Panasonic

PROGRAMMABLE CONTROLLER

FP7-series User's Manual

SCU communication

[Applicable models]

FP7 CPU Unit (Model number AFP7CPS*)

FP7 Serial Communication Unit (Model number AFP7NSC)

FP7 Extension Cassettes (Communication Cassettes)

- RS-232C x 1ch type (Model number AFP7CCS1)
- RS-232C x 2ch type (Model number AFP7CCS2)
- RS-422/RS-485 x 1ch type (Model number AFP7CCM1)
- RS-422/RS-485 x 2ch type (Model number AFP7CCM2)
- RS-232C x 1ch +RS-422/RS-485 x 1ch type (Model number AFP7CCS1M1)

WUME-FP7COM-02

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Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safety.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent excessive exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
-Do not dismantle or remodel the product. It could cause excessive exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock.
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection could cause excessive exothermic heat or smoke generation.
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It could cause excessive exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on. It could lead to an electric shock.

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Introduction

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

Types of Manual

- There are different types of user's manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website: http://industrial.panasonic.com/ac/e/dl_center/manual/ .

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit Users Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit	FP7 CPU Unit Command Reference Manual	WUME-FP7CPUPGR
	FP7 CPU Unit Users Manual (Logging Trace Function)	WUME-FP7CPULOG
	FP7 CPU Unit Users Manual (Security Function)	WUME-FP7CPUSEC
Instructions for Built-in LAN Port	FP7 CPU Unit Users Manual (LAN Port Communication)	WUME-FP7LAN
Instructions for Built-in COM Port	FP7 series Users Manual (SCU communication)	WUME-FP7COM
FP7 Extension Cassette (Communication) (RS-232C/RS485 type)		
FP7 Extension Cassette (Communication) (Ethernet type)	FP7 series Users Manual (Communication cassette Ethernet type)	WUME-FP7CCET
FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette Users Manual	WUME-FP7FCA (Upcoming)
FP7 Digital Input/Output Unit	FP7 Digital Input/Output Unit Users Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit Users Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit Users Manual	WUME-FP7AOH
FP7 High-speed counter Unit	FP7 High-speed counter Unit Users Manual	WUME-FP7HSC
FP7 Pulse Output Unit	FP7 Pulse Output Unit Users Manual	WUME-FP7PG (Upcoming)
FP7 Positioning Unit	FP7 Positioning Unit Users Manual	WUME-FP7POSP
FP7 Serial Communication Unit	FP7 series Users Manual (SCU communication)	WUME-FP7COM
PHLS System	PHLS System Users Manual	WUME-PHLS
Programming Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

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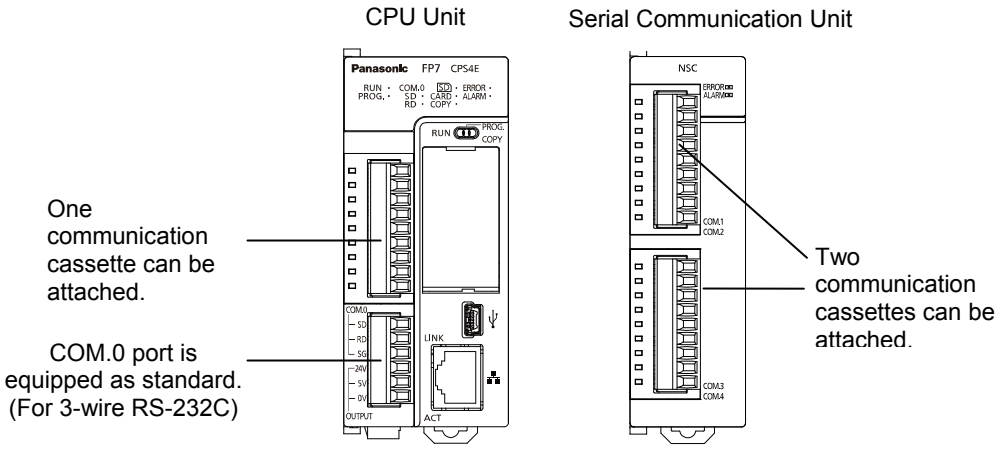
1

Functions of Units and Restrictions on Combination

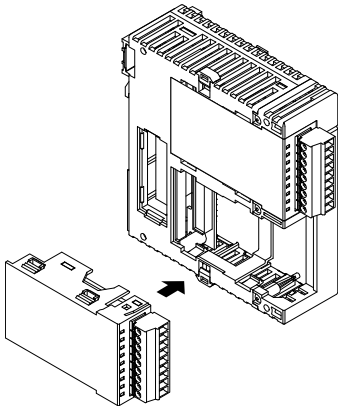
1.1 Features and Functions of Units

1.1.1 Functions of Units



■ **Removable serial communication cassettes are used.**

- Selectable from five communication cassettes in conformity with communication standards of RS-232C, RS-422 and RS-485. (Sold separately)
- One communication cassette can be attached to the CPU unit, and two communication cassettes to the serial communication unit.



■ **The CPU unit includes a COM.0 port as standard equipment.**

The CPU unit includes a RS-232C port (3-wire type) for the connection with a programmable display and a power supply as standard equipment.

■ **Four communication modes are available.**

The PC link, MEWTOCOL, MODBUS RTU and general-purpose communication modes are provided, and many serial communication devices can be connected by the combination of communication cassettes.

1.1.2 Types of Unit

■ Types of unit that can perform serial communication

Name	Model no.	Communication ports that can be allocated				
		COM.0	COM.1	COM.2	COM.3	COM.4
CPU Unit	AFP7CPS4E AFP7CPS3E AFP7CPS3	●	●	●		
Serial Communication Unit	AFP7NSC		●	●	●	●

(Note 1) The COM.0 port equipped in the CPU unit is a terminal block especially for RS-232C (3-wire type).

1.1.3 Types of Cassette

■ Types of communication cassette

Model no.	Communication interface	Communication ports that can be allocated				
		COM.0	COM.1	COM.2	COM.3	COM.4
AFP7CCS1	1-channel RS-232C		●		●	
AFP7CCS2	3-wire 2-channel RS-232C		●	●	●	●
	5-wire 1-channel RS-232C		●		●	
AFP7CCM1	1-channel RS-422 / RS-485		●		●	
AFP7CCM2	2-channel RS-422 / RS-485		●	●	●	●
AFP7CCS1M1	1-channel RS-485		●		●	
	3-wire 1-channel RS-232C			●		●

(Note 1) For AFP7CCS2, select and use either 3-wire 2-channel RS-232C or 5-wire 1-channel RS-232C. Switching should be performed using a switch on the Communication Cassette.

(Note 2) For AFP7CCM1 and AFP7CCM2, select and use either RS-422 or RS-485. Switching should be performed using a switch on the Communication Cassette.

(Note 3) For AFP7CCS1M1, both 1-channel RS-485 and 3-wire 1-channel RS-232C can be used.

1.1.4 Applications that can be Used in Each Port

■ Available functions for each communication port

Communication function to be used		Communication ports that can be allocated				
		COM.0	COM.1	COM.2	COM.3	COM.4
PLC link			●			
MEWTOCOL7-COM (Note 1) MEWTOCOL-COM	Master	●	●	●	●	●
	Slave	●	●	●	●	●
MODBUS-RTU	Master	●	●	●	●	●
	Slave	●	●	●	●	●
General-purpose communication		●	●	●	●	●

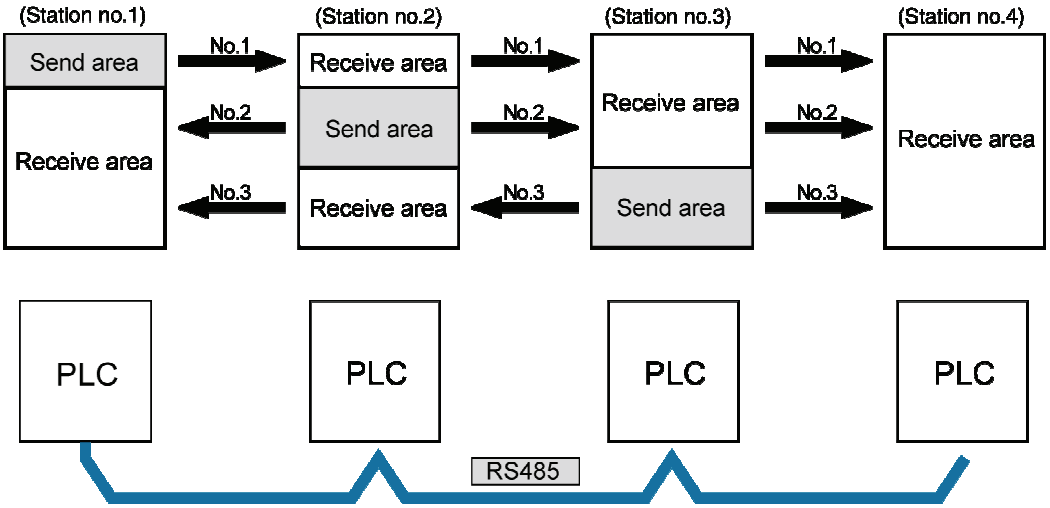
(Note 1) In MEWTOCOL7-COM, there is no master communication function.

1.2 Overview of Communication Functions

1.2.1 PLC Link Functions (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 the connected PLCs.
- Among up to 16 PLCs, data can be exchanged with 1,008 link relay points and 128 link register words.



■ Applications of PLC Link Functions (MEWNET-W0)

Among our FP series PLC, it can be used for link functions with the following models. It is also capable of 1:1 communication via RS-232C port.

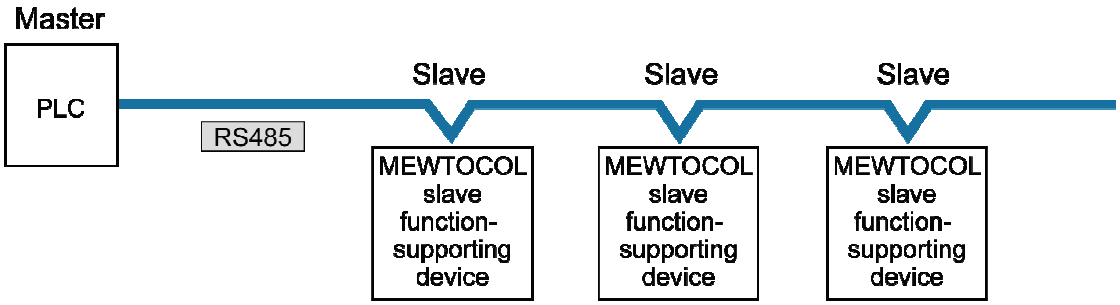
- FP-X0 (L40MR / L60MR)
- FP0R (RS485 type)
- FPΣ (Using Communication cassette RS-485 type)
- FP-X (Using Communication cassette RS-485 type)
- FP2 Multi Communication Unit (Using Communication cassette RS-485 type)

1.2.2 MEWTOCOL Master/Slave Communication

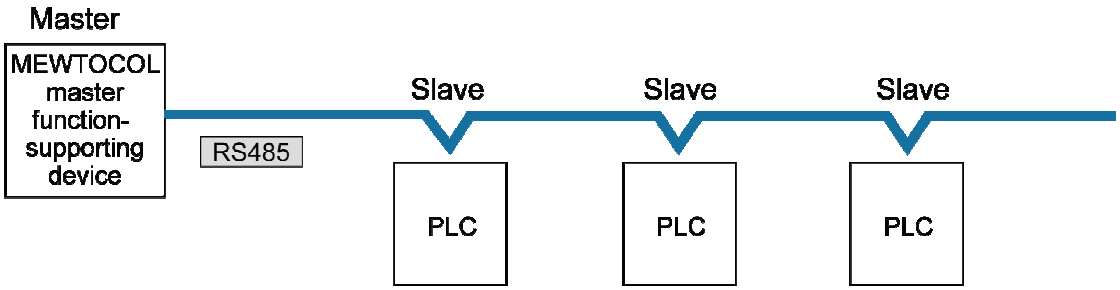
■ Overview of function

- Execute communication using MEWTOCOL-COM, a communication protocol used by our PLC.
- In master communication, PLC executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV instructions.
- Slave communication is performed when the computer or display connected to PLC has the sending right, and sends commands, and PLC returns responses. In slave communication, PLC responds automatically, so no program concerning communication is necessary on the PLC side.
- The data size that can be sent or received in a single communication is up to 507 words for register transmission (up to 1,014 words for MEWTOCOL7-COM) and 1 bit for bit transmission.

Master function



Slave function



■ Examples of applications of MEWTOCOL master communication

This is used for connection with a device that supports our PLC's protocol MEWTOCOL.

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

■ Examples of applications of MEWTOCOL slave communication

This is used for connection with a device that supports our PLC's protocol MEWTOCOL-COM master communication.

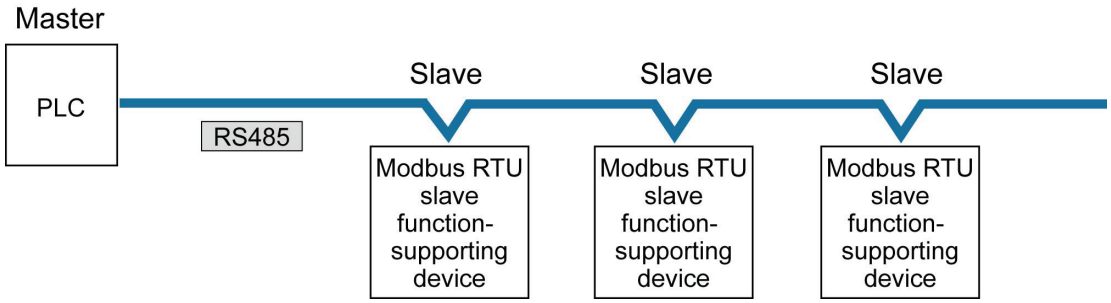
- Programmable displays made by various manufacturers

1.2.3 MODBUS RTU Master/Slave Communication

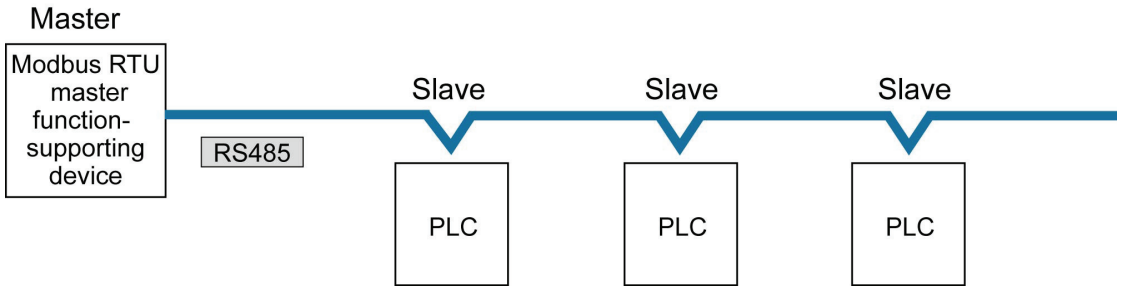
■ Overview of function

- This is used for communicating with other devices that support the MODBUS RTU protocol.
- In master communication, communication is performed when the master unit sends instructions (command messages) to slave units and the slave unit returns responses (response messages) according to the instructions. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV instructions.
- Slave communication is performed when the higher device connected to PLC has the sending right, and sends commands, and PLC returns responses. In slave communication, PLC responds automatically, so no program concerning communication is necessary on the PLC side.
- The data size that can be sent or received in a single communication is up to 127 words for register transmission and 2,040 bit for bit transmission.

Master function



Slave function



■ Examples of applications of MODBUS-RTU master communication

This is used for connection with a device that supports the MODBUS-RTU protocol.

- Thermoregulator KT series
- Devices from other manufacturers that support MODBUS-RTU

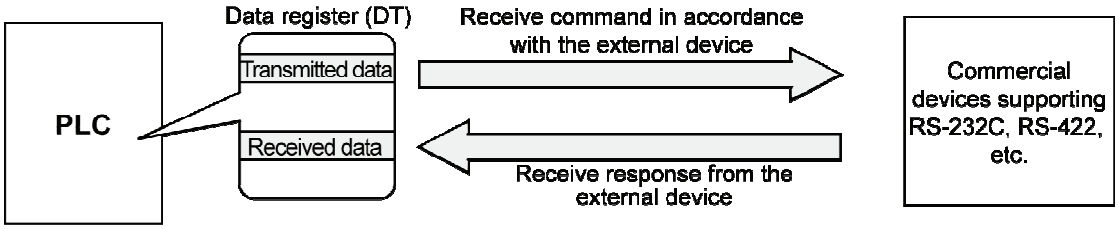
■ Examples of applications of MODBUS-RTU slave communication

This is used when access is made from the higher device using MODBUS-RTU commands.

1.2.4 General-Purpose Communication

■ Overview of function

- General-purpose communication is used when PLC executes communication in accordance with the protocol of the partner device.
- Formulation and sending of command messages to the partner device, and reception processing of responses from the partner device, are performed by the user program. Sending/receiving of data with an external device is executed via given operation memory (e.g. data register).
- Data are sent by converting commands in accordance with the partner device as strings into ASCII text, setting them into a given data register, and executing GPSEND instruction.
- Response received from the partner device is temporarily saved in the buffer. Based on the reception done flag, GPRECV instruction is executed. The ASCII strings can be converted into numerical data, etc. as necessary, by the user program.
- The data size that can be sent or received in a single communication is up to 4,096 bytes. (including control codes)



■ Applications of general-purpose communication

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

1.3 Restrictions on Units Combination

1.3.1 Restrictions on the Number of Installed Units

There are following restrictions depending on units to be used.

Unit type	Number of installed units	Remarks
Serial Communication Unit	Max. 8 units	

1.3.2 Restrictions on the Combination of Extension Cassettes (Communication Cassettes)

- One communication cassette can be attached to the CPU unit, and two communication cassettes to the serial communication unit.
- The FP7 communication cassette (Ethernet type) can be attached to the CPU only. It cannot be attached to the serial communication unit (SCU).

1.3.3 Restrictions on Communication Functions to be Used

There are the following restrictions on functions to be used when using the SCU or ET-LAN that is built in the CPU unit, or the serial communication unit (SCU).

Function to be used	Restrictions
PLC link function	Up to two communication ports can be used. For using two ports, allocate different link areas to them. CPU with built-in SCU (COM.1 port) Serial communication unit (COM.1 port)
MEWTOCOL-COM master MODBUS-RTU master	A maximum of 16 communication ports and the number of connections in combination can be used simultaneously. CPU with built-in SCU (COM.1 port to COM. 2 port) Serial communication unit (COM.1 port to COM.4 port) CPU with built-in ET-LAN (User connections 1 to 16)
MEWTOCOL-COM slave MEWTOCOL7-COM slave MODBUS-RTU slave	A maximum of 15 communication ports and the number of connections in combination can be used simultaneously. CPU with built-in SCU (COM.1 port to COM. 2 port) Serial communication unit (COM.1 port to COM.4 port) CPU with built-in ET-LAN (System connections 1 to 4 / User connections 1 to 16)
General-purpose communication	There is no restriction.

1.3.4 Unit to be Used and Applicable Versions of CPU Unit and FPWIN GR7

For using the unit, the following versions of CPU unit and FPWINGR7 are required.

Unit type	Applicable versions		Remarks
	CPU unit	FPWINGR7	
FP7 Serial Communication Unit	Ver.1.2 or later	Ver.1.3 or later	

1.3.5 Restrictions on Consumption Current

Including other units, the consumption current should be within the allowable capacity of a power supply unit.

■ **Unit's consumption current table (24 V)**

Product name			Model number	Consumption current (mA)
CPU Unit		196k steps, Built-in Ethernet function	AFP7CPS4E	200 mA or less
		120k steps, Built-in Ethernet function	AFP7CPS3E	200 mA or less
		120k steps, No Ethernet function	AFP7CPS3	200 mA or less
	When attaching Extension Cassette (Communication Cassette) to CPU Unit (Note 1) (Note 2)	RS-232C x 1ch	AFP7CCS1	35 mA or less
		RS-232C x 2ch	AFP7CCS2	60 mA or less
		RS-422 / 485 x 1ch	AFP7CCM1	60 mA or less
		RS-422 / 485 x 2h	AFP7CCM2	90 mA or less
		RS-232C x 1ch RS-422 / 485 x 1ch	AFP7CCS1M1	70 mA or less
		Ethernet	AFP7CCET	35 mA or less
Serial Communication Unit			AFP7NSC	50 mA or less
	When attaching Extension Cassette (Communication Cassette) to Serial Communication Unit (Note 1) (Note 2)	RS-232C x 1ch	AFP7CCS1	20 mA or less
		RS-232C x 2ch	AFP7CCS2	40 mA or less
		RS-422 / 485 x 1ch	AFP7CCM1	30 mA or less
		RS-422 / 485 x 2h	AFP7CCM2	60 mA or less
		RS-232C x 1ch RS-422 / 485 x 1ch	AFP7CCS1M1	50 mA or less

(Note 1) The consumption currents listed in the Extension Cassette column indicate the increased amount of the CPU's consumption current which increases when each extension cassette is added.

(Note 2) The consumption current of extension cassette (communication cassette) varies according to the unit to which the cassette is attached (CPU or serial communication unit).

◆ **REFERENCE**

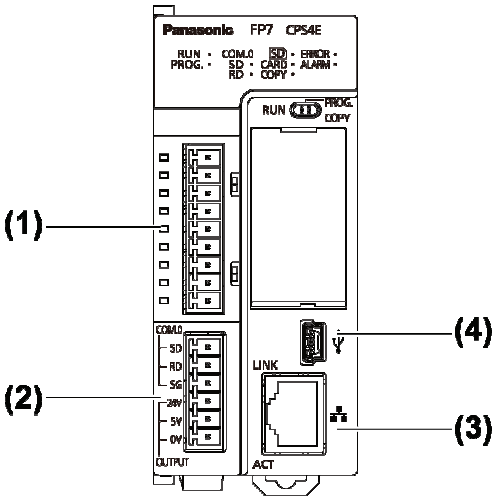
For information on the restrictions on the combination of units, also refer to FP7 CPU Unit User's Manual (Hardware).

2

Names and Functions of Parts

2.1 Names and Functions of Parts

2.1.1 Communication Port of CPU Unit



(In the above figure, a communication cassette is attached to the COM.1 and COM.2 ports.)

■ **Names and Functions of Parts**

(1) COM.1 and COM.2 ports

Attach a separately sold communication cassette to use these ports. A blank cover is fitted when the unit is shipped.

(2) COM.0 port, GT power supply terminals

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

(3) LAN port

This is equipped to a standard model of CPU unit. This is used for connection to Ethernet.

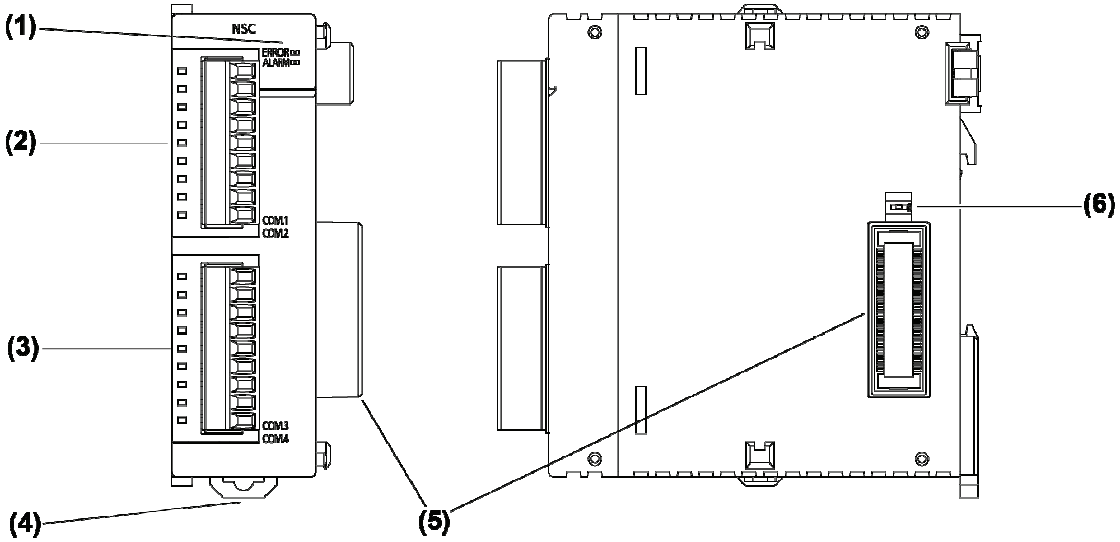
(4) USB port

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

◆ **REFERENCE**

- **For details of the communication method using LAN port, refer to FP7 CPU Unit User's Manual (LAN port communication).**
- **For details of the communication using Communication cassette (Ethernet type) AFP7CCET, refer to FP7 series User's Manual (Communication cassette Ethernet type).**

2.1.2 Parts Names and Functions of Serial Communication Unit



(In the above figure, two communication cassettes are attached.)

■ **Names and Functions of Parts**

(1) Operation monitor LEDs

Display	LED color	Description
-	Blue	Lights when the power supply of the CPU unit is on.
ERROR	Red	Lights when the configuration setting is incorrect, or a communication error occurs.
		Flashes when the factory acceptance test switch is on. (Flashing cycle: 100 ms)
		Flashes when an extension cassette that cannot be used is installed. (Flashing cycle: 500 ms)
ALARM	Red	Lights when an error occurs in hardware.

(2) COM.1 and COM.2 ports

Attach a separately sold communication cassette to use these ports. No blank cover is fitted when the unit is shipped.

(3) COM.3 and COM.4 ports

Attach a separately sold communication cassette to use these ports. A blank cover is fitted when the unit is shipped.

(4) DIN hook

This is used to fix the unit to a DIN rail.

(5) Unit connector

This is used to connect the internal circuit of an I/O unit or advanced unit.

(6) Factory acceptance test switch

This is used for factory acceptance test. Do not turn it on.

