

Programmable Controller

FP-XH Series

User's Manual

Communication Edition

Western version

(MEMO)

Introduction

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

Types of Manuals

- This manual describes the "Communication Function" provided by the FP-XH Control Unit.
- The following user's manuals are available for the FP-XH series. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website: <https://industry.panasonic.com/global/en/downloads/?tab=manual>.

Unit name or purpose of use	Manual name	Manual code
FP-XH Control Unit	FP-XH User's Manual (Basic)	WUME-FPXHBASG
FP-X Expansion Unit FP-X Extension Cassette	FP-XH Series Programming Manual	WUME-FPXHPGRG
Positioning Function / PWM Output / High-speed Counter Function	FP-XH User's Manual (Positioning / PWM Output / High-speed Counter)	WUME-FPXHPOSG
Communication Functions		
FP-X Extension (Communication) Cassette	FP-XH User's Manual (COM Communication)	WUME-FPXHCOMG

SAFETY PRECAUTIONS

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



WARNING

Incorrect operation may lead to death or serious injury.

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



CAUTION

Incorrect operation may lead to injury or material loss.

- To prevent the excessive exothermic heat or smoke generation of the product, a certain margin is required for guaranteed characteristics and performance ratings of relative products.
- Do not disassemble or modify the product.
Otherwise it may lead to the excessive exothermic heat or smoke generation of the product.
- Do not touch terminal blocks during power-on.
Otherwise it may result in an electric shock.
- Create an emergency stop and interlock circuit in the external devices.
- Connect wires and connectors reliably.

Otherwise it may lead to the excessive exothermic heat or smoke generation of the product.

- Do not carry out construction (wiring, removal, etc.) during power-on.
Otherwise it may result in an electric shock.
- If the equipment is used in a manner not specified by the Panasonic, the protection provided by the equipment may be impaired.
- This product has been developed/produced for industrial use only.

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- Other company and product names are trademarks or registered trademarks of their respective companies.

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 password to limit users who can log in.
- Take measures such as limiting access through password protection to prevent the leakage of confidential information onto the network.
- Periodically change the 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.

Table of Contents

1 Unit Functions and Restrictions on Combination	1-1
1.1 Unit Functions and Features	1-2
1.1.1 Unit Functions	1-2
1.1.2 Restrictions on Communication Functions to be Used	1-2
1.2 Overview of Communication Functions	1-4
1.2.1 PLC Link Function (MEWNET-W0)	1-4
1.2.2 MEWTOCOL Master / Slave Communication	1-4
1.2.3 MODBUS RTU Master / Slave Communication	1-5
1.2.4 General-Purpose Communication	1-6
1.3 Restrictions on Units Combination	1-8
1.3.1 Restrictions on Combinations of Extension Cassettes	1-8
2 Wiring of COM Port	2-1
2.1 Installing Extension Cassettes	2-2
2.1.1 Precautions When Installing the Extension Cassette	2-2
2.1.2 Installing the Communication Cassette	2-2
2.2 Wiring of the COM Port Terminal Block	2-4
2.2.1 Suitable Wires and Tools	2-4
2.2.2 Applicable Cables	2-5
2.2.3 Wiring Method	2-5
2.3 Wiring of the Control Unit (GT Power Supply, COM0 Port)	2-7
2.3.1 Handling of GT Power Supply Terminal	2-7
2.3.2 Terminal Layout Diagrams and Wiring Examples	2-7
2.4 Wiring for Communication Cassettes COM1 to COM4 Ports	2-9
2.4.1 Communication Cassette AFPX-COM1 (RS-232C 1ch Non-Isolated Type)	2-9
2.4.2 Communication Cassette AFPX-COM2 (RS-232C 2ch Non-Isolated Type)	2-10
2.4.3 Communication Cassette AFPX-COM3 (RS-485 / RS-422 1ch Non-Isolated Type)	2-10
2.4.4 Communication Cassette AFPX-COM4 (RS-485 1ch Isolated Type + RS-232C 1ch Non-Isolated Type)	2-12
2.4.5 Communication Cassette AFPX-COM5 (Ethernet 1ch + RS-232C 1ch Non-Isolated Type)	2-13
2.4.6 Communication Cassette AFPX-COM6 (RS-485 2ch Isolated Type)	2-15
3 Setting and Confirmation of Communication Conditions	3-1
3.1 Setting of Purpose and Communication Conditions	3-2
3.1.1 Purpose to be Set for Each Port	3-2
3.1.2 Communication Conditions to be Set for Each Port	3-2
3.2 Communication Conditions Settings	3-4
3.2.1 System Register Settings	3-4
3.2.2 Settings Using a Program	3-5
4 PLC link	4-1

4.1	Operation of PLC Link MEWNET-W0	4-2
4.1.1	Operation Overview of PLC Link.....	4-2
4.1.2	Roles of Link Relays and Link Registers	4-2
4.2	Setting Items for PLC Link	4-4
4.2.1	Unit Number Setting.....	4-4
4.2.2	Setting of the Largest Unit Number.....	4-4
4.2.3	Memory Block No. of Link Relays and Link Registers to be Used... ..	4-4
4.2.4	Ranges of Link Relays and Link Registers to be Used.....	4-5
4.2.5	Link Relay Transmission Start Number and Sending Size	4-5
4.2.6	Link Register Transmission Start Number and Sending Size	4-6
4.3	Response Time of PLC Link	4-9
4.3.1	Response Time of One Transmission Cycle	4-9
4.3.2	Response Time when There are Units that have not been Added to the Link	4-10
5	MEWTOCOL Master-Slave Communication	5-1
5.1	List of MEWTOCOL Supported Commands	5-2
5.1.1	List of MEWTOCOL-COM Commands	5-2
5.2	MEWTOCOL-COM Master Communication (RECV).....	5-3
5.2.1	Reading Data from External Device.....	5-3
5.3	MEWTOCOL-COM Master Communication (SEND).....	5-6
5.3.1	Writing Data to External Device	5-6
6	MODBUS RTU Master-Slave Communication	6-1
6.1	List of MODBUS RTU Supported Commands	6-2
6.1.1	List of MODBUS Function Codes	6-2
6.1.2	Device No. Correspondence Table	6-2
6.2	MODBUS RTU Master Communication (RECV)	6-3
6.2.1	Reading Data from External Device.....	6-3
6.3	MODBUS RTU Master Communication (SEND)	6-6
6.3.1	Writing Data to External Device	6-6
7	General-Purpose Communication	7-1
7.1	Overview of Sending Data	7-2
7.1.1	Overview of Sending Data	7-2
7.1.2	Send Data Area	7-3
7.2	Receiving Data from External Devices	7-4
7.2.1	Overview of Receiving Data.....	7-4
7.2.2	Receive Data Area.....	7-5
7.3	Flag Operations in Transmission / Reception	7-7
7.3.1	When the Header is Set to “No STX” and the Terminator to “CR” ...	7-7
7.3.2	When the Header is Set to “STX” and the Terminator to “ETX”	7-8
8	Ethernet Communication (AFPX-COM5 cassette)	8-1
8.1	AFPX-COM5.....	8-2
8.1.1	Functions of AFPX-COM5	8-2
8.1.2	Communication Tool Software Configurator WD	8-2
8.2	Computer Link (Ethernet).....	8-6

8.2.1 Overview	8-6
8.2.2 Setting of Communication Environment for Computer Link (Ethernet)	8-6
8.3 Connection for 1:1 Communication (Computer Link (Ethernet)).....	8-9
8.4 1:N Communication (Computer Link (Ethernet)).....	8-13
8.5 MEWTOCOL Master Communication Setting.....	8-14
8.6 MEWTOCOL Master (Ethernet) (Sample Program)	8-16
8.6.1 Behavior of Sample Program	8-16
8.6.2 Setting Communication Environment when MEWTOCOL Master (Ethernet) is Used	8-16
8.6.3 Master Unit Sample Program.....	8-20
8.7 General-purpose Communication	8-22
8.7.1 Overview of General-purpose Communication (Ethernet)	8-22
8.7.2 Setting for Using the General-purpose Communication (Ethernet) .	8-22
8.8 PLC Link Communication (Ethernet)	8-27
8.8.1 Overview of PLC Link Communication (Ethernet)	8-27
8.8.2 PLC Link Communication Setting	8-27
8.9 Applied Usage (Ethernet).....	8-30
8.9.1 How to Confirm the Network Information on the FP-XH Control Unit.....	8-30
8.9.2 How to Transmit a Command Message to Each Unit	8-34
8.10 Example of Connections (Ethernet).....	8-35
8.11 Initialization Procedure.....	8-37
9 Instruction References	9-1
9.1 Serial Communication Instructions	9-2
9.1.1 [F145 SEND] [F146 RECV] Instructions: Common Items	9-2
9.1.2 [F145 SEND] Data Transmission (MEWTOCOL-COM Master).....	9-3
9.1.3 [F146 RECV] Data Reception (MEWTOCOL-COM Master)	9-5
9.1.4 [F145 SEND] Data Transmission (MODBUS Master: Function Code Specification).....	9-7
9.1.5 [F146 RECV] Data Reception (MODBUS Master: Function Code Specification)	9-9
9.1.6 [F145 SEND] Data Transmission (MODBUS Master).....	9-11
9.1.7 [F146 RECV] Data Reception (MODBUS Master).....	9-13
9.1.8 [F159 MTRN] Serial Data Send / Receive Instruction.....	9-15
9.2 Character String Instructions	9-19
9.2.1 F253 SSET (Character Constant → ASCII Code Conversion: with Storage Area Size).....	9-19
10 Troubleshooting	10-1
10.1 What to Do If an Error Occurs.....	10-2
10.1.1 If a communication error occurs (RS-232C)	10-2
10.1.2 If a communication error occurs (RS-422)	10-3
10.1.3 If a communication error occurs (RS-485)	10-3
10.1.4 If a communication error occurs (Ethernet).....	10-4
11 List of Specifications	11-1
11.1 Communication Function Specifications	11-2

11.1.1	Communication Specifications of the Control Unit	11-2
11.1.2	Specifications of the Communication Cassette	11-2
11.2	MEWTOCOL-COM Format	11-5
11.2.1	MEWTOCOL-COM Command Type	11-5
11.2.2	MEWTOCOL-COM Response Format	11-6
11.3	MODBUS RTU Format.....	11-8
11.3.1	MODBUS RTU Command Format	11-8
11.3.2	MODBUS RTU Response Format.....	11-8
11.4	List of System Registers (COM Communication).....	11-10
11.5	List of Special Relays (COM Communication)	11-14
11.6	List of Special Data Registers (COM Communication)	11-24
11.7	Error Codes List	11-29
11.7.1	List of MEWTOCOL-COM Communication Error Codes.....	11-29

1 Unit Functions and Restrictions on Combination

1.1 Unit Functions and Features.....	1-2
1.1.1 Unit Functions	1-2
1.1.2 Restrictions on Communication Functions to be Used	1-2
1.2 Overview of Communication Functions	1-4
1.2.1 PLC Link Function (MEWNET-W0).....	1-4
1.2.2 MEWTOCOL Master / Slave Communication	1-4
1.2.3 MODBUS RTU Master / Slave Communication	1-5
1.2.4 General-Purpose Communication.....	1-6
1.3 Restrictions on Units Combination.....	1-8
1.3.1 Restrictions on Combinations of Extension Cassettes	1-8

1.1 Unit Functions and Features

1.1 Unit Functions and Features

1.1.1 Unit Functions

■ **Removable serial Communication Cassettes are used**

- Can be selected from six Communication Cassettes (sold separately) that conform to communication standards RS-232C, RS-422, RS-485 and Ethernet.
- Two Communication Cassettes can be attached to the control unit. Only one communication cassette can be attached to the C14 Control Unit.

■ **The control unit has a built-in COM0 port as standard equipment**

The control unit has a built-in RS-232C port (3-wire type) for connection with a programmable display, and a 5V power supply, as standard equipment.

■ **Four communication modes are available**

Different communication modes are available (PLC link, MEWTOCOL, MODBUS-RTU, and general-purpose communication mode). Depending on combination with Communication Cassettes, the product can be connected with diverse serial communication devices.

1.1.2 Restrictions on Communication Functions to be Used

- When a communication port that is built in the control unit as standard equipment or a Communication Cassette is used, the following restrictions are applied depending on functions to be used.
- Allocated communication port No. varies depending on where the cassette is installed.

■ **Types of communication ports / cassettes (●: Available; ○: Conditionally available; Blank: Not available)**

Product No.	Communication interface	Allocated communication port No.					
		Control Unit		Cassette mounting part 1		Cassette mounting part 2	
		USB	COM0	COM1	COM2	COM3	COM4
Control Unit standard equipment	USB x 1 channel	●					
	RS-232C (3-wire type) x 1 channel		●				
AFPX-COM1	RS-232C (5-wire type) x 1 channel			●		●	
AFPX-COM2	RS-232C (3-wire type) x 2 channels			●	●	●	●
AFPX-COM3	RS-485 / RS-422 x 1 channel			●		●	
AFPX-COM4	RS-485 x 1 channel			●		●	
	RS-232C (3-wire type) x 1 channel				●		●
AFPX-COM5	Ethernet x 1 channel			●		●	

1.1 Unit Functions and Features

Product No.	Communication interface	Allocated communication port No.					
		Control Unit		Cassette mounting part 1		Cassette mounting part 2	
		USB	COM0	COM1	COM2	COM3	COM4
	RS-232C (3-wire type) x 1 channel				•		•
AFPX-COM6	RS-485 x 2 channel			•	•	•	•

(Note 1) The RS-232C port of AFPX-COM1 is a 5-wire type capable of RS / CS control.

(Note 2) Select either RS-485 or RS-422 for AFPX-COM3. They can be selected using the switch on the Communication Cassette.

(Note 3) With AFPX-COM4, both RS-485 x 1 channel and RS-232C (3-wire type) x 1 channel can be used.

(Note 4) With AFPX-COM5, both Ethernet x 1 channel and RS-232C (3-wire type) x 1 channel can be used.

■ List of available functions by communication port (●: Available; ○: Conditionally available; Blank: Not available)

Available communication functions		Allocated communication port No.					
		Control Unit		Cassette mounting part 1		Cassette mounting part 2	
		USB	COM0	COM1	COM2	COM3	COM4
PLC link			○	○			
MEWTOCOL-COM	Master		•	•	•	•	•
	Slave	•	•	•	•	•	•
MODBUS-RTU ^(Note 3)	Master		•	•	•	•	
	Slave		•	•	•	•	
General-purpose communication			•	•	•	•	

(Note 1) For PLC link, only one port may be used (either COM0 port that is built in the Control Unit as standard equipment, or COM1 port on a cassette).

(Note 2) The COM4 port supports only MEWTOCOL-COM communication. In addition, the communication parameters (unit number, communication format, baud rate) when the power is ON are the same as the settings of the COM3 port. After RUN, you can also change the conditions by the SYS1 instruction.

(Note 3) The AFPX-COM5 Cassette (Ethernet type) does not support MODBUS-RTU (master / slave).

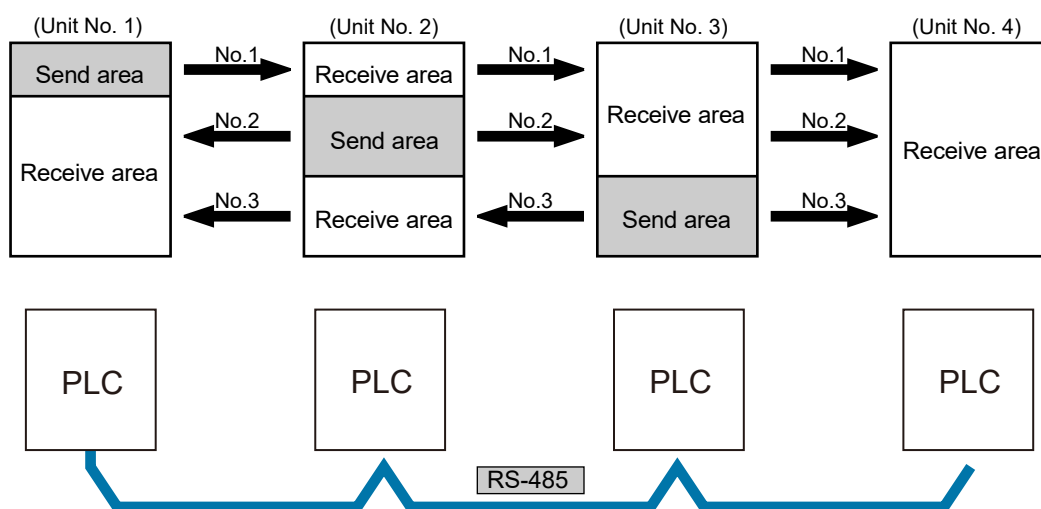
(Note 4) When all the five ports from COM0 to COM4 are used, the baud rate is set to the maximum of 115.2 kbps and the available pulse output function is set to allow the maximum of two channels. When four or less number of ports are used, the baud rate is set to the maximum of 230.4 kbps and the available pulse output function is set to allow the maximum of six channels.

1.2 Overview of Communication Functions

1.2.1 PLC Link Function (MEWNET-W0)

■ Overview of function

- A system can be configured for the PLC link (MEWNET-W0).
- Exclusive internal relays “link relays (L)” and data registers “link registers (LD)” are shared between connected PLCs.
- Data of link relays (1024 points) and link registers (128 words) can be exchanged between max. 16 PLC units.



■ Purpose of PLC link function (MEWNET-W0)

This is used when using the following models and link functions of Panasonic FP series PLCs. 1:1 communication is also possible via RS-232C port.

- FP0R (RS-485 type)
- FP0H (communication cassette RS-485 type is used)
- FPsigma (communication cassette RS-485 type is used)
- FP-X (communication cassette RS-485 type is used)
- FP2 multi-communication unit (communication cassette RS-485 type is used)
- FP7CPU unit (communication cassette RS-485 type is used)

1.2.2 MEWTOCOL Master / Slave Communication

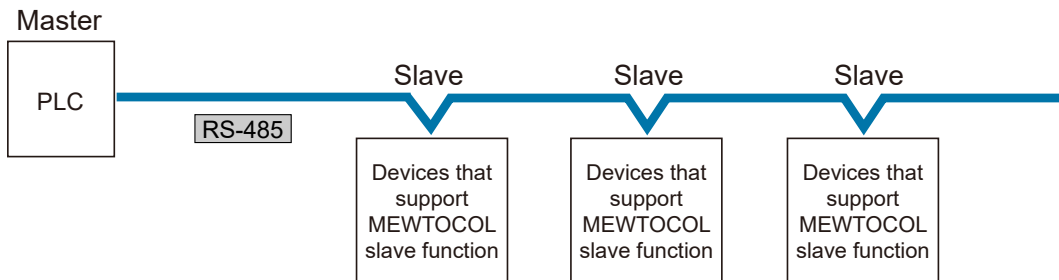
■ Overview of function

- Communication is performed using a communication protocol “MEWTOCOL-COM” used by Panasonic PLC.
- Master communication is performed by PLC sending commands to, and receiving responses from, devices that support MEWTOCOL. Data can be read and written by specifying unit

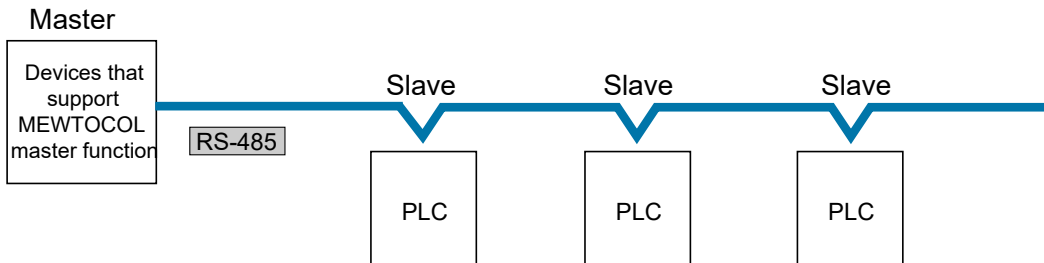
numbers and memory addresses and executing F145 (SEND) / F146 (RCV) instructions in a user program, because PLC automatically creates messages according to the protocol.

- A computer or display connected to PLC has the transmission right in slave communication. Slave communication is performed when the device sends a command, and PLC returns a response. In slave communication, no communication program is required on the PLC side, because PLC automatically returns a response.
- The data size that can be sent or received at a time is a maximum of 507 words for register transmission, 509 words for register reception, and 1 bit for bit transmission or reception.

Master function



Slave function



■ Purpose of MEWTOCOL master communication (example)

This is used for connection with devices that support MEWTOCOL (Panasonic PLC protocol).

- Programmable controller FP series
- Displacement sensor HL series
- Eco-power meter KW series

■ Purpose of MEWTOCOL slave communication (example)

This is used for connection with devices that support MEWTOCOL-COM master communication (Panasonic PLC protocol).

- Programmable displays from other manufacturers

1.2.3 MODBUS RTU Master / Slave Communication

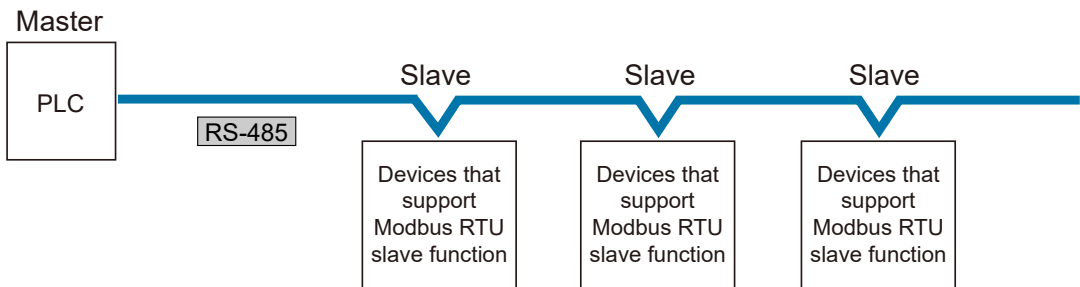
■ Overview of function

- Used for communication with other devices that support the MODBUS RTU protocol.

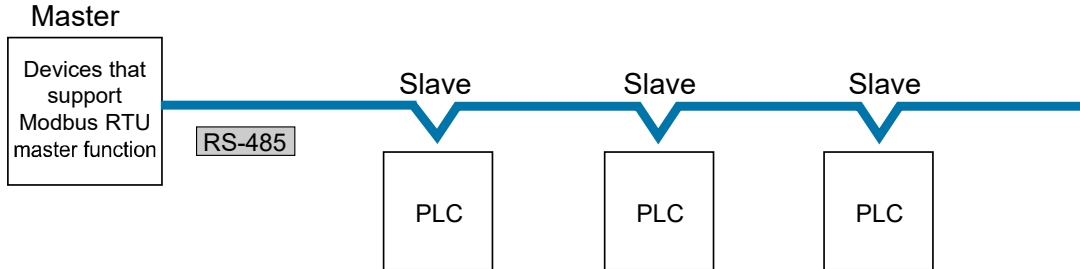
1.2 Overview of Communication Functions

- Master communication is performed when the master unit sends commands to slave units, and the slave unit returns responses (response messages) according to the instructions. Data can be read and written between PLC and external devices by specifying unit numbers and memory addresses and executing F145 (SEND) / F146 (RECV) instructions in a user program, because PLC automatically creates messages according to the protocol.
- A higher device connected to PLC has the transmission right in slave communication. Slave communication is performed when the device sends a command, and PLC returns a response. In slave communication, no communication program is required on the PLC side, because PLC automatically returns a response.
- The data size that can be sent or received at a time is a maximum of 127 words for register transmission, and 2,040 bits for bit transmission.

Master function



Slave function



■ Purpose of MODBUS-RTU master communication (example)

Used for connection with devices that support the MODBUS-RTU protocol.

- Temperature regulator KT series
- Devices that support MODBUS-RTU from other manufacturers

■ Purpose of MODBUS-RTU slave communication (example)

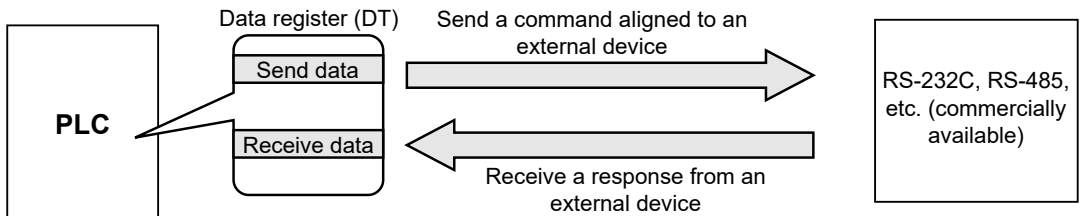
Used for access from a higher device using MODBUS-RTU commands.

1.2.4 General-Purpose Communication

■ Overview of function

- General-purpose communication is used when PLC performs communication in accordance with the protocol of the connected device.

- A user program should process the creation and transmission of command messages to connected devices, and the reception of responses therefrom. Data transmission / reception with external devices is handled through data registers and other given operation memories.
- For transmission, a command aligned to a connected device is ASCII converted into a string, and set to a given data register. The F159 (MTRN) instruction is executed to send a command.
- For reception, a response received from a connected device is temporarily stored in the buffer. The F159 (MTRN) instruction is executed to receive a response. The received ASCII string data is converted into numerical data, etc. based on a user program.
- The maximum data that can be sent at a time is 2,048 bytes (including control codes). The maximum data that can be received at a time is 4,096 bytes (including control codes).



■ Purpose of general-purpose communication

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

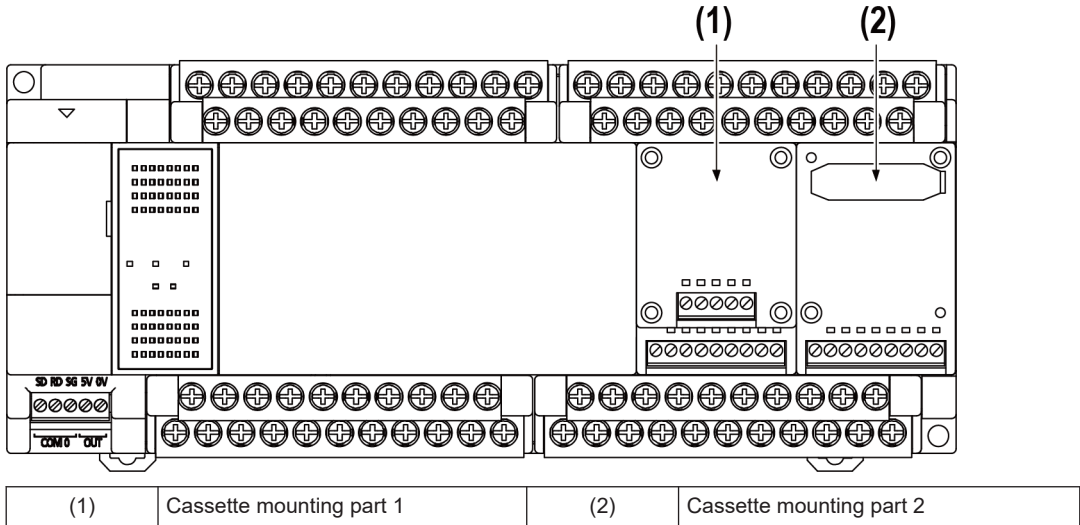
1.3 Restrictions on Units Combination

1.3 Restrictions on Units Combination

1.3.1 Restrictions on Combinations of Extension Cassettes

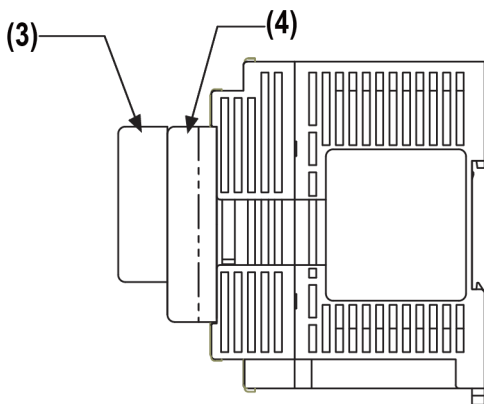
■ **Extension Cassette mounting position (1)**

- The FP-XH Control Unit is provided with two Extension Cassette mounting parts. In case of the C14 Control Unit, only the cassette mounting part 1 can be used.



■ **Extension Cassette installation position (2)**

- The Function Cassette can be put together with the Communication Cassette and mounted on the same cassette mounting part. When doing so, be sure to put the Communication Cassette on top of the Function Cassette.



(3)	Communication Cassette	(4)	Function Cassette
-----	------------------------	-----	-------------------

■ **Number of Extension Cassettes to be mounted**

- Up to two Function Cassettes and up to two Communication Cassettes can be mounted.

■ **Types of Extension Cassettes and mounting position (●: Available, ○: Conditionally available, Blank: Not available)**

Cassette type			Mounting parts on the Control Unit	
			Cassette mounting part 1	Cassette mounting part 2
Type	Item name	Product No.	All units	Other than C14
Communication Cassette (Note 1)	Communication Cassette	AFPX-COM1	○(Note 2)	○(Note 2)
		AFPX-COM2	●	●
		AFPX-COM3	●	●
		AFPX-COM4	●	●
		AFPX-COM5	●	●
		AFPX-COM6	●	●
Function Cassette (Note 3)	Analog Input Cassette	AFPX-AD2	●	●
	Analog Output Cassette	AFPX-DA2	●	●
	Analog I/O Cassette	AFPX-A21	●	●
	Thermocouple Cassette	AFPX-TC2	●	●
	RTD Cassette	AFPX-RTD2	●	●
	Input Cassette	AFPX-IN8	●	●
	Output Cassette	AFPX-TR8	●	●
	Output Cassette	AFPX-TR6P	●	●
	I/O Cassette	AFPX-IN4T3	●	●
	Pulse I/O Cassette	AFPX-PLS	○(Note 4)	○(Note 4)
	Master Memory Cassette	AFPX-MRTC	○(Note 5)	○(Note 5)

(Note 1) When mounting it together with the Function Cassette, mount it on top of the Function Cassette.

(Note 2) With the AFPX-COM1, RS/CS control is possible.

(Note 3) When mounting the Function Cassette on the unit other than C14, the cassette can be mounted either on the cassette mounting part 1 or cassette mounting part 2.

(Note 4) The Pulse I/O Cassette can be mounted only on the relay output type Control Unit. If it is mounted on other unit, the self-diagnostic error (27: Unit installed limit) will occur.

(Note 5) Only one FP-X Master Memory Cassette can be mounted. If two FP-X master memory cassettes are mounted, the self-diagnostic error (27: Unit installed limit) will occur.

i Info.

- For information on the restrictions on the combination of units, also refer to *User's Manual (Basic Edition)* for each control unit.

(MEMO)

2 Wiring of COM Port

2.1	Installing Extension Cassettes	2-2
2.1.1	Precautions When Installing the Extension Cassette	2-2
2.1.2	Installing the Communication Cassette.....	2-2
2.2	Wiring of the COM Port Terminal Block	2-4
2.2.1	Suitable Wires and Tools	2-4
2.2.2	Applicable Cables	2-5
2.2.3	Wiring Method	2-5
2.3	Wiring of the Control Unit (GT Power Supply, COM0 Port)	2-7
2.3.1	Handling of GT Power Supply Terminal	2-7
2.3.2	Terminal Layout Diagrams and Wiring Examples	2-7
2.4	Wiring for Communication Cassettes COM1 to COM4 Ports	2-9
2.4.1	Communication Cassette AFPX-COM1 (RS-232C 1ch Non-Isolated Type)	2-9
2.4.2	Communication Cassette AFPX-COM2 (RS-232C 2ch Non-Isolated Type)	2-10
2.4.3	Communication Cassette AFPX-COM3 (RS-485 / RS-422 1ch Non-Isolated Type).....	2-10
2.4.4	Communication Cassette AFPX-COM4 (RS- 485 1ch Isolated Type + RS-232C 1ch Non-Isolated Type).....	2-12
2.4.5	Communication Cassette AFPX-COM5 (Ethernet 1ch + RS-232C 1ch Non-Isolated Type).....	2-13
2.4.6	Communication Cassette AFPX-COM6 (RS-485 2ch Isolated Type).....	2-15

2.1 Installing Extension Cassettes

2.1 Installing Extension Cassettes

2.1.1 Precautions When Installing the Extension Cassette

- Fix the Extension Cassette to the Control Unit using the screws provided with the unit.
- The screw tightening torque should be 0.3 to 0.5 N·m. Securely tighten them.

■ Recommended screws

Type	Input	Quantity
Tapping screw	Material: SW pan head (+) P-tight, 2.6 x 16 Galvanized, trivalent chromate (black)	2 pcs./1 cassette



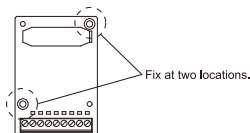
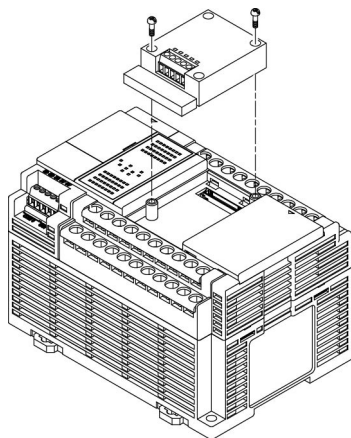
- The installation must be carried out when the power supply is off. If the cassette is installed while the power supply to the control unit is ON, it may cause faults.
- Do not touch the back side and the connector of the Extension Cassette. The parts such as IC may be damaged by static electricity.

2.1.2 Installing the Communication Cassette

The Communication Cassette can be installed on the control unit or on the Function Cassette.

