Machine Controller MP920

Communications Module

USER'S MANUAL

YASKAWA

MANUAL NO. SIEZ-C887-2.6B

Using this Manual

Please read this manual to ensure correct usage of the MP900-Series system. Keep this manual in a safe place for future reference.

■ Overview

This manual describes the Communications Modules designed for MP900-Series Machine Controllers.

The following Communications Modules can be used with MP900-Series Machine Controllers.

- 215IF (for realtime core networks)
- 217IF (for serial, RS-422/485 networks)
- 218IF (for Ethernet networks)

This manual describes the following items required to use these Communications Modules.

- Communications Module setup
- Communications protocols
- Communications messages
- Communications programming examples

Read this manual carefully when building a communications system or network around MP900-Series Machine Controllers. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

■ Intended Audience

This manual is intended for the following users.

- Those responsible for estimating the MP920 system
- Those responsible for deciding whether to apply the MP920 system
- Those responsible for designing the MP920 system so that it can be mounted in the control and operating panels
- Those responsible for making, inspecting, testing, adjusting, and maintaining the control and operating panels in which the MP920 is mounted

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MP920 = MP920 Machine Controller, which consists of a Power Supply Module, CPU Module, I/O Modules, and other Modules
- PC: Programmable Logic Controller
- PP: Programming Panel
- MPE720: The Programming Device Software or a Programming Device (i.e., a personal computer) running the Programming Device Software
- PLC = Programmable Logic Controller
- "—" in "MOV [axis1]—..." represents numeric data for axis 1.

■ Visual Aids

The following aids are used to indicate types of information for easier reference.

IMPORTANT	Indicates important information that should be memorized.
INFO	Indicates supplemental information.
◀ EXAMPLE ▶	Indicates application examples.
TERMS	Describes technical terms that are difficult to understand, or in the text without an explanation being given.

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following example:

- $\overline{\text{S-ON}}$ = /S-ON
- $\overline{\text{P-CON}}$ = /P-CON

■ Related Manuals

Refer to the following related manuals as required.

Thoroughly check the specifications, restrictions, and other conditions of the product before attempting to use it.

Manual Name	Manual Number	Contents
Machine Controller MP900/MP2000 Series Ladder Logic Programming User's Manual	SIEZ-C887-1.2	Describes the instructions used in MP900/ MP2000 Series ladder logic programming.
Machine Controller MP900/MP2000 Series Motion Programming User's Manual	SIEZ-C887-1.3	Describes the motion programming language used for MP900/MP2000 Series Machine Controllers.
Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device	SIEPC88070005	Describes how to install and operate the MP900/MP2000 Series programming system MPE720.
Machine Controller MP920 Motion Module User's Manual	SIEZ-C887-2.5	Describes the functions, specifications, and usage of the MP920 Motion Modules (SVB-01 and PO-01).
Machine Controller MP920 User's Manual: Design and Maintenance	SIEZ-C887-2.1	Describes the design and maintenance for the MP920 Machine Controller.
FDS System Installation Manual	SIE-C873-16.4	Describes transmission line wiring methods.

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed provided in this manual can result in serious or possibly even fatal injury or damage to he products or to related equipment and systems.

WARNING	Indicates precautions that, if not heeded, could possibly result in loss of life, serious injury.
CAUTION	Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

The warning symbols for ISO and JIS standards are different, as shown below.

ISO	JIS
	

The ISO symbol is used in this manual.

Both of these symbols appear on warning labels on Yaskawa products. Please abide by these warning labels regardless of which symbol is used.

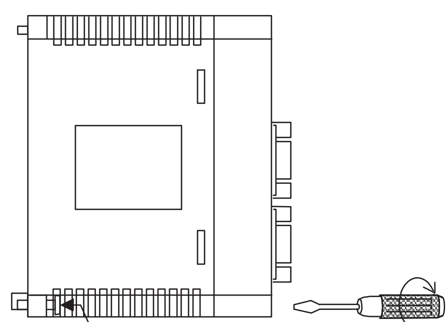
Safety Precautions

This section describes precautions that apply to ladder programming. Before programming, always read this manual and all other documents provided to ensure correct programming. Before using the equipment, familiarize yourself with equipment details, safety information, and all other precautions.

■ Handling

> **⚠ CAUTION**
>
> - Do not subject the product to halogen gases, such as fluorine, chlovine, bromine, and iodine, at any time even during transportation or installation.
>
>   Failure to observe this caution may cause damage or failure of the product.

■ Installation

> **⚠ CAUTION**
>
> - Firmly tighten the Module mounting screws and terminal block mounting screws to prevent them from loosening during operation.
>
>   Loose screws may result in a malfunction of the MP920.
>
> 
>
>
> - Always turn OFF the power supply to the Module before installing it.
> - Insert the connectors of the cables that are to be connected to the MP920 Modules and secure them well.
>
>   Incorrect insertion of the connectors may result in a malfunction of the MP920.

■ Wiring

⚠ CAUTION

- Always connect a power supply that meets the given specifications.

  Connecting an inappropriate power supply may cause fires.
- Wiring must be performed by qualified personnel.

  Incorrect wiring may cause fires, product failure, or electrical shocks.
- Do not accidentally leave foreign matter such as wire chips on the Mounting Base or in the Module when wiring.

  This may cause fires, failures, and malfunctions.

MANDATORY

- Always ground the FG terminal to a ground resistance 100Ω or less.

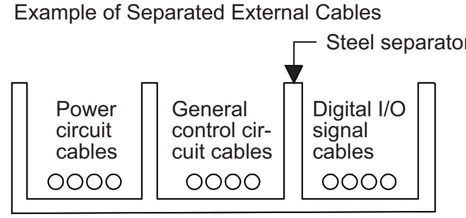
  Failure to ground the MP920 may result in electrical shocks or malfunctioning.