3

Wiring the COM. Port

3.1 Attaching a Communication Cassette

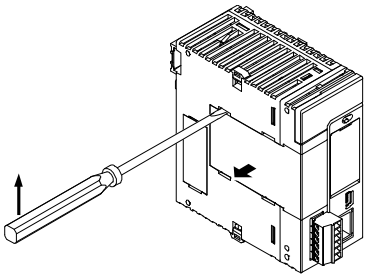
3.1.1 Attachment Instructions

When an optional Communication Cassette is to be used, attach it in the following procedures.

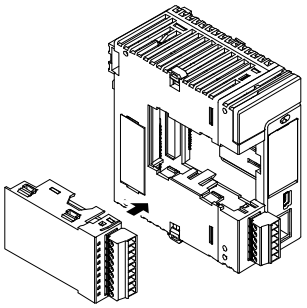
◆ **PROCEDURE**

1. Using a flathead screwdriver, remove the cover on the side of the CPU unit.

You will find four toggles.



2. Attach a desired Communication Cassette.

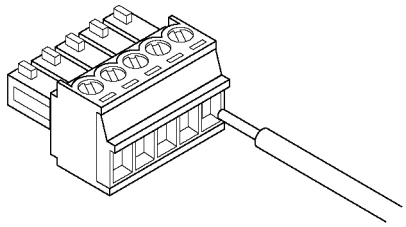


The illustration is the CPU unit. As for the Serial Communication Unit, the attachment procedure is the same.

3.2 Wiring of COM Port Terminal Block

3.2.1 Suitable Wires and Tools

A screw-down connection type for terminal block is used for the communication port. Use the following items for wiring.



■ **Suitable wires (strand wire)**

Size	Nominal cross-sectional area
AWG #28 to 16	0.08 mm^2 to 1.25 mm^2

■ **Pole terminal with a compatible insulation sleeve**

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

Manufacturer	Cross-sectional area	Size	Part no.	
			With insulating sleeve	Without insulating sleeve
Phoenix Contact	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
	0.75 mm^2	AWG #18	AI 0.75-6 GY	A 0.75-6
	1.00 mm^2	AWG #18	-	A 1-6

■ **Pressure welding tool for pole terminals**

Manufacturer	Model no.	
	Part no.	Product no.
Phoenix Contact	CRIMPFOX 6	1212034

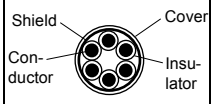
Screwdriver for terminal block

To tighten the terminals, use a screwdriver by Phoenix Contact (model No. SZS 0.4 x 2.5, product No. 1205037, blade size 0.4 x 2.5) or our screwdriver (part No. AFP0806). The tightening torque should be 0.22 to 0.25 N·m.

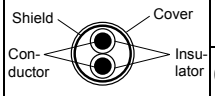
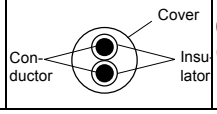
3.2.2 Applicable Cable

Use a cable as prescribed below.

■ **Suitable wires (strand wire): For RS-232C / RS-422 communication**

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

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

Classifi0cation	Cross-sectional view	Conductor		Insulator		Cable diam.	Sample appropriate cable
		Size	Resistance value (at 20°C)	Material	Thickness		
Shielded twisted pair		1.25 mm^2 (AWG16) or larger	Max. 16.8 Ω/km	Poly-ethylene	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 larger	Max. 33.4 Ω/km	Poly-ethylene	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 larger	Max. 25.1 Ω/km	Poly-chlorinated biphenyl	Max. 0.6 mm	Approx. 6.6 mm	VCTF0.75 mm^2 × 2C (JIS)

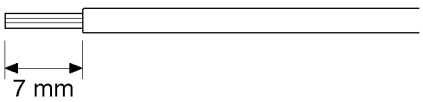
◆ **NOTES**

- **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, grounded one end.**

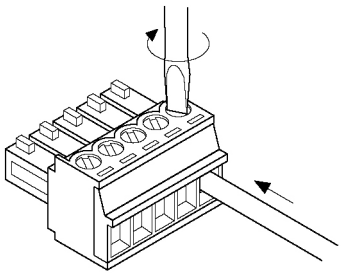
3.2.3 Wiring Method

■ **Wiring method**

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



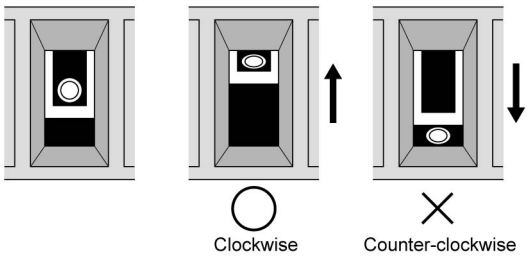
(2) Insert wire into terminal hole until it stops. Tighten screw clockwise to fix wire in place.
(The tightening torque: 0.22 to 0.25 N·m (2.3 to 2.5 kgf·cm))



■ **Precautions on wiring**

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 wires to connect them.
- Do not solder the 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.



3.3 Wiring for CPU Unit (GT Power Supply and COM0 Port)

3.3.1 Handling of GT Power Supply Terminals

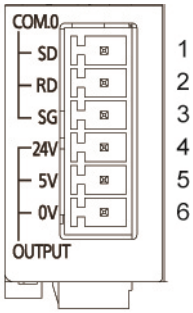
- GT power supply terminals can be used as power supply terminals for the GT series of our programmable displays.
- In accordance with the model to be used, use either 5V DC or 24V DC.

◆ **NOTES**

- **GT power supply terminals (5V DC / 24V DC) are design exclusively for the GT series of our programmable displays. Do not use the terminals for other devices.**
- **GT power supply terminals and COM0 port (RS-232C) are insulated inside.**

3.3.2 Terminal Layouts and Examples of Wiring

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

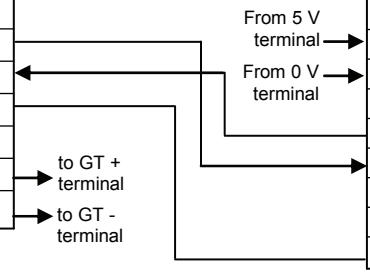


Terminal no.	Terminal part Symbol		Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	COM.0	SD	Sent data	PLC → External device	COM.0
2		RD	Received data	PLC ← External device	
3		SG	Signal Ground	-	
4	OUTPUT	24V	24V	-	-
5		5V	5V	-	
6		0V	0V	-	

■ Example of wiring (in the case of GT02 5V DC type)

FP7 CPU unit
COM.0 port terminal / GT power supply terminal

Terminal No.	Signal name	Terminal part symbol	
1	Sent Data	COM.0	SD
2	Received Data		RD
3	Signal Ground		SG
4	GT power supply		24V
5			5V
6		OUTPUT	0V



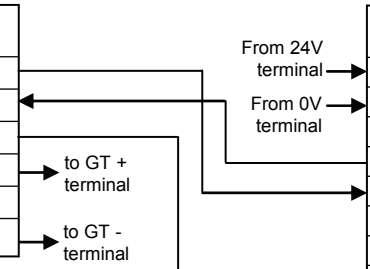
GT02 / GT02L series
5V DC type

Terminal part symbol	Signal name
+	5 V
-	0 V
⏚	Functional Ground
SD	Sent Data
RD	Received Data
RS	NC
CS	NC
SG	Signal Ground

■ Example of wiring (in the case of GT series 24V DC type)

FP7 CPU unit
COM.0 port terminal / GT power supply terminal

Terminal No.	Signal name	Terminal part symbol	
1	Sent Data	COM.0	SD
2	Received Data		RD
3	Signal Ground		SG
4	GT power supply		24V
5			5V
6		OUTPUT	0V



GT series
24V DC type

Terminal part symbol	Signal name
+	24V
-	0V
⏚	Functional Ground
SD	Sent Data
RD	Received Data
RS	NC
CS	NC
SG	Signal Ground

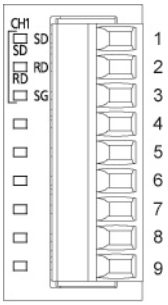
◆ NOTE

- **The terminal layout on the display side differs for the existing models GT01 series.**

3.4 Wiring for Communication Cassettes COM.1 to COM.4 Ports

3.4.1 Communication Cassette AFP7CCS1 (RS-232C, 1-Channel Insulated Type)

■ Terminal layout



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	SD	SD: Sent Data	PLC → External device	COM.1
2	RD	RD	RD: Received Data	PLC ← External device	
3	-	SG	SG: Signal Ground	-	
4 - 9	-	-	-	-	-

(Note) Do not connect anything to Terminals No.4 through No.9.

■ Example of wiring

AFP7CCS1

Terminal No.	Terminal part symbol	Signal name	Functions
1	SD	Sent Data 1	SD
2	RD	Received Data 1	RD
3	SG	Signal Ground	SG

Partner

Symbol	Signal name
RD	Received Data
SD	Sent Data
SG	Signal Ground

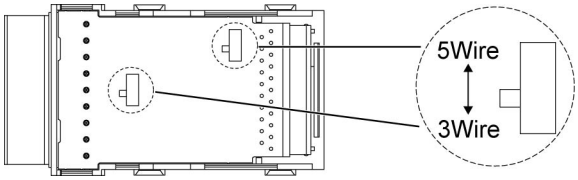
3.4.2 Communication Cassette AFP7CCS2 (RS-232C, 2-channel insulated type)

■ Setting of Application Switch

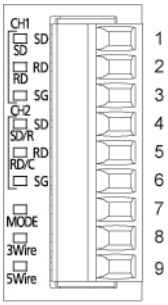
Applications for use can be switched using a switch on the backplane for Communication Cassette AFP7CCS2. Settings can be confirmed with LED lamps at the front of the cassette.

3-wire 2-channel RS-232C

5-wire 1-channel RS-232C (RS/CS controlled)



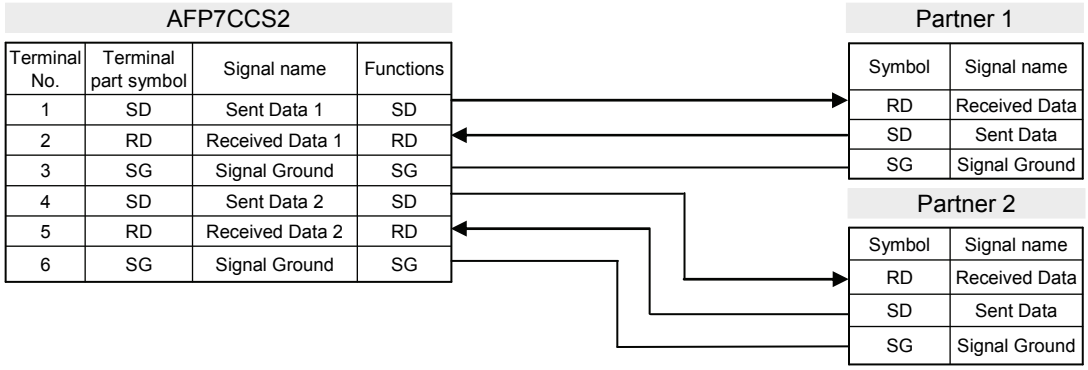
■ Terminal layout (in the setting of 3-wire 2-channel RS-232C)



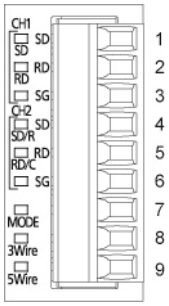
Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	SD	SD: Sent Data	PLC → External device	COM.1
2	RD	RD	RD: Received Data	PLC ← External device	
3	-	SG	SG: Signal Ground	-	
4	CH2 SD / R	SD	SD: Sent Data	PLC → External device	COM.2
5	RD / C	RD	RD: Received Data	PLC ← External device	
6	-	SG	SG: Signal Ground	-	
7	MODE	-	-	-	-
8	3-Wire	-	-	-	-
9	5-Wire	-	-	-	-

(Note 1) Route between CH1 and CH2 are insulated inside.
(Note 2) Do not connect anything to Terminals No.7 through No.9.

■ Example of wiring (in the setting of 3-wire 2-channel RS-232C)



■ Terminal layout (in the setting of 5-wire 1-channel RS-232C RS/CS controlled)



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	SD	SD: Sent Data	PLC → External device	COM.1
2	RD	RD	RD: Received Data	PLC ← External device	
3	-	SG	SG: Signal Ground	-	
4	CH2 SD / R	SD	RS: Request to Send	PLC → External device	
5	RD / C	RD	CS: Clear to Send	PLC ← External device	
6	-	SG	-	-	-
7	MODE	-	-	-	-
8	3-Wire	-	-	-	-
9	5-Wire	-	-	-	-

(Note) Do not connect anything to Terminals No.6 through No.9.

■ Example of wiring (in the setting of 5-wire 1-channel RS-232C RS/CS controlled)

AFP7CCS2

Terminal No.	Terminal part symbol	Signal name	Functions
1	SD	Sent Data	SD
2	RD	Received Data	RD
3	SG	Signal Ground	SG
4	SD	Request to Send	RS
5	RD	Clear to Send	CS

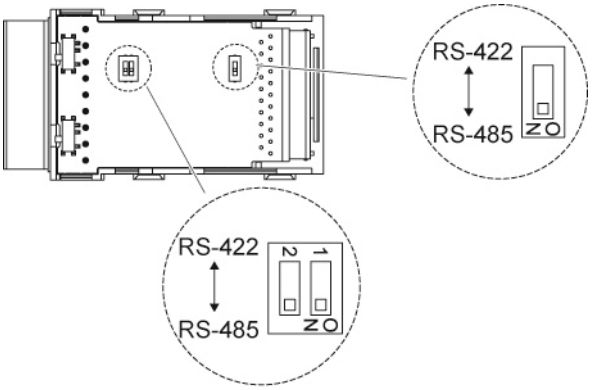
Partner

Symbol	Signal name
RD	Received Data
SD	Sent Data
SG	Signal Ground
RS	Request to Send
CS	Clear to Send

3.4.3 Communication Cassette AFP7CCM1 (RS-422 / RS-485, 1-Channel Insulated Type)

■ Setting of application switch

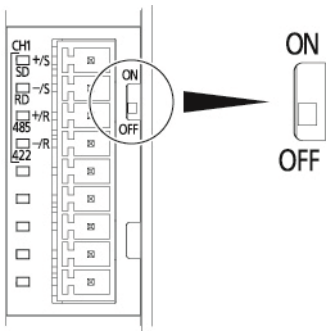
Applications for use can be switched using a switch on the backplane for Communication Cassette AFP7CCM1. Settings can be confirmed with LED lamps at the front of the cassette.



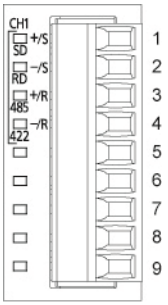
■ Settings for termination resistance selector switch

On the surface of Communication Cassette AFP7CCM2 is located a termination resistance selector switch.

- When RS-422 is used: Turn ON the switch.
- When RS-485 is used: Turn ON the switch only when it is the end unit.



■ Terminal layout (in the setting of RS-485)



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	+ / S	Transmission line (+)	-	COM.1
2	RD	- / S	Transmission line (-)	-	
3	485	+ / R	Transmission line (+)	-	
4	422	- / R	Transmission line (-)	-	
5 - 9	-	-	-	-	-

(Note 1) In the setting of RS-485, Terminal No.1 and Terminal No.3, and Terminal No.2 and Terminal No.4 are respectively connected inside. They can be used as terminals for crossover wiring for the transmission cable.

(Note 2) Do not connect anything to Terminals No.5 through No.9.

■ Example of wiring (in the setting of RS-485)

AFP7CCM1

Terminal No.	Terminal part symbol	Signal name	Functions
1	+ / S	Transmission line (+)	+
2	- / S	Transmission line (-)	-
3	+ / R	Transmission line (+)	+
4	- / R	Transmission line (-)	-

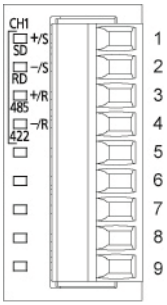
Partner 1

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

Partner 2

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

■ Terminal layout (in the setting of RS-422)



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	+ / S	Sent Data (+)	PLC → External device	COM.1
2	RD	- / S	Sent Data (-)	PLC → External device	
3	485	+ / R	Received Data (+)	PLC ← External device	
4	422	- / R	Received Data (-)	PLC ← External device	
5 - 9	-	-	-	-	-

(Note) Do not connect anything to Terminals No.5 through No.9.

■ Example of wiring (in the setting of RS-422)

AFP7CCM1

Terminal No.	Terminal part symbol	Signal name	Functions
1	+ / S	Sent Data (+)	SD (+)
2	- / S	Sent Data (-)	SD (-)
3	+ / R	Received Data (+)	RD (+)
4	- / R	Received Data (-)	RD (-)

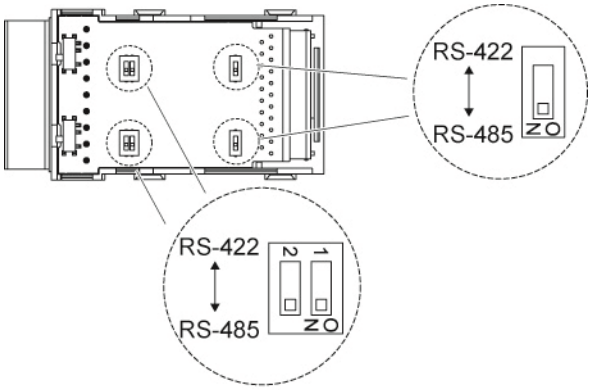
Partner

Terminal	Signal name
RD (+)	Received Data (+)
RD (-)	Received Data (-)
SD (+)	Sent Data (+)
SD (-)	Sent Data (-)

3.4.4 Communication Cassette AFP7CCM2 (RS-422 / RS-485, 2-Channel Insulated Type)

■ Setting of application switch

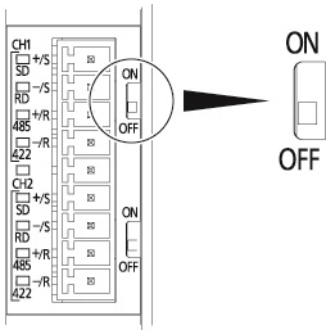
Applications for use can be switched using a switch on the backplane for Communication Cassette AFP7CCM2. Settings can be confirmed with LED lamps at the front of the cassette.



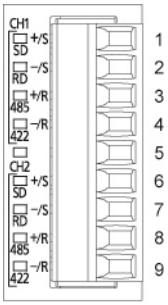
■ Settings for termination resistance selector switch

On the surface of Communication Cassette AFP7CCM2 is located a termination resistance selector switch.

- When RS-422 is used: Turn ON the switch.
- When RS-485 is used: Turn ON the switch only when it is the end unit.



■ Terminal layout (in the setting of RS-485)



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	+ / S	Transmission line (+)	-	COM.1
2	RD	- / S	Transmission line (-)	-	
3	485	+ / R	Transmission line (+)	-	
4	422	- / R	Transmission line (-)	-	
5	-	-	-	-	-
6	CH2 SD	+ / S	Transmission line (+)	-	COM.2
7	RD	- / S	Transmission line (-)	-	
8	485	+ / R	Transmission line (+)	-	
9	422	- / R	Transmission line (-)	-	

(Note 1) In the setting of RS-485, Terminal No.1 and Terminal No.3, and Terminal No.2 and Terminal No.4 are respectively connected inside. They can be used as terminals for crossover wiring for the transmission cable.

(Note 2) In the setting of RS-485, Terminal No.6 and Terminal No.8, and Terminal No.7 and Terminal No.9 are respectively connected inside. They can be used as terminals for crossover wiring for the transmission cable.

(Note 3) Do not connect anything to Terminal No.5.

(Note 4) Route between CH1 and CH2 are insulated inside.

■ Example of wiring (in the setting of RS-485)

AFP7CCM2

Terminal No.	Terminal part symbol	Signal name	Functions
1	+ / S	Transmission line 1 (+)	+
2	- / S	Transmission line 1 (-)	-
3	+ / R	Transmission line 1 (+)	+
4	- / R	Transmission line 1 (-)	-
5	—	NC	NC
6	+ / S	Transmission line 2 (+)	+
7	- / S	Transmission line 2 (-)	-
8	+ / R	Transmission line 2 (+)	+
9	- / R	Transmission line 2 (-)	-

Transmission line 1 Partner 1

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

Transmission line 1 Partner 2

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

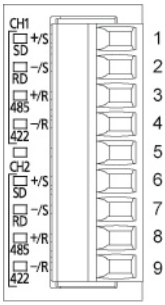
Transmission line 2 Partner 1

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

Transmission line 2 Partner 2

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

■ Terminal layout (in the setting of RS-422)



Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	+ / S	Sent Data (+)	PLC → External device	COM.1
2	RD	- / S	Sent Data (-)	PLC → External device	
3	485	+ / R	Received Data (+)	PLC ← External device	
4	422	- / R	Received Data (-)	PLC ← External device	
5	-	-	-	-	-
6	CH2 SD	+ / S	Sent Data (+)	PLC → External device	COM.2
7	RD	- / S	Sent Data (-)	PLC → External device	
8	485	+ / R	Received Data (+)	PLC ← External device	
9	422	- / R	Received Data (-)	PLC ← External device	

(Note 1) Do not connect anything to Terminal No.5.
(Note 2) Route between CH1 and CH2 are insulated inside.

■ Example of wiring (in the setting of RS-422)

AFP7CCM2

Terminal No.	Terminal part symbol	Signal name	Functions
1	+ / S	Sent Data 1 (+)	SD (+)
2	- / S	Sent Data 1 (-)	SD (-)
3	+ / R	Received Data 1 (+)	RD (+)
4	- / R	Received Data 1 (-)	RD (-)
5	—		
6	+ / S	Sent Data 2 (+)	SD (+)
7	- / S	Sent Data 2 (-)	SD (-)
8	+ / R	Received Data 2 (+)	RD (+)
9	- / R	Received Data 2 (-)	RD (-)

Partner 1

Terminal	Signal name
RD (+)	Received Data (+)
RD (-)	Received Data (-)
SD (+)	Sent Data (+)
SD (-)	Sent Data (-)

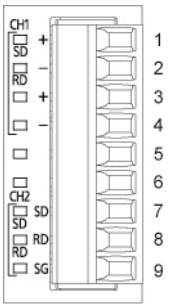
Partner 2

Terminal	Signal name
RD (+)	Received Data (+)
RD (-)	Received Data (-)
SD (+)	Sent Data (+)
SD (-)	Sent Data (-)

3.4.5 Communication Cassette AFP7CCS1M1 (RS-232C 1-Channel + RS-485 1-Channel Insulated Type)

■ **Settings for termination resistance selector switch**

A termination resistance selector switch is located on the RS-485 side of the surface of Communication Cassette AFP7CCS1M1. Turn ON the switch only when it is the end unit.



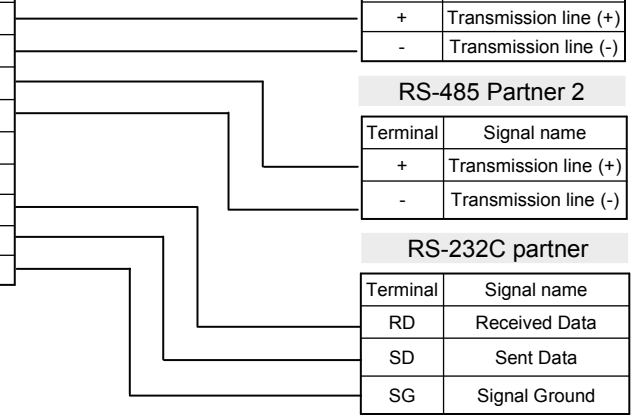
Terminal no.	LED part Symbol	Terminal part Symbol	Functions that can be allocated	Signal direction	Ports that can be allocated in the software
1	CH1 SD	+	Transmission line (+)	-	COM.1
2	RD	-	Transmission line (-)	-	
3		+	Transmission line (+)	-	
4		-	Transmission line (-)	-	
5 - 6	-	-	-	-	-
7	CH2 SD	SD	Sent data	-	COM.2
8	RD	RD	Received data	-	
9	SG	SG	Signal ground	-	

(Note 1) Terminal No.1 and Terminal No.3, and Terminal No.2 and Terminal No.4 are respectively connected inside.
(Note 2) Do not connect anything to Terminals No.5 and No.6.

■ Example of wiring

AFP7CCS1M1

Terminal No.	Terminal part symbol	Signal name	Functions
1	+ / S	Transmission line (+)	+
2	- / S	Transmission line (-)	-
3	+ / R	Transmission line (+)	+
4	- / R	Transmission line (-)	-
5	—	NC	NC
6	—	NC	NC
7	SD	Sent Data	SD
8	RD	Received Data	RD
9	SG	Signal Ground	SG



RS-485 Partner 1

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

RS-485 Partner 2

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

RS-232C partner

Terminal	Signal name
RD	Received Data
SD	Sent Data
SG	Signal Ground

3
I/O Allocation

4.1 Input/Output Signals Used for Communication

4.1.1 I/O Allocation of CPU Unit

■ **Input signal**

Input signal	Communication port	Name	Description	Effective operation mode
X0	For COM.1 Port	General-purpose communication Reception done flag	When the unit completes the data reception, it turns on (1). Waiting for data reception: 0, Reception completed: 1	General-purpose communication
X1	For COM.2 Port			
X2	For COM.0 Port			
X3	-	Not used	Do not use this.	
X4	For COM.1 Port	General-purpose communication Reception done (copy) flag	It turns on (1) if there are copied data when GPRECV instruction is executed. It turns off (0) when END instruction is executed. (Note 1) Reading completed: 1 No data to be read: 0	General-purpose communication
X5	For COM.2 Port			
X6	For COM.0 Port			
X7	-	Not used	Do not use this.	
X8	For COM.1 Port	General-purpose communication Clear to send flag	It turns on (1) when the unit is set to the general-purpose communication mode. It turns off (0) in other modes.	General-purpose communication
X9	For COM.2 Port			
XA	For COM.0 Port			
XB	-	Not used	Do not use this.	
XC	For COM.1 Port	Master communication Clear to send flag	It turns on (1) when the unit is set to modes other than the PLC link mode or general-purpose communication mode. It turns off (0) in other modes.	MEWTOCOL MODBUS-RTU
XD	For COM.2 Port			
XE	For COM.0 Port			
XF	-	Not used	Do not use this.	
X10	For COM.1 Port	Reset done	When the communication channel is reset under the output Y10 - Y12, the flag is turned on (1) once the resetting operation is completed. Resetting done: 1 Y10 - Y12 is off: 0	General-purpose communication
X11	For COM.2 Port			
X12	For COM.0 Port			
X13	-	Not used	Do not use this.	
X14	For COM.1 Port	CTS signal monitor	Status of the CTS signal sent from the device communicating with. Clear to send from COM.1 port = 0 Cannot send from COM.1 port = 1 The RTS signal can be controlled with Y14.	When RS/CS is set to valid in Communication Block COM.1.
X15 - X1F	-	Not used	Do not use this.	