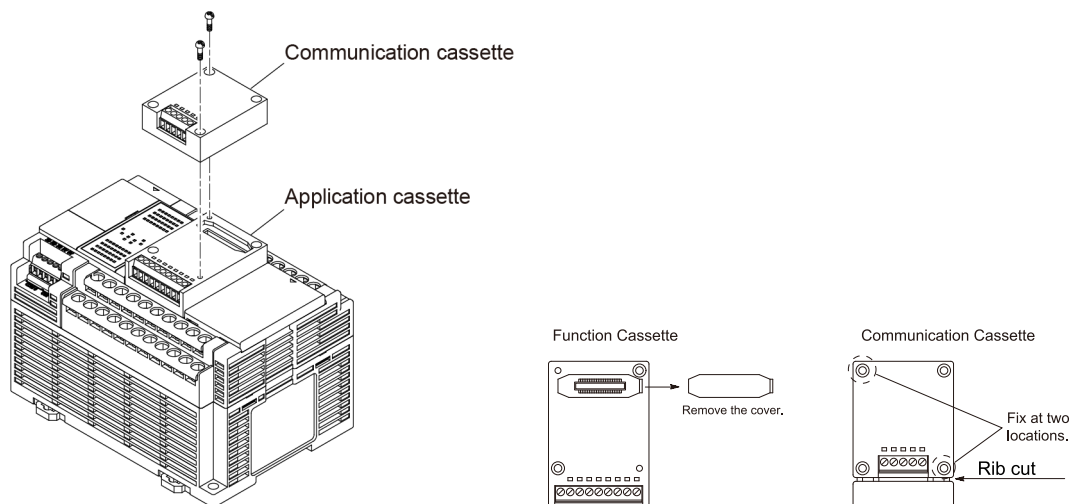
■ Installation on the control unit

- Connect the connector on the back of the Communication Cassette with the connector of the cassette mounting part of the control unit, and secure the two positions, bottom left and top right of the Communication Cassette, with the screws.
- It is no problem if the ribs remain. The AFPX-COM5 has no rib.



■ Installation on the Function Cassette

- Connect the connector on the back of the Function Cassette with the connector of the cassette mounting part of the control unit, and secure the two positions, bottom left and top right of the Function Cassette, with the screws.

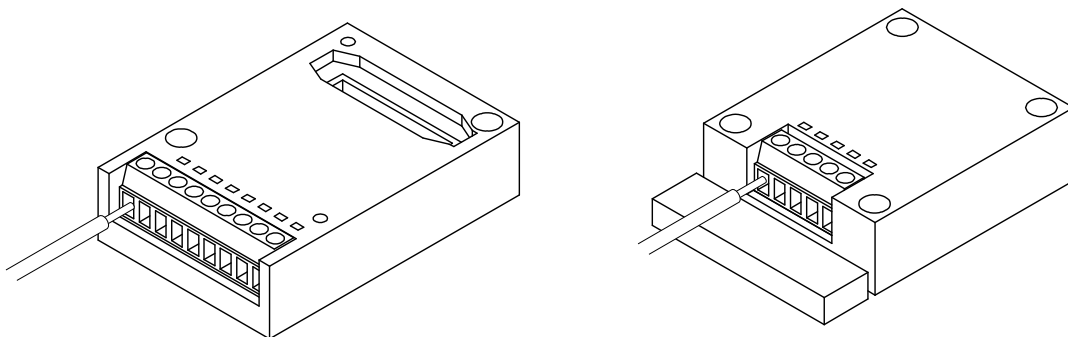


2.2 Wiring of the COM Port Terminal Block

2.2 Wiring of the COM Port Terminal Block

2.2.1 Suitable Wires and Tools

The communication port has a screw-tightening type of terminal block. Use the following items for wiring.



■ Suitable wires (stranded wire)

Size	Nominal cross-sectional area
AWG #28 to 16	0.08 mm ² to 1.00 mm ²

■ Suitable pole terminals

If a pole terminal is used, the following models should be used.

Manufacturer	Cross-sectional area	Size	Part No.	
			With isolating sleeve	Without isolating sleeve
Phoenix Contact Co., Ltd.	0.25 mm ²	AWG #24	AI 0,25 - 6 BU	A 0,25 - 7
	0.34 mm ²	AWG #22	AI 0,34 - 6 TQ	A 0,34 - 7
	0.50 mm ²	AWG #20	AI 0,5 - 6 WH	A 0,5 - 6

■ Pressure welding tool for pole terminals

Manufacturer	Model No.	
	Part No.	Product No.
Phoenix Contact Co., Ltd.	CRIMPFOX 6T-F	1212038

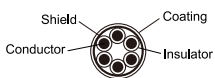
■ Use a special tool to tighten the terminal block of a communication block

To tighten terminals, use a screwdriver from Phoenix Contact (model No. SZS 0,4 x 2,5, product No. 1205037, blade size 0.4 x 2.5) or a screwdriver from Panasonic (Product No. AFP0806). The tightening torque should be 0.22 to 0.25 N·m.


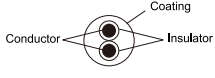
2.2.2 Applicable Cables

The following cables should be used.

■ Suitable wires (stranded wire): From RS-232C / RS-422 communication wire

Classification	Cross-sectional view	Conductor		Insulator		Cable diam.	Sample appropriate cable
		Size	Resistance (at 20°C)	Material	Thickness		
Shielded multi-core cable		0.3 mm ² (AWG22) or more	Max. 58.8 Ω/km	Polyvinyl chloride	Max. 0.3 mm	Approx. 6.6 mm	Onamba Co., Ltd. ONB-D6 × 0.3 mm ²

■ Suitable wires (strand wire): RS-485 communication wire

Classification	Cross-sectional view	Conductor		Insulator		Cable diam.	Sample appropriate cable
		Size	Resistance (at 20°C)	Material	Thickness		
Shielded twisted pair		1.25 mm ² (AWG16) or more	Max. 16.8 Ω/km	Polyethylene	Max. 0.5 mm	Approx. 8.5 mm	Hitachi Cable, Ltd. KPEV-S1.25 mm ² × 1P Belden Inc. 9860
		0.5 mm ² (AWG20) or more	Max. 33.4 Ω/km	Polyethylene	Max. 0.5 mm	Approx. 7.8 mm	Hitachi Cable, Ltd. KPEV-S0.5 mm ² × 1P Belden Inc. 9207
VCTF		0.75 mm ² (AWG18) or more	Max. 25.1 Ω/km	Polyvinylchloride	Max. 0.6 mm	Approx. 6.6 mm	VCTF0.75 mm ² × 2C (JIS)

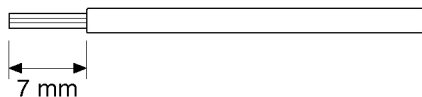
- Use shielded twisted pair cables.
- Use only one type of transmission cable. Do not mix more than 1 type.
- Twisted pair cables are recommended in noisy environments.
- ! When using shielded cable with crossover wiring for the RS-485 transmission line, ground one end.
- If two wires are connected to the plus and minus terminals of RS-485, use the above cables with wires of the same material and the same cross-sectional area between 0.5 and 0.75 mm².

2.2.3 Wiring Method

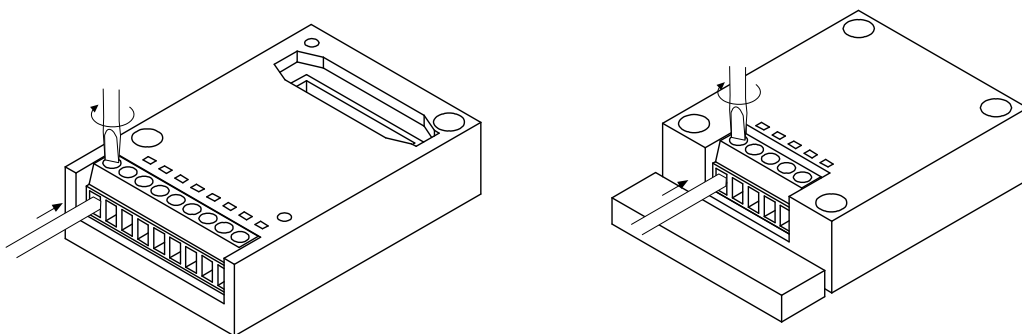
2.2 Wiring of the COM Port Terminal Block

1.2 Procedure

1. Remove a portion of the wire's insulation.

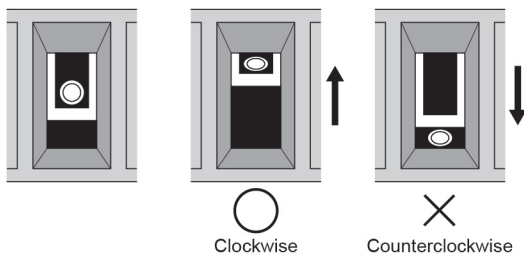


2. Insert wire into terminal hole until it stops. Tighten screw clockwise to fix wire in place. The tightening torque should be 0.22 to 0.25 N·m.



The following precautions should be observed to avoid broken or disconnected wires.

- When removing the wire's insulation, be careful not to scratch the core wire.
- Do not twist the core wires to connect them.
- Do not solder the core wires to connect them. The solder may break due to vibration.
- After wiring, make sure stress is not applied to the wire.
- In the terminal block socket construction, if the wire is fastened upon counter-clockwise rotation of the screw, the connection is faulty. Disconnect the wire, check the terminal hole, and then re-connect the wire.



- If two wires are connected to the RS-485 terminal, use the same wire material of the same cross-sectional area (0.5 mm^2).

2.3 Wiring of the Control Unit (GT Power Supply, COM0 Port)

2.3.1 Handling of GT Power Supply Terminal

A GT power supply terminal can be used as a power supply terminal for the GT series programmable display manufactured by Panasonic.

■ **Displays that can be connected to the 5V power supply section**

GT02 / GT02L series

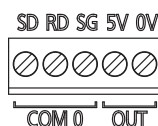
Model	LCD	Power supply	Full-area panel cover	Communication port	Product No.
GT02M	STN monochrome LCD White / pink / red back light	5 V DC	Black	RS-232C	AIG02MQ02D
				RS-422 / RS-485	AIG02MQ04D
			Silver	RS-232C	AIG02MQ03D
				RS-422 / RS-485	AIG02MQ05D
GT02G	STN monochrome LCD Green / orange / red back light	5 V DC	Black	RS-232C	AIG02GQ02D
				RS-422 / RS-485	AIG02GQ04D
			Silver	RS-232C	AIG02GQ03D
				RS-422 / RS-485	AIG02GQ05D
GT02L	STN monochrome LCD White back light	5 V DC	Black	RS-232C	AIG02LQ02D
				RS-422 / RS-485	AIG02LQ04D



- The GT power supply terminal (5 V DC) is dedicated to the GT02 / GT02L series of Panasonic programmable displays. Do not connect it to other devices.
- The GT power supply terminal and COM0 port (RS-232C) are not internally isolated.

2.3.2 Terminal Layout Diagrams and Wiring Examples

■ **Layout diagrams for GT power supply terminals and COM0 port terminals**



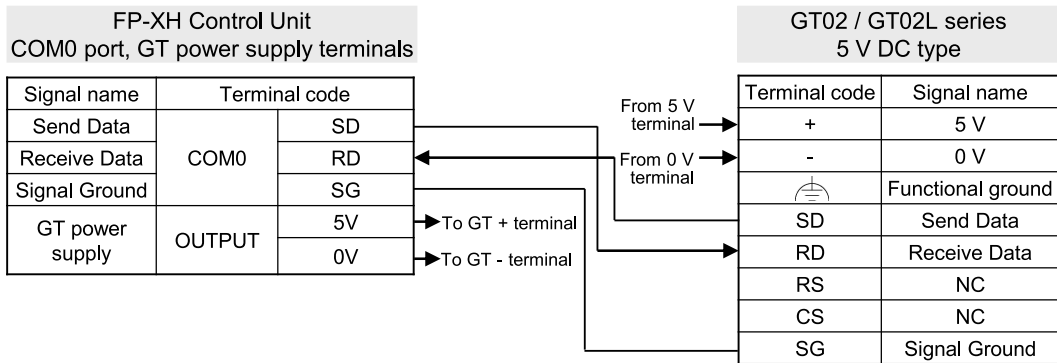
Indication on the Control Unit		Description	
COM 0	SD	Send data (unit → external device)	General-purpose RS-232C port of a 3-wire type
	RD	Receive data (external device → unit)	
	SG	Signal Ground	
OUT	5V	5 V DC is output as power supply for a GT series display.	

2.3 Wiring of the Control Unit (GT Power Supply, COM0 Port)

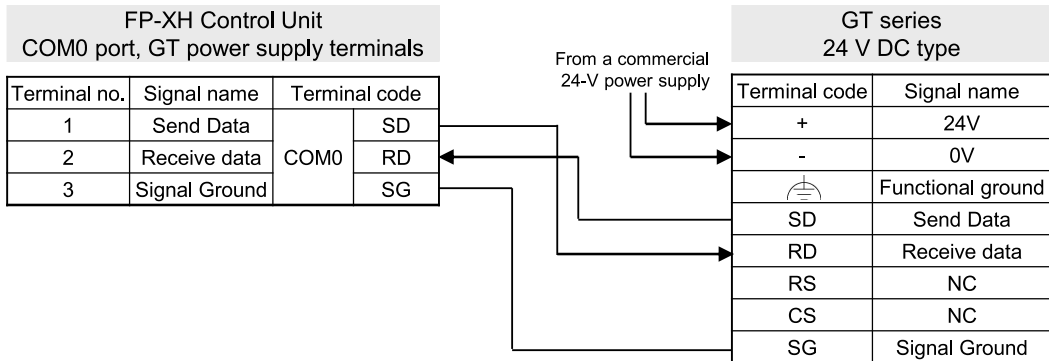
Indication on the Control Unit	Description
0V	

■ Wiring example (connection with GT series, 5V type)

The terminal layout on the display side differs for the existing model GT01 series.



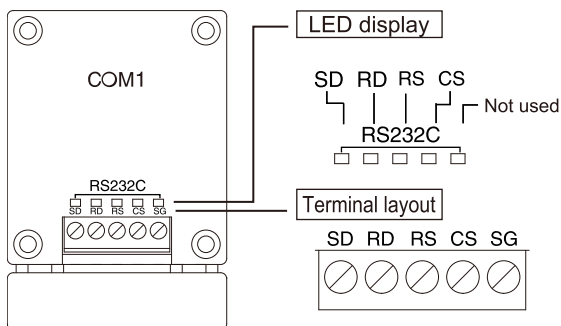
■ Wiring example (connection with GT series, 24V type)



2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

2.4.1 Communication Cassette AFPX-COM1 (RS-232C 1ch Non-Isolated Type)

■ Terminal layout

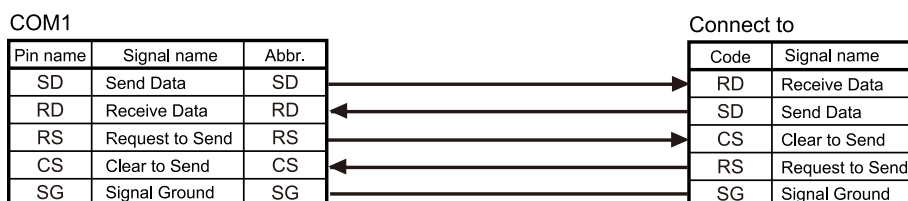


Terminal code	Allocated function	Signal direction	Port allocated on the software	
			Cassette mounting part 1	Cassette mounting part 2
SD	SD: Send Data	PLC → External device	COM1	COM3
RD	RD: Receive Data	PLC ← External device		
RS	RS: Request to Send	PLC → External device		
CS	CS: Clear to Send	PLC ← External device		
SG	SG: Signal Ground	-		

(Note 1) RS (Request to Send) is controlled by SYS1 instruction.

(Note 2) Data cannot be sent without a CS (Clear to Send) signal. When using it as a 3-wire type, short-circuit RS and CS.

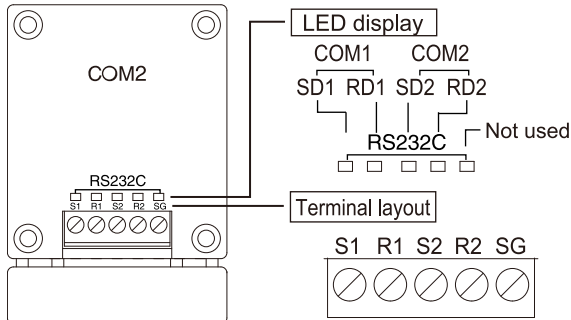
■ Example of wiring



2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

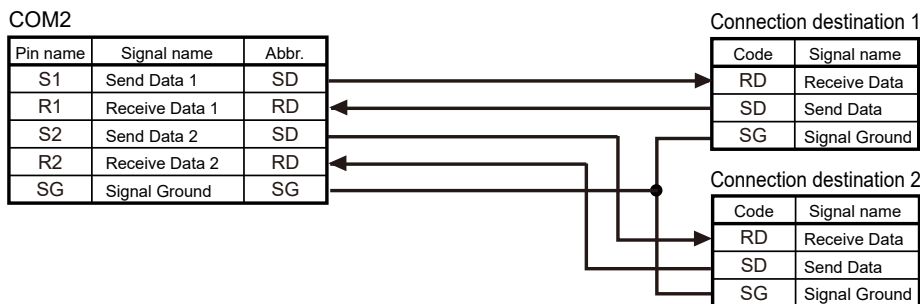
2.4.2 Communication Cassette AFPX-COM2 (RS-232C 2ch Non-Isolated Type)

Terminal layout



Terminal code	Allocated function	Signal direction	Port allocated on the software	
			Cassette mounting part 1	Cassette mounting part 2
S1	SD: Send Data	PLC → External device	COM1	COM3
R1	RD: Receive Data	PLC ← External device		
S2	SD: Send Data	PLC → External device	COM2	COM4
R2	RD: Receive Data	PLC ← External device		
SG	SG: Signal Ground	-	-	-

Example of wiring

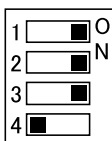


2.4.3 Communication Cassette AFPX-COM3 (RS-485 / RS-422 1ch Non-Isolated Type)

Setting of cassette backside switch

A selector switch for setting the communication interface and terminator is located on the surface of the Communication Cassette AFPX-COM3. The setting status of communication interface can be confirmed with the LED on the front of the cassette.

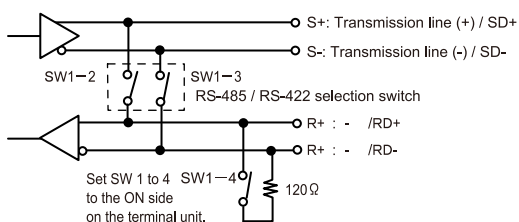
2.4 Wiring for Communication Cassettes COM1 to COM4 Ports



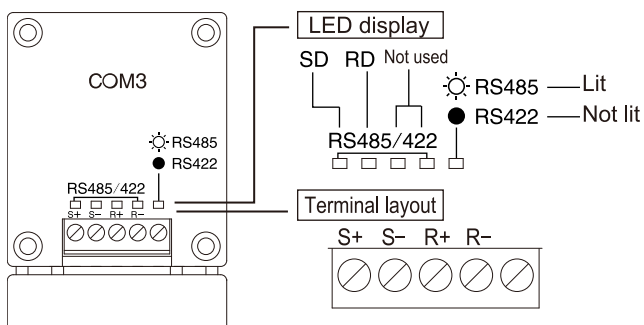
Switch No.	Function	Setting method
1	RS-485 / RS-422 switching	Move all the three switch pins to the same side.
2		When set to the ON side: RS-485, When set to the OFF side: RS-422
3		
4	Terminal resistance	When using RS-485: Turn ON this switch pin only when it is the terminal unit. When using RS-422: Turn ON this switch.

■ Setting of cassette backside switch

The relationship between the settings of switches on the back of the cassette and the communication interface part is shown in the figure below.



■ Terminal layout



Terminal code	Allocated function (When RS-485 is selected)	Allocated function (When RS-422 is selected)	Port allocated on the software		
			Signal direction	Cassette mounting part 1	Cassette mounting part 2
S+	Transmission line (+)	Send data (+)	PLC → External device	COM1	COM3
S-	Transmission line (-)	Send data (-)	PLC → External device		
R+	Transmission line (+)	Receive data (+)	PLC ← External device		

2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

Terminal code	Allocated function (When RS-485 is selected)	Allocated function (When RS-422 is selected)	Port allocated on the software		
			Signal direction	Cassette mounting part 1	Cassette mounting part 2
R-	Transmission line (-)	Receive data (-)	PLC ← External device		
-	-	-			-

■ Wiring example (when using RS-485)

COM3

Pin name	Signal name	Abbr.
S+	Transmission line (+)	S+
S-	Transmission line (-)	S-
	Not used	
	Not used	
	Not used	

Connect to

Code	Signal name
+	Transmission line (+)
-	Transmission line (-)

To another device

■ Wiring example (when using RS-422)

COM3

Pin name	Signal name	Abbr.
S+	Send data (+)	SD+
S-	Send data (-)	SD-
R+	Receive data (+)	RD+
R-	Receive data (-)	RD-
	Not used	

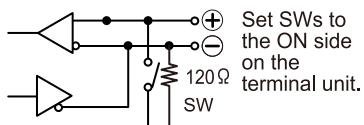
Connect to

Code	Signal name
RD+	Receive data (+)
RD-	Receive data (-)
SD+	Send data (+)
SD-	Send data (-)

2.4.4 Communication Cassette AFPX-COM4 (RS-485 1ch Isolated Type + RS-232C 1ch Non-Isolated Type)

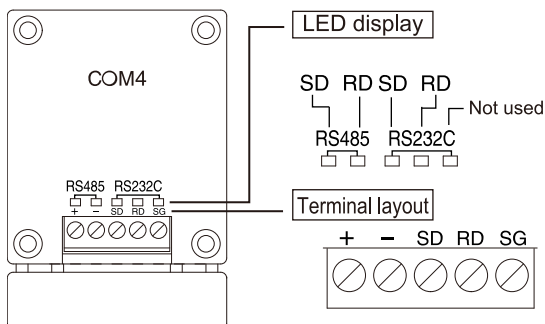
■ Setting of cassette backside switch

A termination resistance selector switch for RS-485 interface is located on the surface of the Communication Cassette AFPX-COM4. Turn ON this switch only when it is the terminal unit. The relationship between the settings of switches on the back of the cassette and the communication interface part is shown in the figure below.



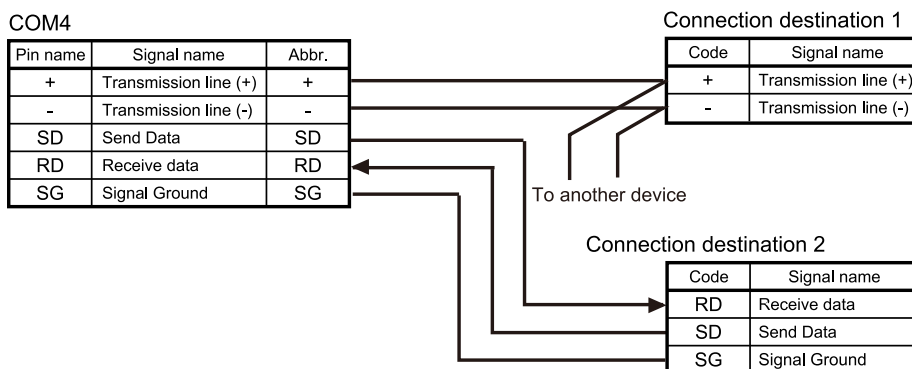
2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

Terminal layout



Terminal code	Allocated function	Signal direction	Port allocated on the software	
			Cassette mounting part 1	Cassette mounting part 2
+	Transmission line (+)	-	COM1	COM3
-	Transmission line (-)	-		
SD	Send Data	PLC → External device	COM2	COM4
RD	Receive data	PLC ← External device		
SG	Signal Ground	-		

Example of wiring



2.4.5 Communication Cassette AFPX-COM5 (Ethernet 1ch + RS-232C 1ch Non-Isolated Type)

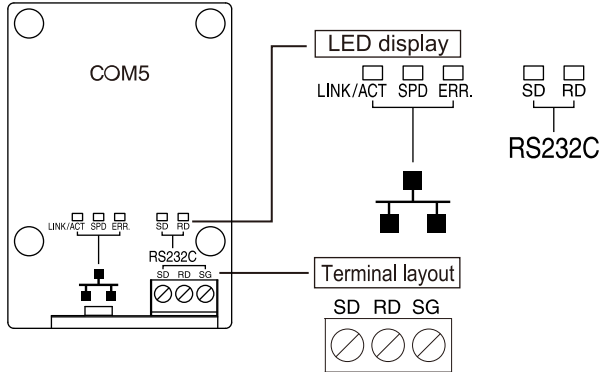
Setting of cassette backside switch

A switch for initializing the Ethernet channel is located on the surface of the Communication Cassette AFPX-COM5. It is used to restore the setting to the factory default in such a case that an error occurred in communication. The setting is initialized by turning ON electricity with the

2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

switch being ON. After initialization, turn OFF the power supply of the Control Unit, and then turn the switch OFF.

Terminal layout

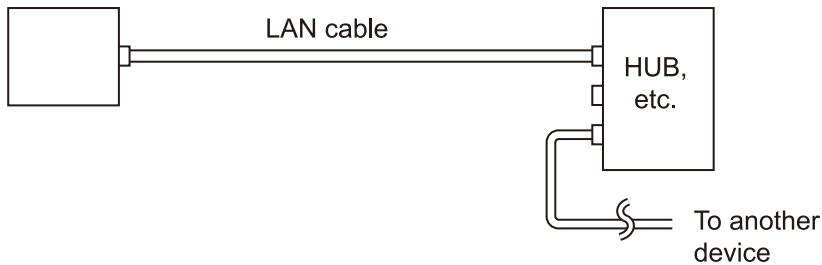


RS-232C part

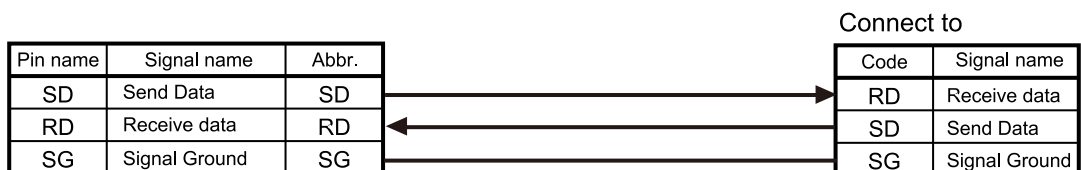
Terminal code	Allocated function	Signal direction	Port allocated on the software	
			Cassette mounting part 1	Cassette mounting part 2
SD	Send Data	PLC → External device	COM2	COM4
RD	Receive data	PLC ← External device		
SG	Signal Ground	-		

(Note 1) The PLC link function of the Control Unit is available via Ethernet.

Wiring example (Ethernet)



Wiring example (RS-232C)



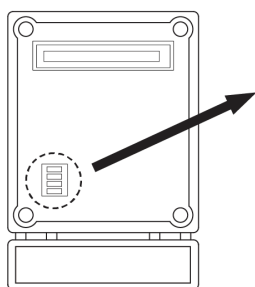
2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

2.4.6 Communication Cassette AFPX-COM6 (RS-485 2ch Isolated Type)

■ Setting of cassette backside switch

By using the switch on the board, applications of the Communication Cassette AFPX-COM6 can be switched.

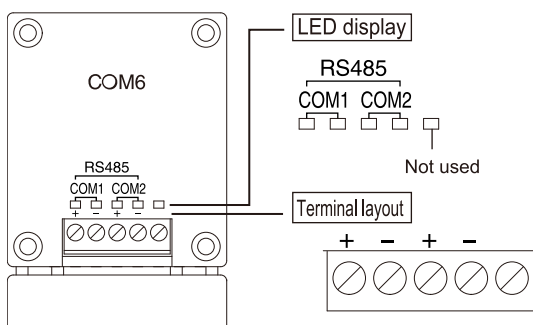
Cassette backside switch



Terminal resistance		COM2 baud rate ^(Note 1)	
	COM1 general unit (Default)		115200 bps
	COM1 terminal unit		115200 bps
	COM2 general unit (Default)		19200 bps
	COM2 terminal unit		9600 bps (Default)

(Note 1) To set the baud rate, COM1 requires setting of the system register, while COM2 requires setting of both the switch and the system register.

■ Terminal layout



Terminal code	Allocated function	Port allocated on the software	
		Cassette mounting part 1	Cassette mounting part 2
+	Transmission line (+)	COM1	COM3
-	Transmission line (-)		
+	Transmission line (+)	COM2	COM4
-	Transmission line (-)		
-	-	-	

2.4 Wiring for Communication Cassettes COM1 to COM4 Ports

■ Wiring example (when setting RS-485)

COM6

Pin name	Signal name	Abbr.
+ (COM1)	Transmission line (+)	+
- (COM1)	Transmission line (-)	-
+ (COM2)	Transmission line (+)	+
- (COM2)	Transmission line (-)	-
	Not used	

Connection destination 1

Code	Signal name
+	Transmission line (+)
-	Transmission line (-)

To another device

Connection destination 2

Code	Signal name
+	Transmission line (+)
-	Transmission line (-)

To another device

3 Setting and Confirmation of Communication Conditions

3.1 Setting of Purpose and Communication Conditions	3-2
3.1.1 Purpose to be Set for Each Port	3-2
3.1.2 Communication Conditions to be Set for Each Port.....	3-2
3.2 Communication Conditions Settings	3-4
3.2.1 System Register Settings.....	3-4
3.2.2 Settings Using a Program	3-5

3.1 Setting of Purpose and Communication Conditions

3.1 Setting of Purpose and Communication Conditions

3.1.1 Purpose to be Set for Each Port

- List of available functions by communication port (●: Available; ○: Conditionally available; Blank: Not available)

Available communication functions		Allocated communication port No.				
		Control Unit	Cassette mounting part 1		Cassette mounting part 2	
		COM0	COM1	COM2	COM3	COM4
PLC link		○	○			
MEWTOCOL-COM	Master	●	●	●	●	●
	Slave	●	●	●	●	●
MODBUS-RTU ^(Note 3)	Master	●	●	●	●	
	Slave	●	●	●	●	
General-purpose communication		●	●	●	●	

(Note 1) For PLC link, only one port may be used (either COM0 port that is built in the Control Unit as standard equipment, or COM1 port on a cassette).

(Note 2) The COM4 port supports only MEWTOCOL-COM communication. In addition, the communication parameters (unit number, communication format, baud rate) when the power is ON are the same as the settings of the COM3 port. After RUN, you can also change the conditions by the SYS1 instruction.

(Note 3) The AFPX-COM5 Cassette (Ethernet type) does not support MODBUS-RTU (master / slave).

3.1.2 Communication Conditions to be Set for Each Port

Communication conditions that can be set vary by the mode to be used.

- Communication conditions

Communication port		Setting range	Default	Remarks
Unit number		1 to 99	1	
Communication mode		Computer link, general-purpose communication PLC link, MODBUS RTU	Computer link	
Baud rate		2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400	9600	
Transmission format	Data length	7 bits, 8 bits	8 bits	
	Parity	None, Odd, Even	Odd	
	Stop bit	1 bit, 2 bits	1 bit	
	Terminator	CR, CR+LF, ETX, time Terminator judgment time ^(Note 3)	CR	(Note 1)

3.1 Setting of Purpose and Communication Conditions

Communication port		Setting range	Default	Remarks
	Header	No STX / STX	No STX	(Note 1)
Modem connection		Invalid / valid	Invalid	(Note 2)
Receive buffer starting number in general-purpose communication		DT0 to DT32764 ^(Note 4)	Depends on port No.	(Note 1)
Receive buffer capacity in general-purpose communication		0 to 2048	2048	(Note 1)

(Note 1) It can be set only for general-purpose communication.

(Note 2) It can be set only for computer link.

(Note 3) For terminator (end code) judgment time, select 0.01 ms to 100 ms (by 0.01 ms), or transfer time of approx. 4 characters.

(Note 4) The setting range of receive buffer starting number in general-purpose communication varies by the value of system register No. 0.

3.2 Communication Conditions Settings

3.2 Communication Conditions Settings

3.2.1 System Register Settings

Purposes and communication conditions of each communication port should be set using tool software FPWIN GR7.

1 2 Procedure

1. Select **Option>System register settings** from the menu bar.
The "PLC Configuration" dialog box opens.
2. Select any "COM Port setting" in the left pane.
Setting items for communication conditions are displayed.

PLC Configuration

Memory Allocation
Hold/Non-hold 1
Hold/Non-hold 2
Action on Error
Time setting
Link W0-0
Link W0-1
Controller input settings 1 (HSC/PLS)
Controller input settings 2 (HSC/PLS)
Controller output settings (PLS/PWM)
Interrupt / pulse catch settings
Interrupt edge settings
Time constant setting 1 of CPU input
Time constant setting 2 of CPU input
Time constant setting 3 of CPU input
Time constant setting 4 of CPU input
COM0 Port
COM1 Port
COM2 Port
COM3 Port

No. 410 Unit No. 1

No. 412 Communication Mode
Computer Link

Modem Enabled

No. 48 PLC link Baud rate
115200bps

No. 415 Baud rate
9600 bps

No. 413 Communication Format
Char. Bit: 8 bits
Parity: Odd
Stop Bit: 1
Terminator slt: Code
Terminator: CR
Header: STX Not Exist.

No. 420 Starting address for data received of serial data communication mode
DT 4096 (0 - 32764)

No. 421 Buffer capacity setting for data received of serial data communication mode
2048 (0 - 2048)

No. 424 Terminator judgement time (X0.01 msec)
0 (0 - 10000)

OK Cancel Read PLC Initialize

3. Set communication conditions, and press the [OK] button.
The set conditions are reflected in the program being edited.

i Info.

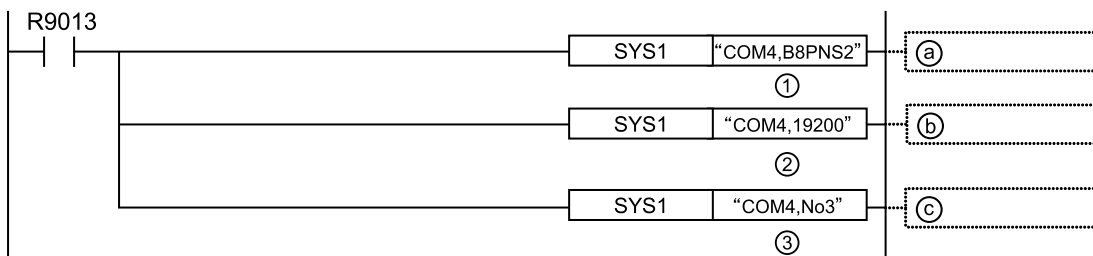
- Settings of the COM4 port when the power supply is turned ON are the same as those for the COM3 port. When changing the settings of the communication mode, baud rate, or transmission format set for the COM3, follow the procedure as specified in "3.2.2 Settings Using a Program". However, note that the COM4 port supports only the computer link.