Select, separate, and lay external cables correctly.

- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP920 Module to external devices.
  - Mechanical strength
  - Noise interference
  - Wiring distance
  - Signal voltage, etc.
- Separate the I/O signal lines from the power lines both inside and outside the control panel to reduce the influence of noise from the power lines.

  If the I/O signal lines and power lines are not separated properly, malfunctioning may result.

Example of Separated External Cables



■ Application

⚠ WARNING

- Do not touch any Module terminals when the system power is ON.

  There is a risk of electrical shock.

⚠ CAUTION

- Do not attempt to modify the MP920 programs, force outputs, switch between RUN and STOP, or perform other similar operations while the MP920 is operating without knowing the direct and indirect consequences of the operation.

  Incorrect programming or operation may damage the equipment or cause an accident.

■ Maintenance

⚠ WARNING

- Make sure that the polarity of the Module's built-in battery is correct. The battery must be installed correctly and must not be charged, disassembled, heated, thrown into fire, or short-circuited.

  Improper handling may cause the battery to explode or ignite.

⃠ PROHIBITED

- Do not attempt to disassemble or modify the MP920 Modules in any way.

  Doing so can cause fires, product failure, or malfunctions.

- The customer must not replace any built-in fuses.

  If the customer replaces a built-in fuse, the MP920 Module may malfunction or break down. The built-in fuse must always be replaced by Yaskawa service staff.

■ General

Always note the following to ensure safe use.
• MP920 was not designed or manufactured for use in devices or systems directly related to human life. Users who intend to use the product described in this manual for special purposes such as devices or systems relating to transportation, medical, space aviation, atomic power control, or underwater use must contact Yaskawa Electric Corporation beforehand. • MP920 has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of MP920 involves a life and death situation or in a facility where failure may cause a serious accident, safety devices MUST be installed to minimize the likelihood of any accident. • Drawings in this manual show typical product examples that may differ somewhat from the product delivered. • This manual may change without prior notice due to product improvements and specification changes or for easier use. We will update the manual number of the manual and issue revisions when changes are made. The revision number of the revised manual appears on the back of the manual. • Contact your nearest Yaskawa sales representative or the dealer from whom you purchased the product and quote the manual number on the front page of the manual if you need to replace a manual that was lost or destroyed. • Contact your nearest Yaskawa sales representative or the dealer from whom you purchased the product to order new nameplates whenever a nameplate becomes worn or damaged. • Products modified by the customer are not covered by the Yaskawa warranty, nor does Yaskawa assume any liability for injury or damage that may result from such modifications.

CONTENTS

4 Communications Process

5 215IF Module

Appendix E Module Appearance

INDEX

Revision History

1

Communications Modules

This chapter gives an overview of the Communications Modules and the communications software that can be used for the MP900-Series Machine Controllers.

1.1 Overview

This section describes the Communications Module that are provided as options in the MP920 and outlines their specifications.

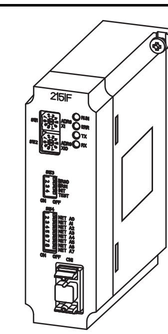
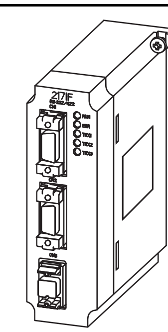
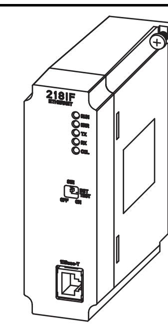
1.1.1 Communications Modules

The following three Communications Modules are provided for the MP900-Series building-block Machine Controllers:

- The 215IF Realtime Core Network Interface Module with link transmission functions. This is a special Yaskawa network.
- The 217IF Serial Interface Module with RS-232C and RS-422/485 ports
- The 218IF Ethernet Interface Module with 10Base-T port

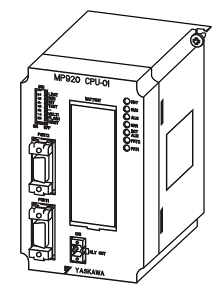
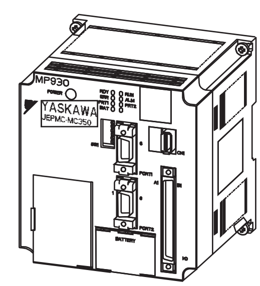
The following illustration lists the name, a brief description, and the appearance of each Communications Module.

Table 1.1 Communications Modules

Module Name	Overview	Appearance
215IF	A Yaskawa Realtime Core Network Interface Module equipped with one communications line and having a transmission speed of 4 Mbps. A relay function can be used to access Machine Controllers that are not directly connected to the same network.	
217IF	A Serial Interface Module equipped with two RS-232C lines and one RS-422/485 line.	
218IF	An Interface Module for the international Ethernet standard equipped with one communications line. Communications are easily achieved with controllers manufactured by other companies, personal computers, workstations, and other devices.	

INFO

RS-232C ports are standard features on MP920 and MP930 CPU Modules and can be used for communications even without an optional Communications Module. While some functions of the communications protocols for these Modules differ, the RS-232C ports are almost the same as those for the 217IF.

Module Name	Overview	Appearance
CPU Module (standard serial port)	An RS-232C interface with two communications lines are standard features on the CPU Module.	 MP920 CPU  MP930 CPU

1.1.2 Specifications

The following table lists the communications specifications of the Communications Modules and outlines their functions. Refer to the chapters on individual Communications Modules for details.