(Note 1) The general-purpose communication reception done (copy) flag is effective after the execution of the RECV instruction until one of the following instructions is executed. This flag does not remain ON across several scans. Execute 1: END instruction (scan header), and 2: RECV instruction

■ Output signal

Output signal	Communication port	Name	Description	Effective operation mode
Y0	For COM.1 Port	Sending done result	Reports the results of sending in master communication or general-purpose communication. Normal completion: 0, Abnormal completion: 1	MEWTOCOL MODBUS-RTU General-purpose communication
Y1	For COM.2 Port			
Y2	For COM.0 Port			
Y3 - Y7	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	
Y8	For COM.1 Port	General-purpose communication Sending active flag	It turns on (1) during sending in the general-purpose communication mode. （Note 1） Sending done: 0, Sending: 1	General-purpose communication
Y9	For COM.2 Port			
YA	For COM.0 Port			
YB	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	
YC	For COM.1 Port	Master communication Sending active flag	It turns on (1) during sending in the master communication mode. Sending done: 0, Sending: 1	MEWTOCOL MODBUS-RTU
YD	For COM.2 Port			
YE	For COM.0 Port			
YF	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	
Y10	For COM.1 Port	Request to reset CH	By turning on (1) Y10 - Y12, the communication channel can be reset. Without a request to reset = 0, With a request to reset = 1 After ON (1) is output and the completion of the reset is confirmed by X10 - X12, return to OFF (0). The reset is performed only once when this signal rises. This function can be used to delete unnecessary received data or to clear errors before starting normal reception. 1:Sending canceled 2:Reception canceled 3:Re-set communication parameters 4:Clear error information (only for errors that can be cleared)	General-purpose communication
Y11	For COM.2 Port			
Y12	For COM.0 Port			
Y13	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	
Y14	For COM.1 Port	Output RTS signal	By turning on (1) this output, RTS is controlled. Transmission from the device communicating with is permitted = 0 Transmission from the device communicating with is prohibited = 1 Monitor the CTS signal from the device communicating with using X14.	When RS/CS is set to valid in Communication Cassette COM.1
Y15 - Y1F	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	-

(Note 1) When transmission is completed within one scan, it turns off when the GPSEND instruction is executed in the subsequent scan.

◆ **NOTE**

- **Each contact in the table above is used for reading the operation status. Do not write over it with a user program. (excluding Y10 - Y12 and Y14)**

4.1.2 I/O Allocation of Serial Communication Unit

■ Input signal

Input signal	Communication port	Name	Description	Effective operation mode
X0	For COM.1 Port	General-purpose communication Reception done flag	When the unit completes the data reception, it turns on (1). Waiting for data reception: 0, Reception completed: 1	General-purpose communication
X1	For COM.2 Port			
X2	For COM.3 Port			
X3	For COM.4 Port			
X4	For COM.1 Port	General-purpose communication Reception done (copy) flag	It turns on (1) if there are copied data when GPRECV instruction is executed. It turns off (0) when END instruction is executed. (Note 1) Reading completed: 1 No data to be read: 0	General-purpose communication
X5	For COM.2 Port			
X6	For COM.3 Port			
X7	For COM.4 Port			
X8	For COM.1 Port	General-purpose communication Clear to send flag	It turns on (1) when the unit is set to the general-purpose communication mode. It turns off (0) in other modes.	General-purpose communication
X9	For COM.2 Port			
XA	For COM.3 Port			
XB	For COM.4 Port			
XC	For COM.1 Port	Master communication Clear to send flag	It turns on (1) when the unit is set to modes other than the PLC link mode or general-purpose communication mode. It turns off (0) in other modes.	MEWTOCOL MODBUS-RTU
XD	For COM.2 Port			
XE	For COM.3 Port			
XF	For COM.4 Port			
X10	For COM.1 Port	Reset done	When the communication channel is reset under the output Y10 - Y13, the flag is turned on (1) once the resetting operation is completed. Resetting done: 1 Y10 - Y12 is off: 0	General-purpose communication
X11	For COM.2 Port			
X12	For COM.3 Port			
X13	For COM.4 Port			
X14	For COM.1 Port	CTS signal monitor	Status of the CTS signal sent from the device communicating with. Clear to send from COM.1/COM.3 port = 0 Cannot send from COM.1/COM.3 port = 1 The RTS signal can be controlled with Y14/Y16.	When RS/CS is set to valid in Communication Cassette COM.1/COM.3
X16	For COM.3 Port			
X15, X17 - X1F	-	Not used	Do not use this.	

(Note 1) The general-purpose communication reception done (copy) flag is effective after the execution of the RECV instruction until one of the following instructions is executed. This flag does not remain ON across several scans. Execute 1: END instruction (scan header), and 2: RECV instruction

(Note 2): The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the general-purpose communication reception done flag for COM.1 port is X100.

■ Output signal

Output signal	Communication port	Name	Description	Effective operation mode
Y0	For COM.1 Port	Sending done result	Reports the results of sending in master communication or general-purpose communication. Normal completion: 0, Abnormal completion: 1	MEWTOCOL MODBUS-RTU General-purpose communication
Y1	For COM.2 Port			
Y2	For COM.3 Port			
Y3	For COM.4 Port			
Y4 - Y7	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	
Y8	For COM.1 Port	General-purpose communication Sending active flag	It turns on (1) during sending in the general-purpose communication mode. (Note 1) Sending done: 0, Sending: 1	General-purpose communication
Y9	For COM.2 Port			
YA	For COM.3 Port			
YB	For COM.4 Port			
YC	For COM.1 Port	Master communication Sending active flag	It turns on (1) during sending in the master communication mode. Sending done: 0, Sending: 1	MEWTOCOL MODBUS-RTU
YD	For COM.2 Port			
YE	For COM.3 Port			
YF	For COM.4 Port			
Y10	For COM.1 Port	Request to reset CH	By turning on (1) Y10 - Y13, the communication channel can be reset. Without a request to reset = 0, With a request to reset = 1 After ON (1) is output and the completion of the reset is confirmed by X10 - X13, return to OFF (0). The reset is performed only once when this signal rises. This function can be used to delete unnecessary received data or to clear errors before starting normal reception. 1:Sending canceled 2:Reception canceled 3:Re-set communication parameters 4:Clear error information (only for errors that can be cleared)	General-purpose communication
Y11	For COM.2 Port			
Y12	For COM.3 Port			
Y13	For COM.4 Port			
Y14	For COM.1 Port	Output RTS signal	By turning on (1) this output, RTS is controlled. Transmission from the device communicating with is permitted = 0 Transmission from the device communicating with is prohibited = 1 Monitors the CTS signal from the device communicating with using X14/X16.	When RS/CS is set to valid in Communication Cassette COM.1/COM.3
Y16	For COM.3 Port			
Y15	-	Undefined	Do not turn on "undefined". (Default setting is 0.)	-
Y17 - Y1F				

(Note 1) When transmission is completed within one scan, it turns off when the GPSEND instruction is executed in the subsequent scan.

(Note 2): The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the sending done result flag for COM.1 port is Y100.

◆ **NOTE**

- **Each contact in the table above is used for reading the operation status. Do not write over it with a user program. (excluding Y10 - Y14 and Y16)**

4.2 Registration in I/O Map

4.2.1 Settings Using FPWIN GR7 (For CPU with built-in SCU)

- For the CPU with built-in SCU, there is no need to set with FPWIN GR7 because the following fixed areas are allocated.

Unit type		Model number	No. of occupied words (No. of occupied points)	
			Input	Output
CPU Unit	CPU with built-in SCU	Common	2 words (32 points) WX0 - WX1 Fixed	2 words (32 points) WY0 - WY1 Fixed

4.2.2 Settings Using FPWIN GR7 (For Serial Communication Unit)

The explanation below shows the case that the serial communication unit is registered in the slot number 1.

◆ **PROCEDURE**

1. Select "Options" > "FP7 Configuration" in the menu bar.

The "FP7 Configuration" dialog box appears.

2. Select "I/O map" in the left pane.

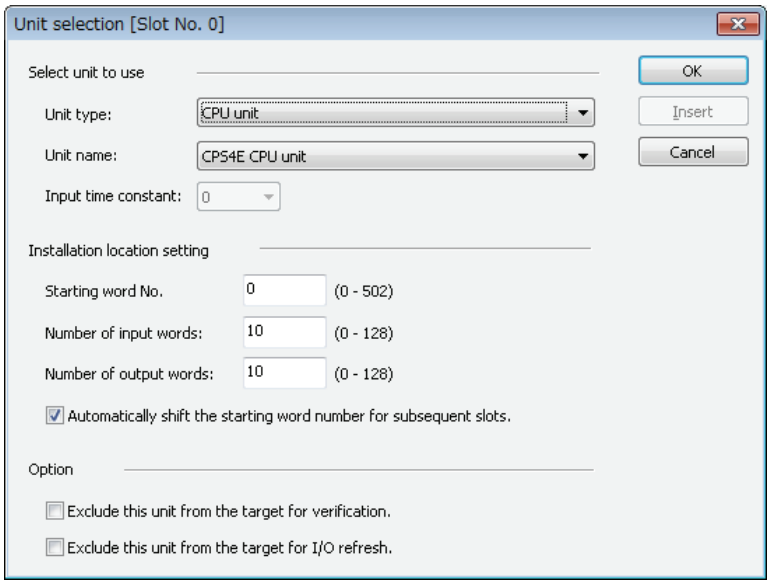
The "I/O map" dialog box is displayed.

3. Double-click Slot No. 0.

The "Unit selection [Slot No. 0]" dialog box is displayed.

4. Select "CPU unit" for Unit type, and select a CPU unit used for Unit name, and press [OK] button.

The CPU unit is registered. Only CPU unit can be registered in Slot No. 0. Slot No.1 and subsequent numbers cannot be set unless Slot No. 0 is set.

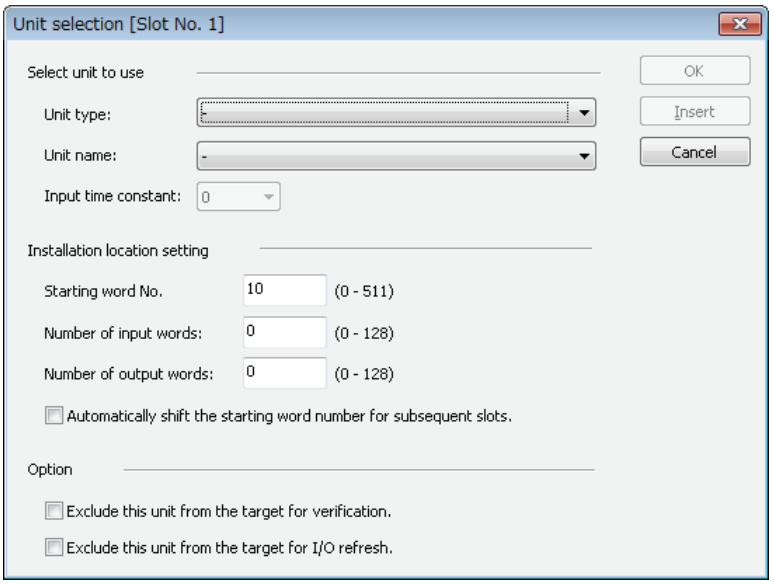


5. Double-click Slot No. 1 in the "I/O map" dialog box.

The "Unit selection [Slot No. 1]" dialog box is displayed.

6. Select "Communications" for Unit type, and select "SCU unit" for Unit name, and press [OK] button.

"SCU unit" is registered in the I/O map.



The set conditions are reflected in the project being edited.

5

Setting and Confirming Communication Conditions

5.1 Setting Applications and Communication Conditions

5.1.1 Applications to be Set for Each Port

■ **Available functions for each communication port**

Communication function to be used		Allocated communication port				
		COM.0	COM.1	COM.2	COM.3	COM.4
PLC link			●			
MEWTOCOL7－COM (Note 1) MEWTOCOL－COM	Master	●	●	●	●	●
	Slave	●	●	●	●	●
MODBUS-RTU	Master	●	●	●	●	●
	Slave	●	●	●	●	●
General-purpose communication		●	●	●	●	●

(Note 1) In MEWTOCOL7-COM, there is no master communication function.

5.1.2 Conditions to be Set for Each Port

■ **Communication condition**

Communication port		Setting range	Default
Station no.		1 - 99 (MEWTOCOL-COM) 1 - 999 (MEWTOCOL7-COM) 1 - 247 (MODBUS-RTU)	1
Baud rate		300,600,1200,2400,4800,9600,19200,38400,57600,115200,230400	9600
Communication format	Data length	7 bits, 8 bits	8 bits
	Parity	None, Odd, Even	Odd
	Stop bit	1 bit, 2 bits	1 bit
	End code	CR, CR+LF, ETX , or time (0.01 ms – 100 ms, by the unit of 0.01 ms)	CR
	Start code	With STX, Without STX	Without STX
RS/CS controlled		No/Yes	Invalid
Send Waiting		0 to 100 ms	0 ms
Modem initialization		Invalid, Valid, Re-initialization	Invalid

(Note) Communication conditions that can be set vary by the mode to be used (PLC link, MEWTOCOL communication, MODBUS-RTU, general-purpose communication).

5.2 Setting Communication Conditions

5.2.1 Settings Using FPWIN GR7 (For CPU with built-in SCU)

Applications and communication conditions for each communication port should be set using the tool software FPWIN GR7.

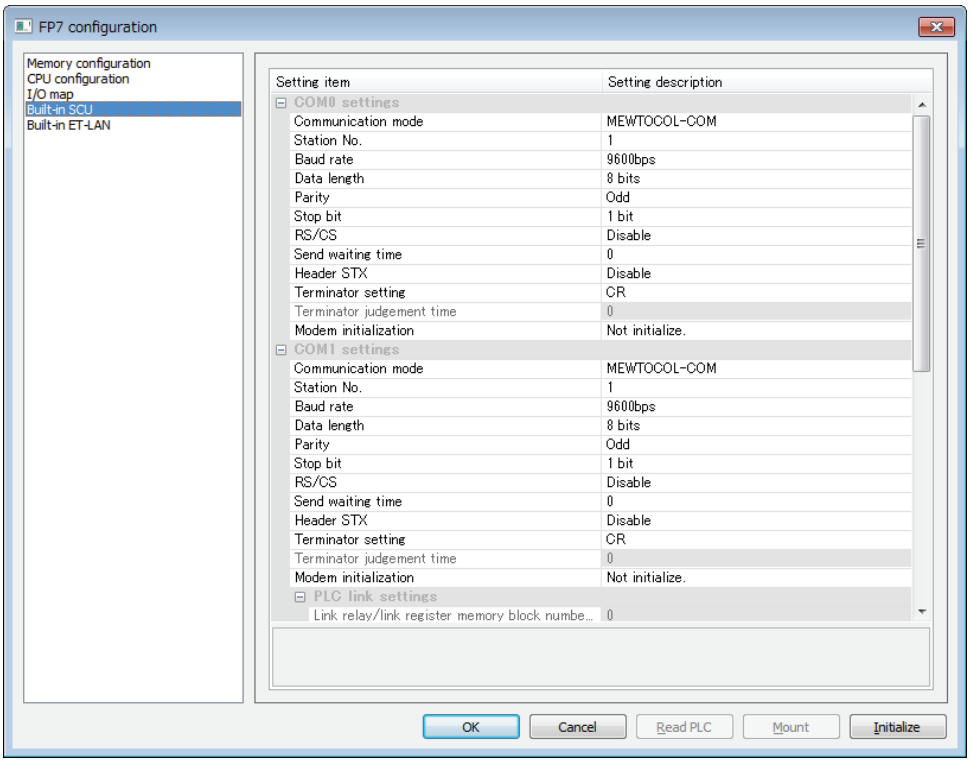
◆ **PROCEDURE**

1. From the menu bar, select "Option" > "FP7 Configuration".

The "FP7 Configuration" dialog box opens.

2. Select "Built-in SCU".

Setting items for "Built-in SCU" appear.



3. Specify communication conditions and press [OK] button.

Set conditions are incorporated into the project that is being edited.

5.2.2 Settings Using FPWIN GR7 (For Serial Communication Unit)

- Applications and communication conditions for each communication port should be set using the tool software FPWIN GR7.
- The explanation below shows the case that the serial communication unit is registered in the slot number 1.

◆ **PROCEDURE**

1. Select "Options" > "FP7 Configuration" in the menu bar.

The "FP7 Configuration" dialog box appears.

2. Select "I/O map" in the left pane.

The "I/O map" dialog box is displayed.

3. Select the Slot No. in which SCU unit is registered in the "I/O map" dialog box, and press the "Advanced" button.

The "SCU Unit Settings" dialog box is displayed.

4. Select COM No. in the left pane.

Setting items available for each COM. number are displayed.

5. Set communication conditions, and press [OK] button.

The set conditions are reflected in the project being edited.

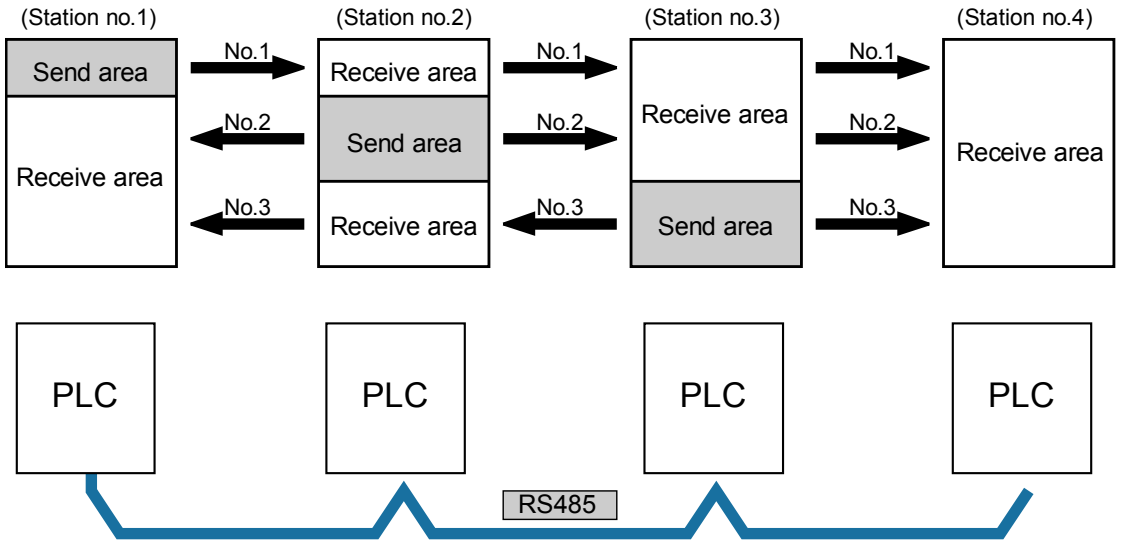
6

PLC Link

6.1 Operation of PLC link MEWNET-W0

6.1.1 Overview of PLC Link Operation

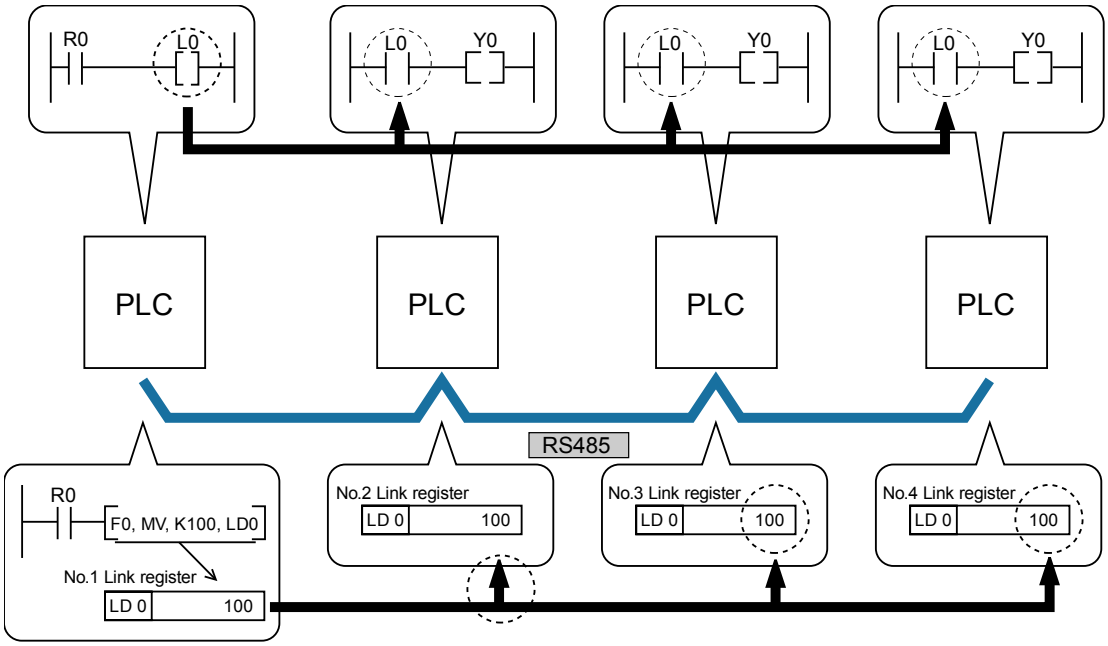
- "Link relays (L)" and data registers "link registers (LD)" are shared between the connected PLCs.
- If the link relay contact for one PLC goes on, the same link relay also goes on in each of the other PLCs connected to the network.
- Likewise, if the contents of a link register are rewritten in one PLC, the change is made in the same link register of each of the other PLCs connected to the network.



6.1.2 Operation of Link Relays and Link Registers

■ Link relay

If the link relay L0 in unit No.1 is turned on, the status change is fed back to the link relay L0 with the same number in other units, and R0 in the other units is output.



■ Link register

If the constant 100 is written into LD0 of the source station no.1, LD0 of the other station no.2 is also changed to the constant 100.

6.2 Configuration Required for PLC Link

6.2.1 Setup Procedure (For CPU with built-in SCU)

- In order to use the PLC link function, setting of communication conditions and allocation of memories are required.
- Settings should be performed by the programming tool FPWIN GR7.

◆ PROCEDURE

1. From the menu bar, select "Option" > "FP7 Configuration".

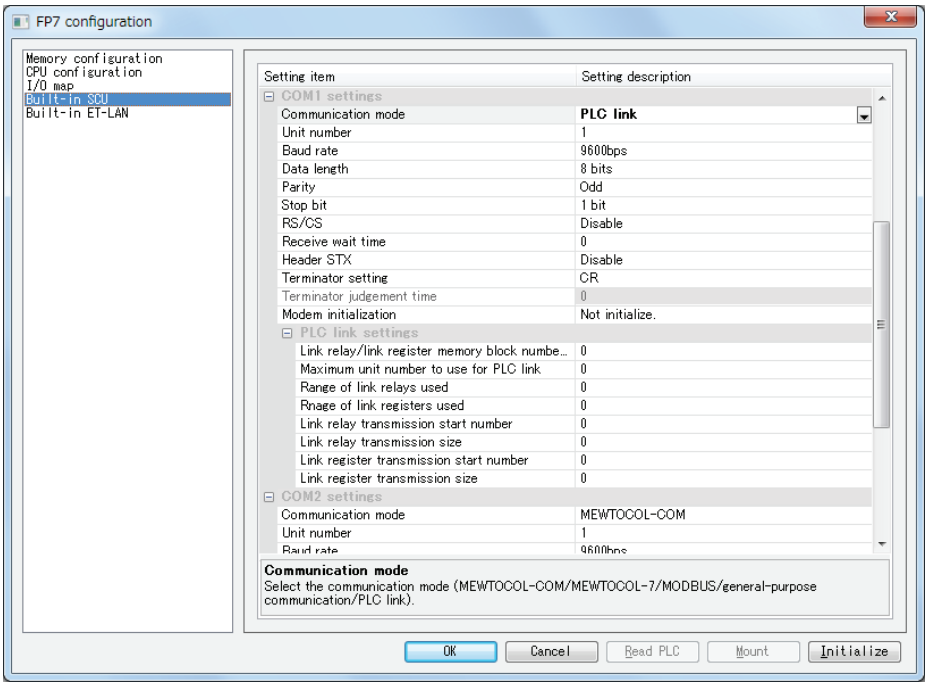
The "FP7 Configuration" dialog box appears.

2. From the left pane of the dialog box, select "Built-in SCU".

Setting items for each COM port are displayed.

3. Select "PLC link" from "Communication mode" in setting items under "COM1 settings".

Setting items for PLC link become valid.



4. Specify conditions to be allocated to each setting item for "Station no." and "PLC link settings" under "COM1 settings", and press [OK] button.

The settings are registered in the project.

6.2.2 Setup Procedure (For Serial Communication Unit)

- In order to use the PLC link function, setting of communication conditions and allocation of memories are required.
- Settings should be performed by the programming tool FPWIN GR7.
- The following procedure describes the case that the serial communication unit has been already registered in the I/O map.

◆ PROCEDURE

1. Select "Options" > "FP7 Configuration" in the menu bar.

The "FP7 Configuration" dialog box appears.

2. From the left pane of the dialog box, select “I/O map”.

The "I/O map" dialog box is displayed.

3. Select a unit used for PLC link, and press [Advanced] button.

The "SCU Unit Settings" dialog box is displayed.

4. Select "COM.1 settings" from the left pane, and select "PLC link" in "Communication mode".

差し替え

5. Set conditions assigned to each item in "PLC link settings", and press [OK] button.

The settings are registered in the project.