3.2.2 Settings Using a Program

Purposes and communication conditions of each communication port may also be specified using system register setting instruction SYS1.

■ Sample program

This is a program that changes the transmission format, baud rate, and unit numbers of COM4 port.

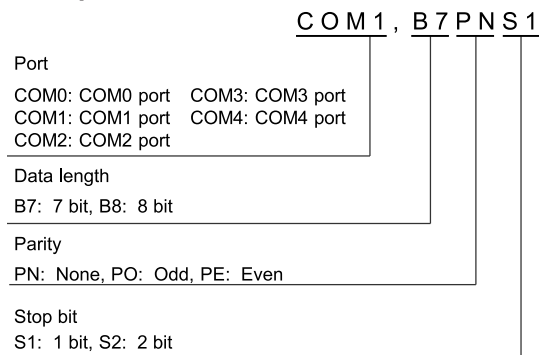


(a)	Set the transmission format of COM4 port to "Data length: 8 bits; Parity: None; Stop bit: 2".
(b)	Set the baud rate of COM4 port to 19200 bps.
(c)	Set the unit No. of COM4 port to No. 3.

■ Input by using FPWIN GR7

Input into an operand of SYS1 instruction should be performed as a string. A string that indicates a port and a string that indicates a parameter should be separated by ", (comma)". On FPWIN GR7, an inputted character constant is bracketed by double quotation marks.

Example: when a transmission format is specified



(Note): For details of instruction programming, refer to the FP Series Programming Manual (No. ARCT1F353C).

(MEMO)

4 PLC link

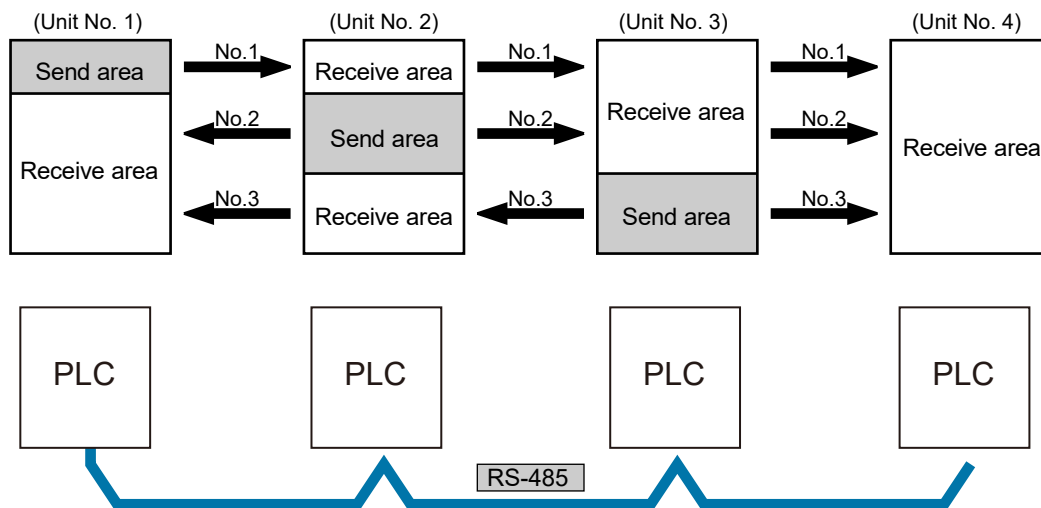
4.1 Operation of PLC Link MEWNET-W0	4-2
4.1.1 Operation Overview of PLC Link.....	4-2
4.1.2 Roles of Link Relays and Link Registers	4-2
4.2 Setting Items for PLC Link	4-4
4.2.1 Unit Number Setting.....	4-4
4.2.2 Setting of the Largest Unit Number.....	4-4
4.2.3 Memory Block No. of Link Relays and Link Registers to be Used ...	4-4
4.2.4 Ranges of Link Relays and Link Registers to be Used.....	4-5
4.2.5 Link Relay Transmission Start Number and Sending Size	4-5
4.2.6 Link Register Transmission Start Number and Sending Size	4-6
4.3 Response Time of PLC Link	4-9
4.3.1 Response Time of One Transmission Cycle.....	4-9
4.3.2 Response Time when There are Units that have not been Added to the Link	4-10

4.1 Operation of PLC Link MEWNET-W0

4.1 Operation of PLC Link MEWNET-W0

4.1.1 Operation Overview of PLC Link

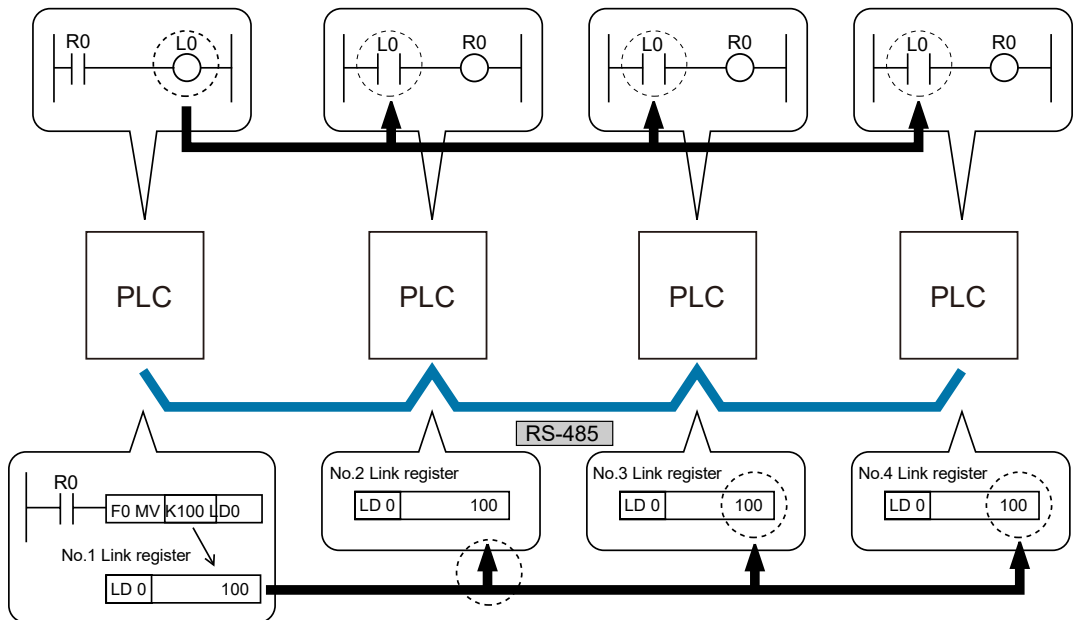
- “Link relays (L)” and data registers “link registers (LD)” are shared between connected PLCs.
- In the case of link relays, if the link relay contact of one PLC turns ON, the same link relays also turn ON in all PLCs on the same network.
- Likewise, in the case of link registers, if the content of a link register in one PLC is rewritten, the value of the same link register is changed in all PLCs on the same network.



4.1.2 Roles of Link Relays and Link Registers

■ Link relay

If link relay L0 in the master unit (No.1) is turned ON, the state change is fed back to link relay L0 that has the same number in other units, and R0 is outputted from these units.



■ Link register

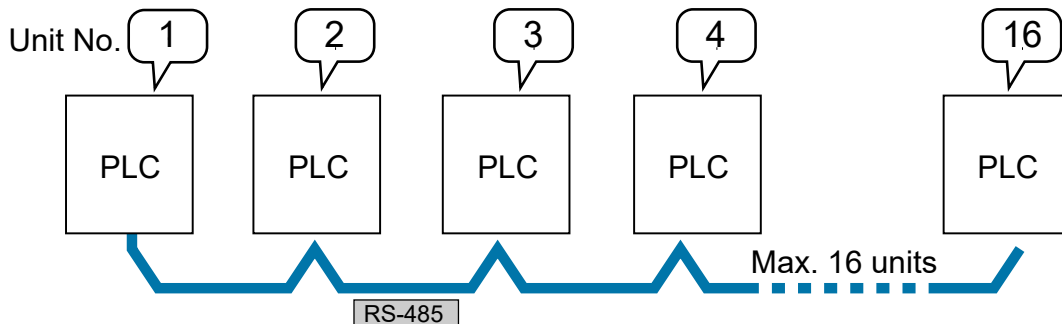
When a constant 100 is written into LD0 of the master unit (No. 1), the content of LD0 of every other unit is also changed to constant 100.

4.2 Setting Items for PLC Link

4.2 Setting Items for PLC Link

4.2.1 Unit Number Setting

- In a PLC link that connects multiple PLCs on the same transmission line, a unit number must be assigned to each PLC for identification.
- A unit number is a unique number used to identify PLCs on a network. The same number must not be used for more than one PLC on the same network.



4.2.2 Setting of the Largest Unit Number

- Specify the largest PLC unit number used for PLCs connected to the PLC link.
- The smaller unit numbers are, the relatively shorter transmission time is required.

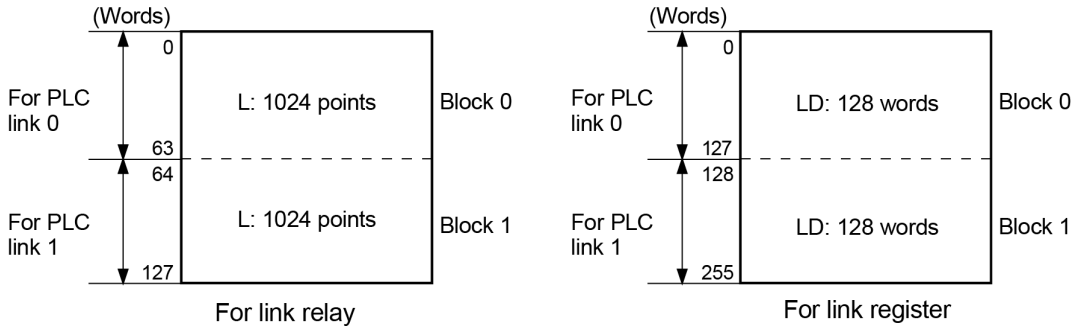


- Unit numbers should be set sequentially and consecutively, starting from 1, with no breaks between them. If there is a missing unit number, the transmission time will be longer.
- Specify the same value as the largest PLC unit number for all units connected in a PLC link.

4.2.3 Memory Block No. of Link Relays and Link Registers to be Used

- The memory areas of link relays and link registers are divided for PLC link 0 and for PLC link 1. Either area can be selected, and max. 1024 points (64 words) can be used for link relays, and max. 128 words can be used for link registers.
- Specify "0" for using memory blocks in the first half, and "1" for using memory blocks in the latter half.

Structure of a link area

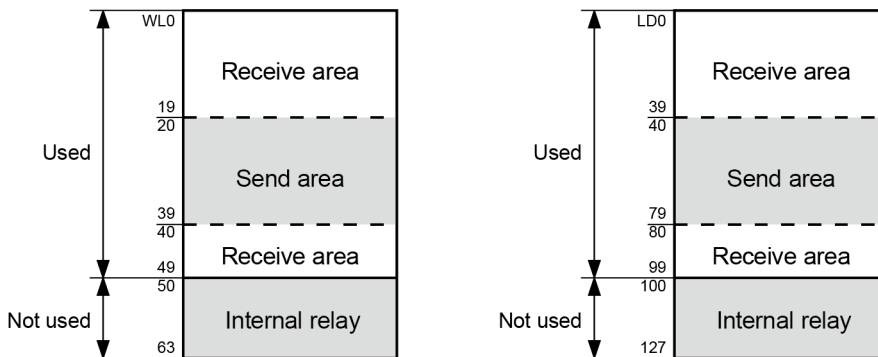


4.2.4 Ranges of Link Relays and Link Registers to be Used

- Specify the ranges of memory areas of link relays and link registers to be actually used.
- Link relays and link registers that are not to be used for linking may be used in place of internal relays and data registers.

Example) Setting of ranges for use (in the case of PLC link 0)

- The diagram below indicates a case when “50” (50 words from WL0 to WL49) is specified for the range of link relay, and “100” (100 words from LD0 to LD99) for the range of link register to be used.



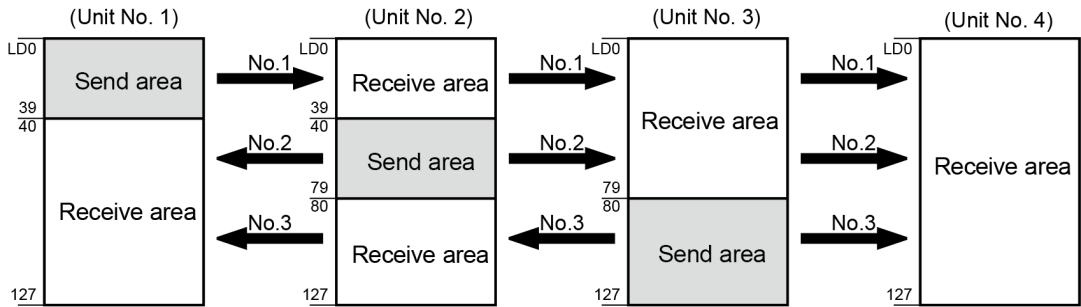
- As the range to be used in PLC link 0, specify “64” (64 words) when all link relays are to be used, and “128” (128 words) when all link registers are to be used.

4.2.5 Link Relay Transmission Start Number and Sending Size

- The memory areas of link relays are divided into send areas and receive areas.
- Link relays are transmitted from the send area of a PLC to the receive area of another PLC. The receiving PLC must have the same link relay No. in its receive area as the sending PLC.

4.2 Setting Items for PLC Link

Example) Setting of the link relay transmission start number and sending size (in the case of memory block No. 0)



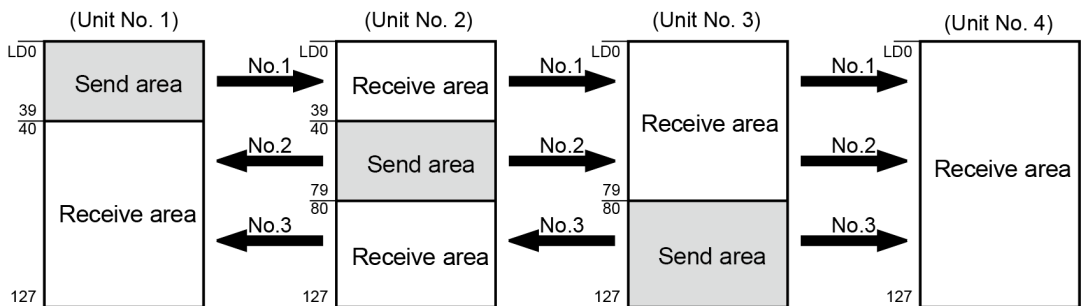
■ List of setting items (for PLC link setting)

Setting item	Setting range	Unit No. and setting method			
		No.1	No.2	No.3	No.4
Memory block No. of link relays and link registers to be used	0 or 1	0	0	0	0
Max. unit No. used for PLC link	0 to 16	4	4	4	4
Range of link relays used	0 to 64 words	64	64	64	64
Transmission start No. for link relays	0 to 63	0	20	40	0
Size of link relay send area	0 to 64 words	20	20	24	0

4.2.6 Link Register Transmission Start Number and Sending Size

- The memory areas of link registers are divided into send areas and receive areas.
- Link registers are transmitted from the send area of a PLC to the receive area of another PLC. The receiving PLC must have the same link register No. in its receive area as the sending PLC.

Example) Setting of the link register transmission start number and sending size (in the case of memory block No. 0)



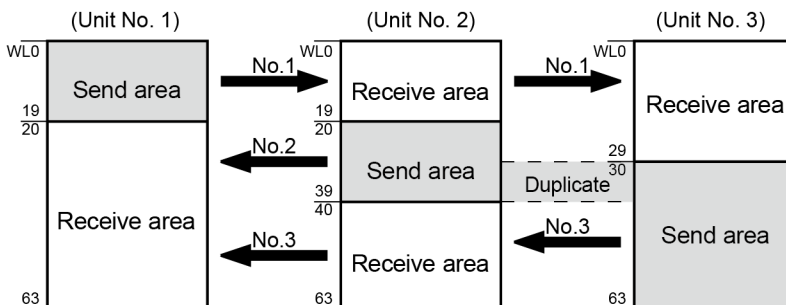
■ List of setting items (for PLC link setting)

Setting item	Setting range	Unit No. and setting method			
		No.1	No.2	No.3	No.4
Memory block No. of link relays and link registers to be used	0 or 1	0	0	0	0
Max. unit number used for PLC link	0 to 16	4	4	4	4
Range of link registers used	0 to 128 words	128	128	128	128
Transmission start no. for link registers	0 to 127	0	40	80	0
Size of link register send area	0 to 127 words	40	40	48	0

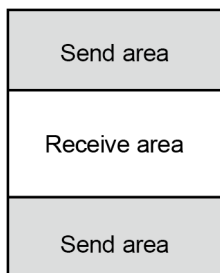
4.2 Setting Items for PLC Link

- If a mistake is made when allocating a link area, be aware that an error will result, and communication will be disabled.
- Avoid overlapping send areas.

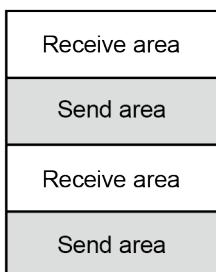
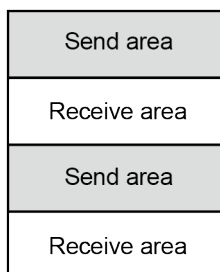
In the following example, there is an overlapping area between link relays No. 2 and 3. This will cause an error and disable communication.



- Allocations as shown below are not possible for link relays or for link registers:
Send area is split in a PLC



Send and receive areas are split into multiple segments



4.3 Response Time of PLC Link

4.3.1 Response Time of One Transmission Cycle

The maximum value of one transmission cycle time (T) can be calculated using the following formula.

■ Calculation formula

$$T_{\max.} = \underbrace{T_{s1} + T_{s2} + \dots + T_{sn}}_{(1) \text{ } T_s \text{ (transmission time per unit)}} + \underbrace{T_{lt}}_{(2) \text{ } T_{lt} \text{ (link table sending time)}} + \underbrace{T_{so}}_{(3) \text{ } T_{so} \text{ (master unit scan time)}} + \underbrace{T_{lk}}_{(4) \text{ } T_{lk} \text{ (link addition processing time)}}$$

(1) T_s (transmission time per unit)

Calculation formula	$T_s = \text{Scan time} + T_{pc}$ (PLC link sending time)
	$T_{pc} = T_{tx}$ (sending time per byte) \times P_{cm} (PLC link sending byte size) $T_{tx} = 1 / (\text{baud rate kbps} \times 1000) \times 11 \text{ ms} \dots$ approx. 0.096 ms when 115.2 kbps $P_{cm} = 23 + (\text{number of relay words} + \text{number of register words}) \times 4$ (an ASCII code needs multiplication by four)

(2) T_{lt} (link table sending time)

Calculation formula	$T_{lt} = T_{tx}$ (sending time per byte) \times L_{tm} (link table sending size)
	$T_{tx} = 1 / (\text{baud rate kbps} \times 1000) \times 11 \text{ ms} \dots$ approx. 0.096ms when 115.2 kbps $L_{tm} = 13 + 2 \times n$ ($n = \text{No. of added units}$)

(3) T_{so} (master unit scan time)

To be checked using tool software.

(4) T_{lk} (link addition processing time)

Calculation formula	If all units have been added, $T_{lk} = 0$ $T_{lk} = T_{lc}$ (link addition command sending time) + T_{wt} (addition waiting time) + T_{ls} (sending time for command to stop transmission if link error occurs) + T_{so} (master unit scan time)
	$T_{lc} = 10 \times T_{tx}$ (sending time per byte) $T_{tx} = 1 / (\text{baud rate kbps} \times 1000) \times 11 \text{ ms} \dots$ approx. 0.096 ms when 115.2 kbps $T_{wt} = \text{initial value } 400 \text{ ms}$ $T_{ls} = 7 \times T_{tx}$ (sending time per byte) $T_{tx} = 1 / (\text{baud rate kbps} \times 1000) \times 11 \text{ ms} \dots$ approx. 0.096ms when 115.2 kbps $T_{so} = \text{master unit scan time}$

■ Calculation example

	Condition	Calculation process	One transmission cycle time (T)
1	16-unit link with all units added Max. unit number = 16	$T_{tx} = 0.096$ Each $P_{cm} = 23 + (4+8) \times 4 = 71$ bytes	$T_{\max.} = T_s + T_{lt} + T_{so}$ $7.82 \times 16 + 4.32 + 1$

4.3 Response Time of PLC Link

	Condition	Calculation process	One transmission cycle time (T)
	Relays / registers are evenly allocated, and Each PLC scan time = 1 ms	$T_{pc} = T_{tx} \times P_{cm} = 0.096 \times 71 \approx 6.82$ ms Each $T_s = 1 + 6.82 = 7.82$ ms $T_{lt} = 0.096 \times (13 + 2 \times 16) = 4.32$ ms	=130.44 ms
2	16-unit link with all units added Max. unit number = 16 Relays / registers are evenly allocated Each PLC scan time = 5 ms	$T_{tx} = 0.096$ Each $P_{cm} = 23 + (4 + 8) \times 4 = 71$ bytes $T_{pc} = T_{tx} \times P_{cm} = 0.096 \times 71 \approx 6.82$ ms Each $T_s = 5 + 6.82 = 11.82$ ms $T_{lt} = 0.096 \times (13 + 2 \times 16) = 4.32$ ms	$T_{max.} = T_s + T_{lt} + T_{so}$ $11.82 \times 16 + 4.32 + 5$ =198.44 ms
3	16-unit link with one unit unadded, Max. unit number = 16 Relays / registers are evenly allocated Each PLC scan time = 5 ms	$T_{tx} = 0.096$ Each $T_s = 5 + 6.82 = 11.82$ ms $T_{lt} = 0.096 \times (13 + 2 \times 15) \approx 4.13$ ms $T_{lk} = 0.96 + 400 + 0.67 + 5 \approx 407$ ms Note: addition waiting time default value = 400 ms	$T_{max.} = T_s + T_{lt} + T_{so} + T_{lk}$ $11.82 \times 15 + 4.13 + 5 + 407$ =593.43 ms
4	8-unit link with all units added Max. unit number = 8 Relays / registers are evenly allocated Each PLC scan time = 5 ms	$T_{tx} = 0.096$ Each $P_{cm} = 23 + (8 + 16) \times 4 = 119$ bytes $T_{pc} = T_{tx} \times P_{cm} = 0.096 \times 119 \approx 11.43$ ms Each $T_s = 5 + 11.43 = 16.43$ ms $T_{lt} = 0.096 \times (13 + 2 \times 8) \approx 2.79$ ms	$T_{max.} = T_s + T_{lt} + T_{so}$ $16.43 + 2.79 + 5$ =139.23 ms
5	2-unit link with all units added Max. unit number. = 2 Relays / registers are evenly allocated Each PLC scan time = 5 ms	$T_{tx} = 0.096$ Each $P_{cm} = 23 + (32 + 64) \times 4 = 407$ bytes $T_{pc} = T_{tx} \times P_{cm} = 0.096 \times 407 \approx 39.072$ ms Each $T_s = 5 + 39.072 = 44.072$ ms $T_{lt} = 0.096 \times (13 + 2 \times 2) \approx 1.632$ ms	$T_{max.} = T_s + T_{lt} + T_{so}$ $44.072 \times 2 + 1.632 + 5$ =94.776 ms
6	2-unit link with all units added Max. unit number = 2 Relay 32 points / register 2W are evenly allocated Each PLC scan time = 1 ms	$T_{tx} = 0.096$ Each $P_{cm} = 23 + (1 + 1) \times 4 = 31$ bytes $T_{pc} = T_{tx} \times P_{cm} = 0.096 \times 31 \approx 2.976$ ms Each $T_s = 1 + 2.976 = 3.976$ ms $T_{lt} = 0.096 \times (13 + 2 \times 2) \approx 1.632$ ms	$T_{max.} = T_s + T_{lt} + T_{so}$ $3.976 \times 2 + 1.632 + 1$ =10.584 ms

4.3.2 Response Time when There are Units that have not been Added to the Link

- If there is an unadded unit, T_{lk} (link addition processing time) becomes longer, and makes transmission cycle time longer.

$$T_{max.} = T_{s1} + T_{s2} + \dots + T_{sn} + T_{lt} + T_{so} + T_{lk}$$

$$T_{lk} = T_{lc} \text{ (link addition command sending time)} + T_{wt} \text{ (addition waiting time)} + T_{ls} \text{ (sending time for command to stop transmission if link error occurs)} + T_{so} \text{ (master unit scan time)}$$

Info.

- “Unadded unit” refers to a unit that is not connected between unit No. 1 and the largest unit number, or to a unit that is connected but has not powered ON.

5 MEWTOCOL Master-Slave Communication

5.1 List of MEWTOCOL Supported Commands	5-2
5.1.1 List of MEWTOCOL-COM Commands	5-2
5.2 MEWTOCOL-COM Master Communication (RECV).....	5-3
5.2.1 Reading Data from External Device.....	5-3
5.3 MEWTOCOL-COM Master Communication (SEND).....	5-6
5.3.1 Writing Data to External Device	5-6

5.1 List of MEWTOCOL Supported Commands

5.1 List of MEWTOCOL Supported Commands

5.1.1 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.

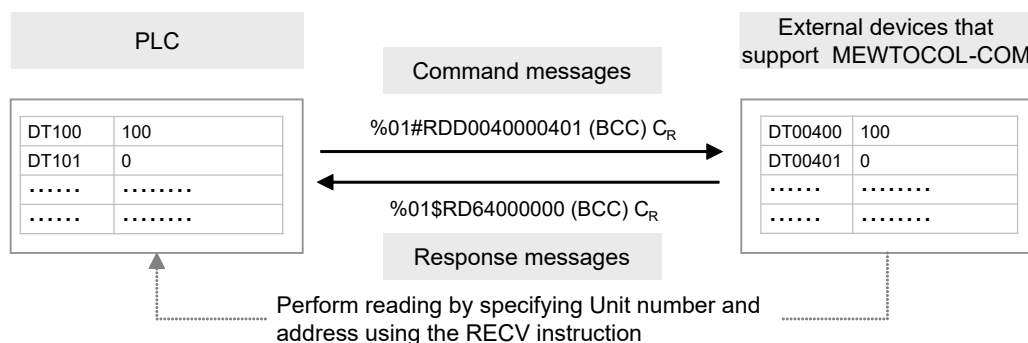
- For more details of MEWTOCOL command, refer to "11.2 MEWTOCOL-COM Format".

5.2 MEWTOCOL-COM Master Communication (RECV)

5.2.1 Reading Data from External Device

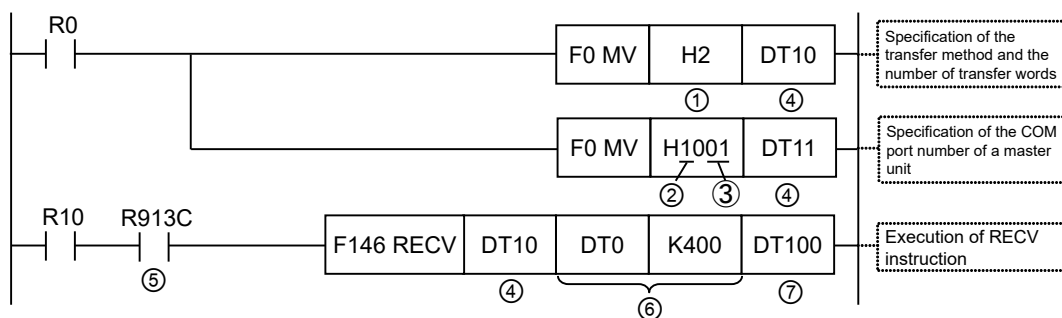
■ Procedure

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



■ Sample program

- Send a command from the COM1 port of the unit, read data from the data areas DT400 to DT401 of an external device (unit No. 1), and write the data into the data registers DT100 to DT101 of PLC.
- Confirm that transmission is not in progress (SEND / RECV instruction execution flag R913C: ON) for the same port, and start up SEND instruction.
- F146 (RECV) instruction is executed by specifying the transfer method (word transfer / bit transfer), the number of words, unit number of a destination unit, starting address, and the starting address of PLC memory area that stores data. Also specify the bit Nos. of both sides in the case of bit transfer.



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

5.2 MEWTOCOL-COM Master Communication (RECV)

Code	Description	
(1)	Transfer method and the number of transfer words	Specify the number of words in higher words of control data. Range: H1 to H1FD (1 word to 509 words)
(2)	COM port No. of a master unit	Specify a COM port No. for the higher 4 bits in lower words of control data. HF: COM0 port; H1: COM1 port; H2: COM2 port; H3: COM3 port; H4: COM4 port
(3)	Unit number of a destination unit	Specify a unit number of a destination unit for the lower 8 bits in lower words of control data. Range: H01 to H63 (K1 to K99)
(4)	Memory area that stores control data	Specify the starting number of the area (2 words) that specifies the transfer method and the number of transfer data.
(5)	SEND / RECV instruction execution flag	This is inserted to confirm that no SEND / RECV instruction is in progress for the same port. Turns ON when an instruction is executable.
(6)	Destination unit send data storage area	Using two operands, specify the type and relative address of the memory area of a destination unit that stores receive data.
(7)	Master unit memory area that store receive data	Specify the memory area of the master unit that stores receive data.

Info.

- Other F145 (SEND) / F146 (RECV) instructions cannot be executed at the same time to a communication port during master communication. Confirm that the “SEND / RECV instruction execution flag” is ON, and execute the instructions.
- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time to a port during slave communication.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the SEND / RECV instruction execution end flag to confirm the completion of transmission / reception. Turned ON in the case of an error, and an error code is stored in DT90123-DT90128. (Example: !61 Data error = H61)
- In the case of COM0 port, specify “HF” as a COM port No. for an operand of the F145 (SEND) / F146 (RECV) instruction.

■ Special relays / special data registers

	Operation	COM0	COM1	COM2	COM3	COM4
SEND/RECV instruction execution flag	0: Not executable 1: Executable	R9134	R913C (R9044)	R9144 (R904A)	R914C	R9154
SEND/RECV instruction execution end flag	0: Successful 1: Unsuccessful	R9135	R913D (R9045)	R9145 (R904B)	R914D	R9155
SEND/RECV instruction end code	When unsuccessful, an error code is stored.	DT90123	DT90124	DT90125	DT90127	DT90128

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

— REFERENCE —

9.1.3 [F146 RECV] Data Reception (MEWTOCOL-COM Master)

11.7.1 List of MEWTOCOL-COM Communication Error Codes

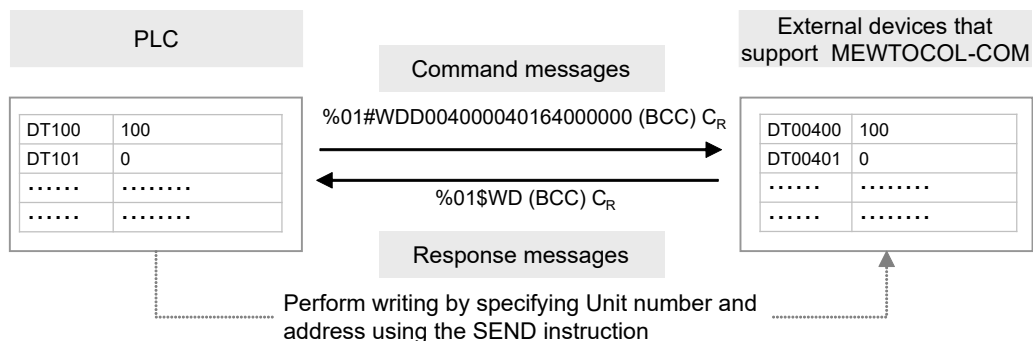
5.3 MEWTOCOL-COM Master Communication (SEND)

5.3 MEWTOCOL-COM Master Communication (SEND)

5.3.1 Writing Data to External Device

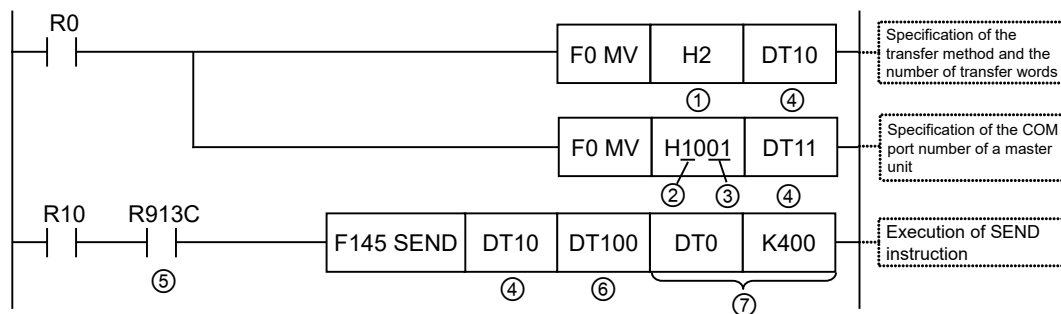
■ Procedure

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



■ Sample program

- Send a command from COM1 port of the unit, and write the content of the data registers DT100 to DT101 of PLC into the data areas DT400 to DT401 of an external device (unit No. 1).
- Confirm that transmission is not in progress (SEND / RECV instruction execution flag R913C: ON) for the same port, and start up SEND instruction.
- F145 (SEND) instruction is executed by specifying the transfer method (word transfer / bit transfer), the number of words, unit number of a destination unit, starting address, and the starting address of PLC memory area that stores data to be transferred. Also specify the bit Nos. of both sides in the case of bit transfer.