Table 1.2 Communications Module Specifications

Item	215IF	217IF	218IFA	Standard Serial
Interfaces	215IF × 1	RS-232C × 2 RS-422/485 × 1	10Base-T RJ-45	RS-232C × 2
Transmission Distance	Total distance 4 Mbps: 170 m 2 Mbps: 270 m 1 Mbps: 420 m	Maximum distance RS-232C: 15 m RS-422/485: 300 m	Total distance: 100 m/segment Total distance when 4 repeaters are connected: 500 m	Maximum distance 15 m
Baud Rate	1/2/4 Mbps (Software selectable)	RS-232C: 30 bps to 19.2 kbps RS-422/485: 2400 bps to 76.8 kbps	10 Mbps	30 bps to 19.2 kbps
Access Method	Token passing	Start-stop synchronization	IEEE802.3 CSMA/CD	Start-stop synchronization
Frame Configuration	Conforms to HDLC	–	DIX specification	–
Connection Type	–	–	TCP, UDP, IP or ARP	–
Max. Number of Nodes	30/segment	–	Depends on the hub that is used and the network.	–
Communications Mode	Message communications Link communications Engineering communications	Message communications Engineering communications	Message communications Engineering communications	Message communications Engineering communications
Max. Number of Words Transmitted	Link communications: 2,048 words Message and engineering communications: 512 words	–	512 words	–
Communications Protocol	MEMOBUS (Master/Slave) No Protocol	MEMOBUS (Master/Slave) MELSEC OMRON No Protocol	Extended MEMOBUS (Master/Slave) MEMOBUS (Slave only) MELSEC No Protocol	MEMOBUS (Master/Slave) MELSEC No Protocol
Max. Number of Connections	Total number of stations 64 stations/network (with repeaters)	–	20 (10 + 10) connections	–
Connection Configuration	N: N	RS-232C: 1:1 RS-422: 1:1 RS-485: 1:N	N: N	1:1
Transmission Format	–	Data bit length: 7 or 8 Stop bits: 1 or 2 Parity: Even, odd or none	–	Data bit length: 7 or 8 Stop bits: 1 or 2 Parity: Even, odd or none

1

1.1.3 General Specifications

The following table lists the general specifications of the Communications Modules. Refer to the chapters on individual Communications Modules for details.

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0 to 55 °C
	Storage Temperature	-20 to 85 °C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B 3501)
	Corrosive Gas	There must be no combustible or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B 3502: 10 to 57 Hz with single-amplitude of 0.075 mm 57 to 150 Hz with fixed acceleration of 9.8 m/s^2 (1G) 10 sweeps each in X, Y, and Z directions (sweep time: 1 octave/min)
	Shock Resistance	Conforming to JIS B 3502: Peak acceleration of 147 m/s^2 (15G) twice for 11 ms each in the ±X, ±Y, and ±Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to JIS B 3502: 1,500 V (p-p): In either normal or common mode 500 V (p-p): Cable noise (Tested with impulse noise simulator)

1.2 Communications Software

This section explains the basic concepts of the communications software.

1.2.1 Communications Processing

Communications software is required for the Machine Controller and the personal computer used as the Programming Device.

The Machine Controller communications software consists of the communications processing software installed in the Communications Module and the user application software stored in the CPU Module.

The personal computer contains communications software called the Communications Process, which is the communications processing part of the MPE720 Programming Software. The Communications Modules to be connected must be set using the Communications Process.

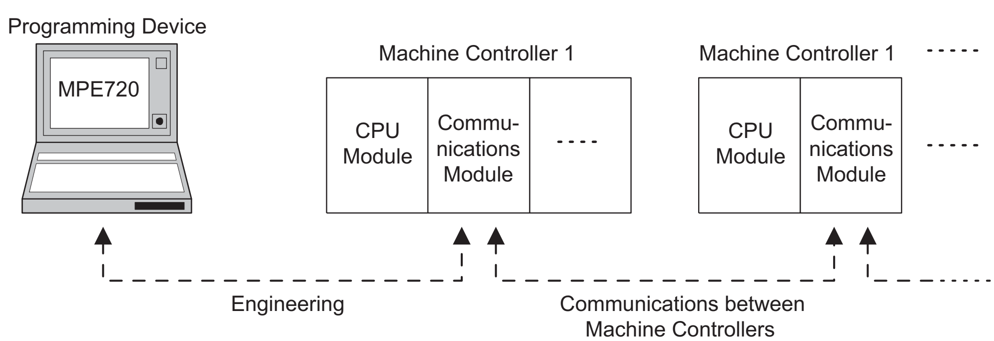


Fig. 1.1 Conceptual Diagram of Communications Processing

1.2.2 Communications Processing Software

Communications control software called communications processing software is installed in each Communications Module. This software is controlled by the CPU Module after the power is turned ON. Software need not be installed when the Communications Module is installed.

The number of channels (CNs) depends on the Communications Module. The configuration, however, is basically the same as the one shown in the following block diagram.

Basic Structure of a Communications Module

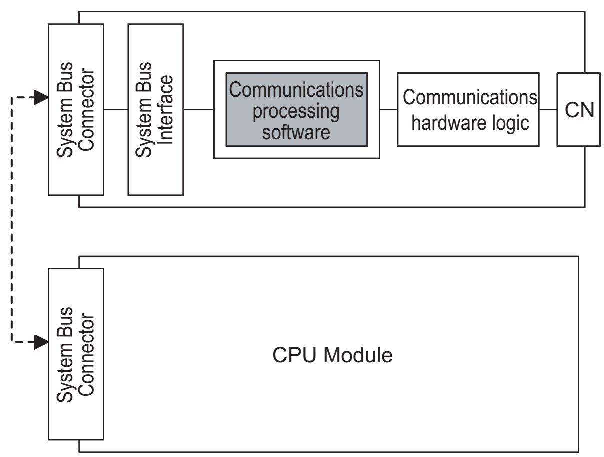


Fig. 1.2 Conceptual Diagram of Communications Processing Software

1.2.3 Communications Process

The communications software required by the Programming Device is called the Communications Process. It is included in the MP900-Series MPE720 Engineering Tool. This software is required for engineering between a Machine Controller and the Programming Device.

