timing chart

- Data received from an external device are saved in the reception buffer for each connection.
- When data are received, the reception done flag (X70 to X7F) turns ON.
- When the GPRECV command is executed, data are copied into the specified area, and the reception done flag (X70 - X7F) turns OFF. The reception done flag (X70 - X7F) turns OFF when the I/O refresh is executed at the beginning of the subsequent scans.

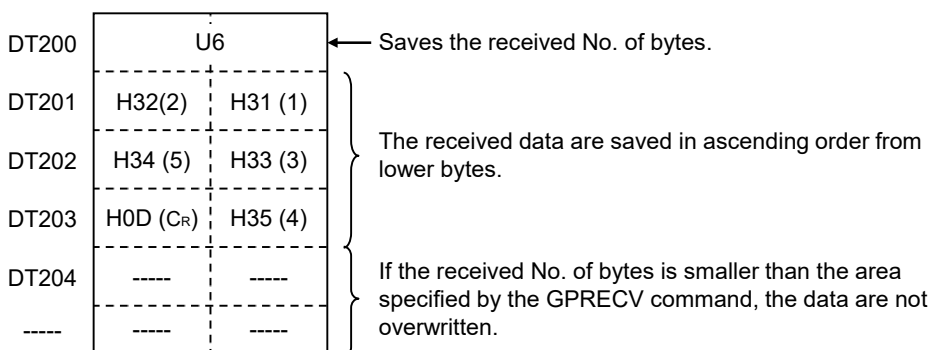


■ I/O number

I/O Allocation	Name	Explanation
X70 - X7F	General-purpose communication reception done flag	Turns ON when the receiving process is completed in the general-purpose communication mode.

■ Saving method for received data

When data are saved in a given data register from the reception buffer, based on GPRECV command, the data are saved in the following manner.



i Info.

- Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.
- The data size that can be received in a single transmission based on GPRECV command from the LAN port of the FP7 CPU unit is up to 16,384 bytes.

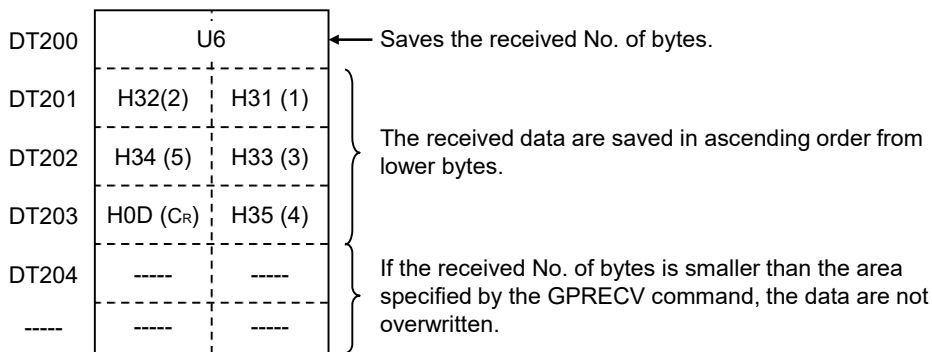
7.3.2 Contents of Received Data

When data are copied into a given data register, based on GPRECV command, the data are saved in the following manner.

■ Saving method for received data

When data are saved in a given data register from the reception buffer, based on GPRECV command, the data are saved in the following manner.

7.3 Receiving Operation

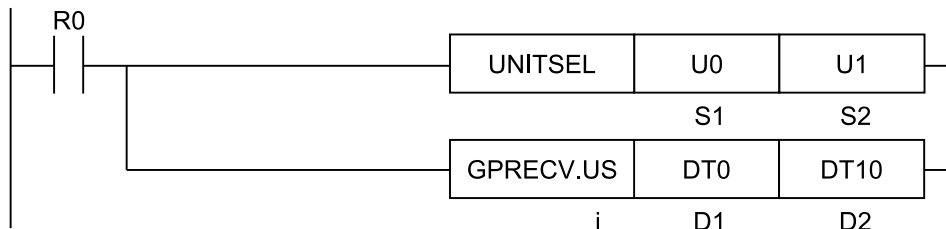


i Info.

- When a start code and an end code are included in accordance with the communication format of an external device, they are saved as a part of received data in the operation memory. As necessary, insert a program for extracting the relevant data.

7.3.3 GPREC V (General-Purpose Communication Receive Instruction)

■ Ladder diagram



(Note 1) The above figure shows the case that S1=U0 (CPU unit with built-in SCU) and S2=U1 (port number 1) are specified by the UNITSEL instruction.

■ Available operation units (●: Available)

Operation unit	bit	US	SS	UL	SL	SF	DF
i		●	●				

■ List of operands

Operand	Description
D1	Starting address of the received data storage data area
D2	Ending address of the received data storage data area

■ Available devices (●: Available)

Operand	16-Bit device:											32-Bit device:			Integer			Real number		String	Index modifier	
	W X	W Y	W R	W L	W S	S D	D T	L D	U M	W I	W O	T S	T E	C E	I X	K	U	H	S F	D F		" "
D1 ^(Note 1)	●	●	●	●			●	●														●
D2 ^(Note 1)	●	●	●	●			●	●														●

(Note 1) Always 16-bit data/device, regardless of the specification of operation units [i].