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

5.3 MEWTOCOL-COM Master Communication (SEND)

Code	Description	
(1)	Number of transfer words	Specify the number of words in higher words of control data. Range: H1 to H1FB (1 word to 507 words)
(2)	COM port No. of a master unit	Specify a COM port No. for the higher 4 bits in lower words of control data. HF: COM0 port; H1: COM1 port; H2: COM2 port; H3: COM3 port; H4: COM4 port
(3)	Unit number of a destination unit	Specify a unit number of a destination unit for the lower 8 bits in lower words of control data. Range: H00 to H63 (K0 to K99)
(4)	Memory area to store control data	Specify the starting number of the area (2 words) that specifies the transfer method and the number of transfer data.
(5)	SEND / RECV instruction execution flag	This is inserted to confirm that no SEND / RECV instruction is in progress for the same port. Turns ON when an instruction is executable.
(6)	Memory area of a master unit that stores send data	Specify the memory area of a master unit that stores send data.
(7)	Destination unit send data storage area	Using two operands, specify the type and relative address of the memory area of a destination unit that stores send data.

Info.

- Other F145 (SEND) / F146 (RECV) instructions cannot be executed at the same time to a communication port during master communication. Confirm that the “SEND / RECV instruction execution flag” is ON, and execute the instructions.
- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time to a port during slave communication.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the SEND / RECV instruction execution end flag to confirm the completion of transmission / reception. Turned ON in the case of an error, and an error code is stored in DT90123-DT90128. (Example: !61 Data error = H61)
- In the case of COM0 port, specify “HF” as a COM port No. for an operand of the F145 (SEND) / F146 (RECV) instruction.

■ Special relays / special data registers

	Operation	COM0	COM1	COM2	COM3	COM4
SEND/RECV instruction execution flag	0: Not executable 1: Executable	R9134	R913C (R9044)	R9144 (R904A)	R914C	R9154
SEND/RECV instruction execution end flag	0: Successful 1: Unsuccessful	R9135	R913D (R9045)	R9145 (R904B)	R914D	R9155
SEND/RECV instruction end code	When unsuccessful, an error code is stored.	DT90123	DT90124	DT90125	DT90127	DT90128

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

5.3 MEWTOCOL-COM Master Communication (SEND)

REFERENCE

9.1.2 [F145 SEND] Data Transmission (MEWTOCOL-COM Master)

11.7.1 List of MEWTOCOL-COM Communication Error Codes

6 MODBUS RTU Master-Slave Communication

6.1 List of MODBUS RTU Supported Commands	6-2
6.1.1 List of MODBUS Function Codes	6-2
6.1.2 Device No. Correspondence Table	6-2
6.2 MODBUS RTU Master Communication (RECV)	6-3
6.2.1 Reading Data from External Device.....	6-3
6.3 MODBUS RTU Master Communication (SEND)	6-6
6.3.1 Writing Data to External Device	6-6

6.1 List of MODBUS RTU Supported Commands

6.1 List of MODBUS RTU Supported Commands

6.1.1 List of MODBUS Function Codes

■ Supported commands (●: Available, Blank: Not available)

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

(Note 1) During master communication, MODBUS function codes 01, 02, 03 and 04 use F146 (RECV) instruction, while MODBUS function codes 05, 06, 15 and 16 use F145 (SEND) instruction.

6.1.2 Device No. Correspondence Table

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

MODBUS reference Nos.		Data on BUS (hexadecimal)	PLC device No.
Coil	000001-001760	0000-06DF	Y0-Y109F
	002049-010240	0800-27FF	R0-R511F
Input	100001-101760	0000-06DF	X0-X109F
Holding register	400001-465533	0000-FFFC	DT0-DT65532
Input register	300001-301028	0000-007F	WL0-WL127
	302001-302256	07D0-08CF	LD0-LD255

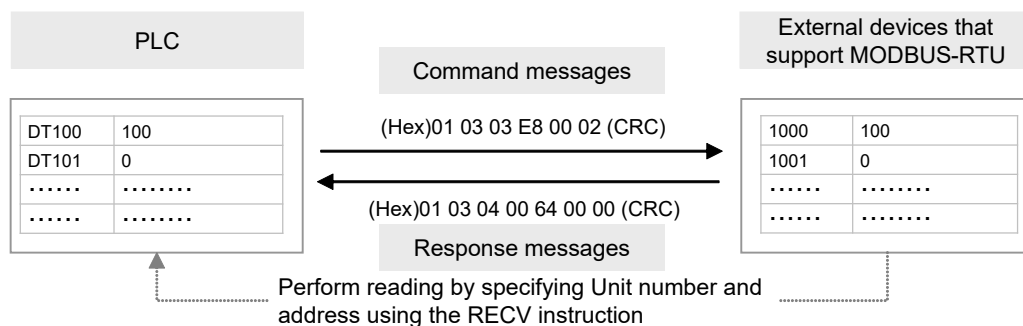
(Note 1) The table above indicates correspondence between MODBUS reference Nos. for accessing PLC through MODBUS protocol from a higher device and operation device Nos. of PLC.

6.2 MODBUS RTU Master Communication (RECV)

6.2.1 Reading Data from External Device

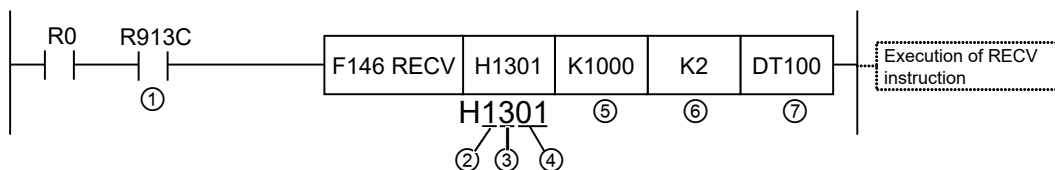
■ Procedure

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



■ Sample program

- Send a command from the COM1 port of the unit, read data from the data areas 1000 to 1001 (H03E8 to H03E9) of an external device (unit No. 1), and write the data into the data registers DT100 to DT101 of PLC.
- Confirm that transmission is not in progress (SEND / RECV instruction execution flag R913C: ON) for the same port, and start up RECV instruction.
- F146 (RECV) instruction is executed by specifying the port No., MODBUS command to be used, unit number of a destination unit, the number of receive data, and the starting address of PLC memory area that stores data. Check addresses of destination devices in the instruction manuals of devices.



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

Code	Description	
(1)	SEND / RECV instruction execution flag	This is inserted to confirm that no SEND / RECV instruction is in progress for the same port. Turns ON when an instruction is executable.
(2)	COM port No. of a master unit	Specify a COM port No. for Bit 15 to Bit 12 of control data.

6.2 MODBUS RTU Master Communication (RECV)

Code	Description	
		HF: COM0 port; H1: COM1 port; H2: COM2 port; H3: COM3 port; H4: COM4 port
(3)	MODBUS command	Specify a MODBUS command for Bit 11 to Bit 8 of control data. H1: Command 01 (Read coil state) H2: Command 02 (Read input state) H3: Command 03 (Read hold register) H4: Command 04 (Read input register)
(4)	MODBUS unit number of a destination unit	Specify a unit number of a destination unit for Bit 7 to Bit 0 of control data. Range: H01 to HFF (K1 to K255)
(5)	MODBUS address of a destination unit	Specify the MODBUS address of the memory area of a destination unit that stores receive data.
(6)	Number of receive data	In the case of bit data, the max. number is 2040 (07F8H). In the case of word data, the max. number is 127 (7FH).
(7)	Master unit memory area that store receive data	Specify the memory area of the master unit that stores receive data.

Info.

- Other F145 (SEND) / F146 (RECV) instructions cannot be executed at the same time to a communication port during master communication. Confirm that the “SEND / RECV instruction execution flag” is ON, and execute the instructions.
- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time to a port during slave communication.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the SEND / RECV instruction execution end flag to confirm the completion of transmission / reception. Turned ON in the case of an error, and an error code is stored in DT90123-DT90128. (Example: Function code error = H1)
- In the case of COM0 port, specify “HF” as a COM port No. for an operand of the F145 (SEND) / F146 (RECV) instruction.

■ Special relays / special data registers

	Operation	COM0	COM1	COM2	COM3	COM4
SEND/RECV instruction execution flag	0: Not executable 1: Executable	R9134	R913C (R9044)	R9144 (R904A)	R914C	R9154
SEND/RECV instruction execution end flag	0: Successful 1: Unsuccessful	R9135	R913D (R9045)	R9145 (R904B)	R914D	R9155
SEND/RECV instruction end code	When unsuccessful, an error code is stored.	DT90123	DT90124	DT90125	DT90127	DT90128

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

REFERENCE

9.1.5 [F146 RECV] Data Reception (MODBUS Master: Function Code Specification)

11.3.2 MODBUS RTU Response Format

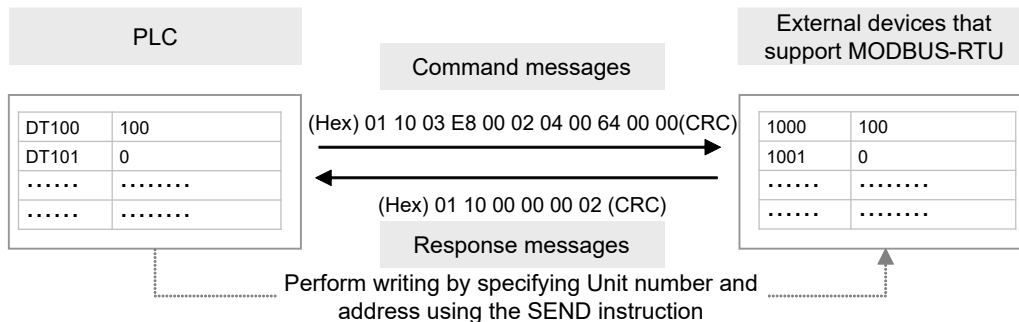
6.3 MODBUS RTU Master Communication (SEND)

6.3 MODBUS RTU Master Communication (SEND)

6.3.1 Writing Data to External Device

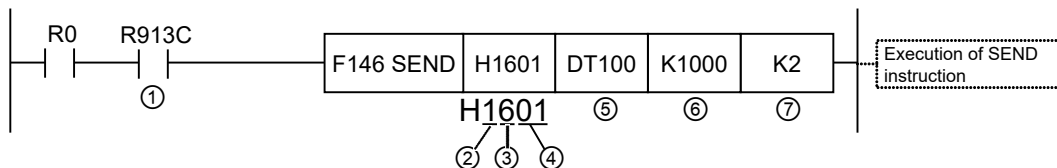
■ Procedure

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



■ Sample program

- Send a command from COM1 port of the unit, and write the content of the data registers DT100 to DT101 of PLC into the data areas 1000 to 1001 (H03E8 to H03E9) of an external device (unit no. 1).
- Confirm that transmission is not in progress (SEND/RECV instruction execution flag R913C: ON) for the same port, and start up SEND instruction.
- F145 (SEND) instruction is executed by specifying the port No., MODBUS command to be used, the starting address of PLC memory area that stores data to be sent, unit number of a destination unit, and the number of send data. Check addresses of destination devices in the instruction manuals of devices.



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

Code	Description	
(1)	SEND / RECV instruction execution flag	This is inserted to confirm that no SEND / RECV instruction is in progress for the same port. Turns ON when an instruction is executable.
(2)	COM port No. of a master unit	Specify a COM port No. for Bit 15 to Bit 12 of control data.

6.3 MODBUS RTU Master Communication (SEND)

Code	Description	
		HF: COM0 port; H1: COM1 port; H2: COM2 port; H3: COM3 port; H4: COM4 port
(3)	MODBUS command (Note 1)	Specify a MODBUS command for Bit 11 to Bit 8 of control data. H5: Command 05 (Force a single coil) or Command 15 (Force multiple coils) H6: Command 06 (Preset a single register) or Command 16 (Preset multiple registers) HD: One-bit transfer by Command 15 HE: One-word transfer by Command 16
(4)	MODBUS unit number of a destination unit	Specify a unit number of a destination unit for Bit 7 to Bit 0 of control data. Range: H00 to HFF (K0 to K255)
(5)	Memory area of a master unit that stores send data	Specify the memory area of a master unit that stores send data.
(6)	Destination unit send data storage area	Specify the MODBUS address of the memory area of a destination unit that stores send data.
(7)	Number of send data	In the case of bit data, the max. number is 2040 (07F8H). In the case of word data, the max. number is 127 (7FH).

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

Info.

- Other F145 (SEND) / F146 (RECV) instructions cannot be executed at the same time to a communication port during master communication. Confirm that the “SEND / RECV instruction execution flag” is ON, and execute the instructions.
- F145 (SEND) / F146 (RECV) instruction cannot be executed at the same time to a port during slave communication.
- The processing of F145 (SEND) / F146 (RECV) instruction is handled during the execution of ED instruction. Check the SEND / RECV instruction execution end flag to confirm the completion of transmission / reception. Turned ON in the case of an error, and an error code is stored in DT90123-DT90128. (Example: Function code error = H1)
- In the case of COM0 port, specify “HF” as a COM port No. for an operand of the F145 (SEND) / F146 (RECV) instruction.

■ Special relays / special data registers

	Operation	COM0	COM1	COM2	COM3	COM4
SEND/RECV instruction execution flag	0: Not executable 1: Executable	R9134	R913C (R9044)	R9144 (R904A)	R914C	R9154
SEND/RECV instruction execution end flag	0: Successful 1: Unsuccessful	R9135	R913D (R9045)	R9145 (R904B)	R914D	R9155
SEND/RECV instruction end code	When unsuccessful, an error code is stored.	DT90123	DT90124	DT90125	DT90127	DT90128

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

6.3 MODBUS RTU Master Communication (SEND)

REFERENCE

9.1.4 [F145 SEND] Data Transmission (MODBUS Master: Function Code Specification)

11.3.2 MODBUS RTU Response Format

7 General-Purpose Communication

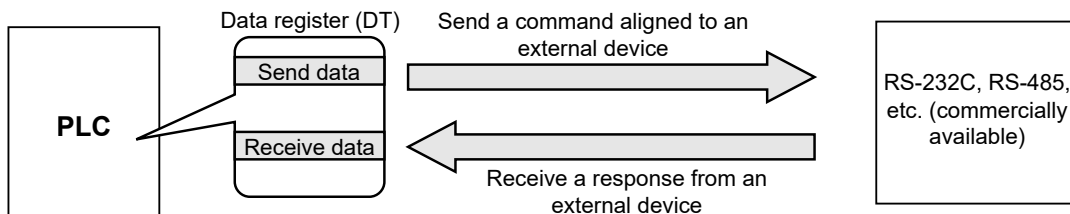
7.1 Overview of Sending Data	7-2
7.1.1 Overview of Sending Data	7-2
7.1.2 Send Data Area	7-3
7.2 Receiving Data from External Devices	7-4
7.2.1 Overview of Receiving Data.....	7-4
7.2.2 Receive Data Area.....	7-5
7.3 Flag Operations in Transmission / Reception	7-7
7.3.1 When the Header is Set to “No STX” and the Terminator to “CR” ...	7-7
7.3.2 When the Header is Set to “STX” and the Terminator to “ETX”	7-8

7.1 Overview of Sending Data

7.1 Overview of Sending Data

7.1.1 Overview of Sending Data

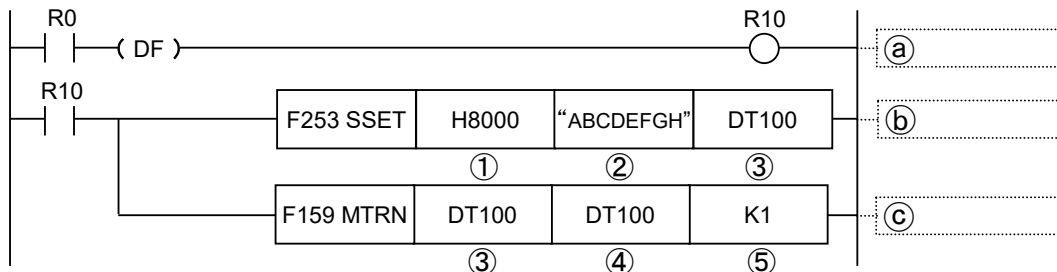
Communication with external devices is handled through the data registers. When data to be sent is stored in the data register (DT) used as a send buffer, and F159 (MTRN) instruction is executed, the data is outputted from the COM port.



■ Sample program

The following program sends a string “ABCDEFGH (Hex)” to an external device via COM1 port. The program described above is executed in the following sequence.

1. “ABCDEFGH” is converted to an ASCII code and stored in a data register.
2. The data of 1) above is sent from COM1 port using an F159 (MTRN) instruction.



Code	Description	
(1)	Character constant to be sent	Input a character constant to be sent. In the case of input using FPWIN GR7, select “M” as a device type. On FPWIN GR7, a character constant is bracketed by double quotation marks.
(2)	Area that stores send data	Specify the starting address of the data register that stores data to be sent.
(3)	Starting area of send buffer	Specify the starting address of the data register allocated to a data table that contains send data and the number of characters of send data.
(4)	Number of send data bytes	Specify the number of send data bytes.
(5)	COM port No.	Specify a COM port No. for sending data. K0: COM0 port; K1: COM1 port; K2: COM2 port; K3: COM3 port
(a)	Sending data instruction	Turn ON the internal relay (R10) according to the timing of send conditions (R0).
(b)	Data conversion	Convert the string “ABCDEFGH (Hex)” into ASCII code, and write it into DT101 to DT104.
(c)	Sending data	Data in the send buffer is sent from COM1 port.

i Info.

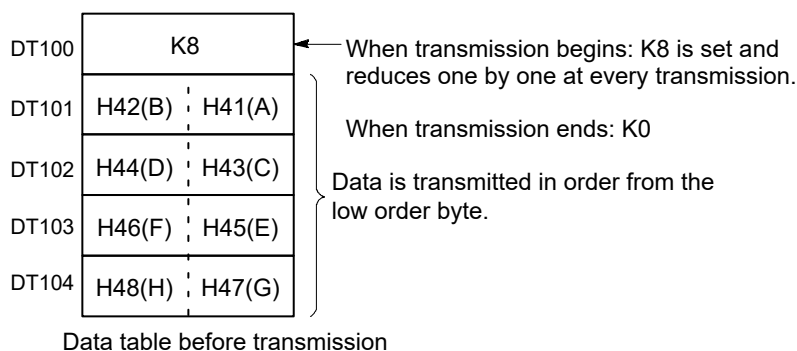
- Do not include the terminator (end code) in the send data if it is specified. The terminator is added automatically.
- When the header (start code) is set to “STX” in system register No. 413 or 414, do not add the header to send data. The header is added automatically.
- When using AFP0HCCS1, transmission does not take place until CS (Clear to Send) turns ON. If you are not going to connect to the other device, connect to RS (Request to Send).
- The maximum number of bytes to be sent [n] is 2048.

7.1.2 Send Data Area

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

■ Structure of send data

Example: When an 8-byte data “ABCDEFGH” is sent



7.2 Receiving Data from External Devices

7.2 Receiving Data from External Devices

7.2.1 Overview of Receiving Data

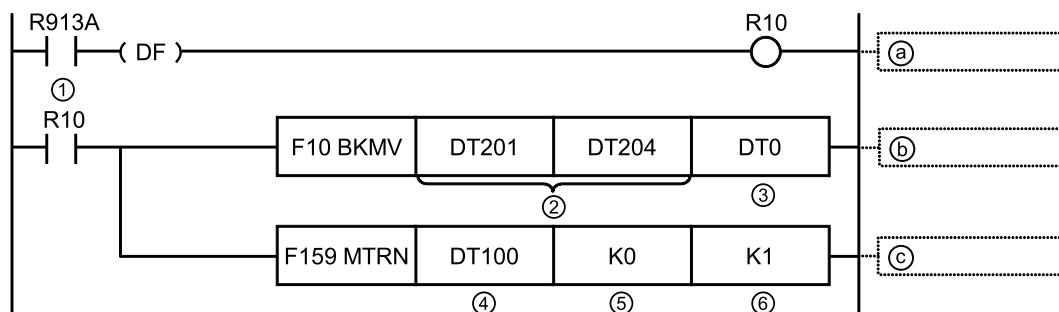
Data received from a COM port is stored in a “receive buffer” specified by the system register, and the “reception done” flag turns ON. If the “reception done” flag is OFF, data can be received at any time.

■ Sample program

8-byte data received in the receive buffer via COM1 port is read into DT0 to DT3.

The program described above is executed in the following sequence.

1. The data sent from external devices is stored in the receive buffer.
2. The “reception done R913A” contact turns ON.
3. The received data is sent from the receive buffer to the area starting with data register DT0.
4. The F159 (MTRN) instruction is executed with no data, in order to reset the receive buffer writing points and to turn OFF the “reception done” contact R913A. The system is now prepared to receive the next data. (The data in the receive buffer is not cleared.)



Code	Description	
(1)	Reception done flag	R9132: COM0 port; R913A: COM1 port; R9142: COM2 port; R914A: COM3 port
(2)	Data area of receive buffer	Specify the area of data stored in a receive buffer. In this example, 5-word area (DT201 to DT204) is specified to receive 10-byte data.
(3)	Area that transfers receive data	Receive data is transferred to a given area from the receive buffer.
(4)	Given area	To execute F159 (MTRN) instruction, specify a dummy area.
(5)	Number of send data bytes	Specify “0” for reception.
(6)	COM port No.	Specify a COM port No. for data reception. K0: COM0 port; K1: COM1 port; K2: COM2 port; K3: COM3 port
(a)	Detection of reception done	Turn ON the internal relay (R10) according to the timing of reception done flag ON.
(b)	Retrieval of receive data	Transfer data from an area of receive buffer that stores receive data (DT201 to DT204) to a given data register (DT100 to DT104).
(c)	Preparation for receiving the next data	Turn OFF the reception done flag, and prepare for receiving the next data. The data in the receive buffer is not cleared.

■ Special relays

	COM0	COM1	COM2	COM3
General-purpose communication reception done flag	9132 (903E)	913A (9038)	9142 (9048)	914A
General-purpose communication transmission done flag	9133 (903F)	913B (9039)	9143 (9049)	914B

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

i Info.

- Note that the reception done flag (R913A) changes even while a scan is in progress.
(e.g., if the reception done flag is used multiple times as an input condition, there is a possibility of different statuses existing within the same scan.)
As a protective measure, replace it with an internal relay at the beginning of the program.

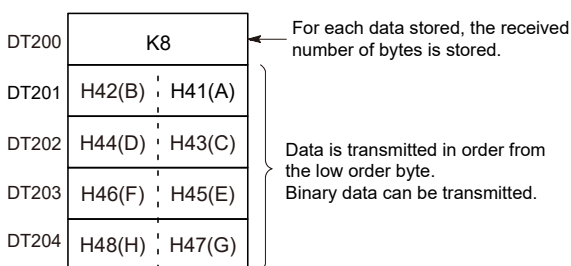
7.2.2 Receive Data Area

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

■ Structure of receive data

Example: When 8-byte data “ABCDEFGH” is received

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



Receive buffer at the time of reception complete

■ Receive buffer setting

Specify the receive buffer area (data register DT) for general-purpose communication using the following system register.

Port		COM0	COM1	COM2	COM3
Receive buffer starting number in general-purpose communication	System register No.	No.420	No.416	No.418	No.422
	Default	4096	0	2048	6144
Receive buffer capacity in general-purpose communication	System register No.	No.421	No.417	No.419	No.423

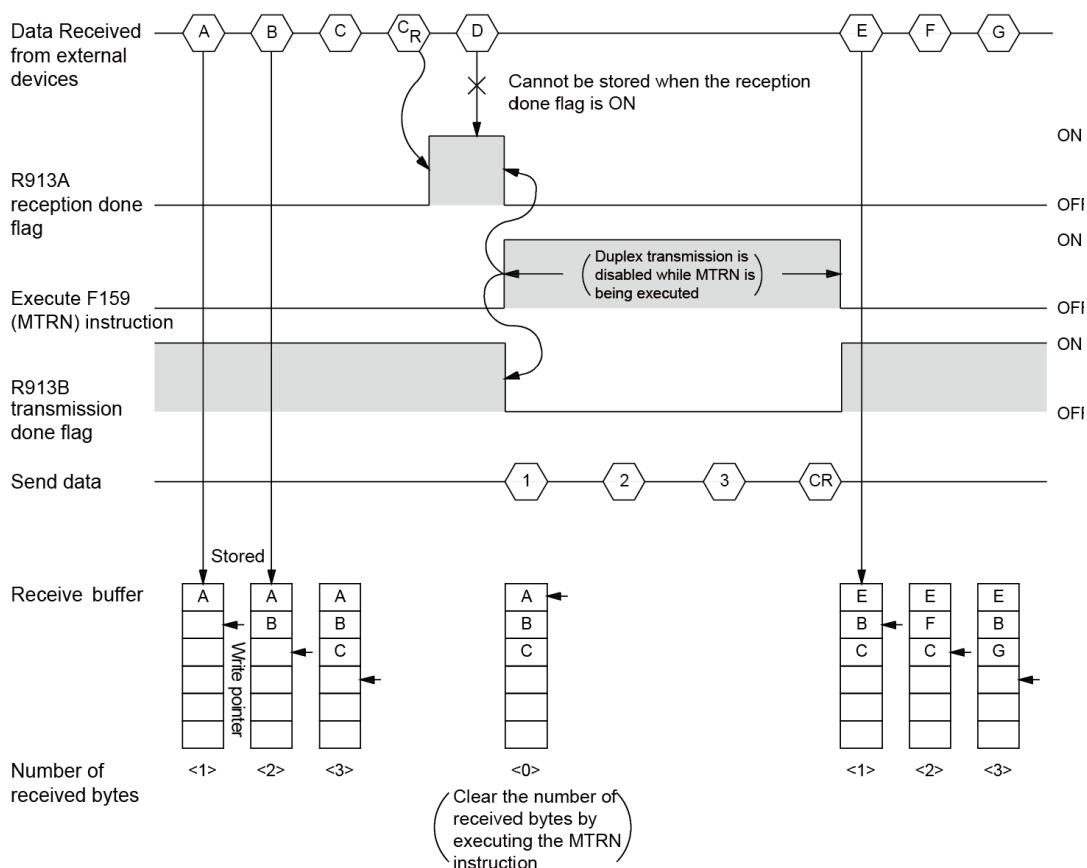
7.2 Receiving Data from External Devices

Port		COM0	COM1	COM2	COM3
	Default	2048	2048	2048	2048

7.3 Flag Operations in Transmission / Reception

7.3.1 When the Header is Set to “No STX” and the Terminator to “CR”

- When receiving data: The reception done flag, the transmission done flag, and the F159 (MTRN) instruction are related as follows:



- For general-purpose serial communication, half-duplex transmission must be used.
- Reception is disabled when the reception done flag R913A is ON.
- When F159 (MTRN) is executed, the number of receive bytes is cleared, and the address (write pointer) in the receive buffer is reset to the starting address.
- When F159 (MTRN) is executed, the error flag R9138, the reception done flag R913A, and the transmission done flag R913B turn OFF.
- Duplex transmission is disabled while F159 (MTRN) instruction is being executed. The transmission done flag R913B must be observed.
- Reception continues even if the error flag R9138 turns ON. To resume reception, execute the F159 (MTRN) instruction to turn OFF the error flag.

7.3 Flag Operations in Transmission / Reception

Special relays

	COM0	COM1	COM2	COM3
General-purpose communication reception done flag	9132 (903E)	913A (9038)	9142 (9048)	914A
General-purpose communication transmission done flag	9133 (903F)	913B (9039)	9143 (9049)	914B

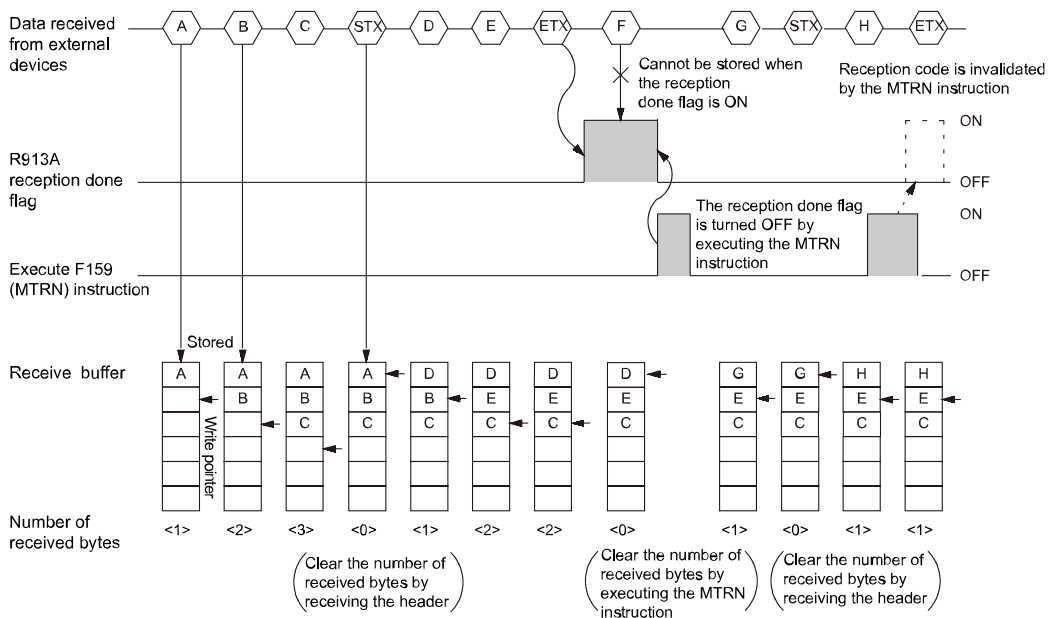
(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

Info.

- Note that the reception done flag (R913A) changes even while a scan is in progress.
(e.g., if the reception done flag is used multiple times as an input condition, there is a possibility of different statuses existing within the same scan.)
As a protective measure, replace it with an internal relay at the beginning of the program.

7.3.2 When the Header is Set to “STX” and the Terminator to “ETX”

- When receiving data: The reception done flag, the transmission done flag, and the F159 (MTRN) instruction are related as follows:

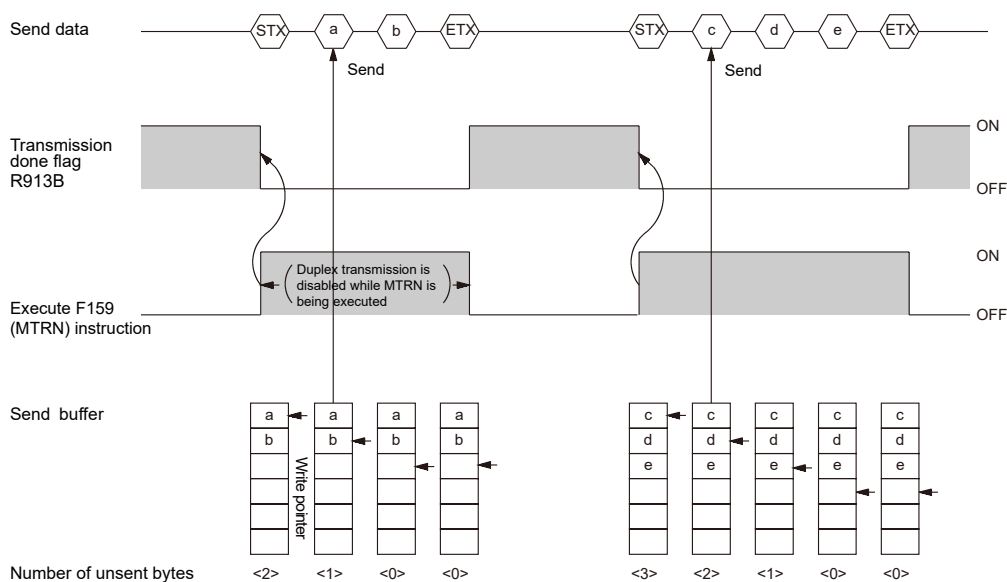


- The data is stored in the receive buffer in sequential order. When the header is received, the number of bytes received is cleared, and the address (write pointer) in the receive buffer is reset to the initial address.
- Reception is disabled when the reception done flag R913A is ON.

7.3 Flag Operations in Transmission / Reception

- When F159 (MTRN) is executed, the number of receive bytes is cleared, and the address (write pointer) in the receive buffer is reset to the starting address.
- If there are two headers, data following the second header is overwritten and the data is stored in the receive buffer.
- The reception done flag R913A is turned OFF by the F159 (MTRN) instruction. Therefore, if F159 (MTRN) is executed at the same time as the reception of the terminator, the reception done flag will not be detected.

■ When sending data: The reception done flag, the transmission done flag, and the F159 (MTRN) instruction are related as follows:



- Header (STX) and terminator (ETX) are automatically added to send data that is transmitted to an external device.
- When F159 (MTRN) is executed, the transmission done flag R913B turns OFF.
- Duplex transmission is disabled while F159 (MTRN) is being executed. The transmission done flag R913B must be observed.

■ Special relays

	COM0	COM1	COM2	COM3
General-purpose communication reception done flag	9132 (903E)	913A (9038)	9142 (9048)	914A
General-purpose communication transmission done flag	9133 (903F)	913B (9039)	9143 (9049)	914B

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

7.3 Flag Operations in Transmission / Reception

Info.

- Note that the reception done flag (R913A) changes even while a scan is in progress.
(e.g., if the reception done flag is used multiple times as an input condition, there is a possibility of different statuses existing within the same scan.)
As a protective measure, replace it with an internal relay at the beginning of the program.