The Communications Process is started automatically if it has not already been started on the Programming Device. The communications parameters need to be set only once. Refer to *Chapter 4 Communications Process* for details.

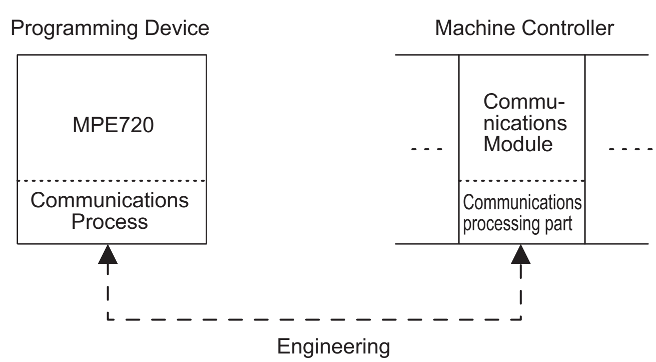


Fig. 1.3 Conceptual Diagram of Programming Device Communications Software

1.2.4 Application Software

Application software refers to the ladder logic programs developed by the user using the MPE720 Programming Device. Communications are coded using the MSG-SND and MSG-RCV system functions.

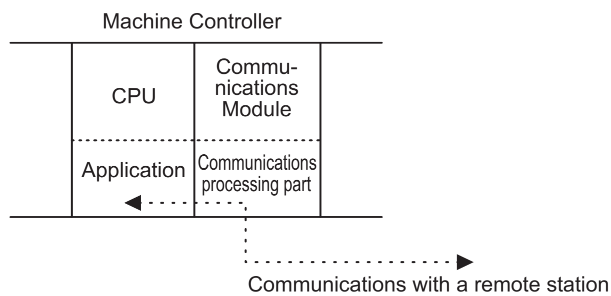


Fig. 1.4 Conceptual Diagram of Application Software

2

Communications Modes

2

This chapter describes the communications processing performed between the Programming Device and a Machine Controller, and between Machine Controllers.

2.1 Communications Modes

2.1.1 Overview

There are basically three communications modes for communications processing implemented in the Communications Modules of the MP900-Series Machine Controller. The communications modes that can be used depend on the type of Communications Module.

Table 2.1 Communications Modes

Communications Mode	Overview	215IF	217IF	218IF
Link Communications	The system transfers data at regular intervals between Machine Controllers in defined memory areas.	Yes	No	No
Message Communications	Data is transmitted by user programs using the MEMOBUS protocol.	Yes	Yes	Yes
	An application-specific protocol (no protocol) is possible. Data is transmitted by a user program.	Yes	Yes	Yes
Engineering Communications (MPE720)	Engineering, such as Machine Controller programming or monitoring, is enabled by connecting a MPE720 Programming Device.	Yes	Yes	Yes

Note: 1. Yes: Communications mode is supported.
No: Communications mode is not supported.
2. When engineering communications are used by the 215IF or the 218IF, a 215PC/AT Card or a general-purpose Ethernet Card is required for the personal computer that is being used as the Programming Device.

Various communications protocols (Extended MEMOBUS, MEMOBUS, MELSEC-A, OMRON, and no protocol) are supported through message communications. See *Chapter 3 Communications Protocols* for details.

2.2 Link Communications

This section explains link communications.

Link communications automatically transfer I/O data (such as relays, coils, and registers) between Machine Controllers, and operate only between 215IF Modules. Links cannot be used with 217IF or 218IF Modules. The Machine Controllers transfer data at regular intervals by a communications mechanism called token passing according to the link allocation map that has been set in advance.

2.2.1 Link Allocation

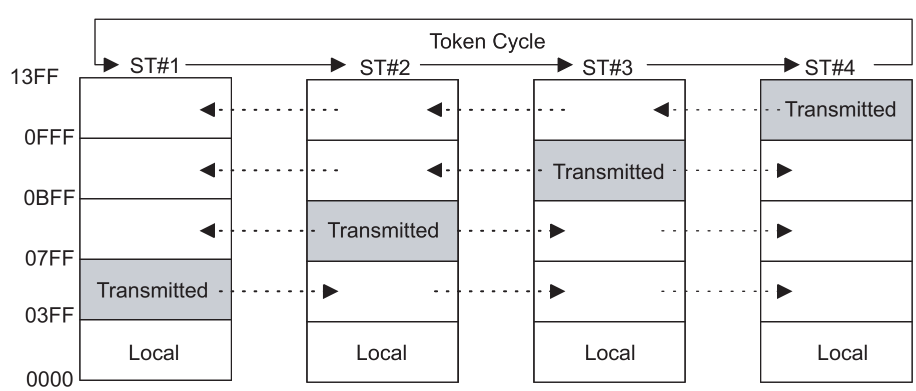
MP900-Series Machine Controllers have the following I/O register areas.