◆ REFERENCE

For details of PLC link settings, please see explanation on the next page onward.

6.2.3 List of Setting Items

■ **List of setting items (COM1 settings)**

Setting items	Settings when the PLC link function is used	Remark
Communication mode	PLC link	
Station no.	1 - 16	Set a specific station no. for PLC to be connected to the PLC link.
Baud rate	115200 bps	
Data length	8 bit	Regardless of settings in FPWIN GR7, the FP7 CPU unit itself performs automatic settings.
Parity	Odd	
Stop bit	1 bit	
RS/CS	Invalid	
Send waiting time	0	
Start code STX	Invalid	
Terminator setting	CR	
Terminator judgment time	0	
Modem initialization	Do not initialize	

■ **List of setting items (PLC link settings)**

Setting items	Setting range	Setting method
Memory block numbers for link relays and link registers to be used	0 or 1	Specify the device No. range for link relays and link registers to be used in a block.
Maximum station no. to be used for PLC link	0 to 16	Set the Max. station no. for PLC to be connected to the PLC link.
Range of link relays used	0 to 64 words	Specify the device No. range for link relays and link registers to be used.
Range of link registers used	0 to 128 words	
Starting no. for link relay send area	0 to 63	
Size of link relay send area	0 to 64 words	
Starting No. for link register send area	0 to 127	
Size of link register send area	0 to 127 words	

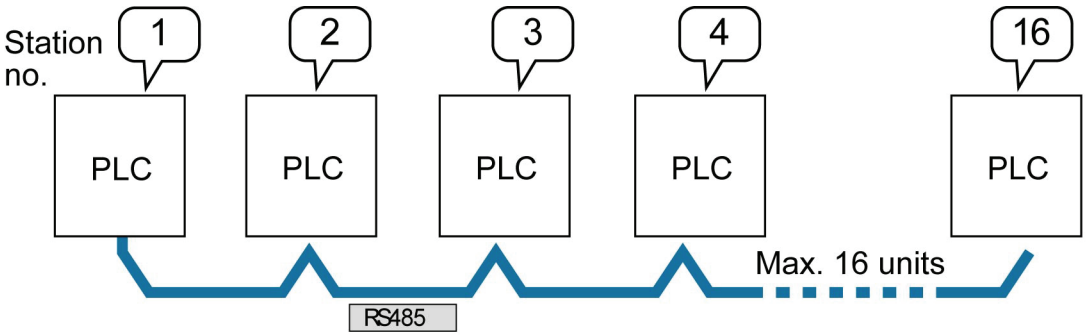
◆ **NOTE**

- **When you want to change the communication mode set in the PLC link to another mode, download the changed project to the CPU unit in FPWIN GR7, and turn on power to the FP7 CPU unit again.**

6.3 Setting Items for PLC Link

6.3.1 Station No. Setting

- In the PLC link where multiple PLCs are connected to the transmission line, station no. should be set to identify each PLC.
- Station nos. are the numbers to identify the different PLCs on the same network. The same number must not be used for more than one PLC on the same network.



6.3.2 Max. Station No. Setting

- Set the Max. station no. for PLC to be connected to the PLC link.
- The smaller the Max. station no. is, the shorter the relative transmission time becomes.

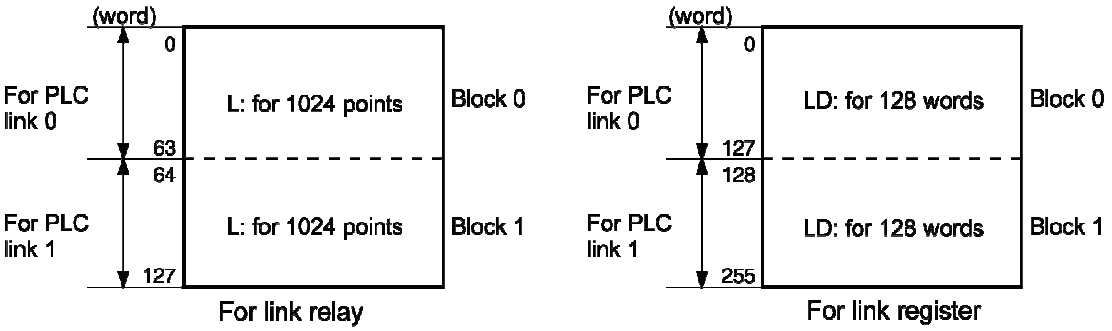
◆ **NOTES**

- **Station nos. should be set sequentially and consecutively, starting from 1, with no breaks between them. If there is a missing station no., the transmission time will be longer.**
- **Set the same value for the Max. station no. for all PLCs connected to the same PLC link.**

6.3.3 Memory Block Numbers for Link Relays and Link Registers to be Used

- The memory area of link relays and link registers are divided into the area for PLC link 0 and the area for PLC link 1, which can respectively use up to 1024 link relay points (64 words) and up to 128 link register words.
- Specify "0" when the former memory block is used, and specify "1" when the latter memory block is used.

Configuration of link area

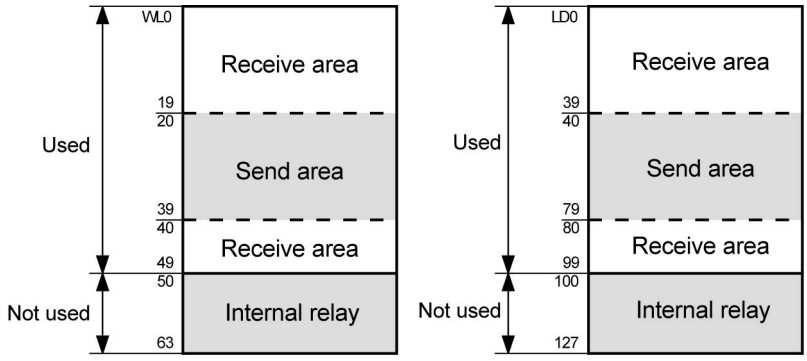


6.3.4 Range of Use of Link Relays and Range of Use of Link Registers

- Specify the memory area range for link relays and link registers to be used.
- Link relays and link registers that do not use the link function can be used in place of internal relays and data registers.

E.g. Examples of setting the range of use (in the case of PLC link 0)

- The figure below indicates a case where the link relay range of use is set to "50" (50 words, WL0 - WL49) and the link register range of use is set to "100" (100 words, LD0 - LD99).

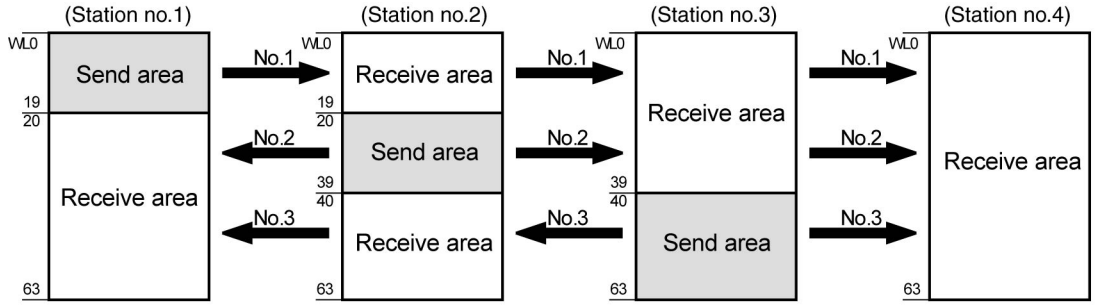


- If all the link relays are used in the PLC link 0 area, set the link relay range of use to "64" (64 words), and all the link register range of use to "128" (128 words).

6.3.5 Starting No. for Link Relay Send Area and Sending Size

- The memory areas for link relays are divided into send areas and receive areas.
- The link relays are transmitted from the send area to the receive area of a different PLC. Link relays with the same numbers as those on the sending side must exist in the receive area on the receiving side.

E.g. Example of setting the starting No. for link relay send area and the sending size (in the case of memory block No.0)



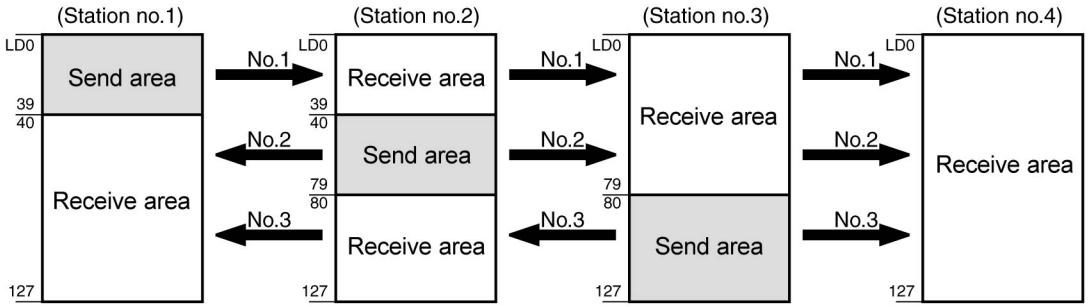
■ **List of setting items (PLC link settings)**

Setting items	Setting range	Station no. and setting method			
		No.1	No.2	No.3	No.4
Memory block numbers for link relays and link registers to be used	0 or 1	0	0	0	0
Maximum station no. to be used for PLC link	0 to 16	4	4	4	4
Range of link relays used	0 to 64 words	64	64	64	64
Starting no. for link relay send area	0 to 63	0	20	40	0
Size of link relay send area	0 to 64 words	20	20	24	0

6.3.6 Starting No. for Link Register Send Area and Sending Size

- The memory areas for link registers are divided into send areas and receive areas.
- The link registers are sent from the send area to the receive area of a different PLC. Link registers with the same numbers as those on the sending side must exist in the receive area on the receiving side.

E.g. Example of setting the starting No. for link register send area and the sending size (in the case of memory block No.0)



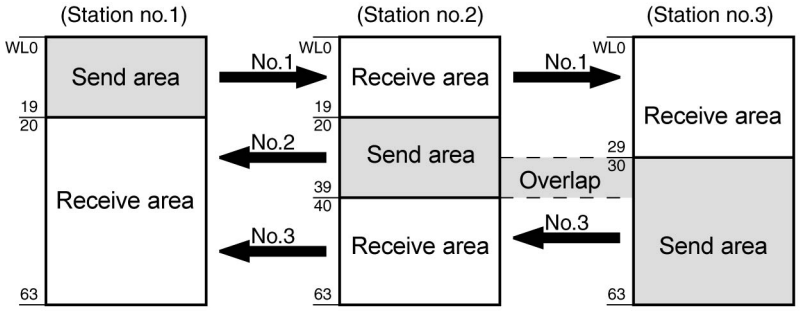
■ **List of setting items (PLC link settings)**

Setting items	Setting range	Station no. and setting method			
		No.1	No.2	No.3	No.4
Memory block numbers for link relays and link registers to be used	0 or 1	0	0	0	0
Maximum station no. to be used for PLC link	0 to 16	4	4	4	4
Range of link registers used for PLC link	0 to 128 words	128	128	128	128
Starting No. for link register send area	0 to 127	0	40	80	0
Size of link register send area	0 to 127 words	40	40	48	0

◆ **NOTES**

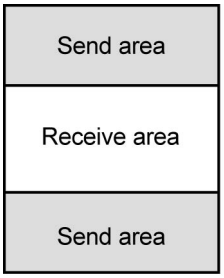
- **If a mistake is made when allocating a link area, be aware that an error will result, and communication will be disabled.**
- **Avoid overlapping send areas.**

In the example shown below, there is an area between No. 2 and No. 3 link relays which is overlapped, and this will cause an error, so that communication cannot be carried out.

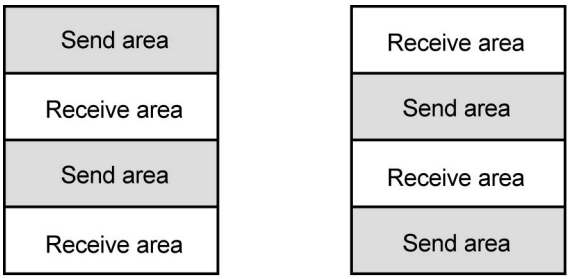


- **The allocations shown below are not possible, neither for link relays nor for link registers.**

Send area is split on a single PLC



Send and receive areas are split into multiple segments



6.4 PLC Link Response Time

6.4.1 Response Time of 1 Transmission Cycle

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

■ **Calculation formula**

T max. = Ts1 + Ts2 + ・・・・・ + Tsn + Tlt + Tso + Tlk

①Ts (transmission time per station)

④Tlk (link addition processing time)

③Tso (master station scan time)

②Tlt (link table sending time)

(1) Ts (transmission time per station)

Calculation formula	Ts = Scan time + Tpc (PLC link sending time)
	Tpc = Ttx (sending time per byte) x Pcm (PLC link sending byte size) Ttx = 1 / (transmission speed kbps × 1000) × 11ms … Approx. 0.096 ms at 115.2 kbps Pcm = 23 + (number of relay words + number of register words) x 4 (4 times based on ASCII code)

(2) Tlt (link table sending time)

Calculation formula	Tlt = Ttx (sending time per byte) x Ltm (link table sending size)
	Ttx = 1 / (transmission speed kbps × 1000) × 11 ms … Approx. 0.096 ms at 115.2 kbps Ltm = 13 + 2 × n (n = No. of added stations)

(3) Tso (Master station scan time)

This should be confirmed using the programming tool.

(4) Tlk (link addition processing time)

Calculation formula	When there is no station that is yet to be added to the link, Tlk = 0 Tlk = Tlc (link addition command sending time) + Twt (addition waiting time) + Tls (sending time for command to stop transmission if link error occurs) + Tso (master station scan time)
	Tlc = 10 x Ttx (sending time per byte) Ttx = 1 / (transmission speed kbps × 1000) × 11ms … Approx. 0.096 ms at 115.2 kbps Twt = Default value: 400 ms Tls = 7 x Ttx (sending time per byte) Ttx = 1 / (transmission speed kbps × 1000) × 11ms … Approx. 0.096 ms at 115.2 kbps Tso = Master station scan time

■ Example of calculation

	Condition	Calculation process	Response time of 1 transmission cycle (T)
1	16 units connected to the link; no station yet to be added Where Max. station no. = 16, Relays/registers are equally allocated, and Scan time for each PLC is set at 1 ms:	Ttx = 0.096 Each Pcm = 23 + (4 + 8) × 4 = 71 bytes Tpc = Ttx × Pcm = 0.096 × 71 ≈ 6.82 ms Each Ts = 1 + 6.82 = 7.82 ms Tlt = 0.096 × (13 + 2 × 16) = 4.32 ms	T Max. = Ts + Tlt + Tso 7.82 × 16 + 4.32 + 1 = 130.44 ms
2	16 units connected to the link; no station yet to be added Where Max. station no. = 16, Relays/registers are equally allocated, and Scan time for each PLC is set at 5 ms:	Ttx = 0.096 Each Pcm = 23 + (4 + 8) × 4 = 71 bytes Tpc = Ttx × Pcm = 0.096 × 71 ≈ 6.82 ms Each Ts = 5 + 6.82 = 11.82 ms Tlt = 0.096 × (13 + 2 × 16) = 4.32 ms	T Max. =Ts+Tlt+Tso 11.82×16+4.32+5 =198.44ms
3	16 units connected to the link; 1 station yet to be added Where Max. station no. = 16, Relays/registers are equally allocated, and Scan time for each PLC is set at 5 ms:	Ttx = 0.096 Each Ts = 5 + 6.82 = 11.82 ms Tlt = 0.096 × (13 + 2 × 15) ≈ 4.13 ms Tlk = 0.96 + 400 + 0.67 + 5 ≈ 407 ms Note: Default value for the addition waiting time: 400 ms	T Max. = Ts + Tlt + Tso + Tlk 11.82 × 15 + 4.13 + 5 + 407 = 593.43 ms
4	8 units connected to the link; no station yet to be added Where Max. station no. = 8, Relays/registers are equally allocated, and Scan time for each PLC is set at 5 ms:	Ttx = 0.096 Each Pcm = 23 + (8 + +16) × 4 = 119 bytes Tpc = Ttx × Pcm = 0.096 × 119 ≈ 11.43 ms Each Ts = 5 +11.43 = 16.43 ms Tlt = 0.096 × (13 + 2 × 8) ≈ 2.79 ms	T Max. = Ts + Tlt + Tso 16.438 + 2.79 + 5 = 139.23 ms
5	2 units connected to the link; no station yet to be added Where Max. station no. = 2, Relays/registers are equally allocated, and Scan time for each PLC is set at 5 ms:	Ttx = 0.096 Each Pcm = 23 + (32 + +64) × 4 = 407 bytes Tpc = Ttx × Pcm = 0.096 × 407 ≈ 39.072 ms Each Ts = 5 + +39.072 = 44.072 ms Tlt = 0.096 × (13 + 2 × 2) ≈ 1.632 ms	T Max. = Ts + Tlt + Tso 44.072 × 2 + 1.632 + 5 = 94.776 ms
6	2 units connected to the link; no station yet to be added Where Max. station no. = 2, Where 32 relay points and 2W registers are equally allocated, and scan time for each PLC is set at 1 ms:	Ttx = 0.096 Each Pcm = 23 + (1 + +1) × 4 = 31 bytes Tpc = Ttx × Pcm = 0.096 × 31 ≈ 2.976 ms Each Ts = 1 + +2.976 = 3.976 ms Tlt = 0.096 × (13 + 2 × 2) ≈ 1.632 ms	T Max. = Ts + Tlt + Tso 3.976 × 2 + 1.632 + 1 = 10.584 ms

6.4.2 Response Time When There is a Station Yet to be Added

- If there are stations that have not been added to the link, the Tlk time (link addition processing time) increases, and with this the transmission cycle time will be longer.

$$T\,max. = Ts1 + Ts2 + \cdots\cdots + Tsn + Tlt + Tso + Tlk$$

Tlk = Tlc (link addition command sending time) + Twt (addition waiting time) +
Tls (link error stop command sending time) + Tso (master station scan time)

◆ **NOTE**

- **"Stations that have not been added (stations yet to be added)" refers to stations between No.1 and the Max. station no. that are not connected, or those that are connected but whose power supply has yet to be turned on.**

7

MEWTOCOL Master/Slave Communication

7.1 Configuration

7.1.1 Setting Communication Conditions

■ **Configuration**

Setting items	Default	Specification range	Remark
Communication mode	MEWTOCOL-COM	MEWTOCOL-COM MEWTOCOL7-COM	Master communication is not possible using MEWTOCOL7.
Station no.	1	MEWTOCOL-COM: 0 - 99 MEWTOCOL7-COM: 0 - 999	Set a specific station no. for PLC to be connected to the PLC link. Set a value that does not overlap with other devices.
Baud rate	9600 bps	300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 / 230400	Set the baud rate to match that of devices to be connected.
Data length	8 bits	8 bits	The setting must be done according to the devices connected. In general, the default values (8-bit length, odd parity, and 1-stop bit) should be used.
Parity	Odd	Odd	
Stop bit	1 bit	1 bit	
RS/CS	Invalid	Invalid / Valid	
Send waiting time (set value × 0.01 ms)	0	0 - 10000 (0 - 100 ms)	Set this when it is necessary to delay response to the partner device in slave communication.
Start code STX	Invalid	-	No need to specify.
Terminator setting	CR	-	
Terminator judgment time (set value × 0.01 ms)	0	-	
Modem initialization	Do not initialize	Do not initialize / Initialize while performing settings / Re-initialize while performing settings	Perform settings only when a modem is to be connected. Perform settings for start-up modem initialization.

(Note 1) In MEWTOCOL communication, the following setting items need not to be specified.
Start code, terminator setting, terminator judgment time, PLC link setting

7.2 List of MEWTOCOL / MEWTOCOL7 Supporting Commands

7.2.1 List of MEWTOCOL Commands

■ **Commands to be used**

Type of instruction	Code	Description
Read contact area	RC (RCS) (RCP) (RCC)	Reads ON/OFF status of contact. - Specifies only one point. - Specifies multiple contacts. - Specifies a range in word units.
Write contact area	WC (WCS) (WCP) (WCC)	Turns ON or OFF the contact. - Specifies only one point. - 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 or Reset contacts monitored	MC	Registers the contact to be monitored.
Register or Reset data monitored	MD	Registers the data to be monitored.
Monitoring start	MG	Monitors a registered contact or data using MC and MD.
Preset contact area (fill command)	SC	Embeds the area of a specified range in 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 the specifications of the programmable controller and error codes if an error occurs.
Abort	AB	Aborts reception of multiple frame responses before completion.

(Note) Some devices are not accessible due to format restrictions of MEWTOCOL-COM communication commands.

7.2.2 List of MEWTOCOL7 Commands

■ **Commands to be used**

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

◆ **REFERENCE**

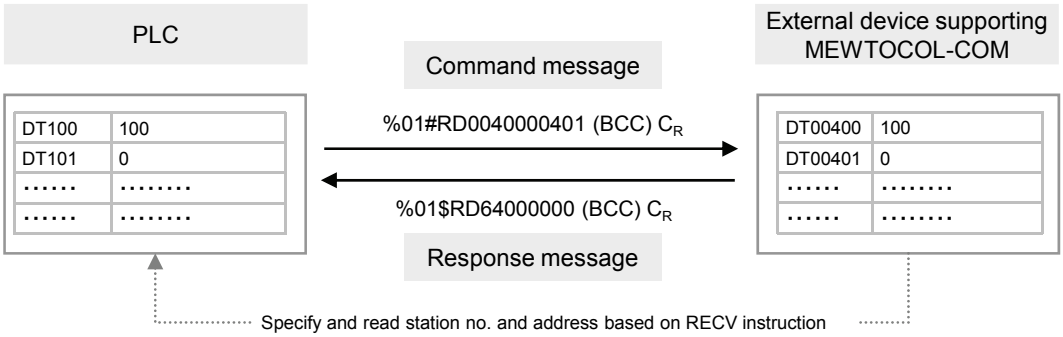
- **For details of MEWTOCOL commands, please see 11.2 MEWTOCOL-COM Format and 11.3 MEWTOCOL7-COM Format.**

7.3 MEWTOCOL-COM Master Communication (RECV)

7.3.1 Read Data from an External Device

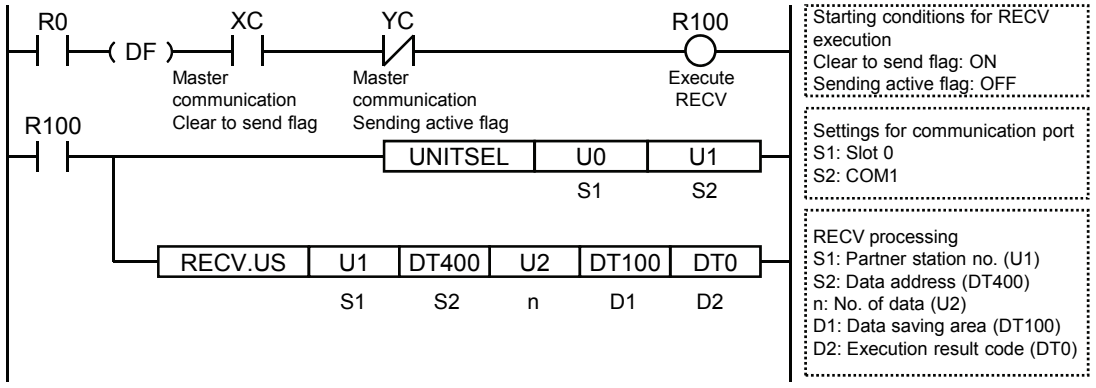
■ Instructions

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



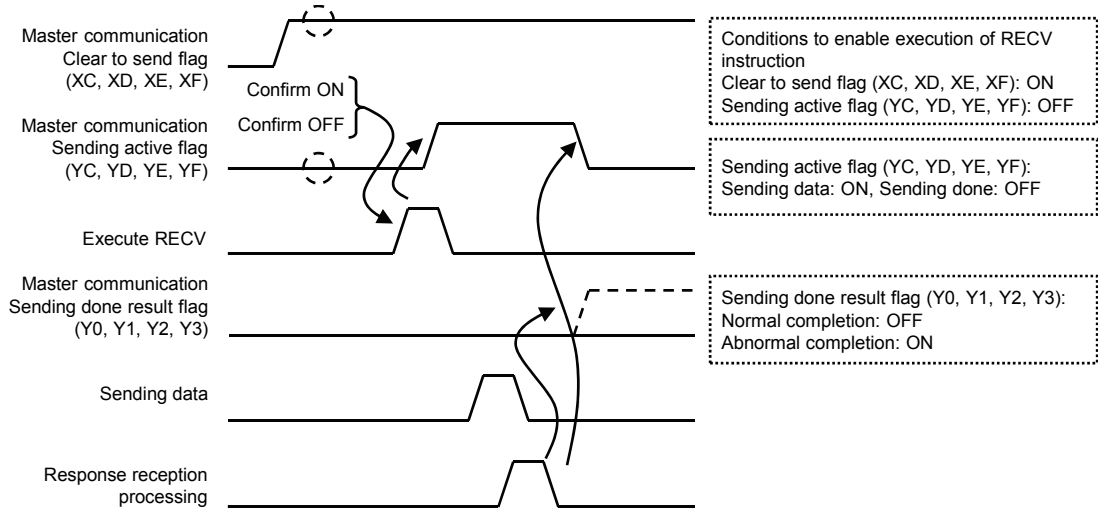
■ Sample program

- Send commands from the COM1 port of the CPU unit, read data from the data area of an external device (station no. 1) DT400 - DT401, and write the content into PLC's data register DT100 - DT101.
- Confirm that the unit is in the master mode (XC), and that the sending process is not in progress for the same port (YC), and start up the SEND instruction.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the RECV instruction, specify and execute the partner station no. (U1), initial address (DT400), No. of data (U2), and initial address on the PLC side to save data (DT100).