8 Ethernet Communication (AFPX-COM5 cassette)

8.1 AFPX-COM5	8-2
8.1.1 Functions of APFX-COM5	8-2
8.1.2 Communication Tool Software Configurator WD	8-2
8.2 Computer Link (Ethernet).....	8-6
8.2.1 Overview	8-6
8.2.2 Setting of Communication Environment for Computer Link (Ethernet)	8-6
8.3 Connection for 1:1 Communication (Computer Link (Ethernet)).....	8-9
8.4 1:N Communication (Computer Link (Ethernet)).....	8-13
8.5 MEWTOCOL Master Communication Setting.....	8-14
8.6 MEWTOCOL Master (Ethernet) (Sample Program)	8-16
8.6.1 Behavior of Sample Program	8-16
8.6.2 Setting Communication Environment when MEWTOCOL Master (Ethernet) is Used	8-16
8.6.3 Master Unit Sample Program.....	8-20
8.7 General-purpose Communication	8-22
8.7.1 Overview of General-purpose Communication (Ethernet)	8-22
8.7.2 Setting for Using the General-purpose Communication (Ethernet) .	8-22
8.8 PLC Link Communication (Ethernet)	8-27
8.8.1 Overview of PLC Link Communication (Ethernet)	8-27
8.8.2 PLC Link Communication Setting	8-27
8.9 Applied Usage (Ethernet).....	8-30
8.9.1 How to Confirm the Network Information on the FP-XH Control Unit.....	8-30
8.9.2 How to Transmit a Command Message to Each Unit	8-34
8.10 Example of Connections (Ethernet)	8-35
8.11 Initialization Procedure	8-37

8.1 AFPX-COM5

■ Overview

The communication cassette AFPX-COM5 has two interfaces: Ethernet (1 channel) and 3-wire RS232C (1 channel).

- The Ethernet interface (1 channel) supports the computer link, general-purpose communication, and PLC link.

Although the Ethernet interface is connected to other devices via Ethernet, the AFPX-COM5 communicates with the FP-XH control unit via RS232C and it functions as a converter between Ethernet and RS232C.

- RS232C interface (1 channel) supports the computer link, general-purpose communication, and MODBUS RTU.

The use of this interface is the same as other cassettes such as the AFPX-COM2.

8.1.1 Functions of APFX-COM5

Port	Communication function
Ethernet × 1 channel	<ul style="list-style-type: none"> • Computer link <ul style="list-style-type: none"> • Max. 1 connection (Client) • Max. 3 connections (Server) • General-purpose communication <ul style="list-style-type: none"> • Max. 1 connection • PLC link^(Note 1)
RS-232C (3-wire) × 1 channel	<ul style="list-style-type: none"> • Computer link • General-purpose communication • MODBUS RTU (1:1)

(Note 1) When attached to the cassette mounting part 1, the PLC link function of the FP-XH control unit is available via Ethernet.

8.1.2 Communication Tool Software Configurator WD

The communication tool software "Configurator WD" is necessary to set Ethernet communication for the AFPX-COM5. Install "Configurator WD" before setting the AFPX-COM5.

Info.

- "Configurator WD" can be downloaded from our web site free of charge.
<https://industry.panasonic.com/global/en/downloads/?tab=software>(Membership registration required. Free of charge)
 The setting is saved in the AFPX-COM5.

IP address setting

Item	Description	Default
Obtain IP address automatically ^(Note 1)	When selecting "Obtain an IP address automatically", an IP address is obtained from the DHCP server. When selecting "Use the following IP address", an IP address is set manually.	Use the following IP address
Unit name	Unit name for the communication cassette AFPX-COM5 can be specified.	FPX_ET
IP address ^(Note 1)	Set an IP address other than 0.0.0.0 and 255.255.255.255, that are the IP addresses of the communication cassette AFPX-COM5.	192.168.1.5
Subnet mask	Netmask of the communication cassette AFPX-COM5	255.255.255.0
Default Gateway	Gateway of the communication cassette AFPX-COM5	192.168.1.1

(Note 1) When an error occurs, the ERROR LED will be turned on.

Communication setting

	Item	Description	Default
Common settings	Communication protocol select	Communication protocol of the AFPX-COM5 Select "TCP" or "UDP".	TCP
	Action mode	Connection mode of the AFPX-COM5 Select "Client mode" or "Server mode".	Server mode
	Baud rate (COM1) ^(Note 3)	Baud rate for communicating with the COM1 port of the FP-XH control unit. Change the baud rate according to the baud rate for the COM1 port of the FP-XH control unit. Select "9600 bps" or "115200 bps".	9600bps
	Communication mode select	Communication mode of the AFPX-COM5 Select "Computer link" or "General-purpose communication".	Computer link
	Transmission method	It is valid when selecting "UDP" in the communication protocol. Method for transmitting data to partner devices. Select "UNICAST" or "BROADCAST".	UNICAST
Server setting ^(Note 1)	Source port No.	Port number that the AFPX-COM5 opens. Setting range: 1025 to 32767	9094
	Time out	If AFPX-COM5 not communicate with a destination device during this setting time (seconds) in the state that connection is established, connection will be cut. Setting range: 0 to 1800s When "0" is set, the communication will not be cut.	0
Client setting ^(Note 2)	Destination IP address	IP address of a destination device Set an IP address other than 0.0.0.0 and 255.255.255.255.	192.168.1.100
	Destination port No.	Destination port number of a destination device Setting range: 1025 to 32767	9094
	Source port No.	Source port No. of a destination device Setting range: 0, 1025 to 32767 When "0" is set, optional.	0

8.1 AFPX-COM5

	Item	Description	Default
	Time out	If AFPX-COM5 not communicate with a destination device during this setting time (seconds) in the state that connection is established, connection will be cut. Setting range: 0 to 1800s When "0" is set, the communication will not be cut.	0
	Retry time	When failed in the connection with a destination device. Setting range: 0 to 1800s	15

(Note 1) Set when the "Server mode" has been selected for the action mode.

(Note 2) Set when the "Client mode" has been selected for the action mode.

(Note 3) As the communication between the FP-XH control unit and AFPX-COM5 is performed using serial communication, the baud rate for them should be set to the same value. When attaching the AFPX-COM5 to the cassette mounting part 2, adjust it to that of the COM3 port.

Option setting

Item	Description	Default	
Response timeout (When selecting the computer link only)	Set the wait time for the response.	5000 ms	
End code	This is the code for the AFPX-COM5 to confirm the end of the message (data) to be received from the FP-XH control unit. "CR", "CR+LF", or "NONE" can be selected. Reception continues until the end of the message (CR, CR+LF) will be received. When selecting "NONE", the end code is not confirmed.	CR	
Judgment time without termination	Set the wait time for the end code. If the next message (data) is not received within the judgment time without termination (ms) after the last received message (data), the AFPX-COM5 judges that is no termination, and performs the following operation. (End code: when selecting CR, CR+LF) The received message (data) is discarded. For TCP, the connection is disconnected. (End code: when selecting NONE) The message (data) is transmitted to the connected destination.	20 ms	
Network information	Information area first No.	Set the area of DT to be used for the network information and connection information. Setting range: 3000 to 12000	10000
	Network information notification	When the power turns on, the network information will be notified to the FP-XH.	Invalid
	Network information confirmation	When using the computer link and client, the network information can be confirmed.	Invalid
	Connection	When using the computer link and server, the connection information can be confirmed from the LAN side.	Invalid

Item		Description	Default
	informati on confirmat ion		
Target IP address for unit No.	Destinati on unit No. and IP address is specified	A command is transmitted to the IP address corresponding to the unit number.	Invalid
	Unit No.	Select a unit number. Can be selected from the range of 1 to 99.	Invalid
	IP address	Set an IP address.	192.168.1.100

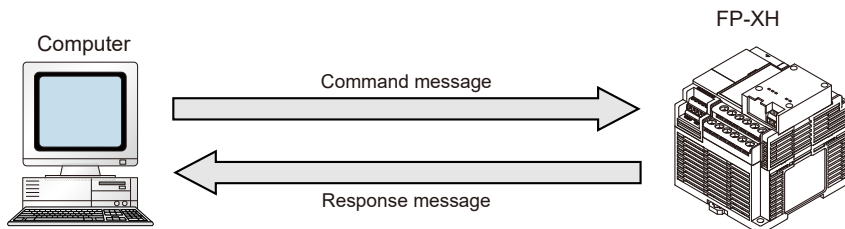
8.2 Computer Link (Ethernet)

8.2 Computer Link (Ethernet)

To perform Ethernet communication by the computer link, follow the description below.

8.2.1 Overview

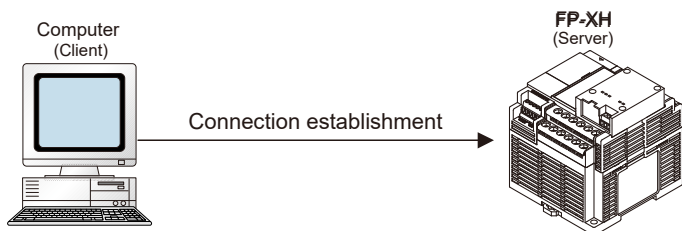
■ Overview



- Communication is conducted between a computer and a PLC using Ethernet by the computer link.
- Remote programming and monitoring is possible via LAN line by using a programming tool such as FPWIN GR7.

■ Outline of operation

- Establish connection between a computer and the FP-XH.
- In that case, the connected computer is called "Client" and the connected FP-XH is called "Server". After connection establishment, communication via TCP/IP is conducted. Up to 3 connections can be established at the specified source port.



8.2.2 Setting of Communication Environment for Computer Link (Ethernet)

The following two settings for the FP-XH control unit and communication cassette AFPX-COM5 should be set.

- Setting communication environment of the FP-XH control unit
- Setting Ethernet communication environment of the communication cassette AFPX-COM5

■ Setting communication environment of the FP-XH control unit

The programming tool FPWIN GR7 is used to set the baud rate or transmission format of the COM1 port. The following explanation assumes that the communication cassette AFPX-COM5 will be attached to the cassette mounting part 1.

Select **Option>System register setting** in the menu bar, and click **COM1 port** tab.

Dialog box of PLC system register setting

The screenshot shows the 'PLC Configuration' dialog box. The left sidebar lists various settings, with 'COM0 Port' selected. The main area displays the following settings:

- No. 410 Unit No.: 1
- No. 412 Communication Mode: Computer Link
- Modem Enabled:
- No. 413 Communication Format: Char. Bit: 8 bits, Parity: Odd, Stop Bit: 1, Terminator slt: Code, Terminator: CR, Header: STX Not Exist.
- No. 415 Baud rate: 9600 bps
- No. 418 PLC link Baud rate: 115200bps
- No. 420 Starting address for data received of serial data communication mode: DT 4096 (0 - 32764)
- No. 421 Buffer capacity setting for data received of serial data communication mode: 2048 (0 - 2048)
- No. 424 Terminator judgement time (X0.01 msec): 0 (0 - 10000)

Buttons at the bottom: OK, Cancel, Read PLC, Initialize.

COM1 port setting (AFPX-COM5)

No.	Item	Range	
No.410	Unit number	1 to 99	
No.412	Communication mode	Computer link	
No.413	Communication format (Fixed) ^(Note 1)	Character bit	8bit
		Parity check	Odd
		Stop bit	1 bit
No.415	Baud rate	115200 bps / 9600 bps ^(Note 2)	

(Note 1) The transmission format for Ethernet communication with the COM5 cassette is fixed.
Set as the above table.

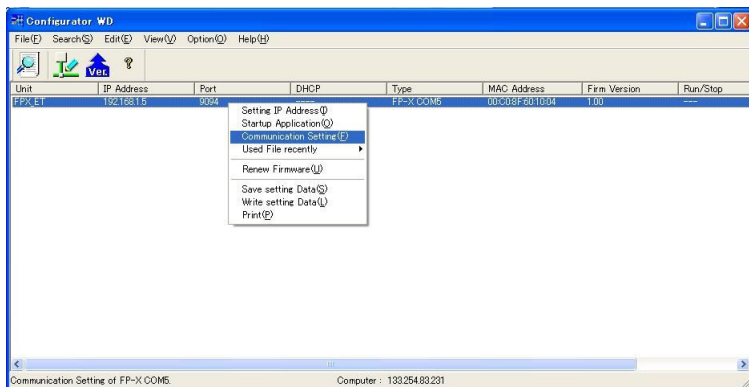
(Note 2) Set the baud rate to match the setting of "Configurator WD".

■ Setting Ethernet communication environment of the communication cassette AFPX-COM5

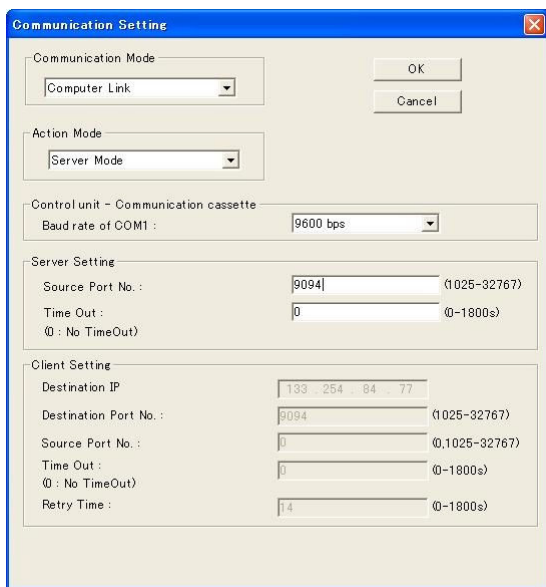
The "Configurator WD" is used to set Ethernet communication environment of the AFPX-COM5.

1. Launch "Configurator WD".
2. Search the AFPX-COM5.
3. Select the communication cassette AFPX-COM5 from the search result, and set an IP address to connect with a computer.
4. After that, search again. Select the communication cassette AFPX-COM5, and select **Edit(E)**→**Communication setting(F)** in the menu or right-click to select **Communication setting**.

8.2 Computer Link (Ethernet)



Dialog box of communication setting



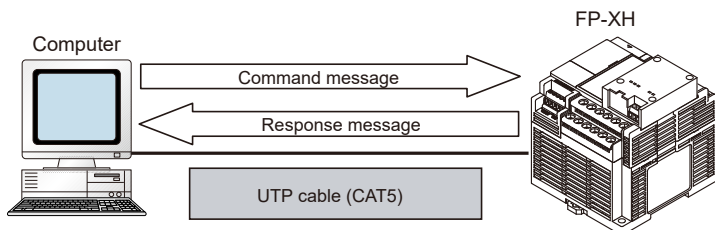
Note

- If the "TCP" is selected for the communication protocol, up to three connections are established using the computer link (Ethernet), however, when using the programming tool FPWIN GR7 for connection (using registration monitor command, multi-frame), more than two connections cannot be established. Also if the "UDP" is selected for the communication protocol, the UDP communication cannot be used as the programming tool FPWIN GR7 does not support it, although no restriction on connections.

8.3 Connection for 1:1 Communication (Computer Link (Ethernet))

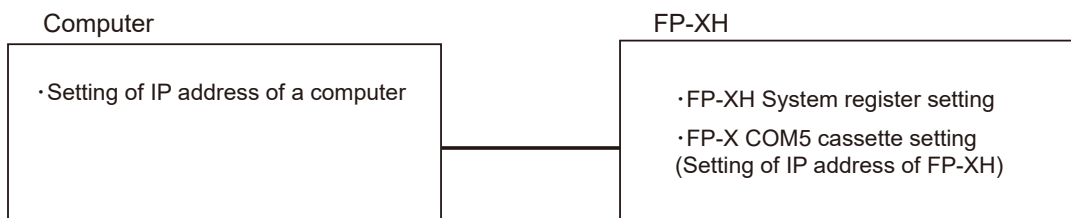
■ Overview

A 1:1 computer link connects the FP-XH and a computer using a UTP cable (CAT5). Communication is conducted via commands from the computer and responses from the PLC.



■ 1:1 communication setting (computer link (Ethernet))

This setting enables the 1:1 communication between the FP-XH and a computer using the computer link (Ethernet).



■ System register setting of FP-XH (specified using FPCOM GR7)

Dialog box of PLC system register setting

No.	Item	Range
No.410	Unit number	1
No.412	Communication mode	Computer link
No.413	Communication format (Fixed)	Character bit 8bit

8.3 Connection for 1:1 Communication (Computer Link (Ethernet))

No.	Item	Range
	Parity check	Odd
	Stop bit	1 bit
No.415	Baud rate	115200 bps / 9600 bps

(Note 1) The transmission format for Ethernet communication with the COM5 cassette is fixed.
Set as the above table.

(Note 2) Set the baud rate to match the setting of "Configurator WD".

■ Setting of the communication cassette AFPX-COM5 (specified using Configurator WD)

IP address setting

Item	Default
Get IP address	Manual
Unit name	FPX_ET
IP address	192.168.1.5
Subnet mask	255.255.255.0
Default Gateway	192.168.1.1

8.3 Connection for 1:1 Communication (Computer Link (Ethernet))

Communication setting

Item	Default
Communication protocol	TCP
Action mode	Server mode
Baud rate (COM1 port)	115200 bps / 9600 bps ^(Note 1)
Communication mode	Computer link
Source port No.	9094
Time out	0

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

■ Setting of a computer

IP address setting

8.3 Connection for 1:1 Communication (Computer Link (Ethernet))

Item	Default
IP address	192.168.1.100 ^(Note 1)
Subnet mask	255.255.255.0
Default Gateway	192.168.1.1

(Note 1) The IP address of a computer is an example.

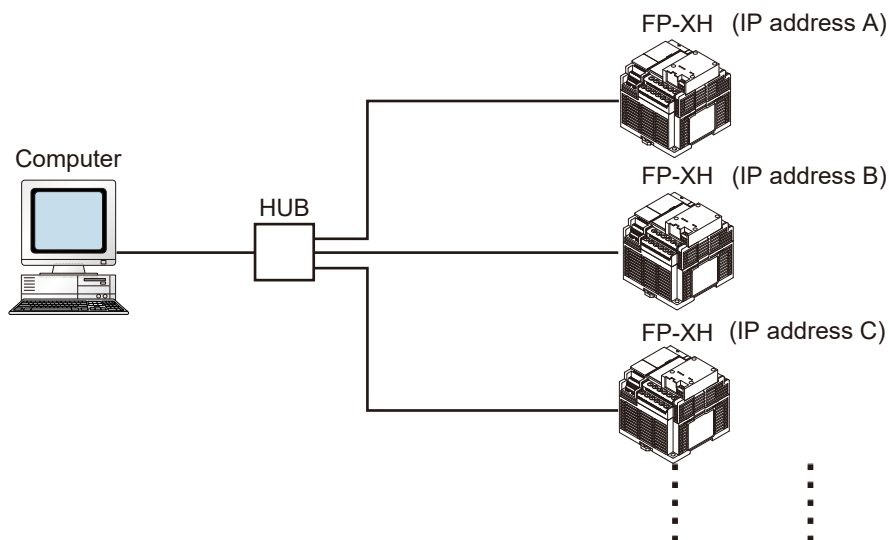
Set the IP addresses of the computer and communication cassette AFPX-COM5 according to the network environment to be used.

8.4 1:N Communication (Computer Link (Ethernet))

■ Overview

A computer is connected respective PLCs through Ethernet. The computer and the PLC communicate via commands and responses: The computer sends a command specifying the destination IP address, and the PLC with that IP address sends a response back to the computer.

It is no problem if the unit number of the PLC overlaps with other PLCs.



■ 1:N communication setting (computer link (Ethernet))

The settings for the FP-XH system register and communication cassette AFPX-COM5 are the same as the settings for the connection (computer link (Ethernet)) by a 1:1 communication.

However, set the IP address for a FP-XH not to overlap with other FP-XH units.

8.5 MEWTOCOL Master Communication Setting

8.5 MEWTOCOL Master Communication Setting

For using as the MEWTOCOL master, set the AFPX-COM5 to the computer link and client. Also, specifying the simultaneous transmission by broadcast or the target IP address for unit number in the option setting enables the communication with various PLCs.

■ MEWTOCOL master setting in TCP

Item	Setting value
Communication protocol	TCP
Action mode	Client connection
Baud rate (COM1)	15200 bps / 9600 bps ^(Note 1)
Communication mode	Computer link
Destination IP address	Destination IP address
Destination port No.	1025 to 32767
Source port No.	0, 1025 to 32767
Time out	0 to 1800 secs
Retry time	0 to 1800 secs

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

Note

- If you want to transmit data when connection is not established, the connection can be established from the AFPX-COM5 and data can be transmitted.
- In the TCP, it takes some time for connection. The connection timeout for the AFPX-COM5 is the same as the response timeout value. Set the timeout time for the **SEND/RCV** instruction longer than the response timeout value to judge the connection timeout.

■ MEWTOCOL master setting in UDP

Item	Setting value
Communication protocol	UDP
Action mode	Client connection
Baud rate (COM1)	15200 bps / 9600 bps ^(Note 1)
Communication mode	Computer link
Transmission method	UNICAST/BROADCAST ^(Note 2)
Destination IP address	Destination IP address
Destination port No.	1025 to 32767
Source port No.	0, 1025 to 32767

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

(Note 2) When selecting BROADCAST, the setting of the destination IP address is not required.

Note

- After the AFPX-COM5 is powered on, it will take about 5 seconds for initializing the Ethernet. Until the Ethernet is initialized, data cannot be transmitted or received. For the Ethernet communication, programming is necessary to start the communication after a lapse of 5 seconds after the power turned on.
- Generally, as a router does not transmit a broadcast packet, communication over the router cannot be achieved.

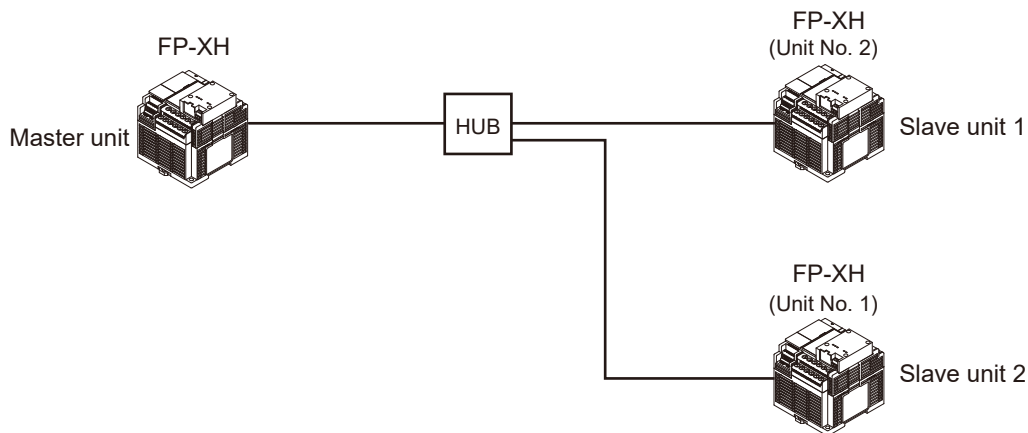
Using the broadcast, processing load is applied on all equipment on the network. Confirm that the broadcast does not affect other equipment before using it.

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

8.6.1 Behavior of Sample Program

MEWTOCOL communication can be performed with the FP-XH using **F145** and **F146** instructions. The following sample program executes 4 MEWTOCOL commands in sequence for 2 slave units using the **F145** and **F146** instructions.



Description

R100	Stores the data for 10 words from DT1000 of the slave unit 1 into the area from DT100 of the master unit.
R101	Writes the data for 10 words from DT100 of the master unit to the area form DT1010 of the slave unit 1.
R102	Stores the data for 10 words from DT1000 of the slave unit 2 into the area from DT120 of the master unit.
R103	Writes the data for 10 words from DT130 of the master unit to the area form DT1010 of the slave unit 2.

8.6.2 Setting Communication Environment when MEWTOCOL Master (Ethernet) is Used

■ Setting system register

- Set the system registers for each units by a tool software (such as FPWIN GR7).

	System register setting
Master unit	No.412: Computer link mode No.415: 115200 bps No.413: 8 bits, Odd, 1 bit
Slave unit 1	No.410: Unit No.1 No.412: Computer link mode No.415: 115200 bps

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

	System register setting
	No.413: 8 bits, Odd, 1 bit
Slave unit 2	No.410: Unit No.2 No.412: Computer link mode No.415: 115200 bps No.413: 8 bits, Odd, 1 bit

■ Setting Configurator WD

(1) When using the MEWTOCOL master function in TCP

- Set as follows for each unit using "Configurator WD".

	IP address setting	Communication setting	Option setting
Master unit	IP address: 192.168.1.5 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: TCP Action mode: Client connection Baud rate: 115200 bps Communication mode: Computer link Destination IP address: 192.168.1.11 Destination port No.: 9094 Source port No.: 0 Time out: 0 Retry time: 15	Destination unit No. and IP address is specified: On Target IP address for unit No.: No.1: 192.168.1.11 No.2: 192.168.1.12
Slave unit 1	IP address: 192.168.1.11 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: TCP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Source port No.: 9094 Time out: 0	Not necessary
Slave unit 2	IP address: 192.168.1.12 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: TCP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Source port No. : 9094 Time out: 0	Not necessary

(2) When using MEWTOCOL master function in UDP, UNICAST communication

- Set as follows for each unit using "Configurator WD".

	IP address setting	Communication setting	Option setting
Master unit	IP address: 192.168.1.5 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Client connection Baud rate: 115200 bps	Destination unit No. and IP address is specified: On Target IP address for unit No.: No.1: 192.168.1.11 No.2: 192.168.1.12

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

	IP address setting	Communication setting	Option setting
		Communication mode: Computer link Transmission method: UNICAST Destination IP address: 192.168.1.11 Destination port No.: 9094 Source port No.: 0	
Slave unit 1	IP address: 192.168.1.11 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Transmission method: UNICAST Source port No.: 9094	Not necessary
Slave unit 2	IP address: 192.168.1.12 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Transmission method: UNICAST Source port No.: 9094	Not necessary

(3) When using MEWTOCOL master function in UDP, BROADCAST communication

- Set as follows for each unit using "Configurator WD".

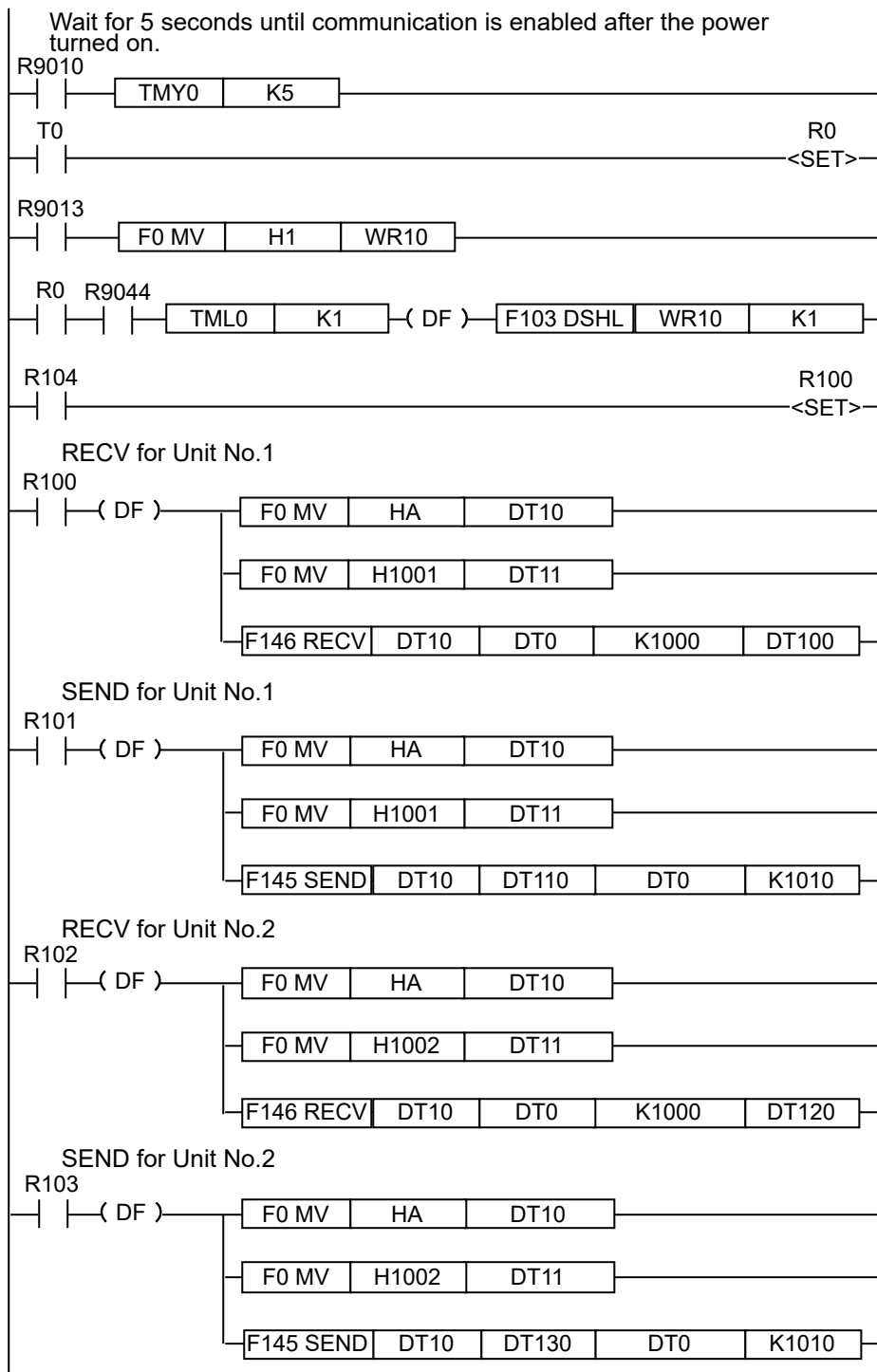
	IP address setting	Communication setting	Option setting
Master unit	IP address: 192.168.1.5 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Client connection Baud rate: 115200 bps Communication mode: Computer link Transmission method: BROADCAST Connection destination IP address: 192.168.1.11 Destination port No.: 9094 Source port No.: 0	Not necessary
Slave unit 1	IP address: 192.168.1.11 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Transmission method: BROADCAST	Not necessary

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

	IP address setting	Communication setting	Option setting
		Source port No.: 9094	
Slave unit 2	IP address: 192.168.1.12 Netmask: 255.255.255.0 Gateway: 192.168.1.1	Communication protocol: UDP Action mode: Server connection Baud rate: 115200 bps Communication mode: Computer link Transmission method: BROADCAST Source port No.: 9094	Not necessary

8.6 MEWTOCOL Master (Ethernet) (Sample Program)

8.6.3 Master Unit Sample Program



Info.

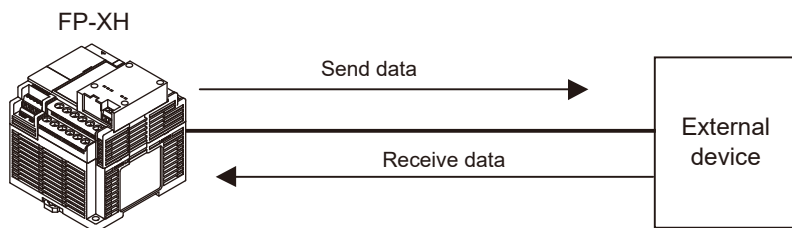
- Reference: For information on the **F145(SEND)** and **F146(RECV)** instructions, "[9 Instruction References](#)".

8.7 General-purpose Communication

8.7.1 Overview of General-purpose Communication (Ethernet)

■ Overview

- Data can be sent and received between the FP-XH and an external device using Ethernet.
- Data is read from and written to an external device connected to Ethernet by means of FP-XH data registers, and the programs are required for the FP-XH.



■ Outline of operation

- Connection with an external device is established using the general-purpose communication (Ethernet). Number of connection is one.
- Select either the client mode or server mode.
- In case of the client mode, connection is established by the AFPX-COM5 for a predetermined IP address after turning on the power supply of the FP-XH.
- There are "Send data" and "Receive data" for the data transfer with an external device.

8.7.2 Setting for Using the General-purpose Communication (Ethernet)

The following two settings for the FP-XH control unit and communication cassette AFPX-COM5 should be set.

- Setting communication environment of the FP-XH control unit
- Setting Ethernet communication environment of the communication cassette AFPX-COM5

■ Setting communication environment of the FP-XH control unit

The programming tool FPWIN GR7 is used to set the baud rate or transmission format of the COM1 port. The following explanation assumes that the communication cassette AFPX-COM5 will be attached to the cassette mounting part 1.

Select **Option>System register setting** in the menu bar, and click **COM1 port** tab.

Dialog box of PLC system register setting

The screenshot shows the 'PLC Configuration' dialog box. On the left is a tree view with 'COM0 Port' selected. The main area contains the following settings:

- No. 410 Unit No.: 1
- No. 412 Communication Mode: General-purpose communication
- Modem Enabled:
- No. 413 Communication Format: Char. Bit: 8 bits, Parity: Odd, Stop Bit: 1, Terminator slt: Code, Terminator: CR, Header: STX Not Exist.
- No. 415 Baud rate: 9600 bps
- No. 420 Starting address for data received of serial data communication mode: DT 4096 (0 - 32764)
- No. 421 Buffer capacity setting for data received of serial data communication mode: 2048 (0 - 2048)
- No. 424 Terminator judgement time (X0.01 msec): 0 (0 - 10000)

Buttons at the bottom: OK, Cancel, Read PLC, Initialize.

COM1 port setting (AFPX-COM5)

No.	Item	Range	
No.410	Unit number	1 to 99	
No.412	Communication mode	General-purpose communication	
No.413	Communication format ^(Note 1)	Character bit	8bit
		Parity check	Odd
		Stop bit	1 bit
		End code	CR, CR+LF, None
		Header	STX not exist, STX exists
No.415	Baud rate	115200 bps / 9600 bps ^(Note 2)	

(Note 1) The transmission format (Character bit, Parity check, Stop bit) is fixed for the Ethernet communication with COM5 cassette. Set as the above table.

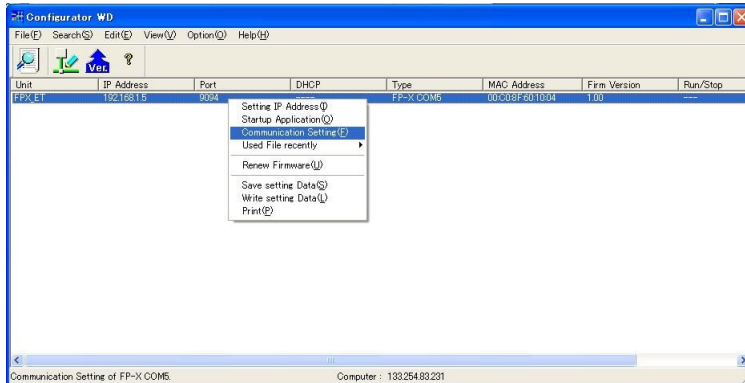
(Note 2) Set the baud rate to match the setting of "Configurator WD".