Machine Controller	Input Registers (IB, IW, IL, LFhhhh)	Output Registers (OB, OW, OL, OFhhhh)
MP920	5,120 words (0000 to 13FF)	5,120 words (0000 to 13FF)

Settings are made to map registers in these I/O register areas between the Machine Controllers to show how data is to be transferred. This is called Link Allocation. See ■*Transmission Parameter Settings* under *5.5.4 Setting CP-215 Transmission Definitions* for details.

2.2.2 Conceptual Diagram of Link Communications

If we assume, for example, that I/O registers 0000 to 03FF are in a local area for each station and that registers 03FF to 13FF are used for shared areas, then the link communications would conceptual appear as shown below.



The I/O registers other than the transmitted registers at each local station will be the reception areas from remote stations.

2.2.3 Communications Overview

When each station has written transmission data to its own transmission area and has received the token, the transmission area information and data will be transmitted to all stations.

When this data is received, all stations will write the reception data to their own I/O registers, according to the area information.

In this way, the contents of the I/O areas of all stations are periodically refreshed, according to the token cycle.

2.3 Message Communications

This section explains message communications.

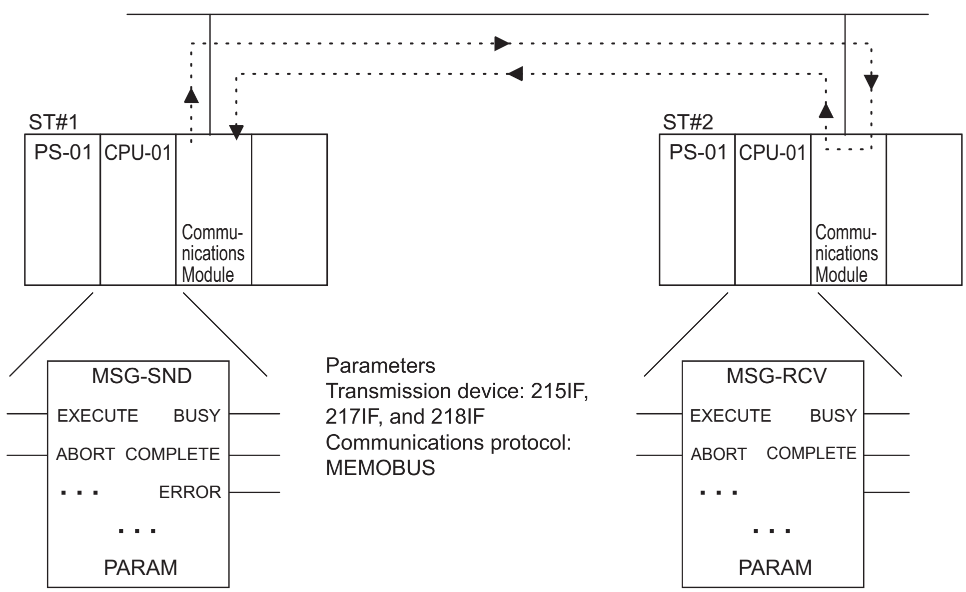
Message communications are used to transfer messages between Machine Controllers one event at a time using the MESSAGE SEND function (MSG-SND) and the MESSAGE RECEIVE function (MSG-RCV). The following two transmission modes are available:

- MEMOBUS message transmission mode
- General-purpose message transmission mode

2.3.1 MEMOBUS Message Transmissions

MEMOBUS messages can be transmitted and received by user programs, and are transmitted using the MEMOBUS protocol.

The Master transmits MEMOBUS messages to the Slaves using the MSG-SND function, and the Slaves return response messages using the MSG-RCV function. The MEMOBUS message flow is shown below.



Data is transmitted to ST#2 via the line from the ST#1 using the MESSAGE SEND function (MSG-SND).

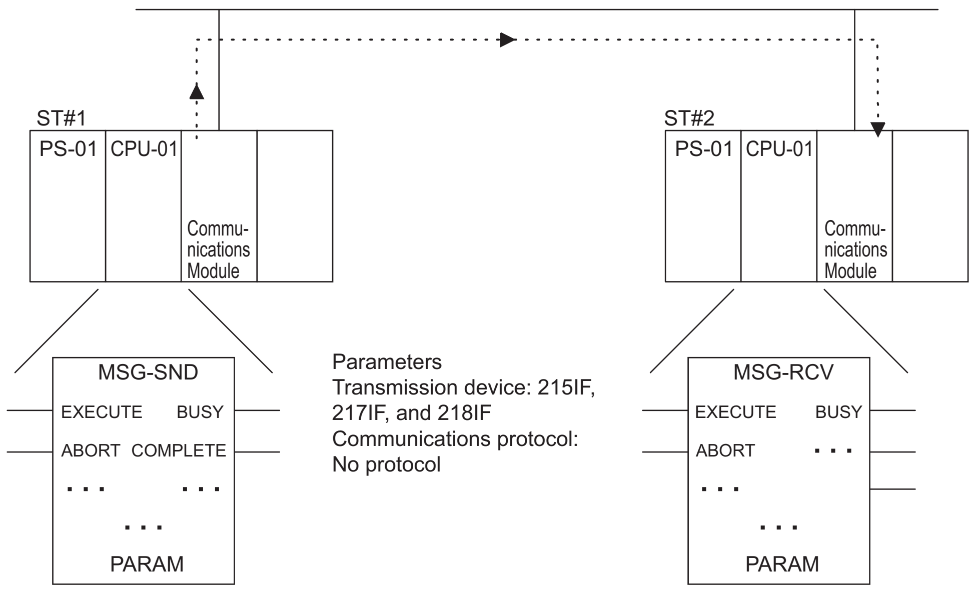
The ST#2 uses the MESSAGE RECEIVE function (MSG-RCV) to read the data from the specified registers and return a response to ST#1.