(Note) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ Timing chart



■ I/O allocation (For CPU Unit)

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

■ I/O allocation (For Serial Communication Unit)

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

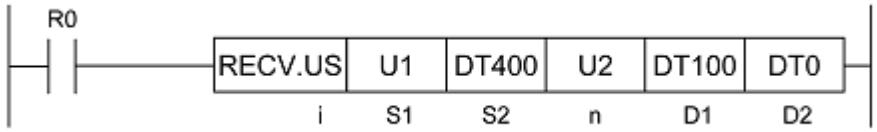
(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the port targeted for communication, using UNITSEL instruction immediately before SEND/RECV instruction.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "Master communication Clear to send flag" (XC - XF) for the targeted channel is ON, and execute SEND/RECV instruction.**
- **You cannot execute other SEND/RECV instruction for a communication port in master communication. Confirm that the "Master communication Sending active flag" (YC - YF) is OFF, and execute instruction.**
- **You cannot execute SEND/RECV instruction for a port in slave communication.**
- **If no response is received, the "Master communication Sending active flag" (YC - YF) remains ON throughout the timeout setting time specified in CPU configuration.**
- **Up to 16 SEND/RECV instructions can be executed simultaneously for different COM. ports.**

7.3.2 RECV Instruction (When MEWTOCOL-COM is Used)

■ Instruction format



Items	Settings	Setting range
i	Specify the operation unit.	US / SS
S1	Specify the partner station no.	1 - 99
S2	Specify the device initial address of the source node data area in the partner node. (Note 1)(Note 2)	0 - 99999
n	Specify the No. of sent data. (Note 3)	1 - 509 words or 1 bit
D1	Specify the device initial address of the receiver node data area in the source node. (Note1)	(Note1)
D2	Specify the device area in the source node to save the execution result code (one word). (Note 4)	-

(Note 1) Transmission methods vary by the type of device to be specified for the operands [S2] and [D1].

Device to be specified for [S2] and [D1]	Transmission method
16 bit device: WX, WY, WR, WL, DT, LD	Register transmission
1 bit device: X; Y; R; L; DT,n; LD,	Bit transmission

(Note 2) Bit device DT, n and LD, n cannot be specified for the header of the sender data in the partner node.

(Note 3) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 4): Device that can be specified for [D2] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

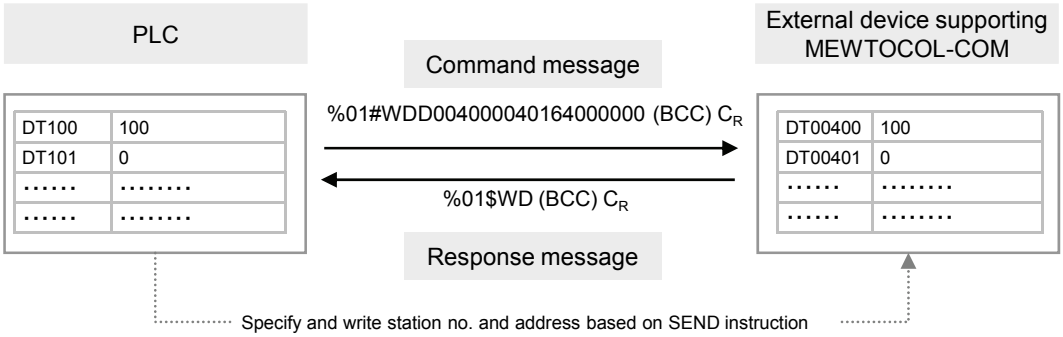
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

7.4 MEWTOCOL-COM Master Communication (SEND)

7.4.1 Write Data into an External Device

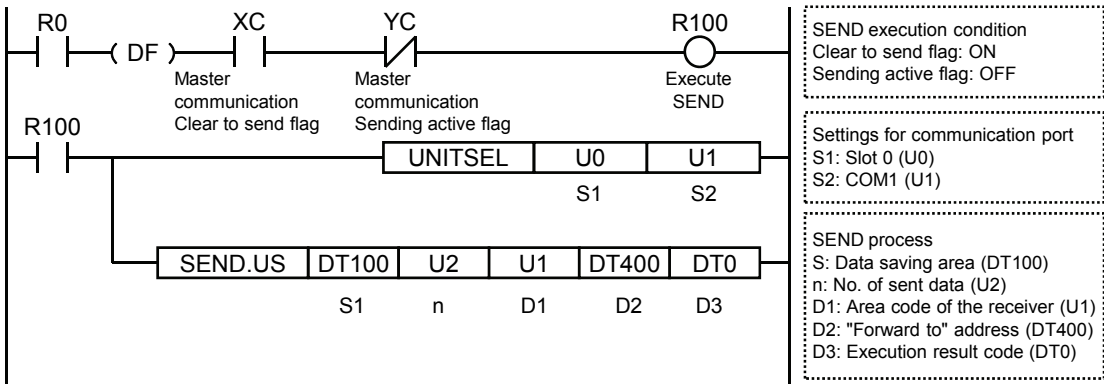
■ Instructions

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



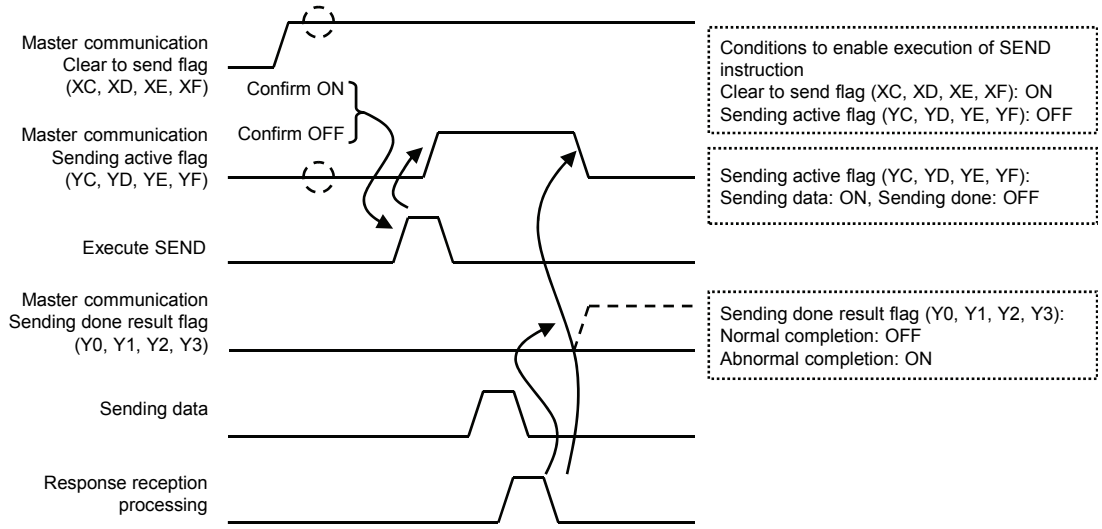
■ Sample program

- Send commands from the COM1 port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device (station no. 1) DT400 - DT401.
- Confirm that the unit is in the master mode (XC), and that the sending process is not in progress for the same port (YC), and start up the SEND instruction.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the SEND instruction, specify and execute the sender initial address (DT100), No. of data (U2), "Transmit to" station no. (U1), and initial address (DT400).



(Note) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ Timing chart



■ I/O allocation (For CPU Unit)

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

■ I/O allocation (For Serial Communication Unit)

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

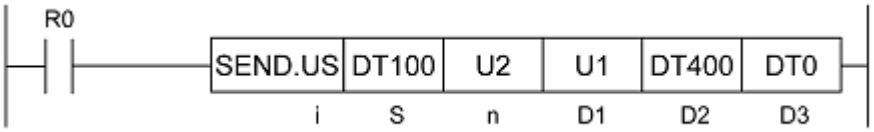
(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ **KEY POINTS**

- **Specify the port targeted for communication, using UNITSEL instruction immediately before SEND/RECV instruction.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "Master communication Clear to send flag" (XC - XF) for the targeted channel is ON, and execute SEND/RECV instruction.**
- **You cannot execute other SEND/RECV instruction for a communication port in master communication. Confirm that the "Master communication Sending active flag" (YC - YF) is OFF, and execute instruction.**
- **You cannot execute SEND/RECV instruction for a port in slave communication.**
- **If no response is received, the "Master communication Sending active flag" (YC - YF) remains ON throughout the timeout setting time specified in CPU configuration.**
- **Up to 16 SEND/RECV instructions can be executed simultaneously for different COM. ports.**

7.4.2 SEND Instruction (When MEWTOCOL-COM is Used)

■ Instruction format



Setting items	Settings	Setting range
i	Specify the operation unit.	US / SS
S	Specify the header of the source node data area. (Note 1)	-
n	Specify the No. of sent data.	1 - 507 words or 1 bit
D1	Specify the partner station no. (Note 2) (Note 3)	0 - 99
D2	Specify the initial address of the receiver node data area in the partner node. (Note 4)	0 - 99999
D3	Specify the device area in the source node to save the execution result code (one word).	(Note 5)

(Note 1) Transmission methods vary by the type of device to be specified for the operands [S] and [D2].

Device to be specified for [S2] and [D1]	Transmission method
16 bit device: WX, WY, WR, WL, DT, LD	Register transmission
1 bit device: X, Y, R, L, DT, n, LD, n	Bit transmission

(Note 2) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 3) When "0" is specified for partner station no., global transmission is applied. In this case, no response message is received from the partner side.

(Note 4) Bit device DT, n and LD, n cannot be specified for the header of the receiver data in the partner node.

(Note 5): Device that can be specified for [D3] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

8

MODBUS RTU Master/Slave Communication

8.1 Configuration

8.1.1 Setting Communication Conditions

■ **Configuration**

Setting items	Default	Specification range	Remark
Communication mode	MEWTOCOL-COM	MODBUS-RTU	Specify "MODBUS-RTU".
Station no.	1	0 - 247	Set a specific station no. for PLC to be connected to the PLC link. Set a value that does not overlap with other devices.
Baud rate	9600	300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200	The setting must be done according to the devices connected.
Data length	8 bits	8 bits	The setting must be done according to the devices connected. In general, 8-bit length, even parity, and 1-stop bit is used.
Parity	Odd	Even	
Stop bit	1 bit	1 bit	
RS/CS	Invalid	Invalid / Valid	
Send waiting time (set value × 0.01 ms)	0	0 - 10000	Set this when it is necessary to delay response to the partner device in slave communication.
Start code STX	Invalid	-	Use the unit in the default setting as indicated on the left.
Terminator setting	CR	-	
Terminator judgment time (set value × 0.01 ms)	0	-	
Modem initialization	Do not initialize	-	

(Note 1) In MODBUS communication, the following setting items need not to be specified.
Start code, terminator setting, terminator judgment time, modem initialization, PLC link setting

8.2 List of MODBUS RTU Supported Commands

8.2.1 List of MODBUS Function Codes

■ Table of supported commands

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

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

■ Correspondence table for MODBUS reference No. and device No.

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

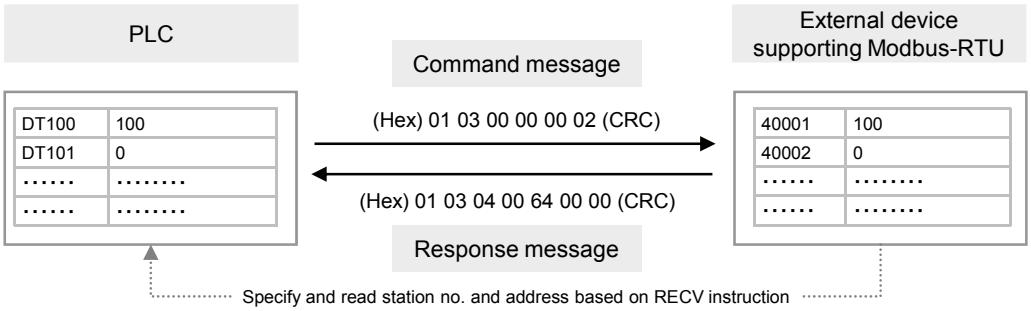
(Note 1) The table above indicates correspondence between the MODBUS reference numbers for accessing from a higher device to FP7 using the MODBUS protocol, and the operation device numbers of FP7.

8.3 MODBUS RTU Master Communication (RECV)

8.3.1 Read Data from an External Device

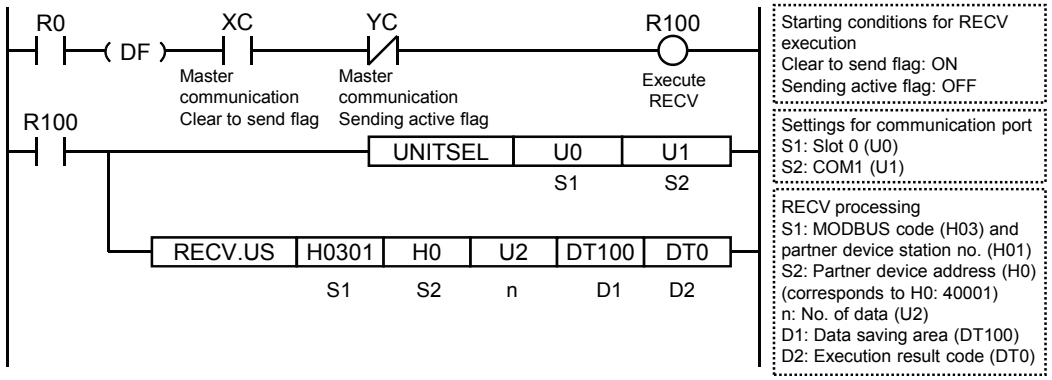
■ Instructions

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



■ Sample program

- Send commands from the COM1 port of the CPU unit, read data from the data area of an external device (station no. 1) 40001 - 40002, and write the content into PLC's data register DT100 - DT101.
- Confirm that the unit is in the master mode (XC), and that the sending process is not in progress for the same port (YC), and start up the SEND instruction.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the RECV instruction, specify and execute the partner device station no. (U1), MODBUS command and partner device station no. to be used (H0301), initial address (40001), No. of data (U2), and initial address on the PLC side to save data (DT100). For the address of the partner device, please check operating instructions, etc. of the relevant device.

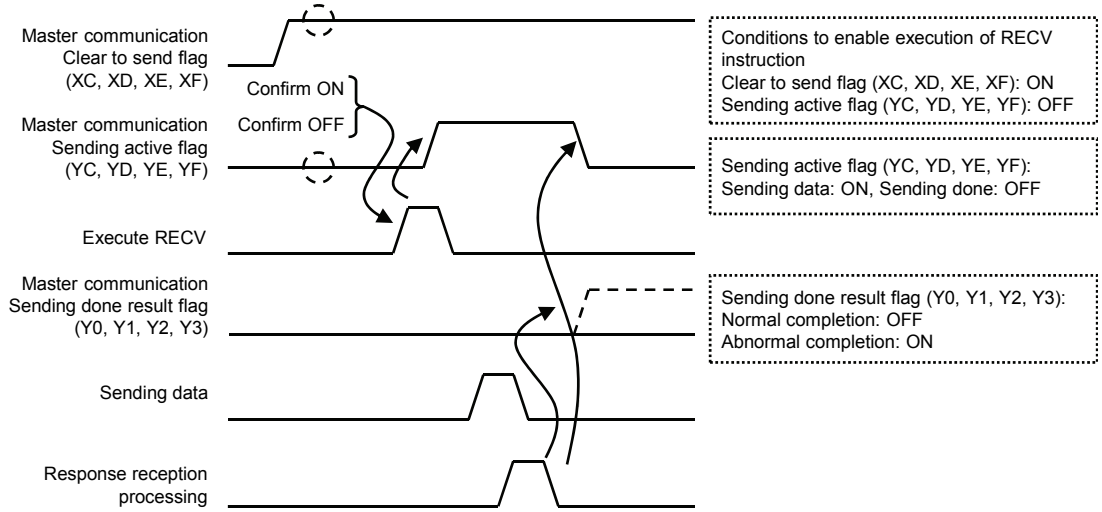


(Note 1) Operand [S1] of RECV instruction is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner device station no.

(Note 2) When the partner device is FP series PLC, Operand [S2] of RECV instruction can be specified using the Device No.

(Note 3) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ Timing chart



■ I/O allocation (For CPU Unit)

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

■ I/O allocation (For Serial Communication Unit)

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

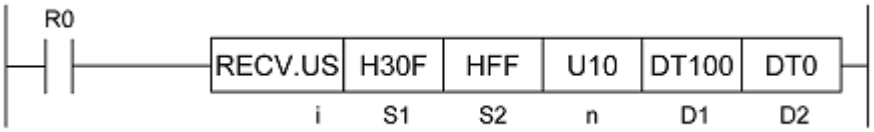
(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the port targeted for communication, using UNITSEL instruction immediately before SEND/RECV instruction.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "Master communication Clear to send flag" (XC - XF) for the targeted channel is ON, and execute SEND/RECV instruction.**
- **You cannot execute other SEND/RECV instruction for a communication port in master communication. Confirm that the "Master communication Sending active flag" (YC - YF) is OFF, and execute instruction.**
- **You cannot execute SEND/RECV instruction for a port in slave communication.**
- **If no response is received, the "Master communication Sending active flag" (YC - YF) remains ON throughout the timeout setting time specified in CPU configuration.**
- **Up to 16 SEND/RECV instructions can be executed simultaneously for different COM. ports.**

8.3.2 RECV Instruction (MODBUS Function Code Specified Type)

■ Instruction format



■ Operand

Items	Settings			Setting range
i	Specify the operation unit.			US / SS
S1	Specify the MODBUS function codes and partner station no. to be used. (Note 1) (Note 2)			
		Higher byte	Two hexadecimal digits that indicate the MODBUS function code	H1 - H4 (1 - 4)
		Lower byte	Two hexadecimal digits that indicate the station no.	H1 - HF7 (1 - 247)
S2	Specify the source MODBUS address in the partner node.			H0 - HFFFF (0 - 65535)
n	Specify the No. of sent data. (Note 3)			1 - 127 words 1 - 2040 bits
D1	Specify the device initial address of the receiver node data area in the source node. (Note 2)			-
D2	Specify the device area in the source node to save the execution result code (one word).			(Note 3)

(Note 1) Operand [S1] is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner station no.
E.g. Specify "H030F" when MODBUS function code is 03 (Read Holding Registers) and station no. is 15.

(Note 2) Based on the types of device specified in operand [D1], the transmission methods and MODBUS function codes that can be used vary.

Device to be specified for [D1]	Transmission method	Values that can be specified in higher bytes of [S1]
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	H1: Read Coil Status (01) H2: Read Input Status (02) H3: Read Holding Registers (03) H4: Read Input Registers (04)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	H1: Read Coil Status (01) H2: Read Input Status (02)

(Note 3) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 4): Device that can be specified for [D2] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

8.3.3 RECV Instruction (MODBUS Function Code Unspecified Type)

■ Instruction format

■ Operand

Items	Settings	Setting range
i	Specify the operation unit.	US / SS
S1	Specify the partner station no.	H1 - HF7 (1 - 247)
S2	Specify the device initial address of the source node data area in the partner node.	H0 - HFFFF (0 - 65535) (Note 1) (Note 2)
n	Specify the No. of sent data.	1 - 127 words 1 - 2040 bits (Note 3)
D1	Specify the device initial address of the receiver node data area in the source node.	(Note 1) (Note 4)
D2	Specify the device area in the source node to save the execution result code (one word).	(Note 5)

(Note 1) Types of devices and transmission methods to be specified for operands [S2] and [D1], and MODBUS function codes to be used for instruction execution vary.

Device to be specified for [S2] and [D1]	Transmission method	MODBUS function codes to be used for instruction execution
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	Read Coil Status (01) Read Input Status (02) Read Holding Registers (03) Read Input Registers (04)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	Read Coil Status (01) Read Input Status (02)

(Note 2) Bit device L; DT, n; and LD, n cannot be specified for the header of the sender data in the partner node.

(Note 3) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 4): Device that can be specified for D1 are: WX, WY, WR, WL, DT, LD.

(Note 5): Device that can be specified for D2 are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

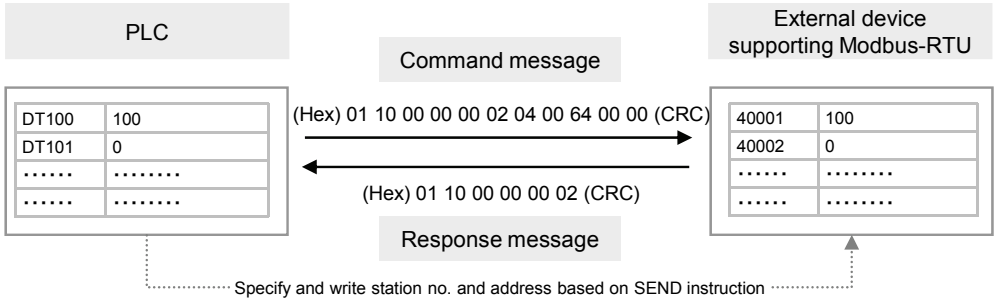
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

8.4 MODBUS RTU Master Communication (SEND)

8.4.1 Write Data into an External Device

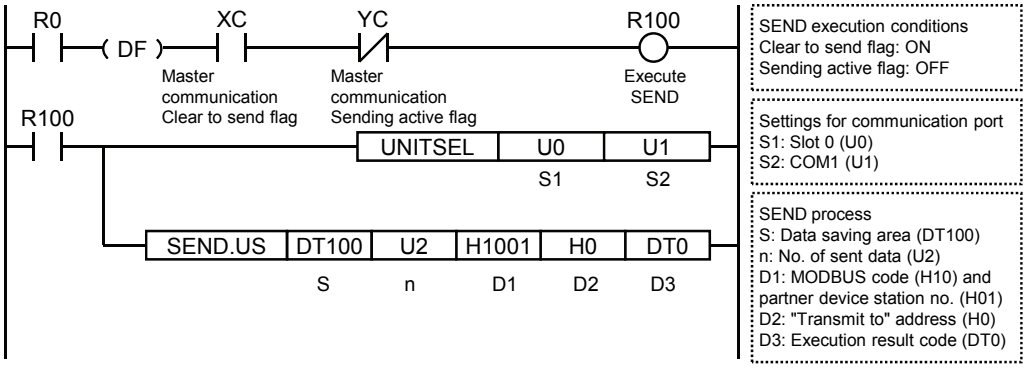
■ Instructions

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



■ Sample program

- Send commands from the COM1 port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device (station no. 1) 40001 - 40002.
- Confirm that the unit is in the master mode (XC), and that the sending process is not in progress for the same port (YC), and start up the SEND instruction.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the SEND instruction, specify and execute the PLC initial address (DT100), No. of data (U2), MODBUS function code to be used (16: H10), partner device station no. (H01), and initial address (H0). For the address of the partner device, please check operating instructions, etc. of the relevant device.

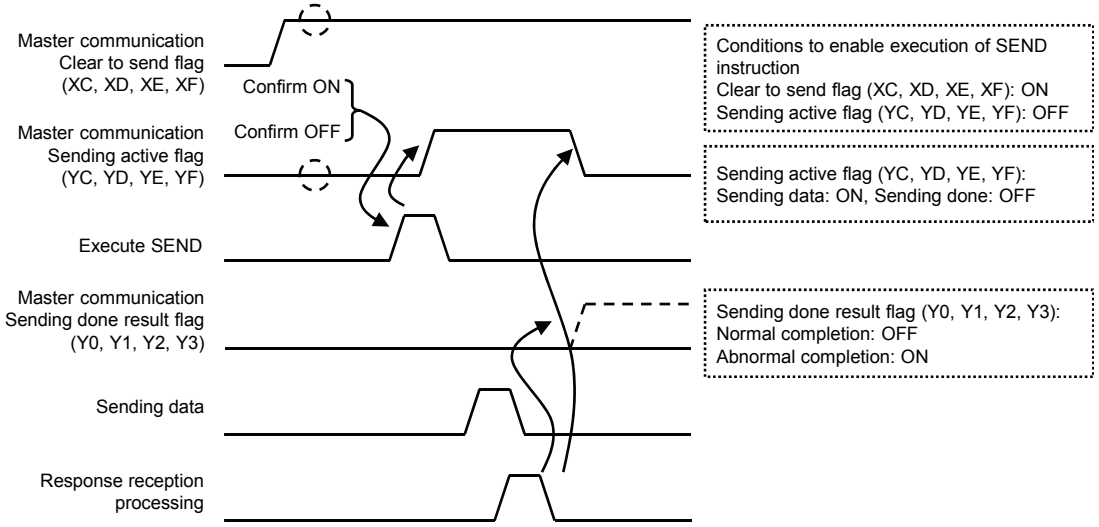


(Note 1) Operand [S1] of SEND instruction is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner device station no. When the MODBUS function code is 16, specify H10 for [D1].

(Note 2) When the partner device is FP series PLC, Operand [S2] of SEND instruction can be specified using the Device No.

(Note 3) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ Timing chart



■ I/O allocation (For CPU Unit)

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

■ I/O allocation (For Serial Communication Unit)

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

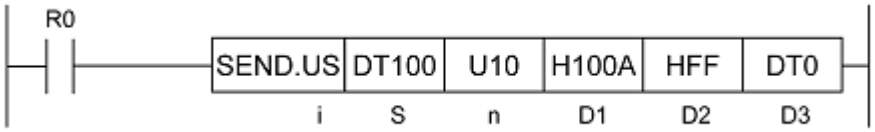
(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ **KEY POINTS**

- **Specify the port targeted for communication, using UNITSEL instruction immediately before SEND/RECV instruction.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "Master communication Clear to send flag" (XC - XF) for the targeted channel is ON, and execute SEND/RECV instruction.**
- **You cannot execute other SEND/RECV instruction for a communication port in master communication. Confirm that the "Master communication Sending active flag" (YC - YF) is OFF, and execute instruction.**
- **If no response is received, the "Master communication Sending active flag" (YC - YF) remains ON throughout the timeout setting time specified in CPU configuration.**
- **You cannot execute SEND/RECV instruction for a port in slave communication.**
- **Up to 16 SEND/RECV instructions can be executed simultaneously for different COM. ports.**

8.4.2 SEND Instruction (MODBUS Function Code Specified Type)

■ Instruction format



■ Operand

Items	Settings			Setting range
i	Specify the operation unit.			US / SS
S	Specify the header of the source node data area. (Note 1)			-
n	Specify the No. of sent data. (Note 1) (Note 2)			1 - 127 words 1 - 2040 bits
D1	Specify the MODBUS command and partner station no. to be used. (Note 3) (Note 4)			
		Higher byte	Two hexadecimal digits that indicate the MODBUS function code	H5, H6, HF, H10
		Lower byte	Two hexadecimal digits that indicate the station no.	H0 - HF7 (0 - 247)
D2	Specify the header of the MODBUS address in the receiver data area in the partner node.			H0~HFFFF (0 - 65535)
D3	Specify the device area in the source node to save the execution result code (one word).			(Note 5)

(Note 1) Based on the types of device specified in operand [S] and the No. of sent data specified in [n], the transmission methods and MODBUS function codes that can be used vary.