■ Outline of operation

- This instruction reads data that is sent from an external device and received by the communication port of the unit.
- This instruction reads received data from the communication unit and the communication port set by the UNITSEL instruction, and stores the number of received bytes in the area specified by [D1] and the received data in the areas [D1+1] to [D2].
- In the case of SCU, data received from the partner are stored in 8 receive buffers for each COM port. By executing the GPRECV instruction, data in the receive buffer can be copied to a given operation memory.
- In the case of CPU with built-in ET-LAN, data received from the partner are stored in 1 receive buffer for each connection. By executing the GPRECV instruction, data in the receive buffer can be copied to a given operation memory.

■ Amount of received data and end code

Items	SCU	In the case of CPU with built-in ET-LAN
Number of received data	0 to 4096 ^(Note 1)	0 to 16384
End code identification	Yes (according to the SCU communication settings (end settings))	No identification

(Note 1) For SCU, up to 4096 bytes can be sent, including a start code and an end code. The start code and end code are set from the configuration menu of the tool software or with the PMSET instruction.

When "Start code STX" is set to "Enabled", the maximum amount of sent data that can be specified is decremented by one.

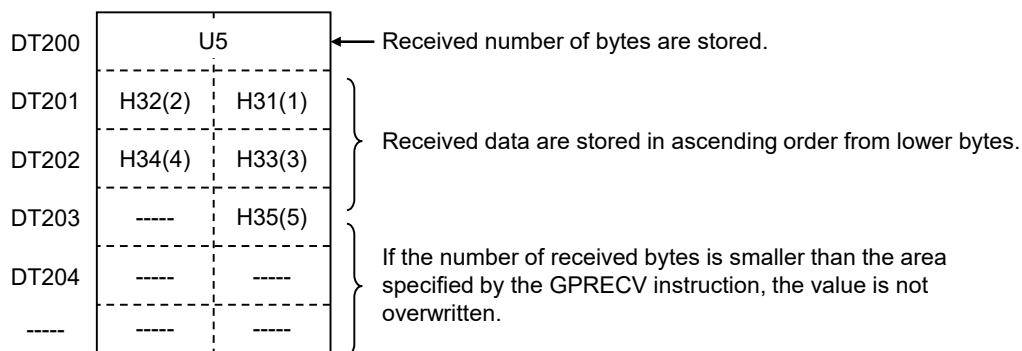
When "Terminator setting" is set to "ETX" or "CR", the maximum amount of sent data is decremented by one.

When "Terminator setting" is set to "CR+LF", the maximum amount of sent data is decremented by two.

When "Terminator setting" is set to "Time", the maximum amount of sent data is not decremented.

7.3 Receiving Operation

Storage method for received data

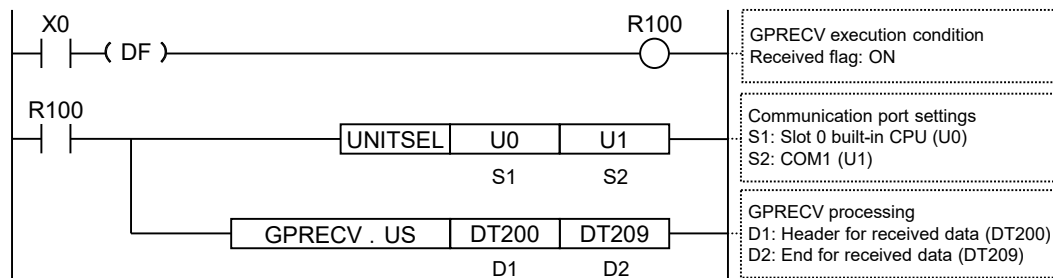


Info.

- The case of SCU shows the case that it is used in the following combination.
 - COM.0 port equipped in the CPU unit
 - Communication cassettes attached to the CPU unit (COM.1 to COM.2 ports)
 - Communication cassettes attached to the serial communication unit (COM.1 to COM.4 ports)
- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN.

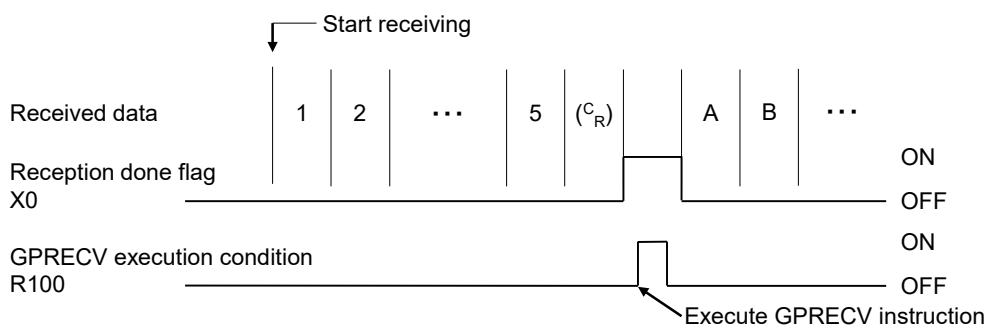
Sample program (in the case of SCU)

- When the received flag (X0) turns ON, the reception program is started up by the GPREC V instruction.
- Using the UNITSEL instruction, specify the slot number (U0) and the COM. port number (U1).
- In the GPREC V instruction, specify and execute the start of the data table that stores the received message (DT200) and the final address (DT209).