The processing results can be checked in MSG-SND PARAM (parameter area).

2.3.2 General-purpose Message Transmissions

The general-purpose message transmission mode transfers consecutive data in MW registers, without any processing, using the transmission and reception functions in user programs. The communications protocol.

An application-specific protocol can be established by transferring packet data using consecutive MW registers.



Data is transferred with no protocol via the line from the ST#1 using the MESSAGE SEND function (MSG-SND).

The ST#2 uses the MESSAGE RECEIVE function (MSG-RCV) to receive data from ST#1. No response is returned to ST#1.

2.4 Engineering Communications

This section explains engineering communications.

2.4.1 Overview

The engineering communications protocol is used between the MPE720 Programming Device and Machine Controllers. If this communications mode is supported by the Communications Module, engineering is enabled by directly connecting the MPE720 to a Machine Controller.

2

The following table shows the channels that can currently be used as engineering ports.

	215IF	217IF			218IF	MP920 and MP930 Serial	
	CN1	CN1	CN2	CN3	CN1	CN1	CN2
Channels (CNs) usable as engineering ports	Yes	Yes	No	No	Yes	Yes	Yes

Note: 1. Yes: Can be used as an engineering port.
No: Cannot be used as an engineering port.
2. If engineering is performed via a 215IF Module, a 215IF I/F Card is required in the personal computer.
3. If engineering is performed via a 218IF Module, an Ethernet Interface Card is required in the personal computer.

3

Communications Protocols

This chapter describes the communications protocol and transmission parameter settings in the Setting Parameters. These settings are the same for all of the Communications Modules.

3.1 Overview of Communications Protocols

This section describes the communications protocols and the message communications methods.

3.1.1 List of Communications Protocols

This section gives an overview of the communications protocols used in message communications. The following communications protocols are supported for the MP900-Series Machine Controller. The protocols that can be used depend on the Communications Module.

Table 3.1 List of Communications Protocols

No.	Communications Protocols	215IF	216IF	218IF	Standard Serial*1	Overview
1	Extended MEMO-BUS	Yes	No	Yes	No	Extends the functions of the MEMOBUS protocol.*2
2	MEMOBUS	No	Yes	Yes*3	Yes	Yaskawa's standard protocol conventionally used with RS-232C.
3	MELSEC-A	No	Yes	Yes	Yes	MELSEC-A protocol for connection to Controllers manufactured by Mitsubishi Electric Corporation.
4	OMRON	No	Yes	No	No	OMRON communications protocol for connection to Controllers manufactured by OMRON Corporation.
5	No protocol (Through mode)	Yes	Yes	Yes	Yes	Protocol used to implement the custom protocols.

* 1. "Standard Serial" indicates the standard serial port on a CPU Module.
* 2. Some parts of the data format differ between the 215IF and the 218IF.
* 3. When the MEMOBUS protocol is used with the 218IF, only the Slave (MSG-RCV) function can be used with the MP900-Series Machine Controllers.

Note: Yes: Protocol supported by the Module.
No: Protocol not supported by the Module.

3.1.2 Communications Protocols and Message Communications

There are two message communications modes: The MEMOBUS message mode for command-response communications, and a general-purpose message mode for one-way communications.

The various communications protocols belong to either of these message communications modes.

Message Communications Mode	Communications Protocols	Remarks
MEMOBUS Message Mode	Extended MEMOBUS MEMOBUS MELSEC-A OMRON	Command-response communications
General-purpose Message Mode	No protocol (Through mode)	One-way communications

3.2 Protocol Functions

3.2.1 Extended MEMOBUS Protocol

The Extended MEMOBUS protocol is used between Controllers with the 218IF Module. It can also be used between 215IF Modules.

From a functional point of view, Extended MEMOBUS provides extended functions over the MEMOBUS protocol using conventional RS-232C communications. A wider range of functions and more efficient communications are provided than with the MEMOBUS protocol.

The MEMOBUS mode and the general-purpose message mode are available with the Extended MEMOBUS protocol. These are specified in the parameters of the send message and receive message functions (MSG-SND and MSG-RCV).

■ Extended MEMOBUS Protocol Functions

The functions provided by the Extended MEMOBUS protocol are shown in the following table.

Table 3.2 Extended MEMOBUS Protocol Functions

Function Code	Function	No. of Points	Remarks
01H	Coil status read	2,000 points	–
02H	Input relay status read	2,000 points	–
03H	Holding register write	125 words	–
04H	Input register write	125 words	–
05H	Single coil status change	1 point	–
06H	Single holding register write	1 word	–
08H	Loopback	–	–
09H	Holding register read (extended)	508 words	–
0AH	Input register read (extended)	508 words	–
0BH	Holding register write (extended)	507 words	–
0DH	Discontinuous multiple holding register read (no header)	508 words	–
0EH	Discontinuous multiple holding register write	254 words	–
0FH	Multiple coil status change	800 points	–
10H	Multiple register write	100 words	–
31H	MELSEC fixed buffer communications	507 words	218IF only
32H	MELSEC random buffer read	508 words	218IF only
33H	MELSEC random buffer write	507 words	218IF only

■ Transferring Data Using MEMOBUS Mode

The Extended MEMOBUS protocol is used for communications between MP-series and CP-series products (MP920, CP-316, CP-317, CP-9200SH, and CP-3500H).

The Master transmits Extended MEMOBUS format instructions to the Slave, and the Slave returns a response message when it has received an instruction.