■ Setting Ethernet communication environment of the communication cassette AFPX-COM5

The "Configurator WD" is used to set Ethernet communication environment of the AFPX-COM5.

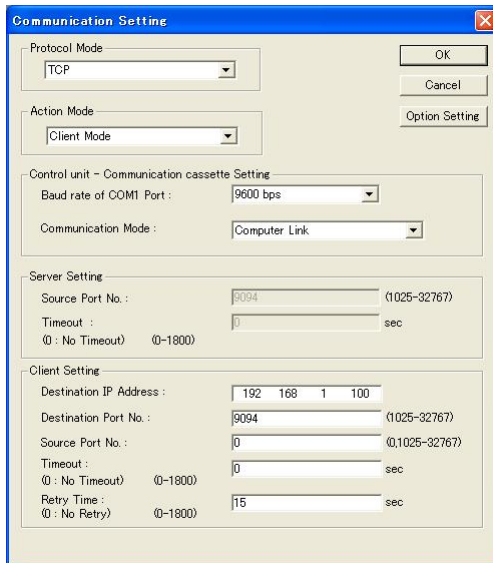
1. Start the Configurator WD.
2. Search the AFPX-COM5.
3. Select the communication cassette AFPX-COM5 from the search result, and set an IP address to connect with a computer.
4. After that, search again. Select the communication cassette AFPX-COM5, and select **Edit(E)**→**Communication setting(F)** in the menu or right-click to select **Communication setting**.

8.7 General-purpose Communication



[When Communication cassette AFPX-COM5 is in the TCP client mode]

Dialog box of communication setting



Setting of AFPX-COM5

Item	Default
Communication protocol	TCP
Action mode	Client mode
Baud rate (COM1)	115200 bps / 9600 bps ^(Note 1)
Communication mode	General-purpose communication
Destination IP address	Destination IP address
Destination port No.	1025 to 32767
Source port No.	0, 1025 to 32767
Time out	0 to 1800s
Retry time	0 to 1800s

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

[When communication cassette AFPX-COM5 is in TCP server mode]

Dialog box of communication setting

Setting of AFPX-COM5

Item	Default
Communication protocol	TCP
Action mode	Server mode
Baud rate (COM1)	115200bps / 9600 bps ^(Note 1)
Communication mode	General-purpose communication
Destination port No.	1025 to 32767
Time out	0 to 1800s

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

8.7 General-purpose Communication

[When communication cassette AFPX-COM5 is in UDP server mode]

Dialog box of communication setting

Setting of AFPX-COM5

Item	Default
Communication protocol	UDP
Baud rate (COM1)	115200 bps / 9600 bps ^(Note 1)
Communication mode	General-purpose communication
Transmission method	UNICAST/BROADCAST ^(Note 2)
Destination IP address	Destination IP address
Destination port No.	0, 1025 to 32767
Source port No.	0, 1025 to 32767

(Note 1) Specify the same baud rate as the communication environment setting of COM1 or COM3 port of the FP-XH control unit.

(Note 2) When selecting BROADCAST, the setting of the destination IP address is not required.

Note

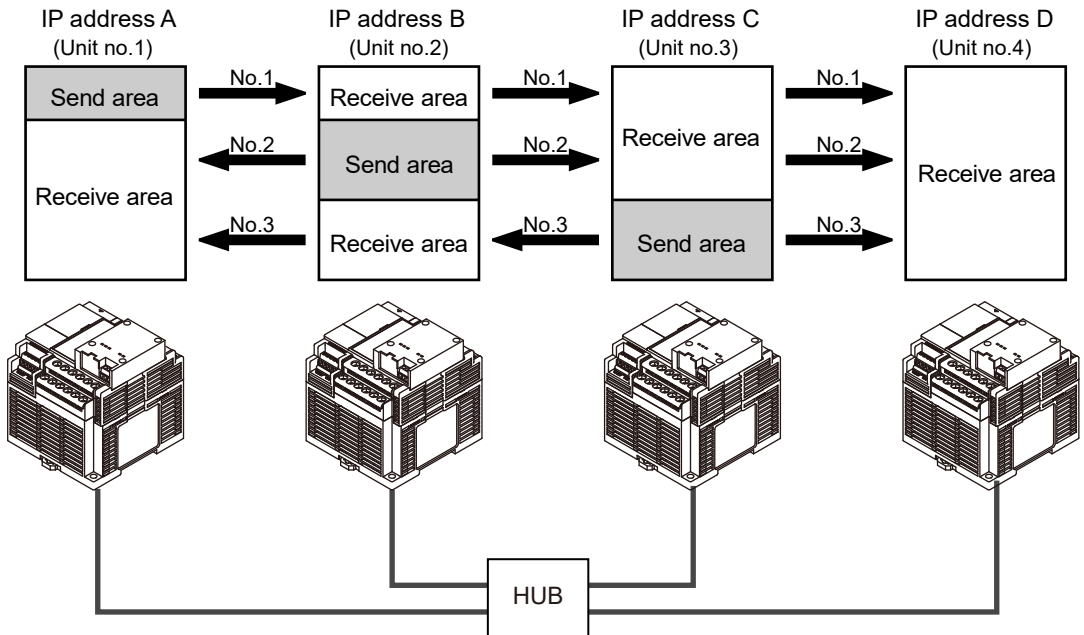
- Initializing Ethernet takes approx. 5 seconds on the AFPX-COM5 after turning on the power supply.

Until it finishes, data cannot be sent or received. For the Ethernet communication, programming is necessary to start the communication after a lapse of 5 seconds after the power turned on.

8.8 PLC Link Communication (Ethernet)

8.8.1 Overview of PLC Link Communication (Ethernet)

Data sharing is available using the PLC link function of the FP-XH control unit via Ethernet. How to use and set is the same as the PLC link via RS485.



8.8.2 PLC Link Communication Setting

When the PLC link function has been selected on the FP-XH control unit the baud rate is automatically 115200 bps. Set the baud rate in the COM1 port communication setting for the AFPX-COM5 to 115200 bps as well.

- **Setting Ethernet communication environment of the communication cassette AFPX-COM5**

The "Configurator WD" is used to set Ethernet communication environment of the AFPX-COM5.

8.8 PLC Link Communication (Ethernet)

Dialog box of communication setting

Item	Default
Communication protocol	UDP
Baud rate	115200 bps / 9600 bps
Communication mode	General-purpose communication
Transmission method	BROADCAST
Destination port No.	1025 to 32767
Source port No.	0, 1025 to 32767

(Note 1) Specify the same number for the destination port No. and the source port No. for the AFPX-COM5 to be used in the PLC link.

■ Setting communication environment of the FP-XH control unit

The programming tool FPWIN GR7 is used to set the baud rate or transmission format of the COM1 port. The following explanation assumes that the communication cassette AFPX-COM5 will be attached to the cassette mounting part 1.

Select **Option>System register setting** in the menu bar, and click **COM1 port** tab.

Dialog box of PLC system register setting

The screenshot shows the 'PLC Configuration' dialog box with the following settings:

- No. 410 Unit No.:** 1
- No. 412 Communication Mode:** PLC link
- Modem Enabled:**
- No. 48 PLC link Baud rate:** 115200bps
- No. 415 Baud rate:** 9600 bps
- No. 413 Communication Format:** Char. Bit: 8 bits, Parity: Odd, Stop Bit: 1, Terminator slt: Code, Terminator: CR, Header: STX Not Exist.
- No. 420 Starting address for data received of serial data communication mode:** DT 4096 (0 - 32764)
- No. 421 Buffer capacity setting for data received of serial data communication mode:** 2048 (0 - 2048)
- No. 424 Terminator judgement time (X0.01 msec):** 0 (0 - 10000)

Buttons at the bottom: OK, Cancel, Read PLC, Initialize.

No.	Item	Range
No.410	Unit number	1 to 99
No.412	Communication mode	PLC link

Do not use the same unit number for multiple FP-XH control units.

8.9 Applied Usage (Ethernet)

8.9 Applied Usage (Ethernet)

8.9.1 How to Confirm the Network Information on the FP-XH Control Unit

The network information (own IP address, destination IP address, destination port No., version) that has been set for the AFPX-COM5 can be confirmed from the FP-XH control unit by the option setting. The connection information (destination IP address, own IP address, version) of the AFPX-COM5 can be confirmed from the LAN side.

Unit Number	IP Address
<input type="checkbox"/> 1	192.168.1.100
<input type="checkbox"/> 2	192.168.1.100
<input type="checkbox"/> 3	192.168.1.100
<input type="checkbox"/> 4	192.168.1.100

Network information notification

Network information is notified to the FP-XH control unit from the AFPX-COM5.
(Network information is written to the data register of the FP-XH control unit by the AFPX-COM5.)

Network information confirmation

Network information on the AFPX-COM5 can be confirmed from the FP-XH control unit.
(The virtual data register within the AFPX-COM5 is read from the FP-XH control unit.)

Connection information confirmation

Connection information on the AFPX-COM5 can be confirmed from a destination device from a device on a LAN.
(The virtual data register within the AFPX-COM5 is read from a destination device on a LAN.)

■ Network information notification area

Set the area to be used for the network information notification, network information confirmation and connection information confirmation.

When DT1000 (default) is set for the network information notification area, the following areas will be used.

Network information notification and network information confirmation areas

Register No.	Description (Higher bytes)	Description (Lower bytes)
DT10000	Error code ^(Note 1)	Own IP address (1st)
DT10001	0x00 (reserve)	Own IP address (2nd)
DT10002	0x00 (reserve)	Own IP address (3rd)
DT10003	0x00 (reserve)	Own IP address (4th)
DT10004	0x00 (reserve)	Destination IP address (1st)
DT10005	0x00 (reserve)	Destination IP address (2nd)
DT10006	0x00 (reserve)	Destination IP address (3rd)
DT10007	0x00 (reserve)	Destination IP address (4th)
DT10008	Destination port No.	
DT10009	Version of the AFPX-COM5	

(Note 1) Error code: 0: Normal, 1: DHCP acquiring error, 2: IP address duplication error

Explanation

- When own IP address is 192.168.1.5, H00C0 (K192) is notified/confirmed in DT10000, and H00A8 (K168) is in DT10001.
- When destination port No. is 9094, H2386 (K9094) is notified/confirmed in DT10008.
- When the version of the AFPX-COM5 is 1.10, H1100 is notified/confirmed.

Note

- The destination IP address and destination port No. can be notified/confirmed only when selecting the computer link and client setting.

Connection information confirmation area

Register No.	Description (Higher bytes)	Description (Lower bytes)
DT10010	0x00 (reserve)	Destination IP address (1st)
DT10011	0x00 (reserve)	Destination IP address (2nd)
DT10012	0x00 (reserve)	Destination IP address (3rd)
DT10013	0x00 (reserve)	Destination IP address (4th)
DT10014	0x00 (reserve)	Own IP address (1st)
DT10015	0x00 (reserve)	Own IP address (2nd)
DT10016	0x00 (reserve)	Own IP address (3rd)
DT10017	0x00 (reserve)	Own IP address (4th)
DT10018	0x0000 (reserve)	
DT10019	Version of the AFPX-COM5	

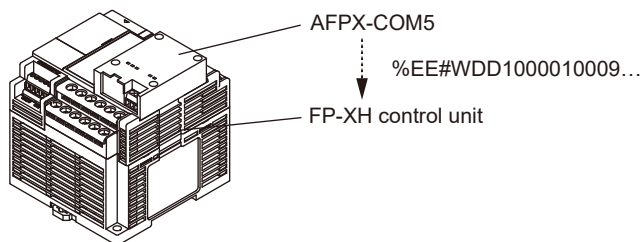
Network information notification

If the network information notification setting is enabled, the AFPX-COM5 notifies the network information to the FP-XH control unit on completion of the initialization of Ethernet. (Ethernet is initialized after the power turns on, and when the unit is restarted after the change in settings.) The information is notified by the data area write command ("WD") of 10 words from the

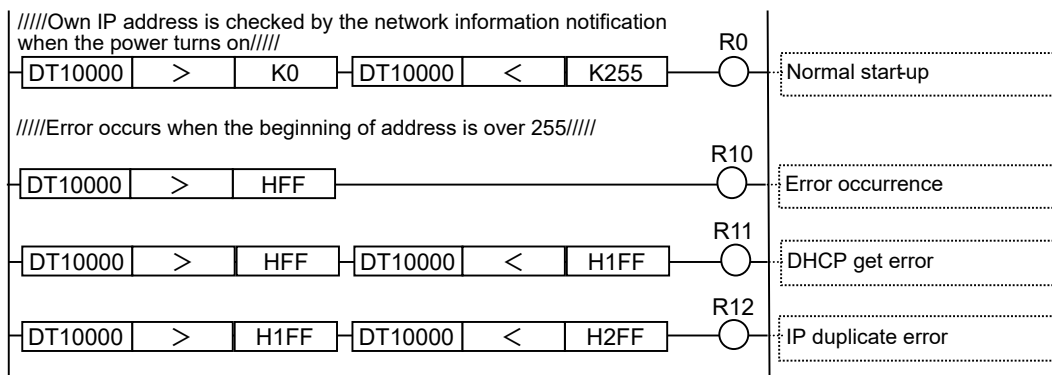
8.9 Applied Usage (Ethernet)

information area first number with MEWTOCOL. (For the memory area, "DT" is fixed. For the unit number, "EE" is fixed.) Using this notification enables the completion of the initialization of Ethernet to be confirmed in a ladder program and to start communication.

When using the general-purpose communication, start the communication after receiving the data area write command for the network information notification and after the response timeout time.

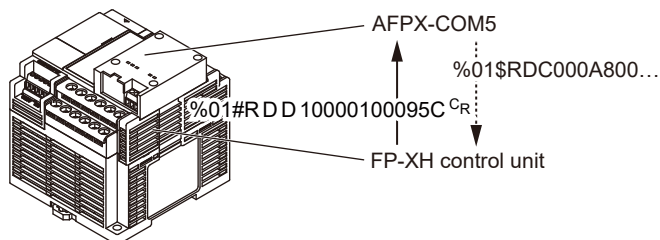


[Sample program] (Set DT10000 in the network information notification area)



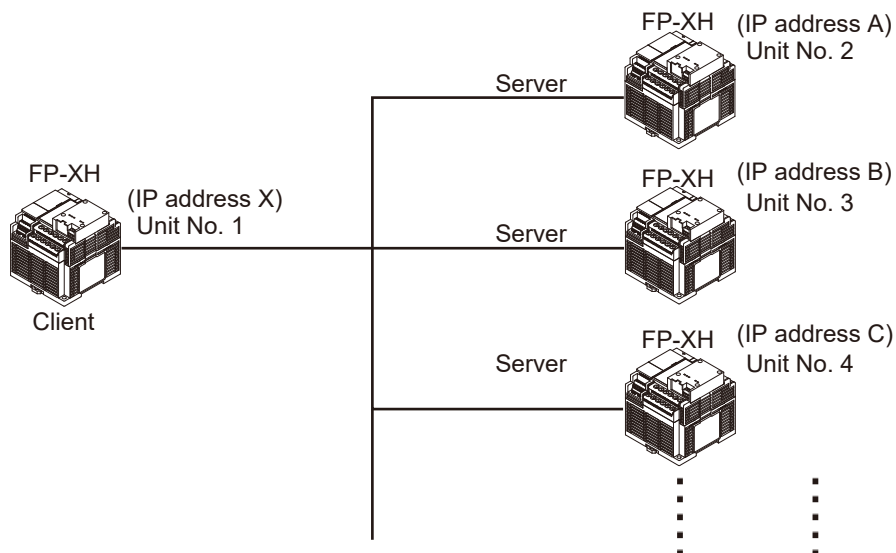
■ Network information confirmation

When selecting the computer link and client setting, the network information can be confirmed from the FP-XH control unit by enabling the network information confirmation setting. It can be confirmed by reading the confirmation area by the MEWTOCOL data area read command ("RD"). (For the memory area, DT is fixed. The unit number is arbitrary.) If the network information confirmation setting is enabled, the AFPX-COM5 responds to the MEWTOCOL data area read command for the confirmation area regardless of unit numbers.



8.9 Applied Usage (Ethernet)

8.9.2 How to Transmit a Command Message to Each Unit



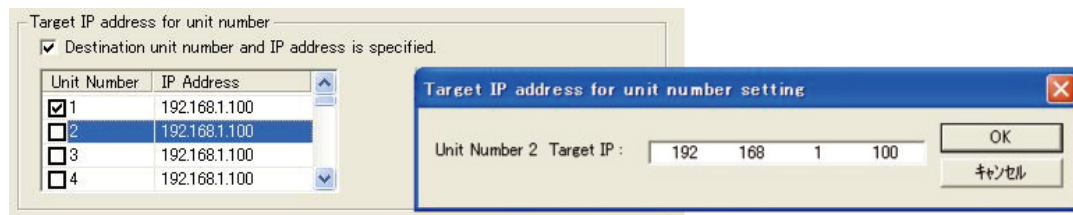
Target IP address for unit number

If "Destination unit number and IP address is specified" is checked, a command can be sent to the IP address corresponding to each unit number.

■ Settable conditions

- When selecting the client and computer link
- When selecting the UDP and general-purpose communication
- When selecting the broadcast (IP address takes priority, and a command is transmitted via unicast.)

■ Setting method



1. Check "Destination unit number and IP address is specified." in the [Option] dialog box.
2. Check the destination unit number you want to set, and double-click the IP address. (Unit numbers 1 to 99)
3. Specify the destination IP address that is corresponding to the unit number.

📌 Note

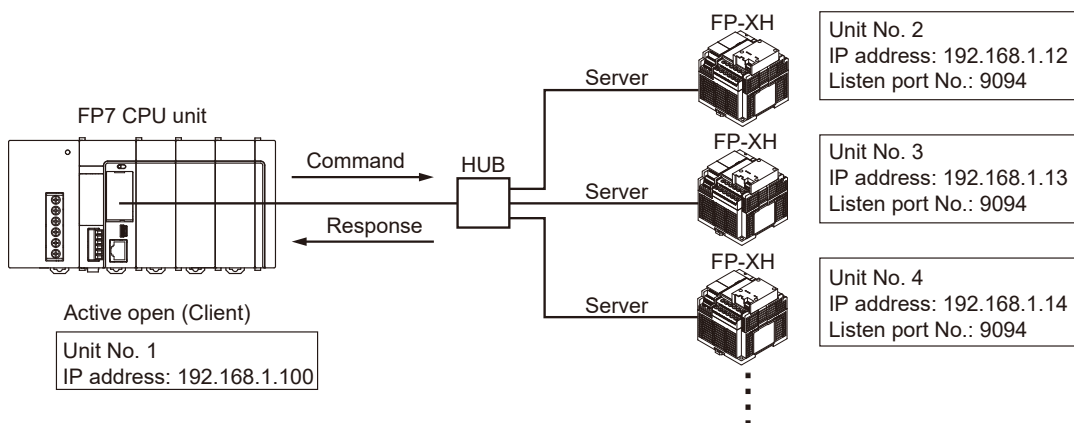
- When connecting to the IP corresponding to a unit number via TCP, a new connection should be established after disconnecting the existing connection.

8.10 Example of Connections (Ethernet)

■ Overview

Connection can be established with multiple FP-XHs simultaneously using a FP7CPU unit, and transmission is performed by the computer link.

[Example of connection]



■ Setting of FP7CPU unit

Item	Setting value
Communication method	TCP/IP
Open method	Client connection Open automatically
Application in which connection is used	MEWTOCOL-COM
Master unit port No.	Arbitrary
Destination unit IP address	Destination FP-XH IP address
Destination unit port No.	9094 (can be changed)

■ Setting of FP-XH

1. FP-XH system register setting
No.412: Computer link mode
2. Setting of AFPX-COM5

Item	Setting value
Communication protocol	TCP
Action mode	Server mode
Communication mode	Computer link
Source port No.	9094 (can be changed)
Time out	0

8.10 Example of Connections (Ethernet)

Note

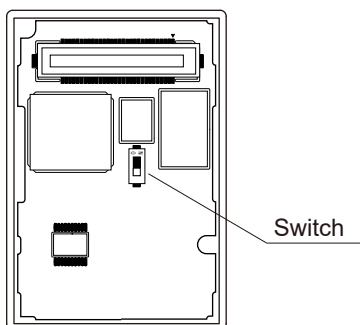
- UDP/IP can be used for the communication method.
In that case, change the communication method of FP7CPU unit to "UDP/IP."
Set the communication protocol of the AFP-COM5 to UDP, and set the transmission method to UNICAST.

8.11 Initialization Procedure

■ Overview

The Ethernet communication environment setting of the AFPX-COM5 can be initialized.

■ Initialization procedure



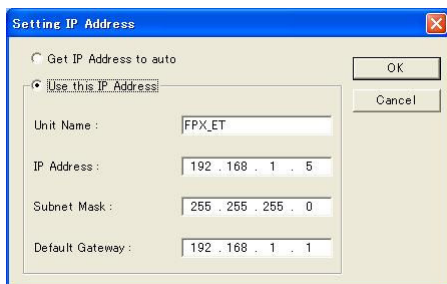
1. Turn on the switch at the back of the AFPX-COM5.
2. Install the AFPX-COM5 on the FP-XH control unit, and turn on the power supply.
3. The ERR. LED of the AFPX-COM5 flashes every 0.5 seconds. (Initialization completes.)
4. Turn off the power supply of the FP-XH control unit. Remove the AFPX-COM5.
5. Turn off the switch at the back of the AFPX-COM5.
6. Install the AFPX-COM5 on the FP-XH control unit, and turn on the power supply.

Note

- The Ethernet communication setting (including the IP address) cannot be changed when the switch at the back of the AFPX-COM5 is on. Always turn it off after initialization.

■ Setting for initialization

IP address setting



Item	Default
Get IP address	Manual
Unit name	FPX_ET
IP address	192.168.1.5
Subnet mask	255.255.255.0

8.11 Initialization Procedure

Item	Default
Default gateway	192.168.1.1

Communication setting

Item	Default
Communication protocol	TCP
Action mode	Server mode
Baud rate (COM1)	9600 bps
Communication mode	Computer link
Source Port No.	9094
Time out	0

9 Instruction References

9.1	Serial Communication Instructions	9-2
9.1.1	[F145 SEND] [F146 RECV] Instructions: Common Items	9-2
9.1.2	[F145 SEND] Data Transmission (MEWTOCOL-COM Master)	9-3
9.1.3	[F146 RECV] Data Reception (MEWTOCOL-COM Master)	9-5
9.1.4	[F145 SEND] Data Transmission (MODBUS Master: Function Code Specification).....	9-7
9.1.5	[F146 RECV] Data Reception (MODBUS Master: Function Code Specification)	9-9
9.1.6	[F145 SEND] Data Transmission (MODBUS Master).....	9-11
9.1.7	[F146 RECV] Data Reception (MODBUS Master).....	9-13
9.1.8	[F159 MTRN] Serial Data Send / Receive Instruction.....	9-15
9.2	Character String Instructions	9-19
9.2.1	F253 SSET (Character Constant → ASCII Code Conversion: with Storage Area Size).....	9-19

9.1 Serial Communication Instructions

9.1 Serial Communication Instructions

9.1.1 [F145 SEND] [F146 RECV] Instructions: Common Items

Common items for SEND / RECV instructions are indicated.

■ System register settings

Using tool software, specify a communication mode for the COM port to be used.

Mode	System register No. 412
MEWTOCOL master	Computer link
MODBUS master	MODBUS RTU

■ Execution conditions for instructions

- Multiple SEND / RECV instructions cannot be executed at the same time to a single communication port. Create a program so that an instruction is executed when the SEND / RECV instruction execution flag is ON (1).

■ Confirmation of execution results of instructions

- While processing SEND / RECV instruction, only a Request to Send is issued. The actual transmission is performed when ED instruction is executed. Check the SEND / RECV instruction execution end flag to confirm the completion of transmission.
- When the instruction terminates abnormally, the SEND / RECV done flag turns ON. The error code is stored in the corresponding special data register. For details of error codes, refer to the error codes of each protocol.

■ Special relays / special data registers

	Operation	COM0	COM1	COM2	COM3	COM4
SEND/RECV instruction execution flag	0: Not executable 1: Executable	R9134	R913C (R9044)	R9144 (R904A)	R914C	R9154
SEND/RECV instruction execution end flag	0: Successful 1: Unsuccessful	R9135	R913D (R9045)	R9145 (R904B)	R914D	R9155
SEND/RECV instruction end code	When unsuccessful, an error code is stored.	DT90123	DT90124	DT90125	DT90127	DT90128

(Note 1) The Nos. in brackets indicate devices that are compatible with existing FP-X / FPsigma.

■ Timeout time setting

- Error code H73 indicates timeout waiting for a response.
- Timeout time can be changed in the area from 10.0 ms to 81.9 s (by 2.5 ms), using the system register No. 32. By default, the value is set to 10 s.
- In your program, be sure to wait for approx. the maximum scan time after transmission complete and before the next transmission, in the case of global transfer (transmission with H00 specified for unit No.).

■ **Other restrictions**

This is not executable for special internal relays (R9000 onward) or for special data register (DT90000).

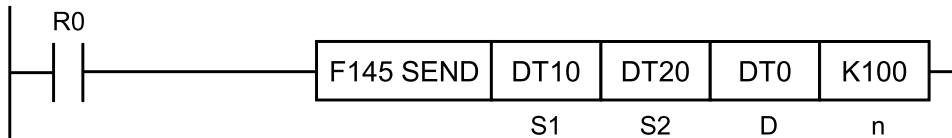
— **REFERENCE** —

11.7.1 List of MEWTOCOL-COM Communication Error Codes

11.3.2 MODBUS RTU Response Format

9.1.2 [F145 SEND] Data Transmission (MEWTOCOL-COM Master)

■ **Instruction format**



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

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

(Note 1) A character constant cannot be specified.

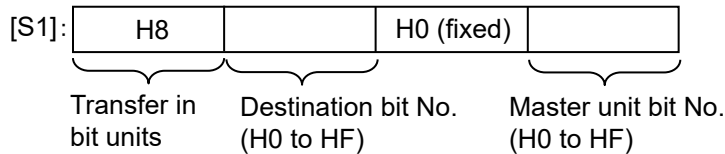
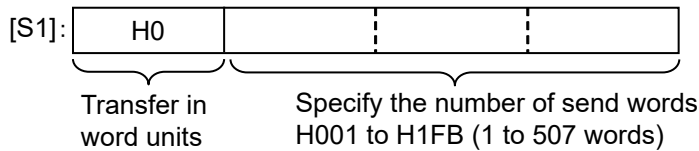
■ **Operands**

Operand	Settings		Setting range
S1	Specify the starting number of the area (2 words) that stores control data.		
	S1	Specify the transfer method. Word transfer: Specify the number of send words. Bit transfer: Specify the bit number of a master unit and that of a destination unit.	(Note 1)
	S1+1	Specify the COM port No. of a master unit and the unit number of a destination unit.	(Note 2)
S2	Specification of a master unit	Specify the area of a master unit that stores send data.	

9.1 Serial Communication Instructions

Operand	Settings	Setting range
D	Specification of a destination unit	Specify the area type of a destination unit that stores send data. The number is specified at 0.
n	Specification of a destination unit	Specify the starting address of a destination unit that stores send data. H0 to HFFFF

(Note 1) To [S1], the following specification should be applied. The specification method differs depending on word transfer and bit transfer.



(Note 2) To [S1+1], the following specification should be applied.



COM port selection (upper four bits)	HF	H1	H2	H3	H4
Port no.	COM0	COM1	COM2	COM3	COM4

■ Specifying the storage area of a destination unit by using [D] and [n]

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

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

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

↓

DT100

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

↓

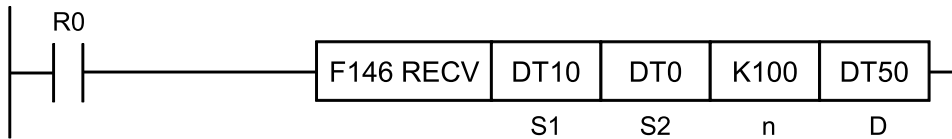
DT65520

■ Flag operations

Name	Description
R9007 R9008 (ER)	Turns ON when the [S1] / [S1+1] control data value is outside the specified range.
	Turns ON when the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units.
	Turns ON when [D]+[n] exceeds the [D] area
	Turns ON when the operation mode of the target COM port is other than computer link.
	Word unit <ul style="list-style-type: none"> • If [D] is DT / LD, turns ON when [n] is not from 0 to 99999. • If [D] is WY / WR / WL / SV / EV, turns ON when [n] is not from 0 to 9999. Bit unit <ul style="list-style-type: none"> • Turns ON when [D] is not WY / WR / WL. • Turns ON when [n] is not from 0 to 999.
	Turns ON when the [D] device No. is not 0.
	Turns ON when a Communication Cassette is not attached to the target COM port.

9.1.3 [F146 REC V] Data Reception (MEWTOCOL-COM Master)

■ Instruction format



■ Devices that can be specified (indicated by ●)

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

(Note 1) A character constant cannot be specified.

■ Operands

Operand	Settings	Setting range
S1	Specify the starting number of the area (2 words) that stores control data.	
	S1 Specify the transfer method.	(Note 1)

DT100

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

↓

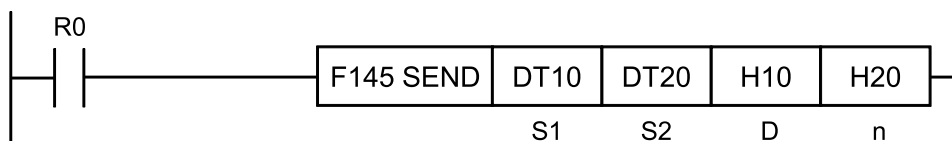
DT65520

■ Flag operations

Name	Description
R9007 R9008 (ER)	Turns ON when the [S1] / [S1+1] control data value is outside the specified range.
	Turns ON when the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units.
	Turns ON when [S2]+[n] exceeds the [S2] area.
	Turns ON when the operation mode of the target COM port is other than computer link.
	Word unit <ul style="list-style-type: none"> ● If [S2] is DT / LD, turns ON when [n] is not from 0 to 99999. ● If [S2] is WX / WY / WR / WL / SV / EV, turns ON when [n] is not from 0 to 9999.
	Bit unit <ul style="list-style-type: none"> ● Turns ON when [S2] is not WX / WY / WR / WL. ● Turns ON when [n] is not from 0 to 999.
	Turns ON when the [S2] device No. is not 0.
Turns ON when a Communication Cassette is not attached to the target COM port.	

9.1.4 [F145 SEND] Data Transmission (MODBUS Master: Function Code Specification)

■ Instruction format



■ Devices that can be specified (indicated by ●)

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

(Note 1) A character constant cannot be specified.

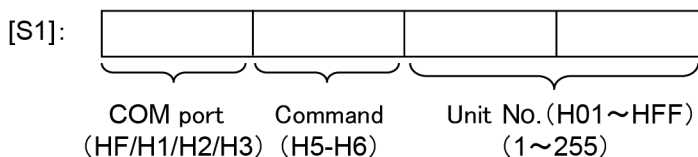
9.1 Serial Communication Instructions

■ Operands

Item	Settings	Setting range
S1	Specify the COM port No. of a master unit, MODBUS command to be sent, and the unit number of a destination unit.	(Note 1)
S2	Specification of a master unit Operation memory area that stores data to be sent.	(Note 2)
D	Specification of a destination unit Specify a MODBUS address ^(Note 3)	H0 to HFFFF
n	Specification of a destination unit Specify the number of sent data. ^{(Note 2)(Note 4)}	1 to 127 words 1 to 2040 bits

(Note 1) In [S1], specify the combination of the COM port No. of a master unit, MODBUS function code and the unit number of a destination unit. When the COM port No. is 0, specify HF for the highest digit.

Example: In the case of COM port 1, MODBUS function code 6, and destination unit No. 10, specify H160A.



COM port selection (upper four bits)	HF	H1	H2	H3
Port no.	COM0	COM1	COM2	COM3

(Note 2) Depending on the operation memory type specified in operand [S1] and the number of send data specified in operand [n], the transfer method and the function code of MODBUS command to be sent vary.

Device type specified in [S2]	Transfer method	Send No. of data [n]	MODBUS command to be sent
16-Bit device: WX, WY, WR, WL, DT, LD	Register transmission	1	Preset single register (06)
		2 to 127	HF: Force multiple coils (15) H10: Preset multiple registers (16)
1-bit device X, Y, R, L	Bit transmission	1	H5: Force single coil (05)
		2 to 2040	HF: Force multiple coils (15):

(Note 3) When "0" is specified for the destination unit number, global transfer is applied. In this process, there is no response message from a destination unit.

(Note 4) For the number of send data [n], specify the number of words in the case of register transfer, and specify the number of bits in the case of bit transfer.

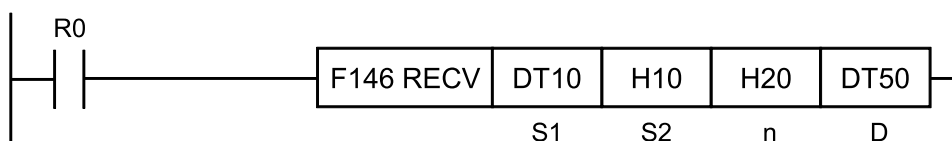
■ Flag operations

Name	Description
R9007 R9008	Turns ON when the [S1] control data value is outside the specified range.

Name	Description
(ER)	Turns ON when the COM port specification of control data specified in [S1] is not MODBUS mode.
	Turns ON when the number of send data [n] is 0.
	Turns ON when the number of send data is negative.
	Turns ON when the number of send data [n] exceeds the operation memory area specified in [S2].
	Turns ON when the number of send data [n] exceeds limitation in MODBUS specification.

9.1.5 [F146 RECV] Data Reception (MODBUS Master: Function Code Specification)

■ Instruction format



■ Devices that can be specified (indicated by ●)

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

(Note 1) A character constant cannot be specified.