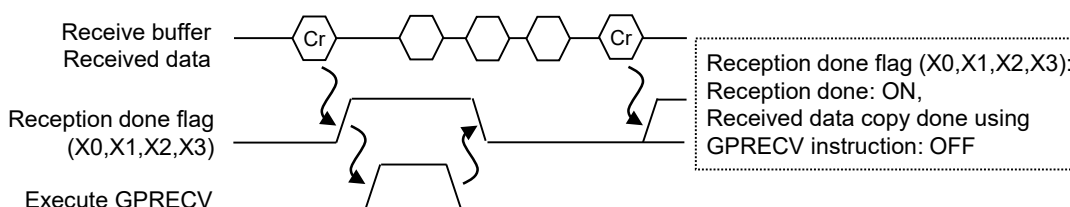


Time chart (in the case of SCU)

- Data received from an external device are stored in the receive buffer.
- When the end code is received, the received flag (X0, X1, X2, X3) turns ON. Subsequently, the following data are stored in the buffers upon reception. Data for 8 buffers can be received consecutively.



- When the GPREC instruction is executed, data are copied to the specified area, and the received flags (X0, X1, X2, X3) are turned OFF. The received flags (X0, X1, X2, X3) are turned OFF when I/O refresh is executed at the start of the following scans.



■ I/O allocation (in the case of CPU with built-in SCU)

COM Port No.			Name	Description
1	2	0		
X0	X1	X2	General-purpose communication received flag	Turns ON when the receiving process is completed in the general-purpose communication mode.
X4	X5	X6	General-purpose communication received data copied flag	Turns ON when the GPREC instruction is executed and the received data have been copied into the specified operation memory. Turns OFF when there are no applicable data.

■ I/O allocation (in the case of Serial Communication Unit)

COM Port No.				Name	Description
1	2	3	4		
X0	X1	X2	X3	General-purpose communication received flag	Turns ON when the receiving process is completed in the general-purpose communication mode.
X4	X5	X6	X7	General-purpose communication received data copied flag	Turns ON when the GPREC instruction is executed and the received data have been copied into the specified operation data. Turns OFF when there are no applicable data.

■ Precautions during programming (in the case of SCU)

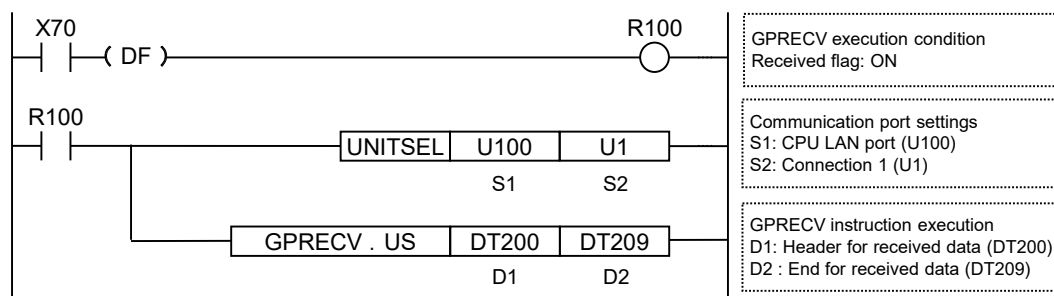
- Use the UNITSEL instruction immediately before the GPREC instruction to specify a target port for communication.

7.3 Receiving Operation

- When the general-purpose communication received flag is ON for the targeted COM port, execute GPREC.V.
- When multiplex reception is in progress, the received flag remains ON after the received data have been copied using the GPREC.V instruction. The received data cannot be copied at the leading edge of the reception done signal.
- The received data copied by the GPREC.V instruction do not include a start code or an end code.
- It is also possible to receive binary data using the GPREC.V instruction. In this case, "time" should be used for the end setting.
- The received data or the received data amount do not include the end code. (It is stripped off.)
- In the case of SCU which has eight 4096-byte buffers inside, data equivalent to the eight buffers can be received consecutively.
- If the reception of the ninth datum of data is performed by SCU before the GPREC.V instruction is executed to take out data from SCU's receive buffer, a buffer FULL error occurs in SCU, and the ninth datum is discarded.
- If the GPREC.V instruction is executed when the receive buffer FULL error is on, the oldest received datum is taken out, and the receive buffer FULL error is canceled.
- When no data have been received, the general-purpose communication control flag (received copy flag) turns OFF.
- After data have been received, and copy to the operation memory of the CPU unit has been completed, the general-purpose communication control flag (received data copied flag) turns ON.
- In the case of a direct address and an index modification address, specify the same device for D1 and D2. At the same time, specify the addresses so that D1 is less than D2.