Types of device to be specified in [S]	Transmission method	No. of sent data [n]	Values that can be specified in higher bytes of [D1]
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	1	H6: Preset Single Register (06) HF: Force Multiple Coils (15) H10: Preset Multiple Registers (16)
		2 - 127	HF: Force Multiple Coils (15) H10: Preset Multiple Registers (16)
1 bit device X, Y, R, L, DT, n, LD,n	Bit transmission	1	H5: Force Single Coil (05) HF: Force Multiple Coils (15)
		2 - 2040	HF: Force Multiple Coils (15)

(Note 2) The No. of sent data [n] is on a word basis for register transmission, and on a bit basis for bit transmission.

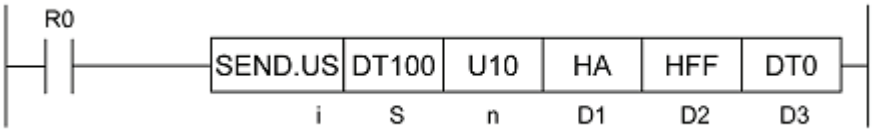
(Note 3) Operand [D1] is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner station no.
E.g. Specify "H100A" when MODBUS function code is 16 (Preset Multiple Registers) and station no. is 10.

(Note 4) When "0" is specified for partner station no., global transmission is applied. In this case, no response message is received from the partner side.

(Note 5): Device that can be specified for [D3] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

8.4.3 SEND Instruction (MODBUS Function Code Unspecified Type)

■ Instruction format



■ Operand

Items	Settings	Setting range
i	Specify the operation unit.	US / SS
S	Specify the header of the source node data area.	(Note 1)
n	Specify the No. of sent data.	1 - 127 words, 1 - 2040 bits (Note 2)
D1	Specify the partner station no.	H0 - HF7 (0 - 247) (Note 3)
D2	Specify the initial address of the receiver node data area in the partner node.	H0 - HFFFF (0 - 65535) (Note 4)
D3	Specify the device area in the source node to save the execution result code (one word).	(Note 5)

(Note 1) Types of devices and transmission methods to be specified for operands [S] and [D2], and MODBUS function codes to be used for instruction execution vary.

Types of device to be specified in [S]	Transmission method	MODBUS function codes to be used for instruction execution
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, DT, n, LD, n	Bit transmission	Force Multiple Coils (15)

(Note 2) The No. of sent data [n] is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 3) When "0" is specified for partner station no., global transmission is applied. In this case, no response message is received from the partner side.

(Note 4) 16 bit device WX, WL, and LD; and 1 bit device X; L; DT, n; and LD, n cannot be specified for the header of the receiver data in the partner node.

(Note 5): Device that can be specified for [D3] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication instructions that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

9

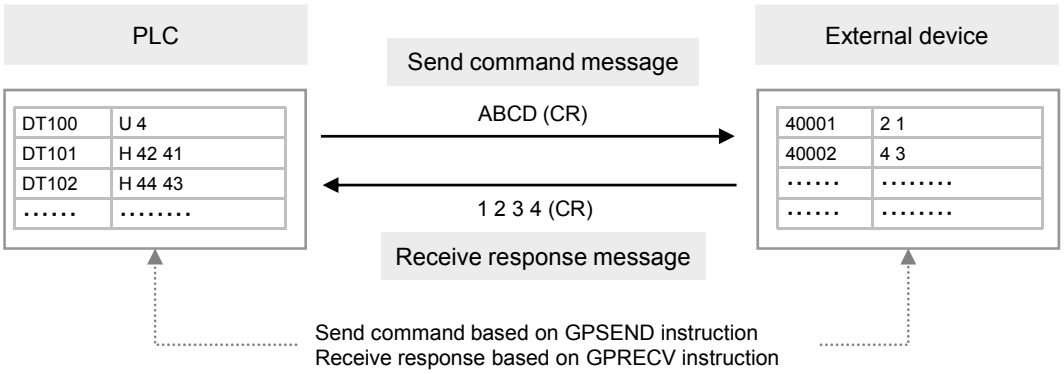
General-Purpose Communication

9.1 Operation of General-Purpose Communication

9.1.1 Read Data from an External Device

■ **Read data from a partner device**

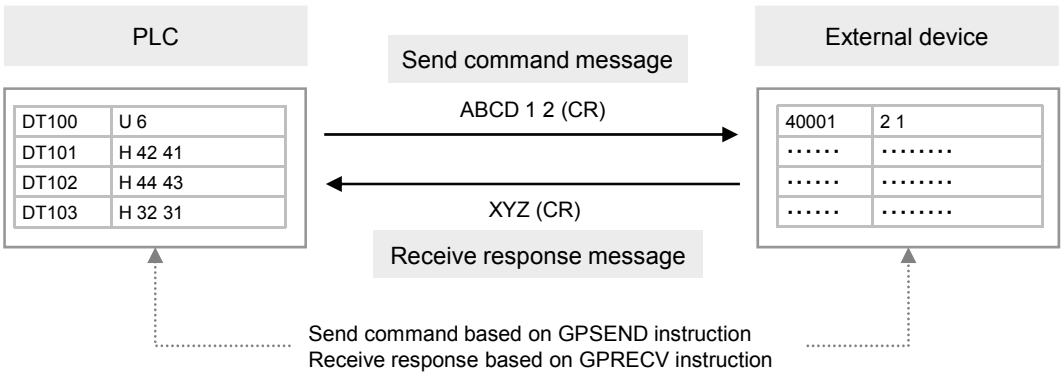
In general-purpose communication, communication is executed by sending commands that suit the partner device, and receiving responses. Command messages are sent by formulating a data table for message in accordance with the protocol, on the given data register, and subsequently executing GPSEND instruction.



9.1.2 Write Data into an External Device

■ **Write data into a partner device**

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



◆ **KEY POINTS**

- **There is no relevance between the operation of transmission by GPSEND instruction and the operation of reception by GPRECV instruction. The CPU with built-in SCU unit is always clear to receive data.**

9.2 Configuration

9.2.1 Setting Communication Conditions

■ **Configuration**

Setting items	Default	Specification range	Remark
Communication mode	MEWTOCOL-COM	General-purpose communication	Specify "general-purpose communication".
Station no.	1	1 - 999	Settings are not necessary.
Baud rate	9600	300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 / 230400	The setting must be done according to the devices connected.
Data length	8 bits	7 bit / 8 bits	
Parity	Odd	None / Odd / Even	
Stop bit	1 bit	1 bit / 2 bits	
RS/CS	Invalid	Invalid / Valid	Set to "Valid" only when Communication Cassette AFP7CCS2 is used in a 5-wire mode.
Send waiting time (unit: 0.01 ms)	0	0 - 10000	Set this when it is necessary to delay response to the partner device.
Start code STX	Invalid	Invalid / Valid	The setting must be done according to the devices connected.
Terminator setting	CR	CR / CR+LF / Time / ETX	
Terminator judgment time (unit: 0.01 ms)	0	0 - 10000 (0 - 100 ms)	In cases where "Time" is specified in the terminator setting, set the time for judging the terminator.
Modem initialization	Do not initialize	Do not initialize / Initialize while performing settings / Re-initialize while performing settings	Perform settings only when a modem is to be connected. Perform settings for start-up modem initialization.

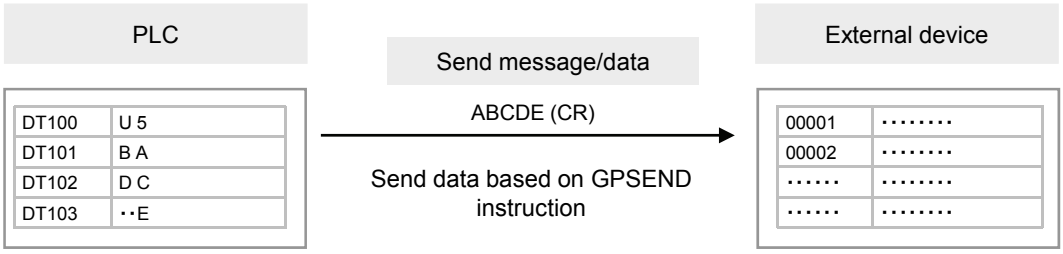
(Note 1) In general-purpose communication, the following setting items need not to be specified.
Station no., PLC link

9.3 Sending Operation

9.3.1 Overview of Sending Operation

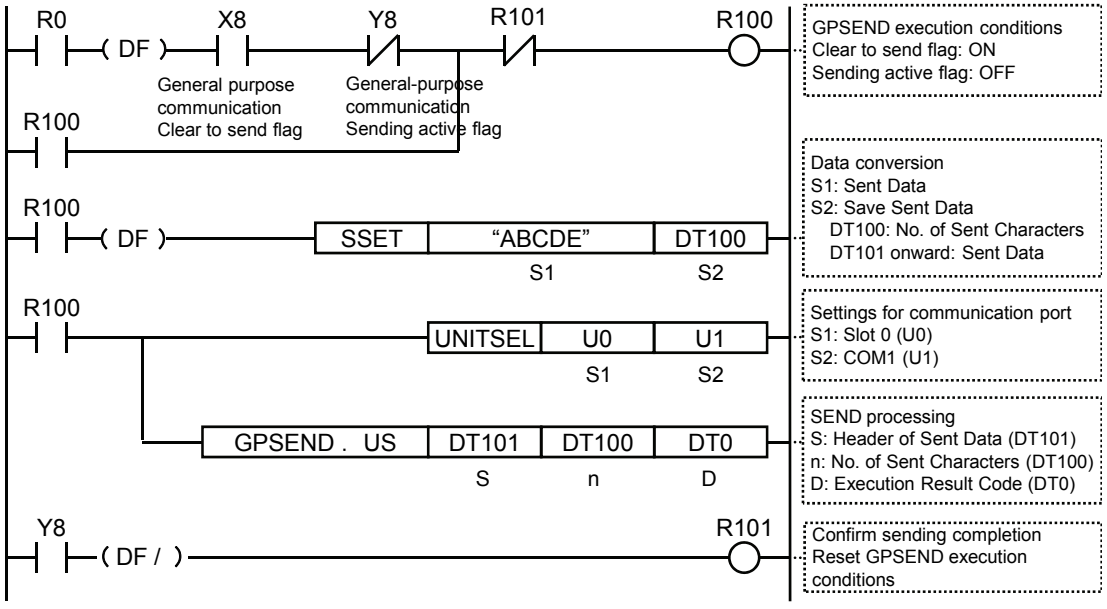
■ **Instructions**

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



■ **Sample program**

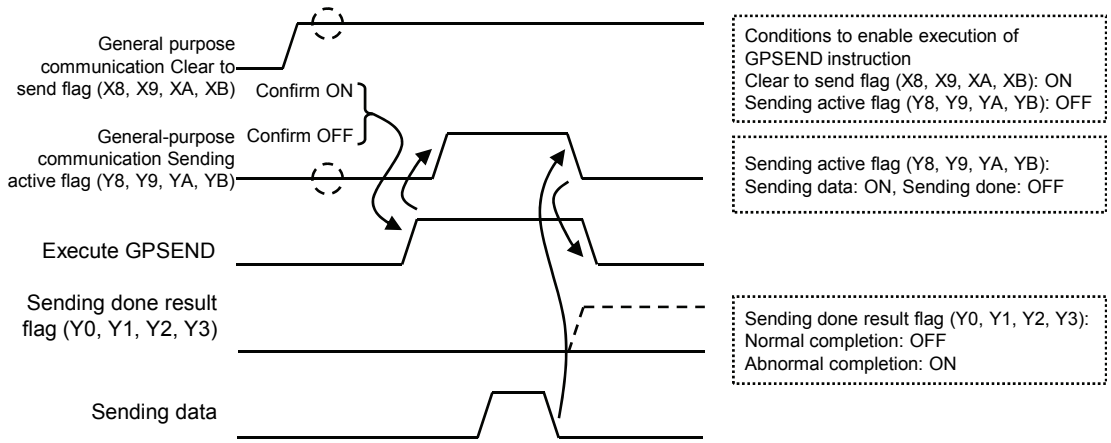
- Confirm that the unit is in the general-purpose communication mode (X8), and that the general-purpose sending process is not in progress for the same port (Y8), and start up the sending program.
- In the SSET instruction, convert a given message into an ASCII text string, and specify the number of strings to be sent in the data register DT100, and the message to be sent from the data register DT101.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the GPSEND instruction, specify and execute the header of the table where the message to be sent is saved (DT101) and the No. of characters (DT100).



(Note) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ **Timing chart**

- Data in the table [S] specified by GPSEND instruction are sent, in ascending order from lower bytes.
- During the sending process, the "General-purpose communication Sending active flag" (Y8, Y9, YA, YB) turns ON. The flag is turned OFF when sending is completed. (The flag does not turn off right after the execution of the instruction. It turns off at the beginning of the second scan.)
- The sending result (0: normal completion, 1: abnormal completion) is saved in the general-purpose communication sending result flag (Y0, Y1, Y2, Y3).



■ **I/O allocation (CPU Unit)**

COM port no.			Name	Explanation
1	2	0		
X8	X9	XA	General-purpose communication Clear to send flag	Turns ON when the unit is set to the general-purpose communication mode.
Y8	Y9	YA	General-purpose communication Sending active flag	Turns ON during sending data based on general-purpose communication GPSEND. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

■ **I/O allocation (For Serial Communication Unit)**

COM port no.				Name	Explanation
1	2	3	4		
X8	X9	XA	XB	General-purpose communication Clear to send flag	Turns ON when the unit is set to the general-purpose communication mode.
Y8	Y9	YA	YB	General-purpose communication Sending active flag	Turns ON during sending data based on general-purpose communication GPSEND. Turns OFF when the sending process is completed.
Y0	Y1	Y2	Y3	Sending done result flag	Reports completion result of sending data in genera-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

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

(Note 2) When the sending time is shorter than the scan time, the "General-purpose communication Sending active flag" (Y8, Y9, YA) turns OFF when the GPSEND instruction is executed in the subsequent scan following data sending completion. In all cases, it is turned ON for at least one scan time.

◆ **KEY POINTS**

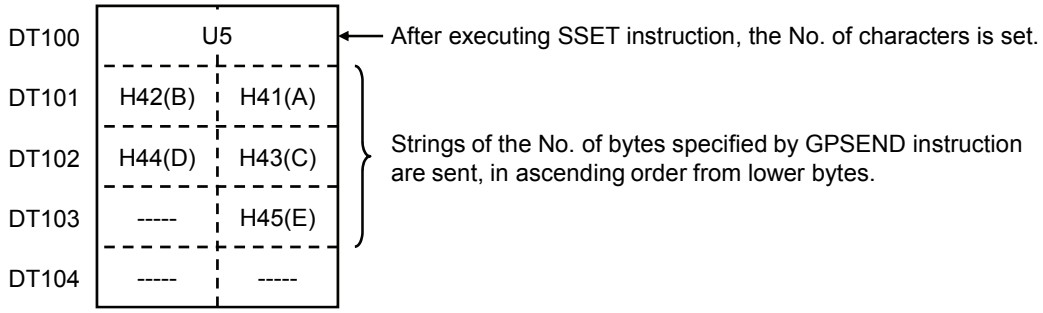
- **Specify the port targeted for communication, using UNITSEL instruction immediately before GPSEND instruction.**
- **Maintain the ON conditions for GPSEND instruction until sending is completed and the general-purpose communication sending active flag (Y8, Y9, YA, YB) turns OFF.**

9.3.2 Contents of Sent Data

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

■ **Sent data table**

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



◆ **KEY POINTS**

- **The start code and the end code specified in the configuration menu are automatically added to the sent data. Do not include the start code or the end code into sent data.**
- **The maximum volume of data that can be sent is 4,096 bytes. If the start code is set to valid, the maximum size is 4,096 bytes including the start code and the end code.**
- **It is also possible to send binary data.**

9.3.3 GPSEND (General-Purpose Communication Sending Instruction)

■ **Instruction format**

Items	Settings	Setting range
i	Specify the operation unit.	US / SS (Note 1)
S	Specify the header of the source node data area.	(Note 2)
n	Specify the No. of sent bytes.	1 to 4094, -1 to -4096 (Note 1) (Note 3)
D	Specify the device area in the source node to save the execution result (one word).	(Note 4)

(Note 1) When a K constant (integer with a symbol) is specified for the No. of sent bytes [n], select SS for operation unit [i]. When a U constant (integer without a symbol) or an H constant (hexadecimal integer), select US for operation unit [i].

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

(Note 3) If a negative value is specified, the end code is not automatically added to the sent data. (Where SCU is targeted)

(Note 4): Device that can be specified for D are: WX, WY, WR, WL, DT, LD.
Once the sending process is completed, the sent bytes are saved. When an error occurs, "FFFFH" is saved.

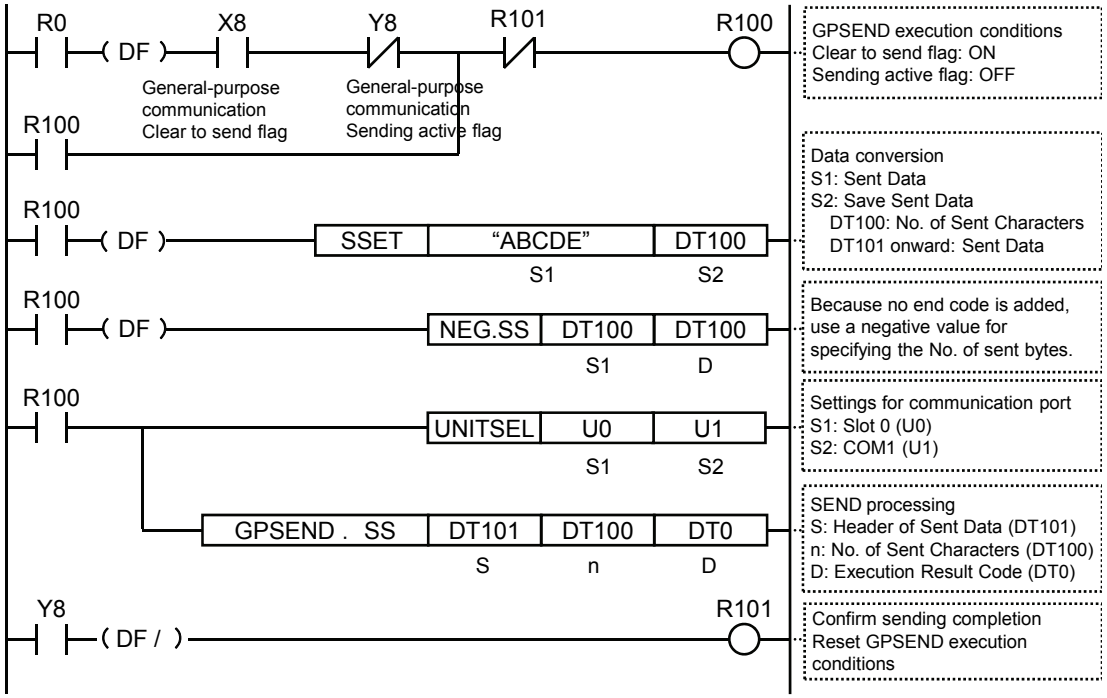
◆ **KEY POINTS**

- **Specify the port targeted for communication, using UNITSEL instruction immediately before GPSEND instruction.**
- **Maintain the ON conditions for GPSEND instruction until sending is completed and the general-purpose communication sending active flag (Y8, Y9, YA, YB) turns OFF.**
- **Confirm that the "General-purpose communication Clear to send flag" for the targeted COM port has turned ON, and execute GPSEND instruction.**
- **When GPSEND instruction is executed for a communication port in the sending process, the sending active flag and the sending result are updated.**
- **GPSEND instruction cannot be used in an interrupt program.**

9.3.4 Precautions on Sending Data

■ **Procedures when the end code is not added in the sending process**

When you do not wish to add the terminator (end code) in the sending process, use a negative value for specifying the No. of sent bytes.



◆ **KEY POINTS**

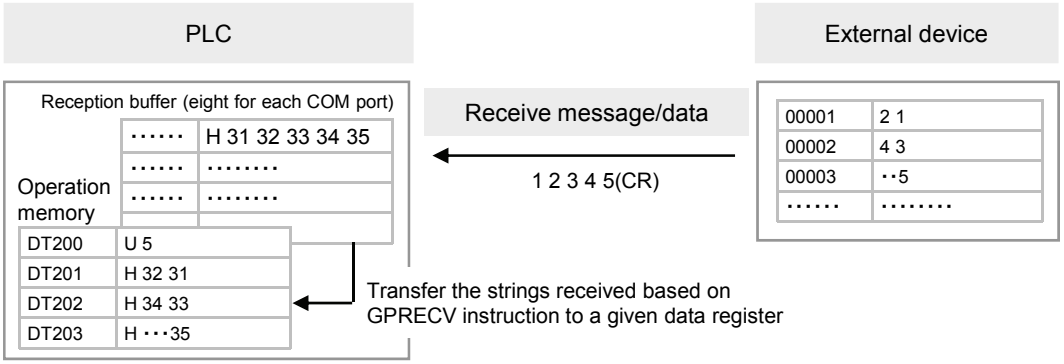
- **When you do not wish to add the terminator (end code), use a negative value for specifying the No. of sent data in GPSEND instruction. Select "SS" for operation unit.**

9.4 Receiving Operation

9.4.1 Overview of Receiving Operation

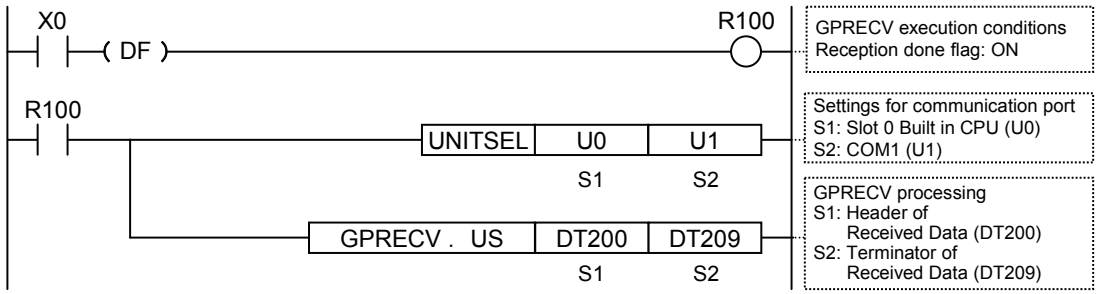
■ **Instructions**

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



■ **Sample program**

- When the reception done flag (X0) turns ON, the reception program is started up by the GPRECV instruction.
- In the UNITSEL instruction, specify the slot No. (U0) and the COM. port No. (U1).
- In the GPRECV instruction, specify and execute the header of the data table where the received message is saved (DT200) and the final address (DT209).



(Note) The unit number and COM port number in the above program is applied when the COM.1 port of the CPU unit is used.

■ **I/O allocation (CPU Unit)**

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

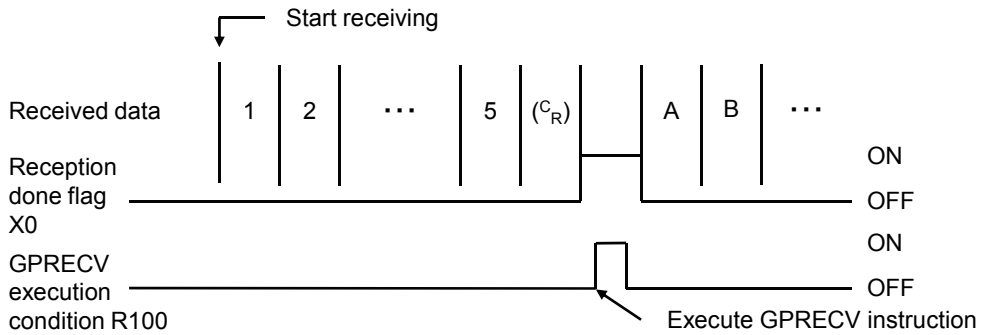
■ **I/O allocation (For Serial Communication Unit)**

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

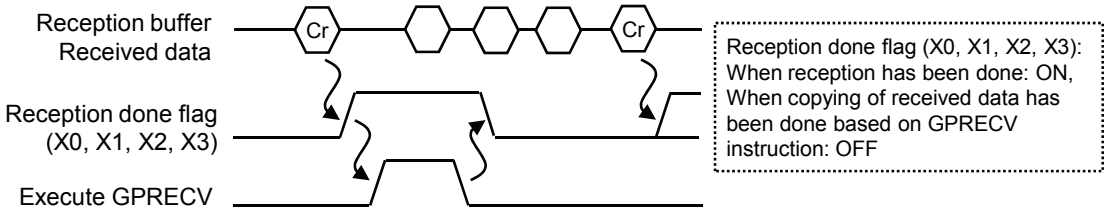
■

■ **Timing chart**

- Data received from an external device are saved in the same reception buffer.
- When the terminator (end code) is received, the “reception done” flag (X0, X1, X2, X3) turns on. Subsequently, the following data are saved in the buffer upon reception. 8 data can be received consecutively.