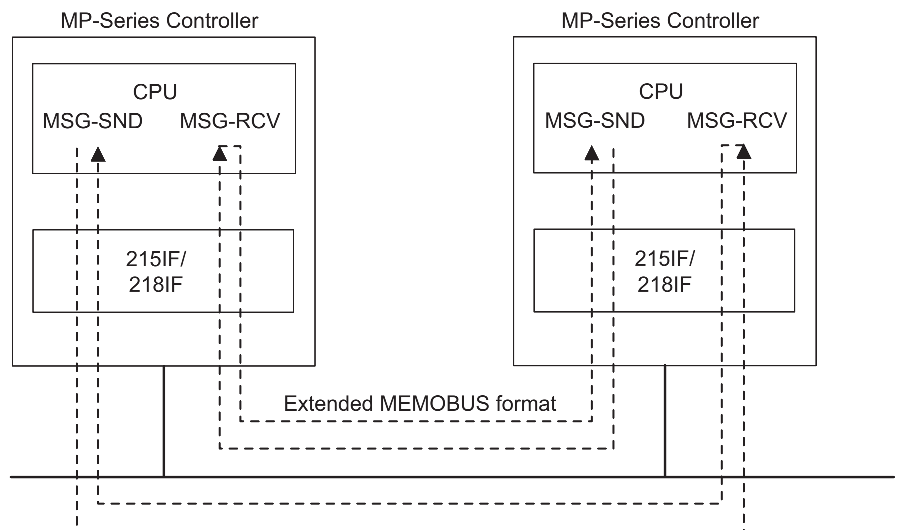


Fig. 3.1 Extended MEMOBUS Protocol Message Flow Between MP-Series Controllers

3

■ General-purpose Message Mode

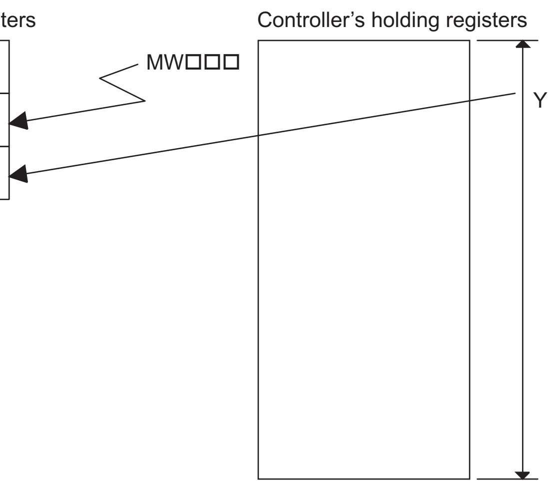
The contents of Controller's holding registers (MW registers) can be transmitted or received in the general-purpose message mode.

As shown in the following diagram, the specified length of data starting from the specified address in consecutive holding registers in the Controller is transmitted without processing. The Controller does not wait for a response.

The data size that can be handled in one communication is from 1 word to 510 words.

MSG-SND function parameters

No.	I/O	Contents
05	IN	Data address
06	IN	Data size



3.2.2 MEMOBUS Protocol

■ Overview

The MEMOBUS Protocol is the standard protocol that has been used up to now for Yaskawa RS-232C communications, and it is the main communications protocol for Yaskawa Controllers.

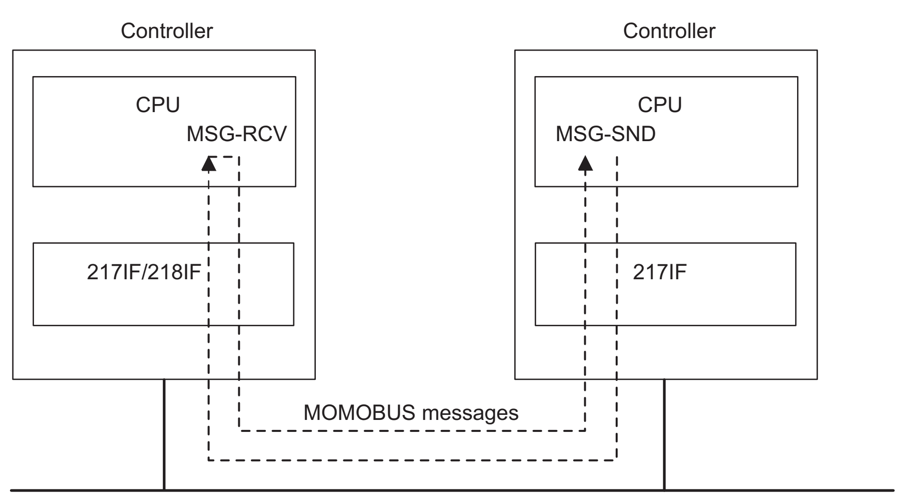


Fig. 3.2 MEMOBUS Message Flow in Communications Between Controller and Personal Computer

■ MEMOBUS Protocol Functions

Function Code	Function	No. of Points	Remarks
01H	Coil status read	2,000 points	–
02H	Input relay status read	2,000 points	–
03H	Holding register write	125 words	–
04H	Input register read	125 words	–
05H	Single coil status change	1 point	–
06H	Single holding register write	1 word	–
08H	Loopback	–	–
0FH	Multiple coil status change	800 points	–
10H	Variable register write	100 word	–

3.2.3 MELSEC-A Protocol

The MELSEC-A protocol is used for communications between MELSEC-A Series general-purpose sequencers manufactured by Mitsubishi Electric Corporation. There is no need to be aware of the communications protocol. In this case, a special-purpose Ethernet Module (AJ71E71) and a Computer Link Unit (AJ71UC24) are required for the Mitsubishi MELSEC-A Sequencers.

■ Communications Using the MELSEC Protocol

The MELSEC protocol is used for communications between a Controller and a MELSEC-A sequencer.