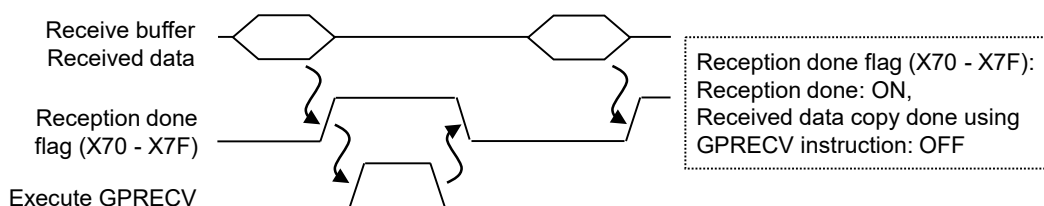
■ Sample program (in the case of CPU with built-in ET-LAN)

- When the received flag (X70) of Connection 1 turns ON, the reception program is started up by the GPREC.V instruction.
- The UNITSEL instruction is used to specify a slot number (LAN port: U100) and the connection number (U1).
- In the GPREC.V instruction, specify and execute the start of the data table that stores the received message (DT200) and the final address (DT209).



■ Time chart (in the case of CPU with built-in ET-LAN)

- Data received from an external device are stored in the receive buffer for each connection.
- When data are received, the received flag (X70 to X7F) turns ON.
- When the GPREC.V instruction is executed, data are copied to the specified area, and the received flags (X70 to X7F) are turned OFF. The received flags (X70 to X7F) are turned OFF when I/O refresh is executed at the start of the following scans.



■ I/O allocation (in the case of CPU with built-in ET-LAN)

I/O allocations	Name	Description
X70 to X7F	General-purpose communication received flag	Turns ON when receiving is completed in the general-purpose communication mode.

■ Precautions during programming (in the case of CPU with built-in ET-LAN)

- Use the UNITSEL instruction immediately before the GPRECV instruction to specify a target connection for communication.
- When the general-purpose communication received flag is ON for the targeted connection, execute GPRECV.
- The maximum volume of data that can be received in one session using the GPRECV instruction, from the LAN port of the FP7 CPU unit, is 16,384 bytes.
- 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.
- In the case of a direct address and an index modification address, specify the same device for D1 and D2. At the same time, specify the addresses so that D1 is less than D2.

i Info.

- As the communication cassette (Ethernet type) has an Ethernet-serial conversion function, the internal interface operates with similar programs as the case of SCU. The setting method and programming method are different from those for the CPU with built-in ET-LAN. Refer to the section describing the case of SCU.

■ Flag operations

Name	Description
SR7 SR8 (ER)	To be set in the case of out-of-range in indirect access (index modification).
	To be set when the destination range is outside the accessible range.
	An SCU or ET-LAN unit does not exist in the slot specified by UNITSEL.
	The communication mode of the communication port specified with UNITSEL is not "General-purpose communication".
	The COM port specified by UNITSEL does not exist.
	Connection specified by UNITSEL is in a "reception done OFF" status, but not in a "connected" status.
	Data device specified by [D1] and/or [D2] exceeds the area.
	The specified [D1] is greater than or equal to [D2].
The devices specified for [D1] and [D2] differ.	

(MEMO)

8 Specifications

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8.1 Specifications of CPU Unit LAN Port Communication Function

8.1 Specifications of CPU Unit LAN Port Communication Function

■ LAN port

Items	Description	
Interface	100BASE-TX / 10BASE-T	
Baud rate	100 Mbps, 10 Mbps auto-negotiation ^(Note 1)	
Transmission system	Baseband	
Max. segment length	100 m ^(Note 2)	
Communication cable	UTP (Category 5)	
Max. distance between nodes	100BASE-TX: 2 segments	
	10BASE-T: 5 segments	
No. of nodes	254 units	
Number of simultaneous connections	User connections: 16	
	System connections: 4 ^(Note 3)	
Communication protocol	TCP/IP, UDP/IP	
DNS	Supports name server	
DHCP	Automatic getting of IP address	
FTP server	File transmission, server function, No. of users: 3	
SNTP	Time synch function	
Communication function	MEWTOCOL-DAT (master/slave), MEWTOCOL-COM (master/slave) MEWTOCOL7-COM (slave), MODBUS TCP (master/slave) General-Purpose Communication	
Ports used by FP7	Port No.	Function
	20, 21	FTP server
	80	Web Server
	443	Web Server
	990	FTPS server
	123	SNTP client
	2222, 44818	EtherNet/IP

(Note 1) Switching of speeds is done automatically by the auto negotiation function.