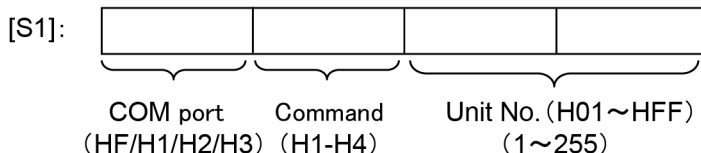
■ Operands

Item	Settings	Setting range
S1	Specify the COM port No. of a master unit, MODBUS command to be sent, and the unit number of a destination unit.	(Note 1)
S2	Specification of a destination unit Specify a MODBUS address	H0 to HFFFF
n	Specification of a destination unit Specify the number of received data. (Note 2)	1 to 127 words 1 to 2040 bits
D	Specification of a master unit Operation memory area that stores receive data. (Note 3)	

9.1 Serial Communication Instructions

(Note 1) In [S1], specify the combination of the COM port No. of a master unit, MODBUS function code and the unit number of a destination unit. When the COM port No. is 0, specify HF for the highest digit.

Example: In the case of COM port No. 1, MODBUS function code 3, and destination unit No. 10, specify H130A.



COM port selection (upper four bits)	HF	H1	H2	H3
Port no.	COM0	COM1	COM2	COM3

(Note 2) For the number of receive data [n], specify the number of words in the case of register transfer, and specify the number of bits in the case of bit transfer.

(Note 3) Depending on the operation memory type specified in operand [D], and the number of receive data specified in operand [n], the transfer method and the function code of MODBUS command vary.

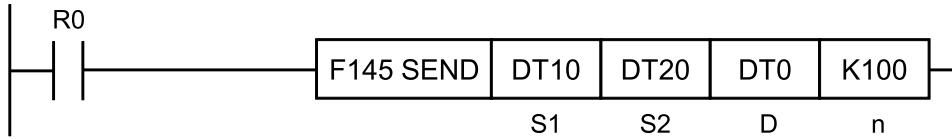
Device specified in [D]	Transfer method	MODBUS command to be sent
16-Bit device: WX, WY, WR, WL, DT, LD	Register transmission	H1: Read coil state (01) H2: Read input state (02) H3: Read hold register (03) H4: Read input register (04)
1-bit device X, Y, R, L	Bit transmission	H1: Read coil state (01) H2: Read input state (02)

■ Flag operations

Name	Description
R9007 R9008 (ER)	Turns ON when the [S1] control data value is outside the specified range.
	Turns ON when the COM port specification of control data specified in [S1] is not MODBUS mode.
	Turns ON when the number of receive data [n] is 0
	Turns ON when the number of receive data is negative
	Turns ON when the number of receive data [n] exceeds MODBUS specification
	Turns ON when the operation memory area specified in [D] is exceeded if the number of receive data [n] is received.

9.1.6 [F145 SEND] Data Transmission (MODBUS Master)

■ **Instruction format**



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

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

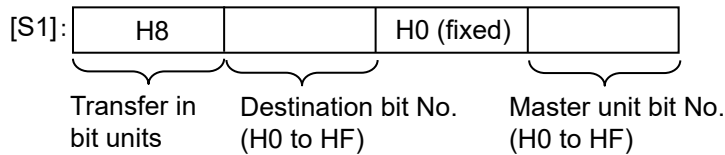
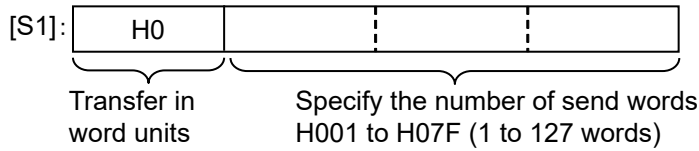
(Note 1) A character constant cannot be specified.

■ **Operands**

Operand	Settings	Remarks	
S1	Specify the starting number of the area (2 words) that stores control data.		
	S1	Specify the transfer method. Word transfer: Specify the number of send words. Bit transfer: Specify the bit number of a master unit and that of a destination unit.	(Note 1)(Note 4)
	S1+1	Specify the COM port No. of a master unit and the unit number of a destination unit.	(Note 2)(Note 3)
S2	Specification of a master unit	Specify the area of a master unit that stores send data. (Note 4)	
D	Specification of a destination unit	Specify the area type of a destination unit that stores send data. The number is specified at 0. (Note 5)	
n	Specification of a destination unit	Specify the starting address of a destination unit that stores send data. (Note 5)	

(Note 1) To [S1], the following specification should be applied. The specification method differs depending on word transfer and bit transfer.

9.1 Serial Communication Instructions



(Note 2) To [S1+1], the following specification should be applied.



COM port selection (upper four bits)	HF	H1	H2	H3
Port no.	COM0	COM1	COM2	COM3

(Note 3) When "0" is specified for the destination unit number, global transfer is applied. In this process, there is no response message from a destination unit.

(Note 4) Depending on the transfer method specified for operand [S1] and the device type specified for operand [S2], the function code of MODBUS command to be sent varies.

Device type specified in [S2]	Transfer method specified in [S1]	MODBUS function code to be sent
16-Bit device: WX, WY, WR, WL, DT, LD	Register transmission	Force multiple coils (15) Preset multiple registers (16)
1-bit device X, Y, R, L	Bit transmission	Force multiple coils (15)

(Note 5) The area of the destination unit is specified by the combination of operands [D] and [n].
When [D] = DT0 and [n] = K100, the memory area of the destination unit starts with DT100.

■ Flag operations

Name	Description
R9007 R9008 (ER)	Turns ON when the [S1] / [S1+1] control data value is outside the specified range.
	Turns ON when the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units.
	Turns ON when [D]+[n] exceeds the [D] area
	Turns ON when the COM port specification of control data specified in [S1+1] is not MODBUS mode.
	Turns ON when the [D] area is DT during transfer in bit units.

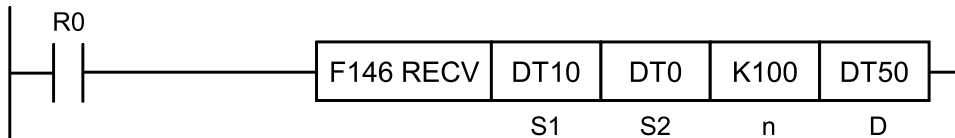
Name	Description
	Turns ON when the [D] device No. is not 0.

i Info.

- This is convenient to write data into Panasonic's PLC via MODBUS RTU.
- For MODBUS reference Nos. and device Nos., refer to "6.1.2 Device No. Correspondence Table".

9.1.7 [F146 RECV] Data Reception (MODBUS Master)

■ Instruction format



■ Devices that can be specified (indicated by ●)

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

(Note 1) A character constant cannot be specified.

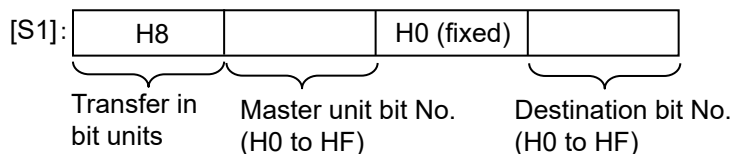
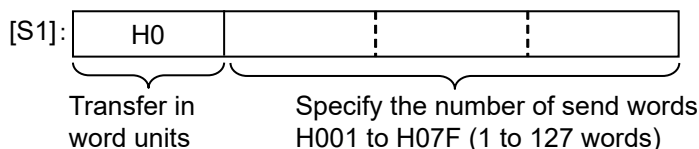
■ Operands

Operand	Settings	Remarks	
S1	Specify the starting number of the area (2 words) that stores control data.		
	S1	Specify the transfer method. Word transfer: Specify the number of send words. Bit transfer: Specify the bit number of a master unit and that of a destination unit.	(Note 1)(Note 3)
	S1+1	Specify the COM port No. of a master unit and the unit number of a destination unit.	(Note 2)
S2	Specification of a destination unit	Specify the source data area of a destination unit. (Device No. is fixed to "0")	(Note 4)
n	Specification of a destination unit	Specify the starting address of the device in the source data area of a destination unit.	(Note 4)

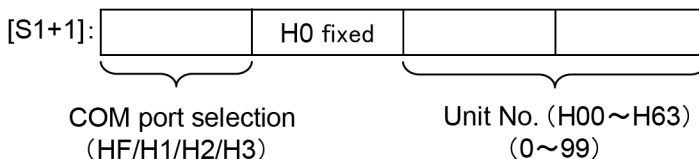
9.1 Serial Communication Instructions

Operand	Settings	Remarks
D	Specification of a master unit Specify the device starting address of the receive data storage area in the master unit.	(Note 3)

(Note 1) To [S1], the following specification should be applied. The specification method differs depending on word transfer and bit transfer.



(Note 2) To [S1+1], the following specification should be applied.



COM port selection (upper four bits)	HF	H1	H2	H3
Port no.	COM0	COM1	COM2	COM3

(Note 3) Depending on the transfer method specified for operand [S1] and the device type specified for operand [D], the function code of MODBUS command to be sent varies.

Device type specified in [D]	Transfer method specified in [S1]	MODBUS function code to be sent
16-Bit device: WX, WY, WR, WL, DT, LD	Register transmission	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	Bit transmission	H1: Read coil state (01) H2: Read input state (02)

(Note 4) The area of the destination unit is specified by the combination of operands [S2] and [n].
When [S2] = DT0 and [n] = K100, the memory area of the destination unit starts with DT100.

■ Flag operations

Name	Description
R9007 R9008	Turns ON when the [S1] / [S1+1] control data value is outside the specified range.

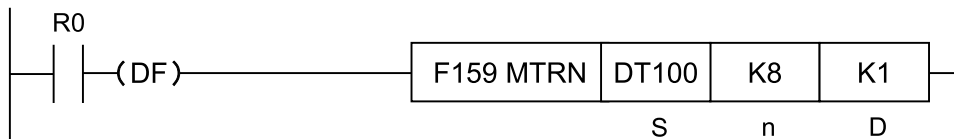
Name	Description
(ER)	Turns ON when the [S2] or [D] area is exceeded, if the number of words specified in [S1] is taken during transfer in word units.
	Turns ON when [S2]+[n] exceeds the [S2] area.
	Turns ON when the COM port specification of control data specified in [S1+1] is not MODBUS mode.
	Turns ON when the [S2] area is DT / WL / LD, during transfer in bit units.
	Turns ON when the [S2] device No. is not 0.

i Info.

- This is convenient to read data from Panasonic PLC via MODBUS-RTU.
- For MODBUS reference Nos. and device Nos., refer to "6.1.2 Device No. Correspondence Table".

9.1.8 [F159 MTRN] Serial Data Send / Receive Instruction

■ Instruction format



■ Devices that can be specified (indicated by ●)

Operands	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Index modifier (Note 1)
										K	H	
S							●					●
n	●	●	●	●	●	●	●	●	●	●	●	●
D											●	●

(Note 1) A character constant cannot be specified.

■ Operands

Item	Settings
S	Starting area (data register) of the data table
n	Area storing the number of bytes of data to be sent, or constant data <ul style="list-style-type: none"> • Add the terminator (end code) during transmission when the value is positive. • Do not add the terminator (end code) during transmission when the value is negative. • In the case of H8000, the purpose of COM port is switched.
D	COM port number for sending data (K0: COM0; K1: COM1; K2: COM2; K3: COM3)

9.1 Serial Communication Instructions

■ Outline of operation

Data is sent or received with an external device connected to the COM port. F159 (MTRN) instruction has the following three functions.

Item	Description
Send	In the data register starting with [S], data to be sent to an external device is set as a table in advance. By executing the [F159 MTRN] instruction, data of [n] bytes is sent from the COM port to an external device.
Receive	Data sent to COM port is stored in the receive buffer (data register DT) specified by the system register. Once the reception is done, the "reception done flag" turns on, and disables further reception. When the [F159 MTRN] instruction is executed, the "reception done flag" turns OFF, and enables reception. The F159 (MTRN) instruction is used to turn OFF the reception done flag for general-purpose communication (i.e. to enable reception).
Operation mode switching	Operation mode of COM port can be switched between "general-purpose communication mode" and "computer link mode".

■ System register settings

- Using the system register, it is required to set to "general-purpose communication mode" in COM port.
- Using the system register, it is required to align the baud rate and transmission format with an external device.
- To secure an area for storing receive data in the data register (DT), it is required to specify "Receive buffer starting number in general-purpose communication" and "Receive buffer capacity in general-purpose communication" using the system register.

■ Related flag / system register No.

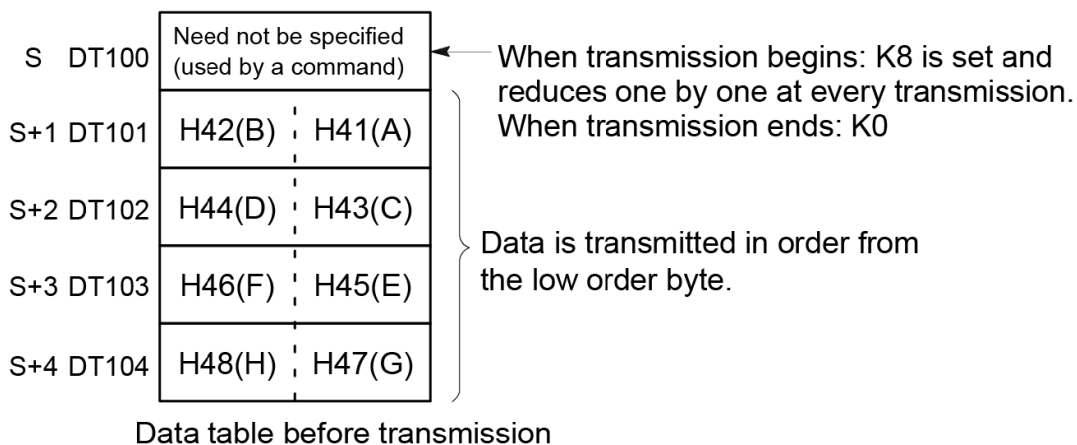
	Operation	COM0	COM1	COM2	COM3
Communication error flag	0: Normal 1: Error	R9130	R9138	R9140	R9148
Operation mode flag	0: Other than general-purpose communication 1: General-purpose communication	R9131	R9139	R9141	R9149
Reception done flag	0: Reception enabled 1: Reception disabled (reception done)	R9132	R913A	R9142	R914A
Transmission done flag	0: Transmission in progress 1: Transmission done (transmission enabled)	R9133	R913B	R9143	R914B
Receive buffer starting number	Specify the DT range to be used as a receive buffer, using the system register.	No.420	No.416	No.418	No.422
Receive buffer capacity		No.421	No.417	No.419	No.423

■ Creation of send data table [S]

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

- Do not include the terminator in the send data. The terminator is added automatically. When no terminator is to be added during transmission, specify a negative value for [n]. Alternatively, select “None” from the terminator setting in the system register.
- When the header (start code) is set to “STX” in system register, do not add the header to send data. The header is added automatically.

Example: When 8-byte data “ABCDEFGH” is sent with [S] as DT100



■ Precautions during programming

- F159 (MTRN) instruction should be executed after confirming that the transmission done flag for the target COM port has turned ON.
- The maximum data that can be sent in a single session is 2,048 bytes.

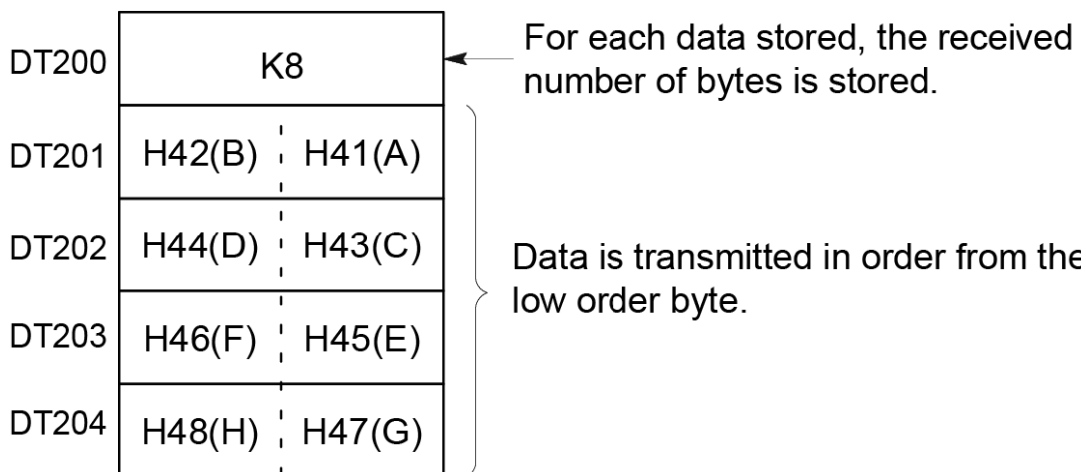
■ Structure of receive data

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

Example: When 8-byte data “ABCDEFGH” is received

Specify 200 for the “receive buffer starting number”, and 5 for the “receive buffer capacity”, in the system register.

9.1 Serial Communication Instructions



Receive buffer at the time of reception complete

■ Operations when data is received

When the reception done flag is OFF, operation takes place as follows when data is sent from an external device.

	Item	Description
(1)	Storage of receive data	Incoming data is stored in ascending order from the lower-order byte of the 2nd-word area of the receive buffer. Header and terminator (start and end codes) are not stored.
(2)	Reception done flag ON	When the terminator (end code) is received, the reception done flag turns ON. Reception of any further data is prohibited.
(3)	Execute F159 (MTRN) instruction	When an F159 (MTRN) instruction is executed, the reception done flag turns OFF. The number of received bytes in the receive buffer starting number is cleared. Data in the receive buffer is not cleared.
(4)	Storage of the following receive data	Reception is enabled when the reception done flag turns OFF, and the storage of receive data is restarted.

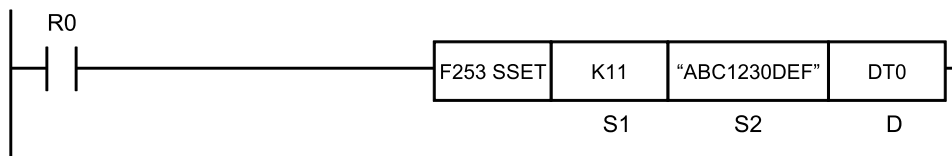
■ Flag operations

Name	Description
R9007	Turns ON when the area is exceeded in index modification
R9008 (ER)	Turns ON when the data table exceeds the area in the specification of bytes in [n].

9.2 Character String Instructions

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

■ Instruction format



■ Operands

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

■ Devices that can be specified (indicated by ●)

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

(Note 1) A character constant cannot be specified.

■ Outline of operation

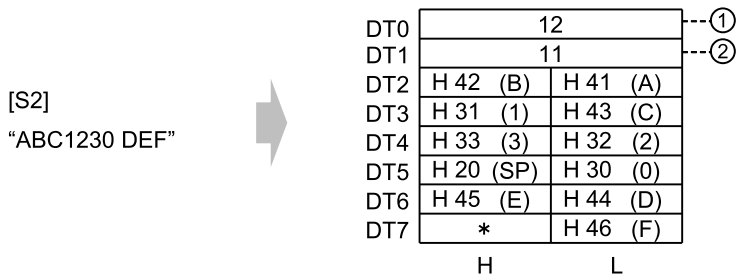
- When **S1** (storage area size) is K1 to K32767:
The storage area size specified in **S1** is stored in **D**.
The character constant specified by **S2** is converted into ASCII code. The number of characters (1 word) is stored in **D+1**, and ASCII converted character data is stored in **D+2** and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

9.2 Character String Instructions

■ Processing

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

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

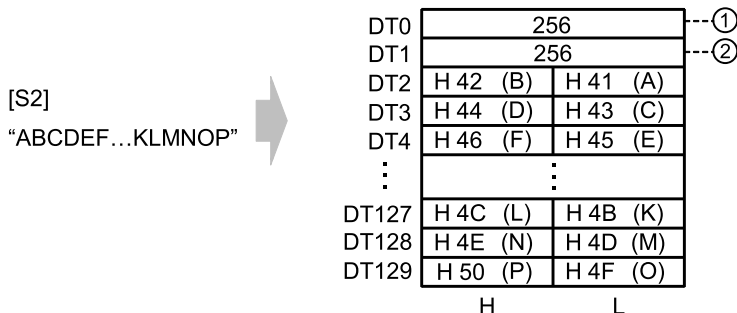


(Note 1) Data outside the range in the destination (*) (bytes higher than DT7) does not change.

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

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

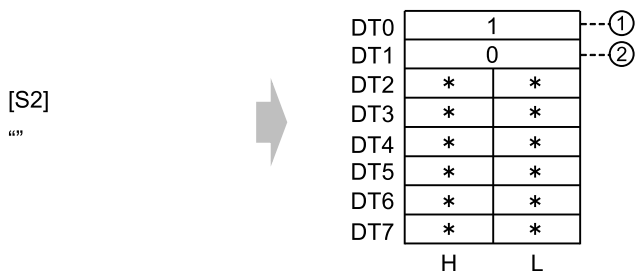
S1...K256 S2... "ABCDEF...KLMNOP" D...DT0



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

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

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

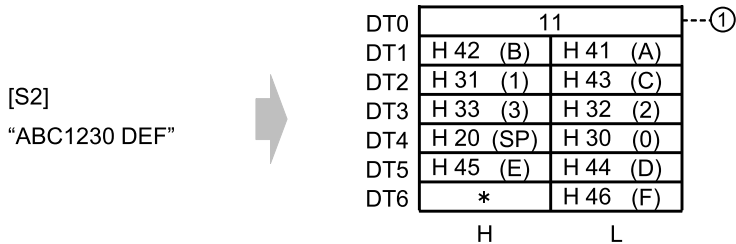


(Note 1) Data outside the range in the destination (*) (DT2 to DT7) does not change.

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

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

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

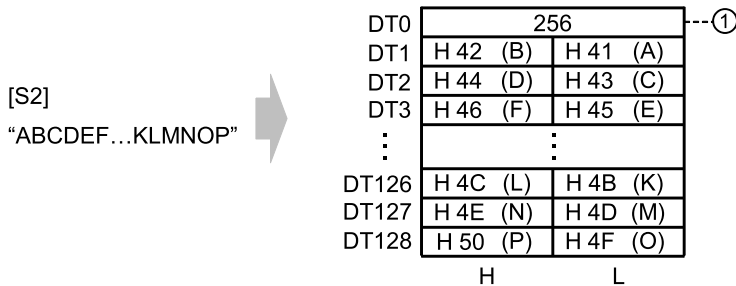


(Note 1) Data outside the range in the destination (*) (bytes higher than DT6) does not change.

(1)	No. of characters
-----	-------------------

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

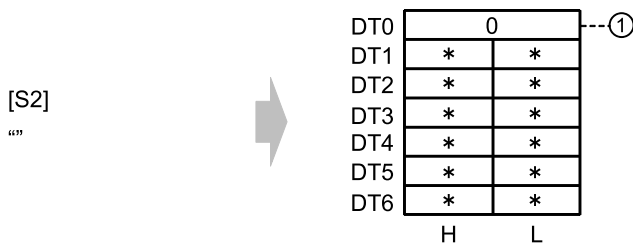
S1...H8000 S2... “ABCDEF...KLMNOP” D...DT0



(1)	No. of characters
-----	-------------------

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

S1...H8000 S2... “” D...DT0



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

(1)	No. of characters
-----	-------------------

9.2 Character String Instructions

■ Flag operations

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

10 Troubleshooting

10.1 What to Do If an Error Occurs.....	10-2
10.1.1 If a communication error occurs (RS-232C)	10-2
10.1.2 If a communication error occurs (RS-422)	10-3
10.1.3 If a communication error occurs (RS-485)	10-3
10.1.4 If a communication error occurs (Ethernet).....	10-4

10.1 What to Do If an Error Occurs

10.1 What to Do If an Error Occurs

10.1.1 If a communication error occurs (RS-232C)

■ Target

Product No.	Communication interface	Allocated communication port No.				
		Control Unit	Cassette mounting part 1		Cassette mounting part 2	
		COM0	COM1	COM2	COM3	COM4
Control Unit standard equipment	RS-232C (3-wire type) x 1 channel	•				
AFPX-COM1	RS-232C (5-wire type) x 1 channel		•		•	
AFPX-COM2	RS-232C (3-wire type) x 2 channels		•	•	•	•
AFPX-COM4	RS-232C (3-wire type) x 1 channel			•		•
AFPX-COM5	RS-232C (3-wire type) x 1 channel			•		•

■ Situation

Connections and settings may be incorrect.

■ Solution

1. Check the setting of the system register.

Check if the settings corresponding to the allocated communication port number are correct. When the PLC link function is selected, check if the link areas do not overlap.

2. Check if the CS signal is on.

When using a 3-wire type, connect the RS signal and CS signal, and turn ON the CS signal. When using a five-wire type, check the Communication Cassette LED, and check the RS signal of the destination device.

3. Check the connection with the destination device.

Check if the SD terminal of the destination device is connected to the RD terminal of the PLC side and also if the RD terminal of the destination device is connected to the SD terminal of the PLC side. Also check if the SG terminal on the destination device and that on the PLC are connected.

10.1.2 If a communication error occurs (RS-422)

■ Target

Product No.	Communication interface	Allocated communication port No.				
		Control Unit	Cassette mounting part 1		Cassette mounting part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM3	RS-485 / RS-422 x 1 channel		•		•	

■ Situation

Connections and settings may be incorrect.

■ Solution

1. Check the setting of the system register.
Check if the settings corresponding to the allocated communication port number are correct. When the PLC link function is selected, check if the link areas do not overlap.
2. Check if the terminal unit is correctly connected.
3. Check if the transmission cables are securely connected to the send data terminal and the receive data terminal of a connected device.
4. Check if the transmission cables are within the specifications range.

10.1.3 If a communication error occurs (RS-485)

■ Target

Product No.	Communication interface	Allocated communication port No.				
		Control Unit	Cassette mounting part 1		Cassette mounting part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM3	RS-485 / RS-422 x 1 channel		•		•	
AFPX-COM4	RS-485 x 1 channel		•		•	
AFPX-COM6	RS-485 x 2 channel		•	•	•	•

■ Situation

Connections and settings may be incorrect.

■ Solution

1. Check the setting of the system register.
Check if the settings corresponding to the allocated communication port number are correct. When the PLC link function is selected, check if the link areas do not overlap.

10.1 What to Do If an Error Occurs

2. Check if the terminal unit is correctly connected.
Do not designate any unit other than those at both ends of the network as a terminal unit.
3. Check if the transmission cables are securely connected between the (+) transmission terminals and between the (-) transmission terminals of each device.
4. Check if the transmission cables are within the specifications range.
* Use only one type of transmission cable. Do not mix more than one type.

10.1.4 If a communication error occurs (Ethernet)

■ Target

Product No.	Communication interface	Allocated communication port No.				
		Control unit	Cassette mounting part 1		Cassette mounting part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM5	Ethernet x 1 channel		•		•	

■ Situation (when the ERR LED is not lit)

Connections and settings may be incorrect.

■ Solution

1. Check the setting of the system register.
Check if the settings corresponding to the allocated communication port number are correct.
2. Check if the LAN cable is securely connected to each cassette or a PC.
3. When using a HUB for the connection, check if the power supply of the HUB is on.
4. Check if the LINK / ACT LED lights up.
When the LED is off, the LAN cable is not connected correctly.
5. Check the IP address of the control unit and the IP address of the connected device
6. Check if the transmission format and baud rate for the COM1 port of the Control Unit matches the configuration setting of the FP-X Communication Cassette (AFPX-COM5).

■ Situation (when the ERR LED is lit)

Connections and settings may be incorrect.

■ Solution

1. Check the status with the Configurator WD.
 - 1-1 If the "IP duplicate error" is indicated for the status, the IP address may be duplicate on the network. Specify an IP address that is not duplicate.

- 1-2** If the "DHCP error" is indicated for the status, getting IP from the DHCP server has failed. Check if there is no problem on the network system.

(MEMO)

11 List of Specifications

11.1	Communication Function Specifications	11-2
11.1.1	Communication Specifications of the Control Unit	11-2
11.1.2	Specifications of the Communication Cassette	11-2
11.2	MEWTOCOL-COM Format	11-5
11.2.1	MEWTOCOL-COM Command Type	11-5
11.2.2	MEWTOCOL-COM Response Format	11-6
11.3	MODBUS RTU Format.....	11-8
11.3.1	MODBUS RTU Command Format	11-8
11.3.2	MODBUS RTU Response Format.....	11-8
11.4	List of System Registers (COM Communication).....	11-10
11.5	List of Special Relays (COM Communication).....	11-14
11.6	List of Special Data Registers (COM Communication)	11-24
11.7	Error Codes List	11-29
11.7.1	List of MEWTOCOL-COM Communication Error Codes.....	11-29

11.1 Communication Function Specifications

11.1 Communication Function Specifications

11.1.1 Communication Specifications of the Control Unit

■ USB port (for tool software)

Item	Specifications
Standard	USB 2.0 FULL SPEED
Communication function	MEWTOCOL-COM (slave)

■ COM0 port

Item	Specifications
Interface	RS-232C (3-wire type) x 1ch (non-isolated)
Transmission distance	15 m ^(Note 1)
Baud rate	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit/s
Communication method	Half-duplex transmission
Synchronous method	Start stop synchronous system
Transmission format	Data length: 7 bits / 8 bits; Stop bit: 1 bit / 2 bits; Parity: None, Odd, Even Header: STX / No STX; Terminator: CR / CR+LF / None / ETX
Data transmission order	Transmits from bit 0 character by character.
Communication function	PLC link MEWTOCOL-COM (master / slave) MODBUS RTU (master / slave) General-Purpose communication Modem initialization

(Note 1) When communication is performed at a baud rate of 38400 bit/s or higher, use a cable not longer than 3 m. When wiring RS-232C, a shielded wire must be used to increase noise suppression.

11.1.2 Specifications of the Communication Cassette

■ RS-232C / RS-422 / RS-485 interface

Item	Specifications				
	AFPX-COM1 AFPX-COM5	AFPX-COM2	AFPX-COM3	AFPX-COM4	AFPX-COM6
Interface	RS-232C x 1 channel (non-isolated) ^(Note 1)	RS-232C (3-wire type) x 2 channels (non-isolated)	RS-485 / RS-422 x 1 channel (isolated) ^{(Note 2)(Note 3)}	RS-485 x 1 channel (isolated) RS-232C (3-wire type) x 1 channel	RS-485 x 2 channels(isolated / non-isolated between channels) ^(Note 3)

11.1 Communication Function Specifications

Item	Specifications				
	AFPX-COM1 AFPX-COM5	AFPX-COM2	AFPX-COM3	AFPX-COM4	AFPX-COM6
				(non-isolated) (Note 3)	
Transmission distance	RS-232C: Max. 15 m ^(Note 4) When using RS-422: Max. 400 m When using RS-485: Max. 1,200 m ^{(Note 5)(Note 6)}				
Baud rate	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit/s				
Communication method	Half-duplex transmission				
Synchronous method	Start stop synchronous system				
Transmission format	Data length: 7 bits / 8 bits; Stop bit: 1 bit / 2 bits; Parity: None, Odd, Even Header: STX / No STX; Terminator: CR / CR+LF / None / ETX / Time (0 to -100 ms)				
Data transmission order	Transmits from bit 0 character by character.				
Communication function and number of connected units	PLC link: Max. 16 units MEWTOCOL-COM (master / slave): Max. 99 units MODBUS RTU (master / slave): Max. 99 units General-purpose communication: Max. 99 units Modem initialization				

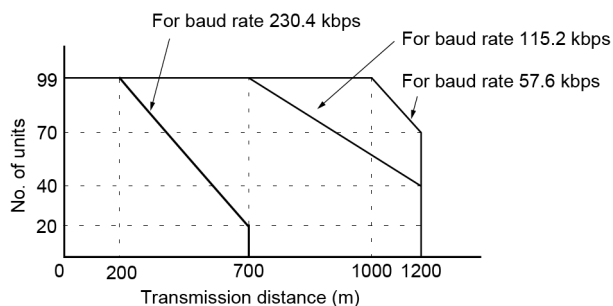
(Note 1) The AFPX-COM1 is a 5-wire type. When using it as a 3-wire type, short-circuit the RS and CS terminals.

(Note 2) By using the DIP switch on the cassette, you can switch between RS-485 and S-422.

(Note 3) When connecting a commercially available device that has an RS-485 / RS-422 interface, confirm operation using the actual device. In some cases, the number of units, transmission distance, and baud rate vary depending on the connected device.

(Note 4) When communication is performed at a baud rate of 38400 bit/s or higher, use a cable not longer than 3 m. When wiring RS-232C, a shielded wire must be used to increase noise suppression.

(Note 5) The transmission distance is limited as shown below by the baud rate when set to RS-485 and the number of connected units. For the baud rate of 38400 bit/s or less, the distance is up to 1200 m, and the number of connected units is 99. When using in combination with the C-NET adapter, the maximum number of connected units is limited to 32, and the baud rate is limited to 19200 bit/s or less.



11.1 Communication Function Specifications

(Note 6) The converter SI-35 manufactured by Lineeye Co., Ltd is recommendable for the RS-485 at the computer side.