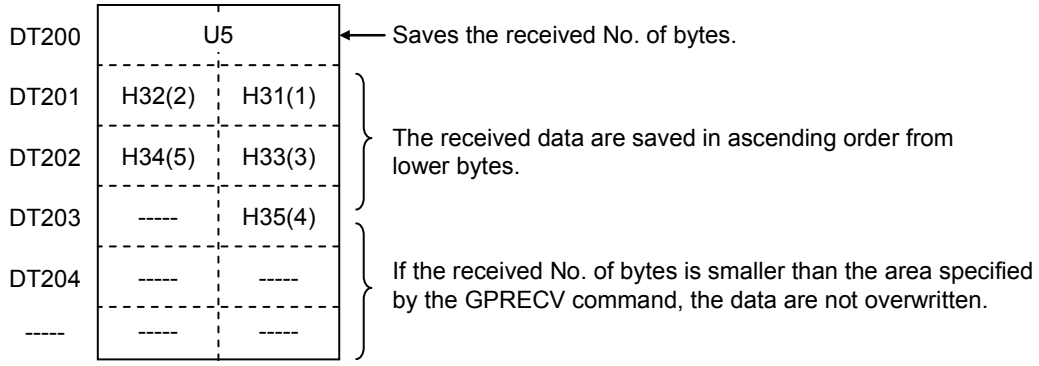


- When the GPRECV instruction is executed, data are copied into the specified area, and the reception done flag (X0, X1, X2, X3) turns OFF. The reception done flag (X0, X1, X2, X3) turns OFF when the I/O refresh is executed at the beginning of the subsequent scans.



■ **Saving method for received data**

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

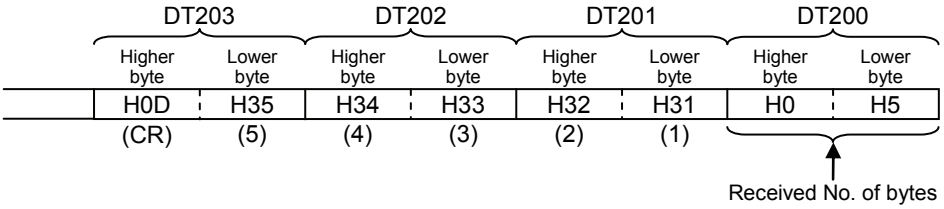


9.4.2 Contents of Received Data

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

Example: The data "12345 CR" is transmitted from a device with RS-232C device.

- At the beginning of the data register, the No. of received bytes is saved.
- The received data are saved in ascending order from lower bytes to higher bytes, starting with DT201.



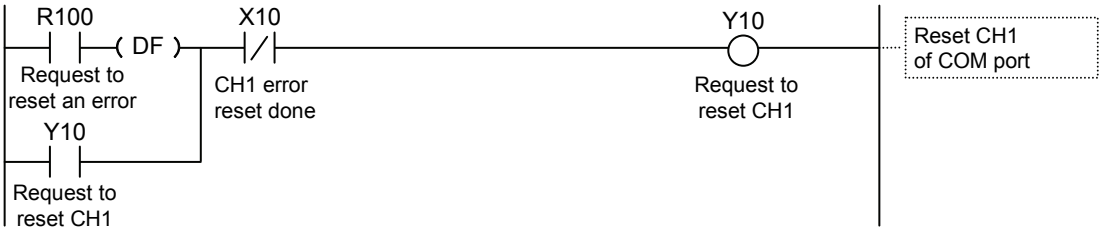
◆ **KEY POINTS**

- **The received data that are copied based on the GPRECV instruction do not include a start code or end code.**
- **It is also possible to receive binary data based on the GPRECV instruction. In this case, the terminator should be specified using "Time".**

9.4.3 Precautions on Receiving Data

■ **Reset communication ports**

- If a communication abnormality has occurred, communication ports can be reset by turning on the "Request to reset" signal (Y10, Y11, Y12, Y13) by the user program.
- Once reset is completed, (X10, X11, X12, X13) turns ON. Subsequently, turn OFF the "Request to reset" (Y10, Y11, Y12, Y13).



■ **Procedure for repeated reception of data**

For repeated reception of data, perform the following steps 1 to 4:

(1) Receive data.
(2) Turn on the "General-purpose communication reception done" flag (X0, X1, X2, X3).
(3) Specify a port to receive data based on the UNITSEL instruction.
(4) Execute the GPRECV instruction and read the received data from the reception buffer.

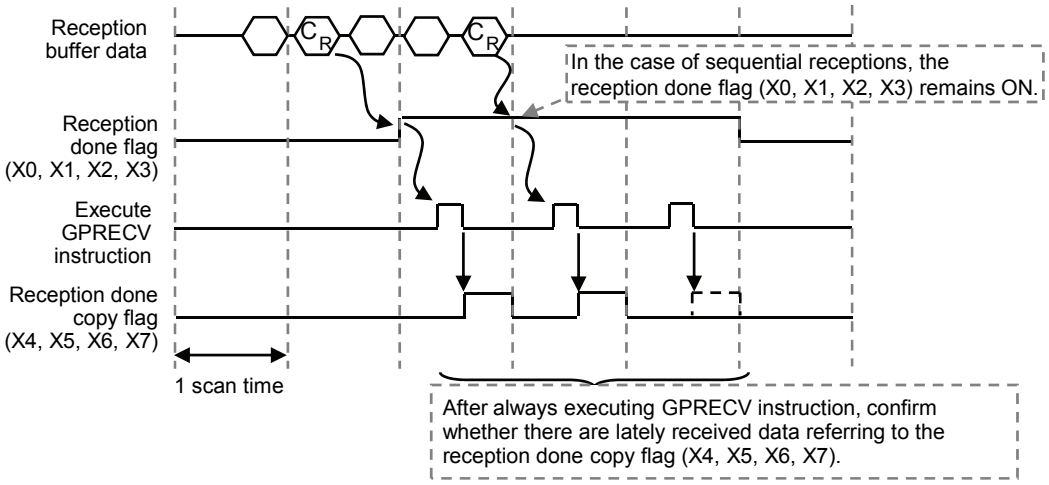
9.4.4 Operations of the "Reception done copy" flag and multiplex reception

■ Operation and function of the "reception done copy" flag (X4, X5, X6, X7)

- The "reception done copy" flag (X4, X5, X6, X7) turns ON when the GPRECV instruction is executed and data are copied from the reception buffer to the specified operation memory, and turns OFF when the END instruction is executed.

■ Processing in the case of multiplex reception

- If the time from the reception of data in the reception buffer to the subsequent data reception is shorter than the PLC scan time, and the receiving frequency is high, it is possible that the reception done flag (X0, X1, X2, X3) remains ON and cannot detect sequential receptions.
- In cases where it is necessary to process sequentially received data, constantly execute the GPRECV instruction, in combination with the "reception done copy" flag (X4, X5, X6, X7).
- Referring to the "reception done copy" flag (X4, X5, X6, X7), you can confirm whether there are lately received data.



9.4.5 GPRECV (General-Purpose Communication Receiving Instruction)

■ **Instruction format**

Setting items	Settings	Setting range
i	Specify the operation unit.	US / SS
D1	Specify the initial address of the data area to save the received data.	(Note 1)
D2	Specify the final address of the data area to save the received data.	(Note 2)

(Note 1): Device that can be specified for D1 are: WX, WY, WR, WL, DT, LD.
(Note 2): Device that can be specified for D2 are: WX, WY, WR, WL, DT, LD.

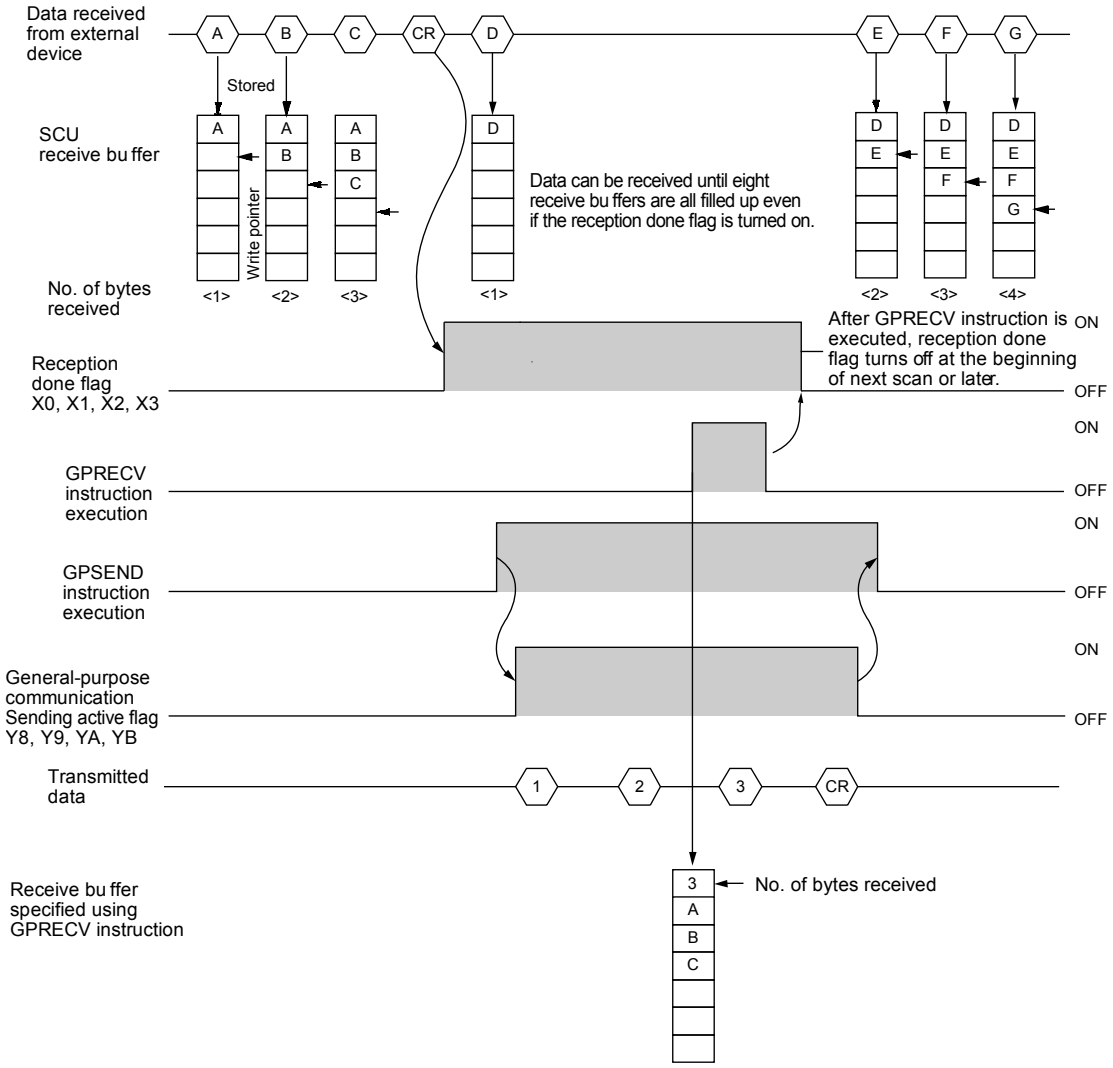
◆ **KEY POINTS**

- **Specify the port targeted for communication, using UNITSEL instruction immediately before GPRECV instruction.**
- **When the general-purpose communication reception done flag is ON for the targeted COM port, execute GPRECV.**
- **When multiplex reception is carried out, the reception done flag (X0, X1, X2, X3) remains ON after the received data are copied based on GPRECV instruction. Therefore, the received data cannot be copied by when the "reception done" signal rises.**

9.5 Sending/Receiving Flag Operation

9.5.1 No Header (Start Code), Terminator (End Code) "CR":

The “reception done” flag, the “sending active” flag, the GPSEND instruction, and the GPRECV instruction are related as follows:

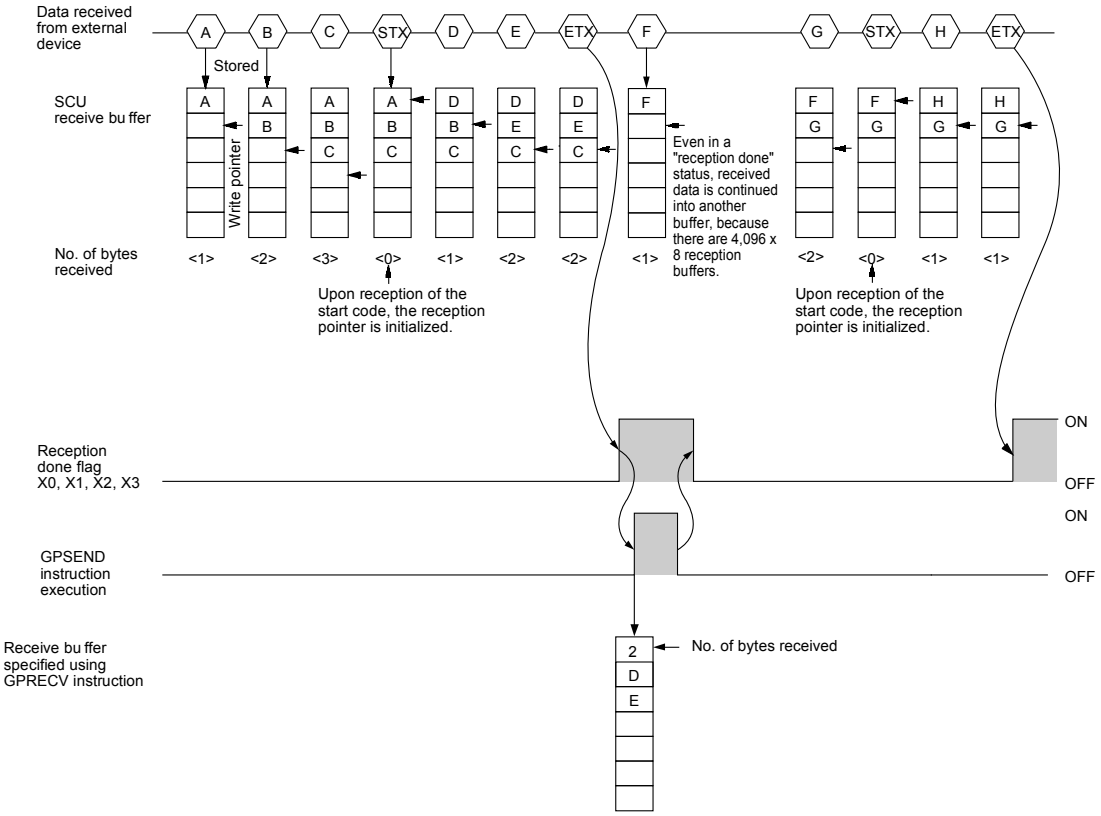


- The COM port has eight reception buffers. The reception process is continued after the reception done flag (X0, X1, X2, X3) turns ON. The reception done flag (X0, X1, X2) does not turn OFF immediately following the execution of GPRECV instruction. It will be turned off at the beginning of the next scan or later.
- After GPSEND instruction is executed, data transmission is started in several μs to several tens of ms. For time before transmission is started, please refer to the communication cycle time (SM208-SM210) using the system monitor function.

- After GPSEND instruction is executed, dual sending to the same port is not possible until the "sending General-purpose communication Sending active flag" (Y8, Y9, YA, YB) turns OFF. The "General-purpose communication Sending active flag" (Y8, Y9, YA, YB) turns OFF in instruction execution in the next scan or later following completion of data sending.

9.5.2 Start Code "STX", End Code "ETX":

Receiving process: Reception done flag and GPRECV instruction are related as follows:



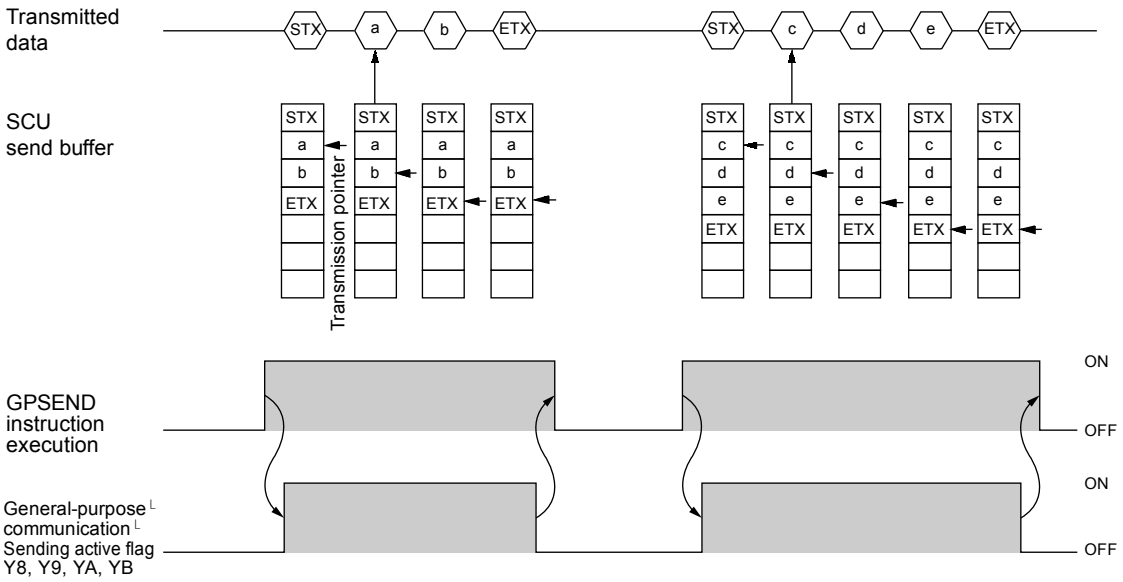
- When the start code is set to "STX", the data are saved in the reception buffer. When the start code is received, the receive pointer is initialized. If there are two headers, data following the second header overwrites the data in the reception buffer.
- The COM port has eight reception buffers. The reception process is continued after the reception done flag (X0, X1, X2, X3) turns ON. The reception done flag (X0, X1, X2, X3) does not turn OFF immediately following the execution of GPRECV instruction. It will be turned off at the beginning of the next scan or later.
- If there are no received data following execution of GPRECV instruction, the reception done copy flag (X4, X5, X6, X7) turns OFF.

◆ **KEY POINTS**

- **The data without the Code STX at the reception is saved in the reception buffer, and the “reception done” flag turns on when the end code is received.**

- **However, if the code STX is added in the middle of the data, the data are saved from the beginning of the reception buffer.**

Sending process: Sending done flag and GPSEND instruction are related as follows:



- Header (STX) and terminator (ETX) are automatically added to the data to be sent. The data are transmitted to an external device.
- After GPSEND instruction is executed, data transmission is started in several μs to several tens of ms. For time before transmission is started, please refer to the communication cycle time (SM208-SM210) using the system monitor function.
- After GPSEND instruction is executed, dual sending to the same port is not possible until the "sending general-purpose communication flag" (Y8, Y9, YA, YB) turns OFF.
- The "General-purpose communication Sending active flag" (Y8, Y9, YA, YB) turns OFF in GPSEND instruction execution in the next scan or later following completion of data sending to an external device. The "General-purpose communication Sending active flag" (Y8, Y9, YA, YB) always remains on for at least 1 scan time.

4

Troubleshooting

10.1 Self-diagnostic Function

10.1.1 CPU Unit's Operation Monitor LED

The CPU unit has a self-diagnostic function which identifies errors and stops operation if necessary. Indications concerning self-diagnosis are as follows.

■ **LED indications concerning self-diagnostic errors**

	LED indications on the CPU unit				Description	Operation status
	RUN Green	PROG Green	ERROR Red	ALARM Red		
Normal operation	●	○	○	○	Normal operation	Operation
	○	●	○	○	PROG. mode	Stop
	▲	○	○	○	Forcing input/output in RUN mode	Operation
Error	●	○	▲	○	When a self-diagnostic error occurs (Operation)	Operation
	○	●	▲	○	When a self-diagnostic error occurs (Stop)	Stop
	○	●	–	●	System watchdog timer has been activated	Stop
	○	▲	–	○	Waiting for connection of the PHLS slave	Stop

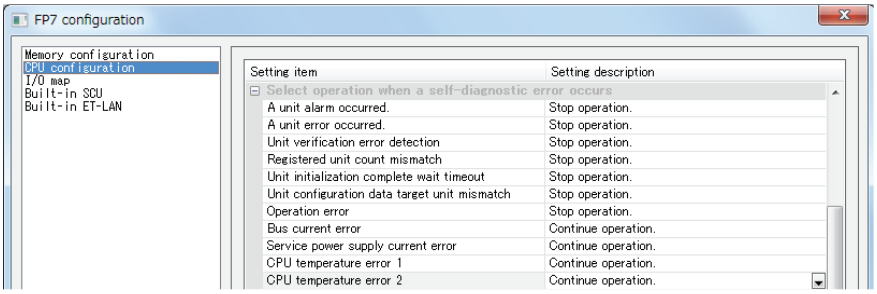
(Note) ●: ON, ▲: Flashing, ○: OFF, -: Varies (ON or OFF)

10.1.2 Operation at the Time of Error

Normally, when an error occurs, the operation stops.

■ **Configuration menu of FPWIN GR7**

Operation mode of the CPU unit at the time of error can be set (Continue or Stop) in the "FP7 Configuration" menu of the tool software FPWIN GR7.



◆ **REFERENCE**

For information on the troubleshooting for the CPU unit, also refer to FP7 CPU Unit User's Manual (Hardware).

10.1.3 Serial Communication Unit's Operation Monitor LED

The serial communication unit has a self-diagnostic function which indentifies errors. Indications concerning self-diagnosis are as follows.

■ **LED indications concerning self-diagnostic errors**

LED indication	Status	Status	Countermeasures
ERROR	ON	Parameter setting error or transmission/reception error occurs.	Refer to10.2 What to DO If an Error Occurs (For Each Communication Mode).
	Flashing (Flashing cycle: 100 ms)	The factory acceptance test switch is ON.	Turn OFF the factory acceptance test switch on the side of the unit.
	Flashing (Flashing cycle: 500 ms)	A cassette that cannot be combined is attached.	Confirm the type of the cassette, and replace it.
ALARM	ON	Hardware error occurs.	Please contact your dealer.

■ **CPU operation when an error occurs in Serial Communication Unit**

- If an alarm or error occurs in the serial communication unit, the CPU unit will stop the operation. The operation can be changed to "Continue" using the CPU configuration.
- In the programming tool, a message of "Unit alarm (80)" or "Unit error (81)" can be confirmed on the status display dialog box.

◆ **KEY POINTS**

- **Even if a communication error occurs, the ERROR LED of the serial communication unit will turn off once communication is completed normally with other COM ports. For confirming error contents, execute PMGET instruction and confirm communication parameters or monitor information.**

10.2 What to DO If an Error Occurs (For Each Communication Mode)

10.2.1 When Using PLC Link Function

■ **What to do If an error occurs**

Situation	Contents to check	Confirmation method
Communication is not possible. (For the serial communication unit, the ERROR LED turns on.)	Is a communication cassette attached?	Check if the communication cassette is attached firmly.
	Are wirings correct?	Check the wirings again.
	Isn't there any problem in environments such as noise?	Check the shielding.
	Is the unit number of each unit set correctly? - Are the unit numbers set sequentially and consecutively from 1? - Isn't there any overlapping unit number? - Isn't any number over 17 used for unit number with PMSET instruction?	- Check the configuration (COM.1 settings) of the CPU with built-in SCU unit or the serial communication unit. - Check the communication parameters with PMGET instruction. (Note)
	Isn't there any overlapping transmission area for each unit.	
	Is the transmission/reception area of PLC link correct?	
	Is the maximum unit number used for the PLC link correct?	
	Is the communication mode set correctly?	

(Note) For checking communication parameters with PMGET instruction, the CPU should be set in the RUN mode. Set "Mode selection when self-diagnostic error occurs - A unit error occurred." to "Continue operation" in the CPU configuration.

10.2.2 When Using MEWTOCOL/ MEWTOCOL7/ MODBUS-RTU Function

■ **What to do if an error occurs**

Situation	Contents to check	Confirmation method
Communication is not possible. (For the serial communication unit, the ERROR LED turns on.)	Is a communication cassette attached?	Check if the communication cassette is attached firmly.
	Are wirings correct?	Check the wirings again.
	Isn't there any problem in environments such as noise?	Check the shielding.
	Is the communication mode set correctly?	- Check the configuration (COM.1 settings) of the CPU with built-in SCU or the serial communication unit. - Check the communication parameters with PMGET instruction. (Note)
Communication is not possible when SD/RDLED of communication cassette is flashing.	Are communication condition settings correct?	
	Are unit numbers set correctly?	
	Is the communication mode set correctly?	
	Is the communication mode set to the same mode as that of a destination device?	
	Is the command length for MEWTOCOL or MEWTOCOL-7 within the prescribed length?	Check the programs of destination devices.

(Note) For checking communication parameters with PMGET instruction, the CPU should be set in the RUN mode. Set "Mode selection when self-diagnostic error occurs - A unit error occurred." to "Continue operation" in the CPU configuration.

10.2.3 When Using General-purpose Communication Function

■ What to do if an error occurs

Situation	Contents to check	Confirmation method
Communication is not possible. (For the serial communication unit, the ERROR LED turns on.)	Is a communication cassette attached?	Check if the communication block is installed firmly.
	Are wirings correct?	Check the wirings again.
	Isn't there any problem in environments such as noise?	Check the shielding.
	Is the communication mode set correctly?	・Check the configuration (COM settings) of the CPU with built-in SCU or the serial communication unit. ・Check the communication parameters with PMGET instruction. (Note)
Transmission is not possible. (For the serial communication unit, the ERROR LED turns on.)	Does an operation error occur when GPSEND instruction is executed?	Review the program.
Transmission is not possible.	Isn't transmission prohibited by CTS signal (Y14 or Y16) when using a communication cassette with RS-232C (5-wire type)?	
	Is the setting for the communication conditions the same as the one for the device communicated?	・Check the configuration (COM settings) of the CPU with built-in SCU or the serial communication unit. ・Check the communication parameters with PMGET instruction. (Note)
	Is the setting of the method for detecting “reception done” the same as the one for the device communicated?	
Reception is not possible. (For the serial communication unit, the ERROR LED turns on.)	Isn't reception error occurring?	・Check the communication parameters and operation status monitor information with PMGET instruction. (Note)
	Isn't the reception buffer FULL error occurring? If the error occurs, the operation cannot be restarted without performing channel reset.	
	Isn't the operation mode set to a mode other than general-purpose communication with PMSET instruction?	