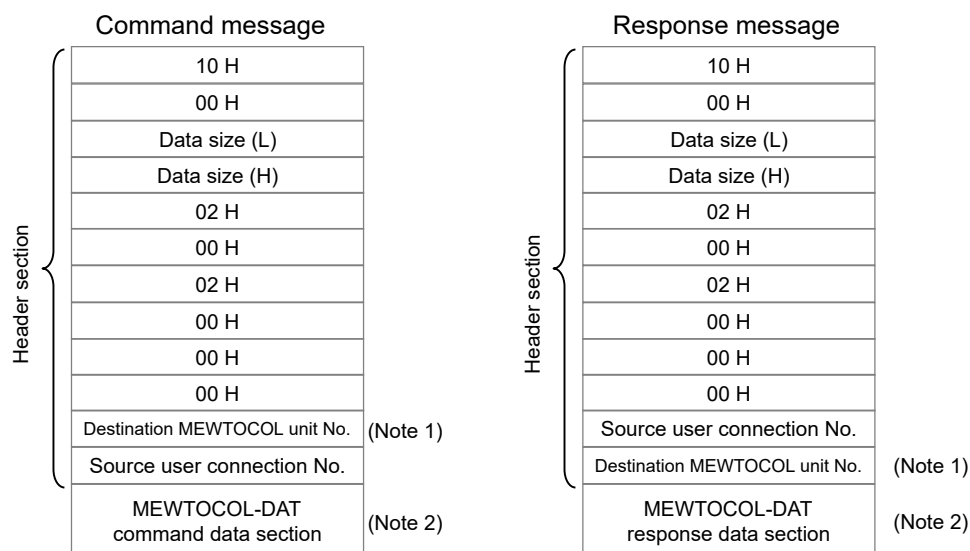
(Note 2) The standards cite 100 m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the user environment. Also, it is recommended to position a hub near the control board, and limit the length within 10 m

(Note 3) This is used when connecting tool software via LAN.

8.2 MEWTOCOL-DAT Format

8.2.1 MEWTOCOL-DAT Command Format in LAN Command Format

- In data sent/received in LAN communication, a header is attached to the MEWTOCOL-DAT command data part, or the MEWTOCOL-DAT response data part, as indicated in the data structure below.
- When the PLC side has the sending right, and executes the sending/receiving process, PLC automatically attaches these data when SEND/RCV command is executed. Therefore, it is not necessary to take account of these data in a user program.



(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".

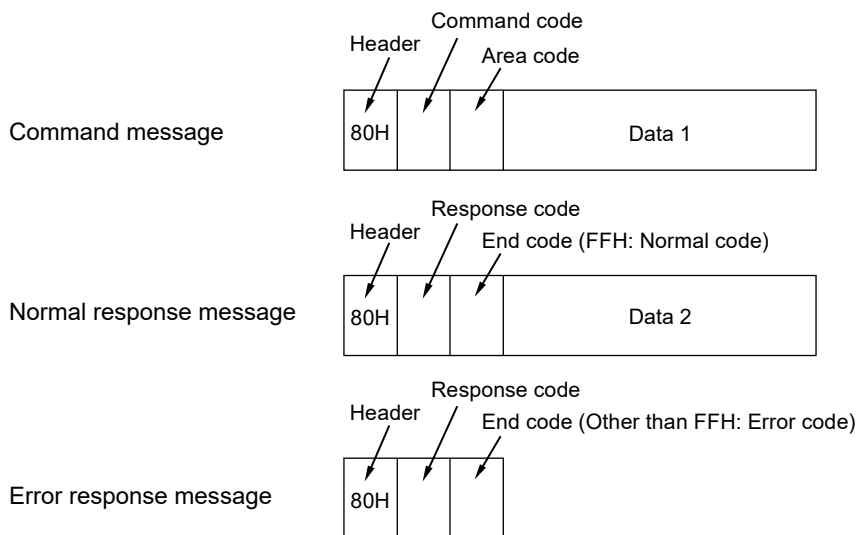
Configuration MEWTOCOL communication type setting	MEWTOCOL station no. of sender	Max. bytes of the command data part and the response data part
Not connect with FP2-ET-LAN	1	Max. 4084 bytes
Connect with FP2-ET-LAN	Station no. specified by the operand of SEND/RCV command	Max. 2048 bytes

8.2.2 MEWTOCOL-DAT Command / Response Format

■ Command / response message format

This is a special procedure and conversational format using binary codes.

8.2 MEWTOCOL-DAT Format



■ 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.

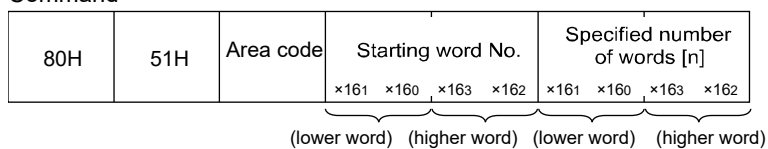
● Data

The content varies depending on the type of instruction. Write an instruction in accordance with its specified format.