■ Ethernet port

Item	Specifications	
	AFPX-COM5	
Interface	IEEE802.3u, 100BASE-TX / 10BASE-T	
Baud rate	100 Mbps, 10 Mbps ^(Note 1)	
Transmission system	Baseband	
Max. segment length	100 m ^(Note 2)	
Communication cable	UTP cable (Category 5)	
Communication protocol	TCP/IP, UDP/IP, ICMP, ARP, DHCP	
Function	Auto-negotiation function MDI / MDI-X Auto-crossover function	
Communication function	MEWTOCOL-COM (master / slave)	Max. 1 connection (Client) Max. 3 connections (Server)
	General-purpose communication	Max. 1 connection (Client)

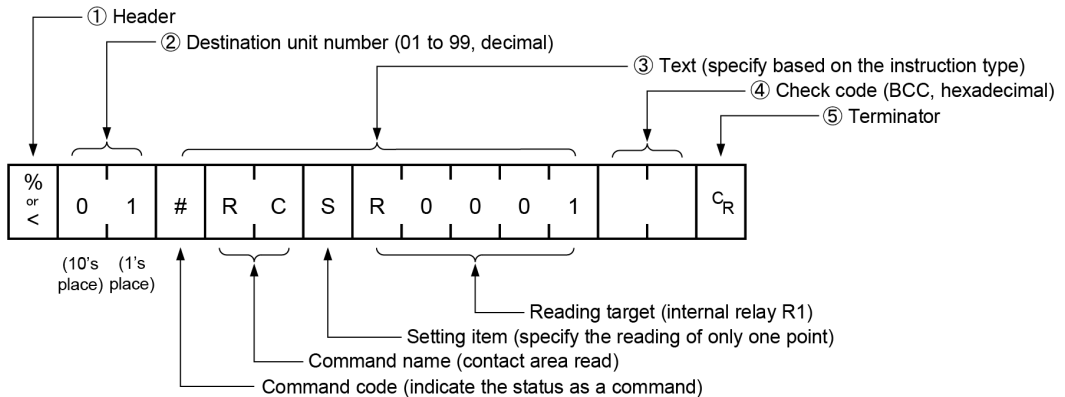
(Note 1) Switching between different speeds is done automatically by auto negotiation function.

(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 usage environment. Also, if the hub is positioned close to a control board, we recommend using it at a distance of 10 m or less.

11.2 MEWTOCOL-COM Format

11.2.1 MEWTOCOL-COM Command Type

■ 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 a single frame 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 number

- The unit No. of PLC to which you want to send a command should be specified. The unit number of PLC is specified by the system register.
- In 1:1 communication, the unit number “EE” (ASCII code: H4545) can be specified.

i Info.

- When the PLC receives a command with “EE” specified for the unit number returns a response regardless of the unit 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 varies depending on the type of instruction. The content should be noted in all upper-case characters, in accordance with the specified format.

11.2 MEWTOCOL-COM Format

(4) Check code

- This is a BCC (block check code) for error detection using horizontal parity. The BCC should be created so that it targets all of the text data from the header (start code) to the last text character.
- BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with character text (ASCII code). It is normally created automatically through calculation program.
- 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).

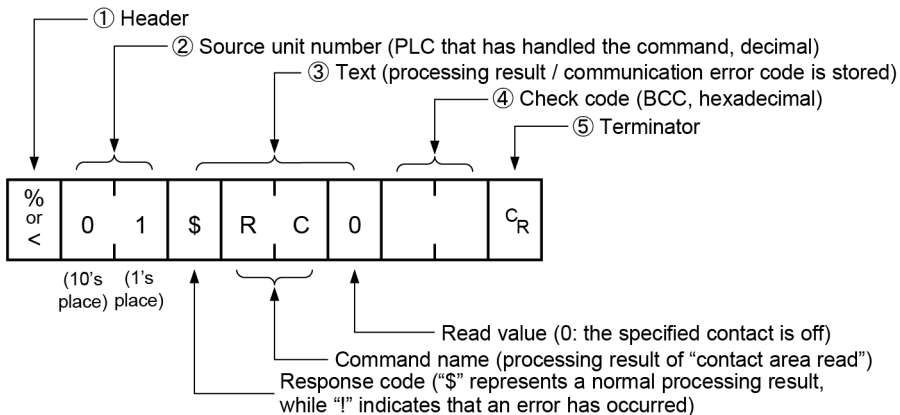
- !**

 - The method for writing text segments in a message varies depending on the type of command.
 - If there are a large number of characters in a message to be sent, divide and send them in several commands.
 - If there are a large number of characters in a message, they are divided into several responses.

11.2.2 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

11.3 MODBUS RTU Format

11.3.1 MODBUS RTU Command Format

■ MODBUS RTU Command Format

START	ADDRESS	FUNCTION	DATA	CRC CHECK	END
3.5-character time	8 bits	8 bits	n*8 bits	16 bits	3.5-Character time

ADDRESS (Unit No.): 8 bits, 0 to 247 (decimal)
Note) 0 = Broadcast address

FUNCTION: 8 bits

DATA: Varies depending on commands.

CRC: 16 bits

END: 3.5-character time (Varies by baud rate. Refer to reception judgment time.)

■ Reception judgment time

The process for receiving a message completes when the time that is exceeding the time mentioned below has passed after the final data was received. Reception done judgment time is time for approx. 32 bits.

Baud rate	Reception done judgment time
300	Approx. 106.7 ms
600	Approx. 53.3 ms
1200	Approx. 26.7 ms
2400	Approx. 13.3 ms
4800	Approx. 6.7 ms
9600	Approx. 3.3 ms
19200	Approx. 1.7 ms
38400	Approx. 0.8 ms
57600	Approx. 0.6 ms
115200	Approx. 0.3 ms
230400	Approx. 0.14 ms

11.3.2 MODBUS RTU Response Format

■ Response in normal status

- The same message as a command is returned for a single write command or for a loop back test.
- A part of a command message (6 bytes from the beginning) is returned for multiple write command.

■ Response in abnormal status

In case a parameter disabled to be processed is found in a command (except transmission error)

Slave address (Unit No.)	1, 2, or 3
Function code + 80H	
Error code	
CRC	

■ Error code contents

1. Function code error
2. Device No. error (outside the range)
3. Device quantity error (outside the range)

11.4 List of System Registers (COM Communication)

11.4 List of System Registers (COM Communication)

Only system registers related to communication by COM0 port of the Control Unit and by COM port of a Communication Cassette are listed below.

	No.	Name	Default	Set value range and description	
Memory Allocation	0	Sequence program area size	16	C14: 16k words (fixed)	
			32	Other than C14: 24, 32, 40k words ^(Note 1) ^(Note 2)	
	1	Internal relay area size ^(Note 3)	8192	4096, 8192	
Hold / Non-hold 1	5	Counter starting address	1008	0 to 1024	
	6	Hold type area starting address for timer / counter	1008	0 to 1024	
	7	Starting number of internal relay hold type area	504	0 to 512	
	8	Hold type area starting number for data registers	C14: 12230 C30 / C60:32450	0 to 65533	^(Note 2) ^(Note 4)
	14	Holding the step ladder	Non-hold	Hold / Non-hold	
4	Leading edge detection of the differential instruction during MC holds the previous value	Hold	Hold / Non-hold		
Hold / Non-hold 2	10	Hold type area starting word number for link relays for PLC link W0-0	64	0 to 64	
	11	Hold type area starting word number for Link relay for PLC link W0-1	128	64 to 128	
	12	Hold type area starting number for link data registers for PLC link W0-0	128	0 to 128	
	13	Hold type area starting number for link data registers for PLC link W0-1	256	128 to 256	
Action on Error	20	Disable settings for duplicated output	Disable	Disable / Enable	
	23	Stop operation when an I/O verification error occurs	Stop	Stop / Run	
	26	Stop operation when calculating error occurs	Stop	Stop / Run	

(Note 1) System register no.0: The sequence program area capacity can be set only in off-line editing. To make the setting effective, you need to download it to the Control Unit.

(Note 2) System register no.0: If you change the sequence program area capacity, the capacity of the data register DT will be changed.

(Note 3) System register No.1: Select "4096" points if the internal relay capacity is required to be compatible with the hold area when the power supply to the conventional FP-X Control Unit is turned off. There is no setting for the FP-XH M8N Control Unit.

11.4 List of System Registers (COM Communication)

(Note 4) The data range set by the system register is retained only when the optional battery is installed. Use the initial values directly when the battery is not installed.

	No.	Name	Default	Set value range and description
Time setting	31	Waiting time for managing multiple frame	6500.0 ms	10 to 81900 ms (In 2.5 ms unit)
	32	SEND / RECV / RMRD / RMWT instruction timeout	10000.0 ms	10 to 81900 ms (In 2.5 ms unit)
	34	Constant scan time	Normal scan	0: Normal scan (In 0.5 ms unit) 0 to 350 ms: Scan at a specified time interval
	36	Expansion Unit recognition time	0	0 to 10 seconds (In 0.1 s unit) 0: No waiting time
	37	Task time priority setting ^(Note 1)	Normal	Normal / operation
PLC link W0-0 setting	40	Size of link relays	0	0 to 64 words
	41	Size of link data registers	0	0 to 128 words
	42	Send area starting word number of link relay	0	0 to 63
	43	Size of link relays used for send area	0	0 to 64 words
	44	Send area starting number of link data register	0	0 to 127
	45	Size of link data registers used for send area	0	0 to 127 words
	46	PLC link switch flag	Normal	Normal / Reverse
	47	MEWNET-W0 PLC link max. station no.	16	1 to 16
	48	PLC link baud rate ^(Note 2)	115200 bps	115200 bps / 230400 bps
PLC link W0-1 setting	50	Size of link relays	0	0 to 64 words
	51	Size of link data registers	0	0 to 128 words
	52	Send area starting word number of link relay	64	64 to 127
	53	Size of link relays used for send area	0	0 to 64 words
	54	Send area starting number of link data register	128	128 to 255
	55	Size of link data registers used for send area	0	0 to 127 words
	57	MEWNET-W0 PLC link max. station no.	16	1 to 16

(Note 1) By selecting "Operation" in the system register No. 37 (Task time priority setting), the time taken for the communication processing is reduced for one port per scan. The operation processing takes priority

(Note 2) The system register no. 48 (PLC link baud rate) is set in the same dialog box for the COM0 port and COM1 port settings.

11.4 List of System Registers (COM Communication)

	No.	Name	Default	Set value range and description
COM0 / COM1 / COM2 / COM3 port setting	410 411	Unit number	1	1 to 99
	412	Communication mode	Computer link	Computer link General-purpose communication PLC link MODBUS RTU
		Modem connection	Not execute	Execute / Not execute
	413	Transmission format	Data length:8 bits Parity check: Odd Stop bit: 1 bit	Data length: 7 bits / 8 bits Parity: None / Odd / Even Stop bit: 1 / 2 Terminator selection: Code / Time Terminator: CR / CR+LF / None Header: STX / No STX
	415	Baud rate	9600 bps	2400 bps, 4800 bps, 9600 bps, 19200 bps 38400 bps, 57600 bps, 115200 bps, 230400 bps
	416	(COM1) Receive buffer starting number in general-purpose communication	0	0 to 65532
	417	(COM1) Receive buffer capacity in general-purpose communication	2048	0 to 2048
	418	(COM2) Receive buffer starting number in general-purpose communication	2048	0 to 65532
	419	(COM2) Receive buffer capacity in general-purpose communication	2048	0 to 2048
	420	(COM0) Receive buffer starting number in general-purpose communication	4096	0 to 65532
	421	(COM0) Receive buffer capacity in general-purpose communication	2048	0 to 2048
	422	(COM3) Receive buffer starting number in general-purpose communication	6144	0 to 65532
	423	(COM3) Receive buffer capacity in general-purpose communication	2048	0 to 2048
	424	(COM0) Terminator judgement time (x 0.01 ms)	0	0, or 1 to 10000 (0.01 ms to 100 ms) When terminator judgement time is 0, transmission time is that for approx. 4 bytes.

11.4 List of System Registers (COM Communication)

No.	Name	Default	Set value range and description
425	(COM1) Terminator judgement time (x 0.01 ms)	0	
426	(COM2) Terminator judgement time (x 0.01 ms)	0	
427	(COM3) Terminator judgement time (x 0.01 ms)	0	

(Note 1) When computer link or MODBUS RTU is selected by no. 412 (Communication mode), no. 413 (Transmission format) and no. 415 (Baud rate) can be set.

(Note 2) You can select terminator in no. 413 (Transmission format) and set the end code and start code only when general-purpose communication is selected by no. 412 (Communication mode). In addition, you can select nos. 424 to 427 only when selecting time for the terminator in no. 413.

(Note 3) The PLC link function is available for the COM0 or COM1 port only. The transmission format is set to "Data length: 8 bits; Parity: Odd; Stop bit: 1 (fixed)". In addition, select the baud rate by the PLC link W0-0 system register no. 48.

11.5 List of Special Relays (COM Communication)

11.5 List of Special Relays (COM Communication)

Only special relays related to communication by COM0 port of the Control Unit and by COM port of a Communication Cassette are listed below.

WR900 (specification in word units)

Relay No.	Name	Description
R900E (R9130)	COM0 port communication error	Turns ON when a communication error is detected during the use of COM0 port

(Note 1) The same function is also allocated to the special internal relay indicated in brackets.

WR903 (specification in word units)

Relay No.	Name	Description
R9030	Not used	
R9031	Not used	
R9032 (R9139)	COM1 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R9033	Print instruction execution flag	OFF: Instruction not active ON: Instruction in progress
R9034	Program edit flag during RUN mode	A special internal relay that only turns on the first single scan following the completion of rewriting during RUN.
R9035	Not used	
R9036	Not used	
R9037 (R9138)	COM1 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9038 (R913A)	COM1 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R9039 (R913B)	COM1 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R903A	Not used	
R903B	Not used	
R903C	Not used	
R903D	Not used	
R903E (R9132)	COM0 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R903F (R9133)	COM0 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication.

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
		Turns OFF when transmission is requested during general-purpose communication.

(Note 1) R9030 to R903F changes even while a scan is in progress. To maintain compatibility with the existing FP-X / FPsigma Control Unit, the same function is also allocated to the special internal relay indicated in brackets.

WR904 (specification in word units)

Relay No.	Name	Description
R9040 (R9131)	COM0 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R9041 (R9136)	COM1 port PLC link flag	Turns ON when the PLC link function is used.
R9042 (R9141)	COM2 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R9043	Not used	
R9044 (R913C)	COM1 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM1 port. OFF: Not executable (execution in progress) ON: Executable
R9045 (R913D)	COM1 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM1 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90124.
R9046	Not used	
R9047 (R9140)	COM2 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9048 (R9142)	COM2 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R9049 (R9143)	COM2 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R904A (R9144)	COM2 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM2 port. OFF: Not executable (execution in progress) ON: Executable
R904B (R9145)	COM2 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM2 port. OFF: Successful ON: Unsuccessful (communication error has occurred)

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
		Error codes are stored in DT90125.
R904C to R904F	Not used	

(Note 1) R9040 to R904F changes even while a scan is in progress. To maintain compatibility with the existing FP-X / FPsigma Control Unit, the same function is also allocated to the special internal relay indicated in brackets.

WR905 (specification in word units)

Relay No.	Name	Description
R9050	MEWNET-W0 PLC link transmission error flag	When using MEWNET-W0 Turns ON when there is a transmission error in the PLC link. Turns ON when there is an error in the setting for the PLC link area.
R9051 to R905F	Not used	

WR906 (specification in word units)

Relay No.	Name	Description
R9060	MEWNET-W0 PLC link 0 transmission assurance relay	Unit No. 1 When Unit No. 1 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9061		Unit No. 2 When Unit No. 2 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9062		Unit No. 3 When Unit No. 3 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9063		Unit No. 4 When Unit No. 4 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9064		Unit No. 5 When Unit No. 5 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9065		Unit No. 6 When Unit No. 6 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9066		Unit No. 7 When Unit No. 7 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
R9067		Unit No. 8 When Unit No. 8 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9068		Unit No. 9 When Unit No. 9 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9069		Unit No. 10 When Unit No. 10 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906A		Unit No. 11 When Unit No. 11 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906B		Unit No. 12 When Unit No. 12 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906C		Unit No. 13 When Unit No. 13 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906D		Unit No. 14 When Unit No. 14 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906E		Unit No. 15 When Unit No. 15 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R906F		Unit No. 16 When Unit No. 16 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF

WR907 (specification in word units)

Relay No.	Name	Description
R9070	MEWNET-W0 PLC link 0 operation mode relay	Unit No. 1 Turns ON when Unit No. 1 is in RUN mode. Turns OFF in PROG. mode.
R9071		Unit No. 2 Turns ON when Unit No. 2 is in RUN mode. Turns OFF in PROG. mode.
R9072		Unit No. 3 Turns ON when Unit No. 3 is in RUN mode. Turns OFF in PROG. mode.

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
R9073		Unit No. 4 Turns ON when Unit No. 4 is in RUN mode. Turns OFF in PROG. mode.
R9074		Unit No. 5 Turns ON when Unit No. 5 is in RUN mode. Turns OFF in PROG. mode.
R9075		Unit No. 6 Turns ON when Unit No. 6 is in RUN mode. Turns OFF in PROG. mode.
R9076		Unit No. 7 Turns ON when Unit No. 7 is in RUN mode. Turns OFF in PROG. mode.
R9077		Unit No. 8 Turns ON when Unit No. 8 is in RUN mode. Turns OFF in PROG. mode.
R9078		Unit No. 9 Turns ON when Unit No. 9 is in RUN mode. Turns OFF in PROG. mode.
R9079		Unit No. 10 Turns ON when Unit No. 10 is in RUN mode. Turns OFF in PROG. mode.
R907A		Unit No. 11 Turns ON when Unit No. 11 is in RUN mode. Turns OFF in PROG. mode.
R907B		Unit No. 12 Turns ON when Unit No. 12 is in RUN mode. Turns OFF in PROG. mode.
R907C		Unit No. 13 Turns ON when Unit No. 13 is in RUN mode. Turns OFF in PROG. mode.
R907D		Unit No. 14 Turns ON when Unit No. 14 is in RUN mode. Turns OFF in PROG. mode.
R907E		Unit No. 15 Turns ON when Unit No. 15 is in RUN mode. Turns OFF in PROG. mode.
R907F		Unit No. 16 Turns ON when Unit No. 16 is in RUN mode. Turns OFF in PROG. mode.

WR908 (specification in word units)

Relay No.	Name	Description
R9080	MEWNET-W0 PLC link 1 transmission assurance relay	Unit No. 1 When Unit No. 1 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9081		Unit No. 2 When Unit No. 2 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9082		Unit No. 3 When Unit No. 3 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9083		Unit No. 4 When Unit No. 4 is normally communicating in PLC link mode: ON

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
		When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9084	Unit No. 5	When Unit No. 5 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9085	Unit No. 6	When Unit No. 6 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9086	Unit No. 7	When Unit No. 7 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9087	Unit No. 8	When Unit No. 8 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9088	Unit No. 9	When Unit No. 9 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R9089	Unit No. 10	When Unit No. 10 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908A	Unit No. 11	When Unit No. 11 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908B	Unit No. 12	When Unit No. 12 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908C	Unit No. 13	When Unit No. 13 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908D	Unit No. 14	When Unit No. 14 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908E	Unit No. 15	When Unit No. 15 is normally communicating in PLC link mode: ON When the unit is stopped, an error has occurred, or PLC link is not established: OFF
R908F	Unit No. 16	When Unit No. 16 is normally communicating in PLC link mode: ON

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
		When the unit is stopped, an error has occurred, or PLC link is not established: OFF

WR909 (specification in word units)

Relay No.	Name	Description
R9090	MEWNET-W0 PLC link 1 operation mode relay	Unit No. 1 Turns ON when Unit No. 1 is in RUN mode. Turns OFF in PROG. mode.
R9091		Unit No. 2 Turns ON when Unit No. 2 is in RUN mode. Turns OFF in PROG. mode.
R9092		Unit No. 3 Turns ON when Unit No. 3 is in RUN mode. Turns OFF in PROG. mode.
R9093		Unit No. 4 Turns ON when Unit No. 4 is in RUN mode. Turns OFF in PROG. mode.
R9094		Unit No. 5 Turns ON when Unit No. 5 is in RUN mode. Turns OFF in PROG. mode.
R9095		Unit No. 6 Turns ON when Unit No. 6 is in RUN mode. Turns OFF in PROG. mode.
R9096		Unit No. 7 Turns ON when Unit No. 7 is in RUN mode. Turns OFF in PROG. mode.
R9097		Unit No. 8 Turns ON when Unit No. 8 is in RUN mode. Turns OFF in PROG. mode.
R9098		Unit No. 9 Turns ON when Unit No. 9 is in RUN mode. Turns OFF in PROG. mode.
R9099		Unit No. 10 Turns ON when Unit No. 10 is in RUN mode. Turns OFF in PROG. mode.
R909A		Unit No. 11 Turns ON when Unit No. 11 is in RUN mode. Turns OFF in PROG. mode.
R909B		Unit No. 12 Turns ON when Unit No. 12 is in RUN mode. Turns OFF in PROG. mode.
R909C		Unit No. 13 Turns ON when Unit No. 13 is in RUN mode. Turns OFF in PROG. mode.
R909D		Unit No. 14 Turns ON when Unit No. 14 is in RUN mode. Turns OFF in PROG. mode.
R909E		Unit No. 15 Turns ON when Unit No. 15 is in RUN mode. Turns OFF in PROG. mode.
R909F		Unit No. 16 Turns ON when Unit No. 16 is in RUN mode. Turns OFF in PROG. mode.

WR913 (specification in word units)

Relay No.	Name	Description
R9130 (R900E)	COM0 port communication error flag	Turns ON when a transmission error occurs during data communication.

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
		Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9131 (R9040)	COM0 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R9132 (R903E)	COM0 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R9133 (R903F)	COM0 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R9134	COM0 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM0 port. OFF: Not executable (execution in progress) ON: Executable
R9135	COM0 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM0 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90123.
R9136	COM0 port PLC link flag	Turns ON when the PLC link function is used.
R9137	Not used	
R9138 (R9037)	COM1 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9139 (R9032)	COM1 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R913A (R9038)	COM1 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R913B (R9039)	COM1 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R913C (R9044)	COM1 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM1 port. OFF: Not executable (execution in progress) ON: Executable
R913D (R9045)	COM1 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM1 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90124.

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
R913E (R9041)	COM1 port PLC link flag	Turns ON when the PLC link function is used.
R913F	Not used	

(Note 1) R9130 to R913F changes even while a scan is in progress. To maintain compatibility with the existing FP-X / FPsigma control unit, the same function is also allocated to the special internal relay indicated in brackets.

WR914 (specification in word units)

Relay No.	Name	Description
R9140 (R9047)	COM2 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9141 (R9042)	COM2 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R9142 (R9048)	COM2 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication
R9143 (R9049)	COM2 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R9144 (R904A)	COM2 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM2 port. OFF: Not executable (execution in progress) ON: Executable
R9145 (R904B)	COM2 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM2 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90125.
R9146	Not used	
R9147	Not used	
R9148	COM3 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9149	COM3 port operation mode flag	Turns ON when the general-purpose communication function is used. Turns OFF when functions other than general-purpose communication are used.
R914A	COM3 port reception done flag during general-purpose communication	Turns ON when the terminator (end code) is received during general-purpose communication

11.5 List of Special Relays (COM Communication)

Relay No.	Name	Description
R914B	COM3 port transmission done flag during general-purpose communication	Turns ON when transmission is done during general-purpose communication. Turns OFF when transmission is requested during general-purpose communication.
R914C	COM3 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM3 port. OFF: Not executable (execution in progress) ON: Executable
R914D	COM3 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM3 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90127.
R914E	Not used	
R914F	Not used	

(Note 1) R9140 to R914F changes even while a scan is in progress. To maintain compatibility with the existing FP-X / FPsigma control unit, the same function is also allocated to the special internal relay indicated in brackets.

WR915 (specification in word units)

Relay No.	Name	Description
R9150	COM4 port communication error flag	Turns ON when a transmission error occurs during data communication. Turns OFF when transmission is requested using an F159 (MTRN) instruction.
R9151 to R9153	Not used	
R9154	COM4 port SEND / RECV instruction execution flag	Indicates the executability of F145 (SEND) or F146 (RECV) instruction to COM4 port. OFF: Not executable (execution in progress) ON: Executable
R9155	COM4 port SEND / RECV instruction execution end flag	Indicates the state of execution of F145 (SEND) or F146 (RECV) instruction to COM4 port. OFF: Successful ON: Unsuccessful (communication error has occurred) Error codes are stored in DT90128.
R9156 to R915F	Not used	

11.6 List of Special Data Registers (COM Communication)

11.6 List of Special Data Registers (COM Communication)

Only special data registers related to communication by COM0 port of the Control Unit and by COM1 to COM4 ports of a Communication Cassette are listed below.

Register No.	Name	Description	Read	Write
DT90008	Communication error flag COM4 port	<p>The content of error is stored during the use of COM4 port. ON(1): Error; OFF(0): Normal</p> <p>bit no. 15 8 7 0</p> <p>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</p> <p>H00 fixed</p> <p>COM4 overflow error</p> <p>COM4 parity error</p> <p>COM4 framing error</p> <p>COM4 overrun error</p>	○	×
DT90009	Communication error flag COM2 port / COM3 port	<p>The content of error is stored during the use of COM2 port / COM3 port. ON(1): Error; OFF(0): Normal</p> <p>bit no. 15 8 7 0</p> <p>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</p> <p>COM3 overflow error</p> <p>COM3 parity error</p> <p>COM3 framing error</p> <p>COM3 overrun error</p> <p>COM2 overflow error</p> <p>COM2 parity error</p> <p>COM2 framing error</p> <p>COM2 overrun error</p>	○	×
DT90059	Communication error code COM0 port / COM1 port	<p>An error code is stored in the case of communication error. ON(1): Error; OFF(0): Normal</p> <p>bit no. 15 8 7 0</p> <p>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</p> <p>COM1 overflow error</p> <p>COM1 parity error</p> <p>COM1 framing error</p> <p>COM1 overrun error</p> <p>COM0 overflow error</p> <p>COM0 parity error</p> <p>COM0 framing error</p> <p>COM0 overrun error</p>	○	×
DT90123	COM0 SEND / RECV instruction end code	<p>An error code is stored when an error occurs during the execution of a SEND / RECV instruction.</p>	○	×
DT90124	COM1 SEND / RECV instruction end code		○	×
DT90125	COM2		○	×

11.6 List of Special Data Registers (COM Communication)

Register No.	Name	Description	Read	Write
	SEND / RECV instruction end code			
DT90126	Forcible I/O in process unit number	Used by the system.	○	×
DT90127	COM3 SEND / RECV instruction end code	An error code is stored when an error occurs during the execution of a SEND / RECV instruction.	○	×
DT90128	COM4 SEND / RECV instruction end code		○	×
DT90140	MEWNET-W0 PLC link 0 status	Number of receptions of PLC link 0	○	×
DT90141		PLC link 0 reception interval (current value) (x 2.5 ms)		
DT90142		PLC link 0 reception interval (min. value) (x 2.5 ms)		
DT90143		PLC link 0 reception interval (max. value) (x 2.5 ms)		
DT90144		Number of transmission of PLC link 0		
DT90145		PLC link 0 transmission interval (current value) (x 2.5 ms)		
DT90146		PLC link 0 transmission interval (min. value) (x 2.5 ms)		
DT90147		PLC link 0 transmission interval (max. value) (x 2.5 ms)		
DT90148	MEWNET-W0 PLC link 1 status	Number of receptions of PLC link 1	○	×
DT90149		PLC link 1 reception interval (current value) (x 2.5 ms)		
DT90150		PLC link 1 reception interval (min. value) (x 2.5 ms)		
DT90151		PLC link 1 reception interval (max. value) (x 2.5 ms)		
DT90152		Number of transmission of PLC link 1		
DT90153		PLC link 1 transmission interval (current value) (x 2.5 ms)		
DT90154		PLC link 1 transmission interval (min. value) (x 2.5 ms)		
DT90155		PLC link 1 transmission interval (max. value) (x 2.5 ms)		
DT90156	MEWNET-W0	PLC link 0 work for measuring reception interval	○	×
DT90157	PLC link 0 status	PLC link 0 work for measuring transmission interval		
DT90158	MEWNET-W0	PLC link 1 work for measuring reception interval	○	×
DT90159	PLC link 1 status	PLC link 1 work for measuring transmission interval		
DT90160	MEWNET-W0 PLC link 0 unit number	PLC link 0 unit number is stored.	○	×

11.6 List of Special Data Registers (COM Communication)

Register No.	Name	Description	Read	Write		
DT90161	MEWNET-W0 PLC link 0 error flag	The content of error of PLC link 0 is stored.	○	×		
DT90162 to DT90169	Not used		×	×		
DT90170	MEWNET-W0 PLC link 0 status	PLC link address duplicate destination	○	×		
DT90171		No. of missing tokens				
DT90172		No. of duplicate tokens				
DT90173		No. of no signal states				
DT90174		No. of receptions of undefined commands				
DT90175		No. of sum check errors for reception				
DT90176		No. of receive data format errors				
DT90177		No. of transmission errors				
DT90178		No. of procedure errors				
DT90179	No. of duplicate master units					
DT90180 to DT90218	Not used		×	×		
DT90219	Unit No. switch from DT90220 to DT90251	0: Unit Nos. 1 to 8; 1: Unit Nos. 9 to 16	○	×		
DT90220	PC (PLC) link unit no. 1 or 9	System registers 40 and 41	○	×		
DT90221		System registers 42 and 43				
DT90222		System registers 44 and 45				
DT90223		System registers 46 and 47				
DT90224	PC (PLC) link unit no. 2 or 10	System registers 40 and 41			○	×
DT90225		System registers 42 and 43				
DT90226		System registers 44 and 45				
DT90227		System registers 46 and 47				
DT90228	PC (PLC) link unit no. 3 or 11	System registers 40 and 41				
<p>System register settings related to the PLC link function of each unit number are stored as below. < Example > DT90219 is 0</p> <p>DT90220 to DT90223 (unit number 1):</p>						
<p>When standard settings are applied to System register 46 of a master unit, the values of the master unit are copied to 46 and 47 on the left.</p>						
<p>When reverse settings are applied to System register 46 of a master unit, 40 to 45 and 47 (portion that corresponds to the master unit on the left) are applied to 50 to 55 and 57, and 46 is directly specified.</p>						
<p>Received values are corrected and applied to 40 to 45 (portion that corresponds to another unit), while 46 and 57 of the master unit are applied to 46 and 47.</p>						

11.6 List of Special Data Registers (COM Communication)

Register No.	Name	Description	Read	Write
DT90229		System registers 42 and 43		
DT90230		System registers 44 and 45		
DT90231		System registers 46 and 47		
DT90232		System registers 40 and 41		
DT90233	PC (PLC) link unit no. 4 or 12	System registers 42 and 43		
DT90234		System registers 44 and 45		
DT90235		System registers 46 and 47		
DT90236		System registers 40 and 41		
DT90237	PC (PLC) link unit no. 5 or 13	System registers 42 and 43		
DT90238		System registers 44 and 45		
DT90239		System registers 46 and 47		
DT90240		System registers 40 and 41		
DT90241	PC (PLC) link unit no. 6 or 14	System registers 42 and 43		
DT90242		System registers 44 and 45		
DT90243		System registers 46 and 47		
DT90244	PC (PLC) link unit no. 7 or 15	System registers 40 and 41		
DT90245		System registers 42 and 43		

11.6 List of Special Data Registers (COM Communication)

Register No.	Name		Description	Read	Write
DT90246		System registers 44 and 45			
DT90247		System registers 46 and 47			
DT90248	PC (PLC) link unit no. 8 or 16	System registers 40 and 41			
DT90249		System registers 42 and 43			
DT90250		System registers 44 and 45			
DT90251		System registers 46 and 47			
DT90252 to DT90299	Not used				

11.7 Error Codes List

11.7.1 List of MEWTOCOL-COM Communication Error Codes

Code	Name	Error code contents
I26	Unit number setting error	A command that cannot be used for global (unit no. FF) was received.
I40	BCC error	Transmission error occurred in received data.
I41	Format error	Command that does not match the format was received.
I42	NOT support error	An unsupported command was received.
I43	Multiframe process error	Another command was received during the multiframe processing.
I60	Parameter error	Specified parameter does not exist, or cannot be used.
I61	Data error	There is an error in the contact, data area, data number, size, range or format specification.
I62	Registration over error	The number of registration exceeded the restriction, or operation is performed without registration.
I63	PC mode error	Invalid command was executed in RUN mode.
I64	External memory error	Hardware failure. There could be an error in the built-in ROM (FROM) / main memory. The capacity of the specified content was exceeded during ROM transmission. A read / write error occurred.
I65	Protection error	A write operation of the program or system register was performed under the protection status (password setting) or with the Master Memory Cassette installed.
I66	Address error	The code format of address data is incorrect. If the address is exceeded or insufficient, the range specification is incorrect.
I67	No program error / no data error	Program cannot be read as there is no program in program area or an error in memory contents. Or, an attempt was made to read unregistered data.
I68	Rewrite forbidden in RUN mode error	An attempt was made to edit instructions (ED, SUB, RET, INT, IRET, SSTP, STPE) that cannot be rewritten in the RUN mode. Nothing is written to the Control Unit.
I70	SIM over error	Program area was exceeded during a program write process.
I71	Exclusive control error	A command that cannot be processed simultaneously with the command in process was executed.

(Note 1) Each error code is returned in hexadecimal data format

(MEMO)

Record of Changes

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

Date	Manual No.	Record of Changes
Oct. 2020	WUME-FPXHCOMG-01	1st Edition
May 2022	WUME-FPXHCOMG-02	2nd Edition <ul style="list-style-type: none">• Added information about the MEWTOCOL-COM command and 1:1 communication.
Mar. 2023	WUME-FPXHCOMG-03	3rd Edition <ul style="list-style-type: none">• Addition of information on Ethernet communication using the AFPX-COM5 cassette
Apr. 2024	WUME-FPXHCOMG-04	4th Edition <ul style="list-style-type: none">• Change in Corporate name

Order Placement Recommendations and Considerations

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

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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.

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

Do not use the Products for the application which breakdown or malfunction of Products may cause damage to the body or property.

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- ii) control equipment for transportation
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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)
- x) machinery and systems which especially require the high level of reliability and safety

[Acceptance inspection]

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

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

[Scope of warranty]

In the event that Panasonic Industry Co., Ltd. confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industry Co., Ltd. during the warranty period, Panasonic Industry Co., Ltd. shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.

However, the following failures and defects are not covered by warranty and we are not responsible for such failures and defects.

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- (2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us.
- (3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
- (4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
- (5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
- (6) When the failure or defect was caused by a natural disaster or other force majeure.
- (7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

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

[Scope of service]

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

Panasonic Industry Co., Ltd.

(MEMO)

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