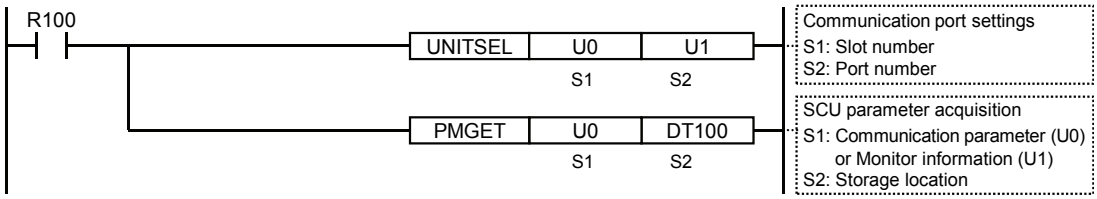
(Note) For checking communication parameters with PMGET instruction, the CPU should be set in the RUN mode. Set "Mode selection when self-diagnostic error occurs - A unit error occurred." to "Continue operation" in the CPU configuration.

10.3 Checking Status with PMGET Instruction

10.3.1 Specifications of PMGET Instruction

■ Confirmation of error information

- Describe UNITSEL instruction immediately before PMGET instruction, and specify the slot and port numbers of the unit to be read.
- Specify the type of data to be read (parameter or monitor information) for operand S1 of PMGET instruction.
- Store 26 words for communication parameters or 7 words for monitor information in the area starting with the area specified by operand S2 of PMGET instruction.



10.3.2 List of Communication Parameters

■ Acquisition of SCU communication parameters

Operand	Parameter	Range	Settings
[D]	Communication mode	U0 U1 U2 U8 U9	U0: MEWTOCOL-COM U1: MEWTOCOL7-COM U2: MODBUS-RTU U8: General-purpose communication U9: PLC link
[D+1]	Unit number setting	U1 to 999	Unit number: U1 to U999 MEWTOCOL-COM :U1 to U99 MEWTOCOL7-COM:U1 to U999 MODBUS-RTU :U1 to U247 PLC link :U1 to U16 (Default: 0)
[D+2]	Baud rate setting	U0 to 10	U0:300, U1:600, U2:1200, U3:2400, U4:4800, U5:9600, U6:19200, U7:38400, U8:57600., U9:115200, U10:230400 bps
[D+3]	Data length setting	U0, U1	U0: 7-bit length, U1: 8-bit length
[D+4]	Parity setting	U0 to U2	U0: No parity, U1: Odd parity, U2: Even parity
[D+5]	Stop bit length setting	U0 to U1	U0: 1 bit, U1: 2 bits
[D+6]	RS/CS (Note 1)	U0, U1	U0: Disable, U1: Enable
[D+7]	Send waiting time	U0 to 10000	U0: Immediate Effective time = Un x 0.01 ms (0 to 100 ms)

(Continued on the next page)

Operand	Parameter	Range	Settings
[D+8]	Header STX	U0, U1	U0: Disable, U1: Enable
[D+9]	Terminator setting	U0 to U3	U0: cR, U1: cR+Lf, U2: Time, U3: ETX
[D+10]	Terminator judgement time	U0 to 10000	U0: For 32 bits Effective time = Un x 0.01 ms (Effective only when the terminator setting is Time)
[D+11]	Modem initialization	U0 to U2	U0: Not initialize U1: Execute the first initialization only. (Note 2) U2: Re-execute initialization at the time of setting.
[D+12]	Reserved area	U0	Reserved area
[D+13]	Reserved area	U0	Reserved area
[D+14]	Link area block No.	U0, U1	Block number of link relay/link register area
[D+15]	PLC link MEWNET-W0 Max. unit No.	U2 to 16	Values outside the range are treated as 16.
[D+16]	Link relay range	U0 to 64	Specification of range of link relays used for communication (Relative values in a specified block)
[D+17]	Link register range	U0 to 128	Specification of range of link registers used for communication (Relative values in a specified block)
[D+18]	Starting number for link relay transmission	U0 to 63	Starting number for link relay transmission (Specified number of words, Relative values in a specified block)
[D+19]	Link relay transmission size	U0 to 64	Link relay transmission size (Specified number of words)
[D+20]	Starting number for link register transmission	U0 to 127	Starting number for link register transmission (Specified number of words, Relative values in a specified block)
[D+21]	Link register transmission size	U0 to 127	Link register transmission size (Specified number of words)
[D+22]	Reserved area	U0	Reserved area
[D+23]	Reserved area	U0	Reserved area
[D+24]	Reserved area	U0	Reserved area
[D+25]	Reserved area	U0	Reserved area

(Note 1) RS/CS is selectable only when using a RS-232C cassette (1-ch, 5-wire type).

(Note 2) The modem is initialized at the time of setting (when the power turns on, PMGET instruction is executed, or switching to the RUN mode). However, only the first initialization is executed. (except the time of repower-on)

(Note 3) The settings of [D+14] to [D+21] are available only when the communication mode for the COM.1 port is PLC link.

■ SCU COM port operation status monitor information

Operand	Monitor information	Range	Settings
[D]	Operation mode	U 0 U 1 U 2 U 8 U 9	U0: MEWTOCOL-COM U1: MEWTOCOL7-COM U2: MODBUS-RTU U8: General-purpose communication U9: PLC link
[D+1]	Communication cassette detection	U0 U232 U422 U485	U 0:No communication cassette U 232:RS-232C U 422:RS-422 U 485:RS-485
[D+2]	Reception error code	bit9: Receive buffer FULL bit8: Receive buffer overflow bit2: Parity mismatch bit1: Stop bit undetected (Frame error) bit0: Receive buffer overrun	
[D+3]	No. of occurrences of reception error	Number of detection of reception errors stored in the low byte of reception error code (Unsigned 16-bit cycle)	
[D+4]	Setting error code	bit9: Number of transmission data error bit8: Communication parameter setting error bit0: Mode setting/change error (A mode number that cannot be set or changed is specified.)	
[D+5]	Error parameter No.	U 1 to 12	Parameter number which data outside the range is specified (Effective only when the communication parameter setting error occurs.)
[D+6]	Modem initialization status	U 0000 U 0100 U 0200 U 02FF	No operation During initialization Initialization completed Initialization failed

10.4 Clearing Errors Using User Programs

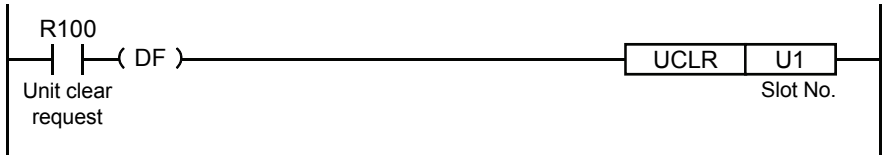
10.4.1 Clearing Errors Using User Programs

- Each error can be cleared by user programs.
- Refer to error codes, correct error factors, and clears the errors.

■ Clearing unit by UCLR instruction

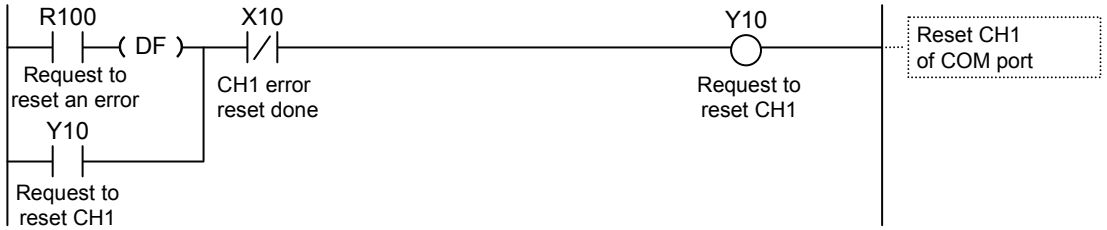
- Executing the dedicated instruction UCLR clears errors occurred in a unit.

Example) Program to clear errors of a unit installed in the slot No.1



■ Resetting communication ports by I/O signals

- Communication ports can be reset by turning on the reset request signals (Y10 to Y13) with user programs when a communication error occurs.
- The signals (X0 to X13) turns on when the reset is completed. Then, turn off the reset request signals (Y10 to Y13).



■ Allocation of I/O signals

Signal name	COM.0	COM.1	COM.2	COM.3	COM.4
Request to reset CH	Y12	Y10	Y11	Y12	Y13
Reset done	X12	X10	X11	X12	X13

(Note 1): The above I/O numbers are those for the slot number 0 (CPU with built-in SCU) and the COM. 1 port. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

11
Specifications

11.1 Communication Function Specifications

11.1.1 CPU Unit Communication Specifications

■ USB port (for tool software)

Items	Description
Standard	USB2.0 FULL SPEED
Communication function	MEWTOCOL-COM (slave), MEWTOCOL7-COM (slave)

■ COM0 Port

Items	Description
Interface	3-wire 1-channel RS-232C
Transmission distance	15 m (Note 1)
Baud rate	300, 600,1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit / s
Communication method	Half-duplex transmission
Synchronous method	Start stop synchronous system
Communication format	Data length: 7 bits / 8 bits, stop bit: 1 bit / 2 bits, parity: Yes / No (Odd / Even) Start code: Without STX / With STX, end code: CR / CR + LF / None / ETX
Data transmission order	Transmits from bit 0 character by character.
Communication function	MEWTOCOL-COM (master/slave), MEWTOCOL7-COM (slave) MODBUS RTU (master/slave) general-purpose communication modem initialization

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

■ LAN port

Items	Description
Interface	100BASE-TX / 10BASE-T
Baud rate	100 Mbps, 10 Mbps auto-negotiation (Note 1)
Transmission system	Baseband
Max. segment length	100 m (Note 2)
Communication cable	UTP (Category 5)
Max. distance between nodes	100BASE-TX: 2 segments
	10BASE-T: 5 segments
No. of nodes	254 units
Number of simultaneous connections	User connections: 16
	System connections: 4 (Note 3)
Communication protocol	TCP/IP, UDP/IP
DNS	Supports name server
DHCP	Automatic getting of IP address
FTP server	File transmission, server function, No. of users: 3
SNTP	Time synch function
Communication function	MEWTOCOL-DAT (master/slave) MEWTOCOL-COM (master/slave) MEWTOCOL7-COM (slave) MODBUS TCP (master/slave) General-purpose communication (16 kB / 1 connection)

(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, it is recommended to position a hub near the control board, and limit the length within 10 m

(Note 3) Used when connecting tool software via LAN.

11.1.2 Extension Cassette Communication Specifications

■ COM1 Port / COM2 Port

Items	Description				
	AFP7CCS1	AFP7CCS2	AFP7CCM1	AFP7CCM2	AFP7CCS1M1
Interface	3-wire 1-channel RS-232C	3-wire 2-channel RS-232C (Note 1)	1-channel RS-422/RS485 (Note 2) (Note 3)	2-channel RS-422/RS485 (Note 2) (Note 3)	3-wire 1-channel RS-232C 1-channel RS485 (Note 3)
Transmission distance	Max. 15 m (Note 4)		When RS-422 is used: Max. 400 m When RS-485 is used: Max. 1200 m (Note 5) (Note 6)		RS-232C: Max. 15 m RS-485: Max. 1200 m (Note 5) (Note 6)
Baud rate	300, 600,1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit/s				
Communication method	Half-duplex transmission (Note 7)				
Synchronous method	Start stop synchronous system				
Communication format	Data length: 7 bits / 8 bits, stop bit: 1 bit / 2 bits, parity: Yes / No (Odd / Even) Start code: Without STX / With STX, end code: CR / CR + LF / None / ETX				
Data transmission order	Transmits from bit 0 character by character.				
Communication functions and No. of units that can be connected	PLC link: Max. 16 units MEWTOCOL-COM (master/slave), MEWTOCOL7-COM (slave): Max. 99 units MODBUS RTU (master/slave): Max. 99 units General-purpose communication: Max. 99 units Modem initialization				

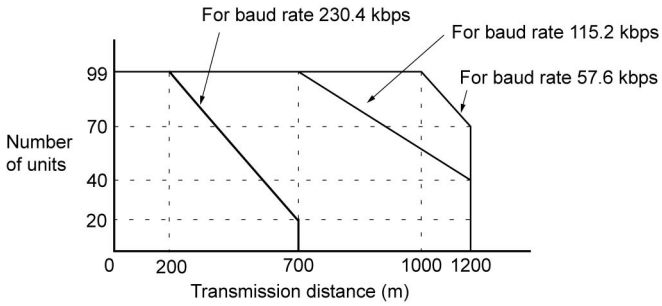
(Note 1) By switching on the dip switch on the cassette, you can use the unit as 5-wire 1-channel RS-232C.

(Note 2) By switching on the dip switch on the cassette, you can switch between RS-422 and RS-485.

(Note 3) When connecting a commercially available device that has an RS485/RS-422 interface, please 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 bps or higher, use the cable not longer than 3 m. For wiring the RS-232C, a shielded wire must be used to increase noise suppression.

(Note 5) The transmission distance is limited by the specified baud rate and No. of connected units in the RS-485 setting. When using a baud rate of 38400 bps or less, the allowable settings are a maximum of 1200 m and 99 units. When a C-NET adapter is mixed, the maximum number of connected units is 32, and the baud rate is limited to 19200 bps or less.



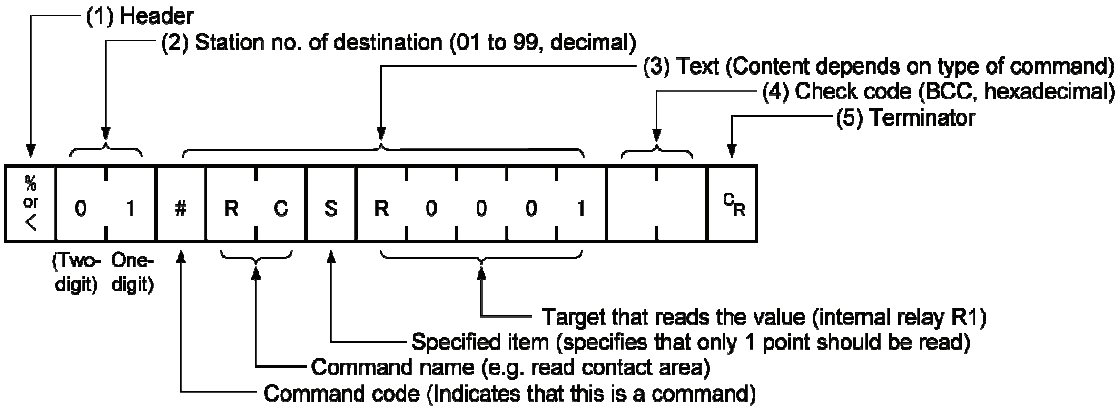
(Note 6) The converter SI-35 manufactured by Lineeye Co., Ltd is recommendable for the RS485 at the computer side.

(Note 7) In general-purpose communication, RS-232C and RS-422 use full-duplex transmission.

11.2 MEWTOCOL-COM Format

11.2.1 MEWTOCOL-COM Command Format

■ **Command message**



(1) Header (start code)

Commands must always have a “%” (ASCII code: H25) or a “<” (ASCII code: H3C) at the beginning of a message.

(2) Station no.

- The station no. of the PLC to which you want to send the command must be specified. The station no. of the PLC is specified by the system register. In the case of the FP7 CPU unit, the station no. is specified in the FPWIN GR7 configuration menu.
- In 1:1 communication, specify "01" (ASCII code: H3031) or "EE" (ASCII code: H4545).

(3) Text

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

(4) Check code

- This is a BCC (block check code) for error detection using horizontal parity. The BCC should be created so that it targets all of the text data from the header to the last text character.
- The BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with ASCII code. It is normally part of the calculation program and is created automatically.
- By entering "**" (ASCII code: H2A2A) instead of BCC, you can omit BCC.

(5) Terminator (end code)

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

◆ NOTES

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

◆ KEY POINTS

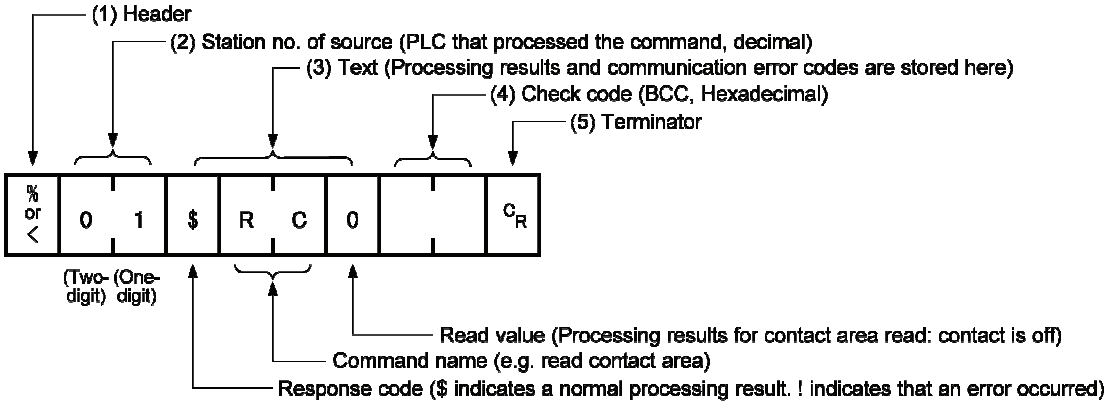
- **An expansion header "<" is supported to send and receive single frames of up to 2048 characters as well as general "%".**

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

11.2.2 MEWTOCOL-COM Response Format

■ **Response message**

After PLC receives a command, it returns the processing result.



(1) Header (start code)

- A “%” (ASCII code: H25) or “<” (ASCII code: H3C) must be at the beginning of a message.
- The response must start with the same header that was at the beginning of the command.

(2) Station no.

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

(3) Text

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

(4) Check code

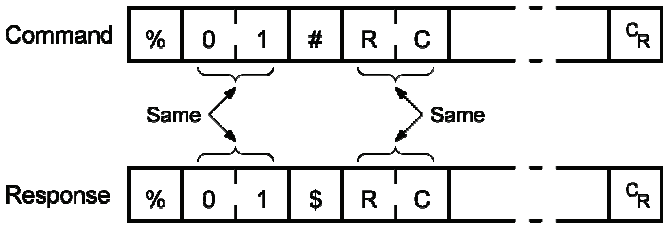
- This is a BCC (block check code) for error detection using horizontal parity.
- The BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and converts the final result.

(5) Terminator (end code)

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

◆ **NOTES**

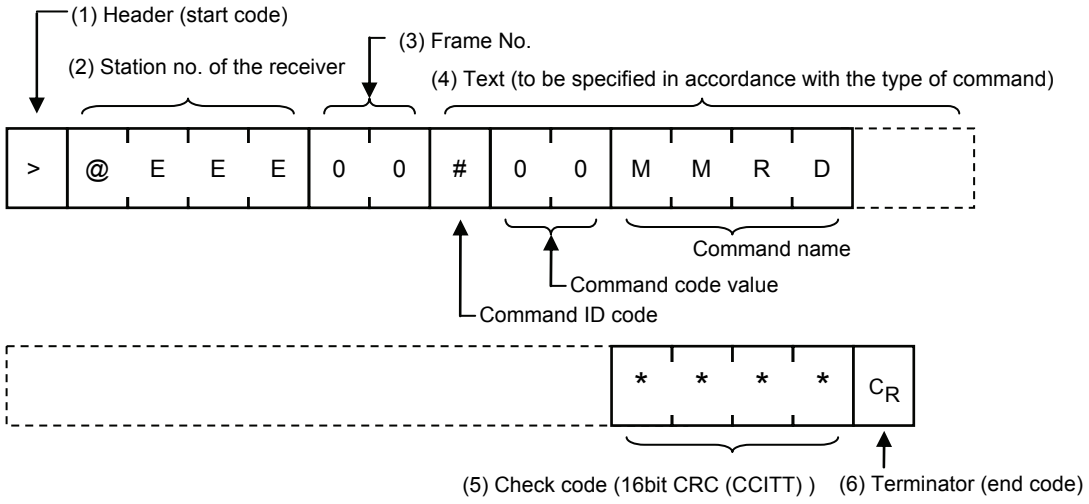
- **If no response is returned, the communication format may not be correct, or the command may not have arrived at the PLC, or the PLC may not be functioning. Check to make sure all of the communication specifications (e.g. baud rate, data length, and parity) match.**
- **If the response contains an "!" instead of a "$", the command was not processed successfully. The response will contain a communication error code. Check the meaning of the error code.**
- **Station no. and command name are always identical in a command and its corresponding response (see below). This makes the correspondence between a command and a response clear.**



11.3 MEWTOCOL7-COM Format

11.3.1 MEWTOCOL7-COM Command Format

■ **Command message**



(1) Header (start code)

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

(2) Station no.

- The station no. of the receiving PLC to which you want to send the command must be specified with "@ and three digits". The station no. of the PLC is specified by the system register. In the case of the FP7 CPU unit, the station no. is specified in the FPWIN GR7 configuration menu.
- In 1:1 communication, specify "001" (ASCII code: H303031) or "EEE" (ASCII code: H45H4545).

(3) Frame No.

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

E.g. Commands for multiple frames

>@EEE00#00MMRDD001G0DT0000000001000****CR

>@EEE01****& CR

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

(4) Text

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

(5) Check code

- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- This should be created so that it targets all of the text data from the header to the last text character.
- CRC is a value given by replacing the result of calculation by CRC-16-CCITT with ASCII code. It is normally part of the calculation program and is created automatically.

(6) Terminator (end code)

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

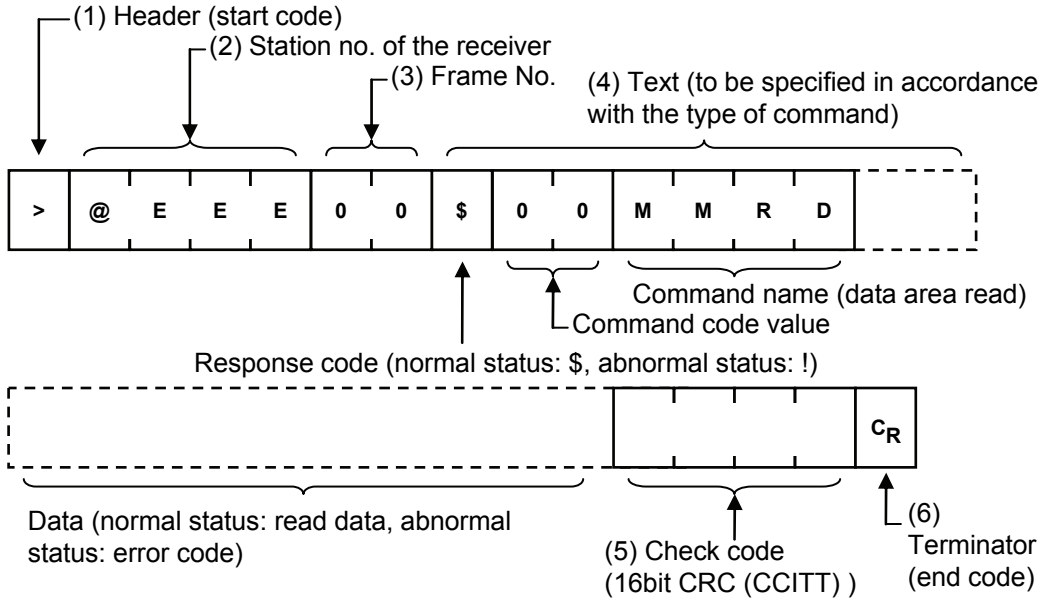
◆ KEY POINTS

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

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

11.3.2 MEWTOCOL7 Response Format

■ **Response message**



(1) Header (start code)

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

(2) Station no.

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

(3) Frame No.

This is the frame number where the command was processed.

(4) Text

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

(5) Check code

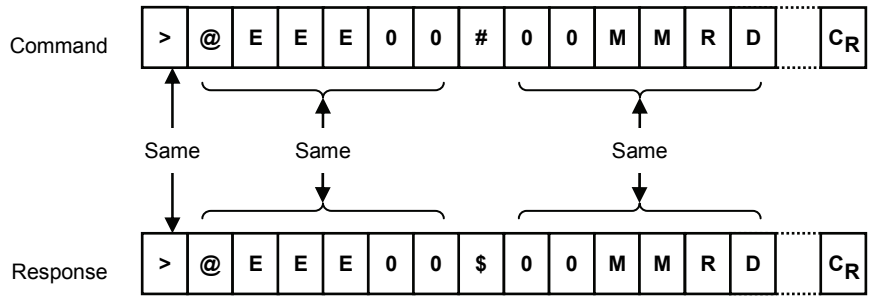
- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- This should be created so that it targets all of the text data from the header to the last text character.
- CRC is a value given by replacing the result of calculation by CRC-16-CCITT with ASCII code. It is normally part of the calculation program and is created automatically.

(6) Terminator (end code)

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

◆ **NOTES**

- **If no response is returned, the communication format may not be correct, or the command may not have arrived at the PLC, or the PLC may not be functioning. Check to make sure all of the communication specifications (e.g. baud rate, data length, and parity) match between the computer and the PLC.**
- **If the response contains an "!" instead of a "$", the command was not processed successfully. The response will contain a communication error code. Check the meaning of the error code.**
- **Station no. and command name are always identical in a command and its corresponding response (see below). This makes the correspondence between a command and a response clear.**



11.4 MODBUS RTU Format

11.4.1 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 (station 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 (Differs depending on baud rate. Refer to the "reception judgment time" section.)

■ 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 set at approx. 32 bits of time.

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

11.4.2 MODBUS RTU Response Format

■ **Response in normal status**

- The same message as a command is returned and 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 (station no.) Function code + 80H Error code CRC	Either 1, 2 or 3

■ **Error code contents**

1. Function code abnormality 2. Device No. abnormality (out of range) 3. No. of devices abnormality (out of range)

Record of changes

Manual No.	Date	Record of Changes
WUME-FP7COM-01	Mar.2013	1st Edition
WUME-FP7COM-02	Dec.2013	2nd Edition - Added new model Serial Communication Unit AFP7NSC - Change of Manual name

Please contact .....

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