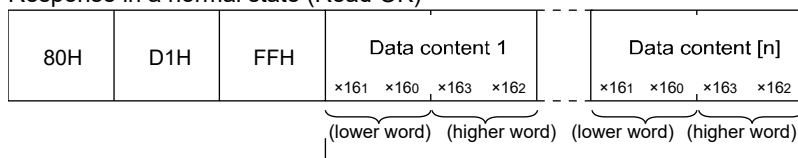
■ Example of command / response message

Example of data area read (command code 51H):

Command



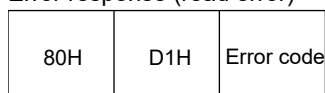
Response in a normal state (Read OK)



No. of read data (n)

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)



8.3 MEWTOCOL-COM Format

8.3.1 MEWTOCOL-COM Command Format in LAN Communication

■ **Format of command/response message**

- Data to be sent/received in LAN communication vary based on settings for user connection information: MEWTOCOL communication type.

MEWTOCOL communication type setting	Format of command and response
Not connect with FP2-ET-LAN	Only send the MEWTOCOL-COM command data part, or the MEWTOCOL-COM response data part, and no header is attached.
Connect with FP2-ET-LAN	A header is attached to the MEWTOCOL-COM command data part, or the MEWTOCOL-COM response data part, as indicated in the data structure below.

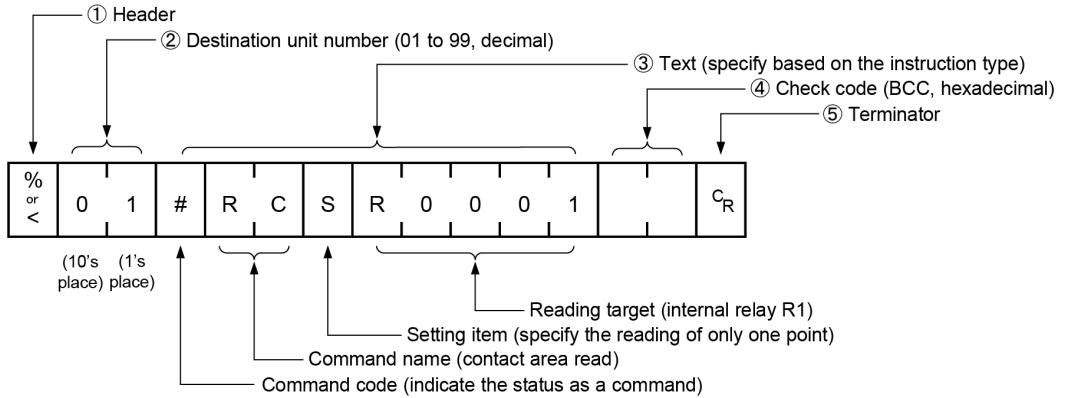
- When the PLC side has the sending right, and executes the sending/receiving process, PLC automatically attaches these data when SEND/RECV command is executed. Therefore, it is not necessary to take account of these data in a user program.

■ **Message format**

MEWTOCOL communication type setting	Message format																										
Not connect with FP2-ETLAN	Command message	Response message																									
	<div style="border: 1px dashed black; padding: 5px; width: fit-content; margin: 0 auto;">No header</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">MEWTOCOL-COM command data section</div>	<div style="border: 1px dashed black; padding: 5px; width: fit-content; margin: 0 auto;">No header</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">MEWTOCOL-COM response data section</div>																									
Connect with FP2-ETLAN	Command message	Response message																									
	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 2em; margin-right: 5px;">Header section</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>10 H</td></tr> <tr><td>00 H</td></tr> <tr><td>Data size (L)</td></tr> <tr><td>Data size (H)</td></tr> <tr><td>02 H</td></tr> <tr><td>00 H</td></tr> <tr><td>02 H</td></tr> <tr><td>00 H</td></tr> <tr><td>00 H</td></tr> <tr><td>00 H</td></tr> <tr><td>Destination MEWTOCOL unit No.</td></tr> <tr><td>Source user connection No.</td></tr> <tr><td>MEWTOCOL-COM command data section</td></tr> </table> </div>	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	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 2em; margin-right: 5px;">Header section</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>10 H</td></tr> <tr><td>00 H</td></tr> <tr><td>Data size (L)</td></tr> <tr><td>Data size (H)</td></tr> <tr><td>02 H</td></tr> <tr><td>00 H</td></tr> <tr><td>02 H</td></tr> <tr><td>00 H</td></tr> <tr><td>00 H</td></tr> <tr><td>00 H</td></tr> <tr><td>Source user connection No.</td></tr> <tr><td>Destination MEWTOCOL unit No.</td></tr> <tr><td>MEWTOCOL-COM command data section</td></tr> </table> </div>	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.
10 H																											
00 H																											
Data size (L)																											
Data size (H)																											
02 H																											
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00 H																											
Destination MEWTOCOL unit No.																											
Source user connection No.																											
MEWTOCOL-COM command data section																											
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Data size (L)																											
Data size (H)																											
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00 H																											
00 H																											
Source user connection No.																											
Destination MEWTOCOL unit No.																											
MEWTOCOL-COM command data section																											

8.3.2 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.

i Info.

- An expansion header “<” is supported to send and receive single frames of up to 2048 characters as well as general “%”.

Type of header	No. of characters that can be sent in 1 frame
%	Max. 118 characters
<	Max. 2048 characters

(2) Unit No.

- The station no. of the PLC to which you want to send the command must be specified. The station no. of the PLC is specified by the system register.
- In 1:1 communication, specify "01" (ASCII code: H3031) or "EE" (ASCII code: H4545). The connection destination is determined by an IP address.

i Info.

- When the PLC receives a command with "EE" specified for the station number, it will respond regardless of the station number setting.
If “EE” is specified in the 1:1 communication, communication can be performed regardless of the unit number setting of the partner PLC.

(3) Text

- The content of this varies depending on the type of command. The content should be noted in all upper-case characters, following the fixed formula.

(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 to the last text character.

8.3 MEWTOCOL-COM Format

- 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 the 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).

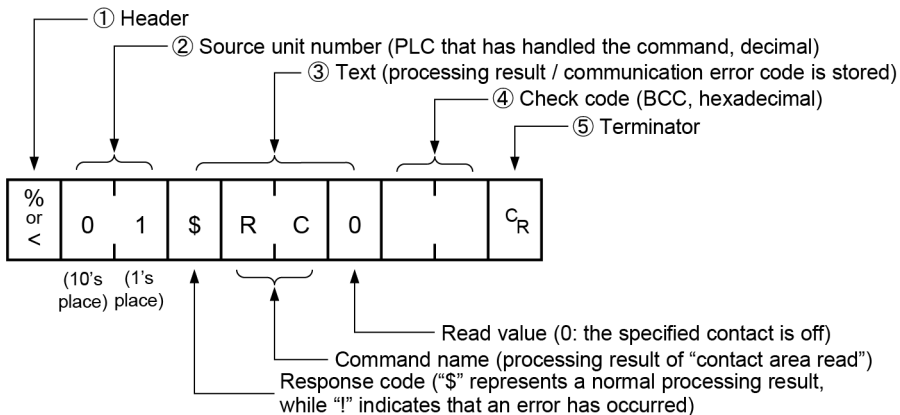


- The method for writing text segments in the message varies depending on the type of command.
- When the message to be sent contains a large number of characters, send the command divided in several times.
- When the message contains a large number of characters, the response is sent divided in several times.

8.3.3 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.

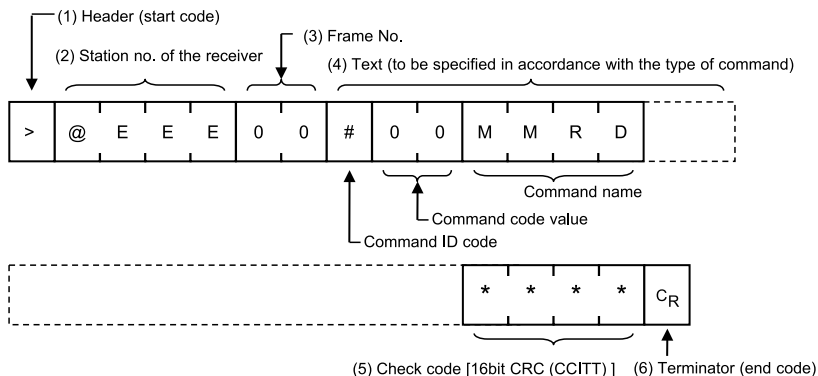
 Unit number and command name are always identical in a command and its corresponding response, as indicated below. This makes correspondence between a command and a response clear.

Command	%	0	1	#	R	C			C _R
	Same			Same					
Response	%	0	1	\$	R	C			C _R

8.4 MEWTOCOL7-COM Format

8.4.1 MEWTOCOL7-COM Command Format

■ **Command message**



(1) Header (start code)

A ">" (ASCII code: H3E) must be at the beginning of a message.

Info.

- The method for writing text segments in the message varies depending on the type of command.
- When the message to be sent contains a large number of characters, send the command divided in several times.
- When the message contains a large number of characters, the response is sent divided in several times.
- In MEWTOCOL7-COM command, up to 4096 characters can be sent/received in a single frame.

Type of header	No. of characters that can be sent in 1 frame
>	Max. 4096 characters

(2) Station no.

- The station no. of the receiving PLC to which you want to send the command must be specified with "@ and three digits". The station no. of the PLC is specified by the system register. In the case of the FP7 CPU unit, the station no. is specified in the FPWIN GR7 configuration menu.
- In 1:1 communication, specify "001" (ASCII code: H303031) or "EEE" (ASCII code: H454545).

The connection destination is determined by an IP address.

i Info.

- When the PLC receives a command with "EEE" specified for the station number, it will respond regardless of the station number setting.
If "EEE" is specified in the 1:1 communication, communication can be performed regardless of the unit number setting of the partner PLC.

(3) Frame No.

This indicates the sending frame No. Make sure to use consecutive frame numbers.

E.g. Commands for multiple frames

>@EEE00#00MMRDD001G0DT0000000001000****CR

>@EEE01****& CR

* Make sure to use consecutive values for frame numbers. The usable number range is from 00 to FF. After FF, return to 00.

(4) Text

The content of this varies depending on the type of command. The content should be noted in all upper-case characters, following the fixed formula for the particular command.

(5) Check code

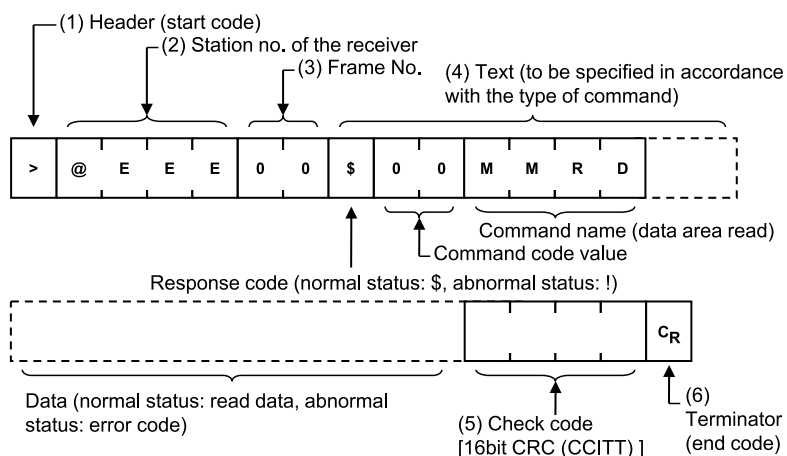
- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- This should be created so that it targets all of the text data from the header to the last text character.
- CRC is text information that is converted from the results of calculations made by CRC-16-CCITT. It is normally part of the calculation program and is created automatically.

(6) Terminator (end code)

Messages must always end with a "CR" (ASCII code: H0D).

8.4.2 MEWTOCOL7-COM Response Format

■ Response message



8.4 MEWTOCOL7-COM Format

(1) Header (start code)

- A ">" (ASCII code: H3E) must be at the beginning of a message.
- The response must start with the same header (start code).

(2) Station no.

This is the station no. of the PLC that processed the command.

(3) Frame No.

This is the frame number where the command was processed.

(4) Text

The content of this varies depending on the type of command. If the processing is not completed successfully, an error code will be stored here, so that the content of the error can be checked.

(5) Check code

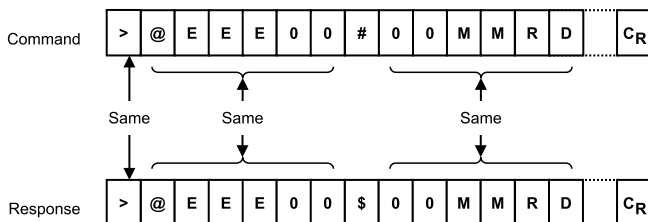
- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- This should be created so that it targets all of the text data from the header to the last text character.
- CRC is text information that is converted from the results of calculations made by CRC-16-CCITT. Normally, CRC is automatically generated by incorporating calculation programs or other similar programs.

(6) Terminator (end code)

The message should end with "CR" (ASCII code: H0D).

Note

- If no response is returned, the communication format may not be correct, or 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, and parity) match between the computer and the PLC.
- 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.
- Station no. and command name are always identical in a command and its corresponding response (see below). This makes the correspondence between a command and a response clear.



Record of Changes

Manual number can be found at the bottom of the cover page.

Date	Manual No.	Record of Changes
Dec. 2012	-	-
Mar. 2013	WUME-FP7LAN-01	1st Edition <ul style="list-style-type: none"> • Errors corrected
Apr. 2018	WUME-FP7LAN-02	2nd Edition <ul style="list-style-type: none"> • Added "Ethernet Security" precautions • Added acquisition method for "Settings for SNTP server" time data • Added precautions regarding "Settings for SNTP server" password input • Errors corrected
Jun. 2019	WUME-FP7LAN-03	3rd edition <ul style="list-style-type: none"> • Added content regarding "Setting Basic Communication Information"
Jan. 2020	-	- <ul style="list-style-type: none"> • Errors corrected 6.1 MODBUS TCP Format
Nov. 2022	WUME-FP7LAN-06	6th Edition <ul style="list-style-type: none"> • Added information regarding MEWTOCOL-COM commands and 1:1 communication • Changed manual formatting
Mar. 2023	WUME-FP7LAN-07	7th Edition <ul style="list-style-type: none"> • Deleted content related to "TCP ULP timeout value" • Added port numbers used by FP7
Apr. 2024	WUME-FP7LAN-08	8th Edition <ul style="list-style-type: none"> • Change in Corporate name
Jan. 2025	WUME-FP7LAN-09	9th Edition <ul style="list-style-type: none"> • Added the maximum number of retransmissions of the TCP timer value.

Order Placement Recommendations and Considerations

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

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

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- v) nuclear control system
- vi) aircraft equipment, aerospace equipment, and submarine repeater
- vii) burning appliances
- viii) military devices
- ix) medical devices (except for general controls)
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[Scope of warranty]

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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.
- (4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
- (5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
- (6) When the failure or defect was caused by a natural disaster or other force majeure.
- (7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

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

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