That is to say, the Master (Controller) transmits the MELSEC format instructions to the Slave (MELSEC), and receives a response message from the Slave.

When communicating with a MELSEC-A computer, the protocol is automatically converted inside the 217IF and the 218IF Modules. Therefore, the MSG-SND and MSG-RCV system functions can be used in the same way as when the Extended MEMOBUS protocol is used by a user program.

The following three MELSEC functions are supported by Ethernet communications using the 218IF and the AJ71E71:

- Communications between CPUs
- Fixed buffer communications
- Random access buffer communications

With fixed buffer communications, the Controller can be either a Master or a Slave. With communications between CPUs and random access buffer communications, however, the Controller will be a Master due to the MELSEC specifications.

With serial communications using the 217IF and the AJ71UC24, the special protocol type 1 is supported. With serial communications, the Controller will be the Master.

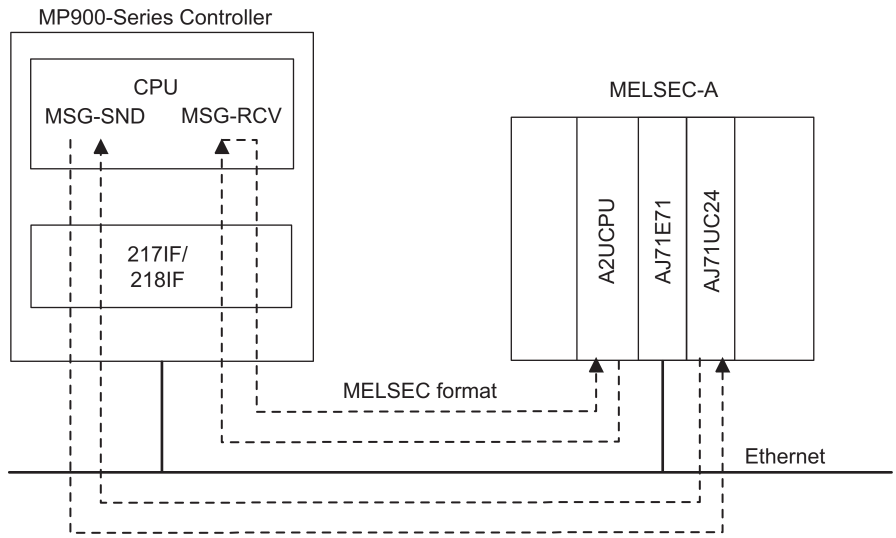


Fig. 3.3 MELSEC Format Message Flow
Between a Controller and MELSEC-A

■ MELSEC Commands Supported by the 217IF

The following table shows the common MELSEC ACPU commands supported by the MP900-Series 217IF Module, and the MEMOBUS command codes corresponding to these commands.

Table 3.3 Common MELSEC ACPU Commands

MEMOBUS Command	MELSEC Command	Description	Qty	Remarks
01H/02H	WR	Reads bit devices in 16-point units	32 words (512 points)	–
03H/04H		Reads word devices in 1-point units	64 points	–
0FH	WW	Writes bit devices in 16-point units	10 words (160 points)	–
10H		Writes word devices in 1-point units	64 points	–
08H	TT	Loopback test	254 characters	–

Note: Special AnACPU commands are not supported. Use the common ACPU commands for AnACPU access. AnACPU expansion registers cannot be accessed.

■ MELSEC Commands Supported by the 218IF

The following table shows the common MELSEC ACPU commands supported by the MP900-Series 218IF Module, and the MEMOBUS command codes corresponding to these commands.

Table 3.4 Common MELSEC ACPU Commands

Extended MEMOBUS Command	MELSEC Command	Description	Qty	Remarks
01H/02H	00H	Reads bit devices in 1-point units	256 points	–
–	01H	Reads bit devices in 16-point units	128 words (2,048 points)	Not supported
03H/04H 09H/0AH		Reads word devices in 1-point units	256 points	–
05H/0FH	02H	Writes bit devices in 1-point units	256 points	–
–	03H	Writes bit devices in 16-point units	40 words (640 points)	Not supported
06H/00BH 10H		Writes word devices in 1-point units	256 points	–
–	05H	Randomly specifies, sets, and resets bit devices and device numbers in 16-point units	40 words (640 points)	Not supported
0EH		Randomly specifies, sets, and resets word devices and device numbers in 1-point units	40 points	–
08H	16H	Loopback test	256 bytes	–
31H	60H	Fixed buffer communications	507 words	–
32H	61H	Reads random access buffer communications	508 words	–
33H	62H	Writes random access buffer communications	508 words	–

Note: Special AnACPU commands are not supported. Use the common ACPU commands for AnACPU access. AnACPU expansion registers cannot be accessed.

■ Communications Programs

MELSEC protocol communications can be performed by user programs using the MSG-SND and MSG-RCV functions.

Refer to *Appendix A System Functions* for information on using the MSG-SND and MSG-RCV functions.

INFO

The MELSEC protocol functions supported by the 217IF and the 218IF differ.

3.2.4 OMRON Protocol

The OMRON protocol is used for communications between SYSMAC Programmable Logic Controllers (PLCs) manufactured by OMRON. There is no need to be aware of the communications protocol.

■ Communications Using the OMRON Protocol

The OMRON protocol is used for communications between a Controller and an OMRON PLC.

That is to say, the Master (Controller) transmits an OMRON format command to the Slave (SYSMAC PLC), and receives a response message from the Slave.

When communicating with a SYSMAC PLC, the protocol is automatically converted inside the 217IF Module. Therefore, the MSG-SND and MSG-RCV system functions can be used in the same way as when the Extended MEMOBUS protocol is used by a user program.

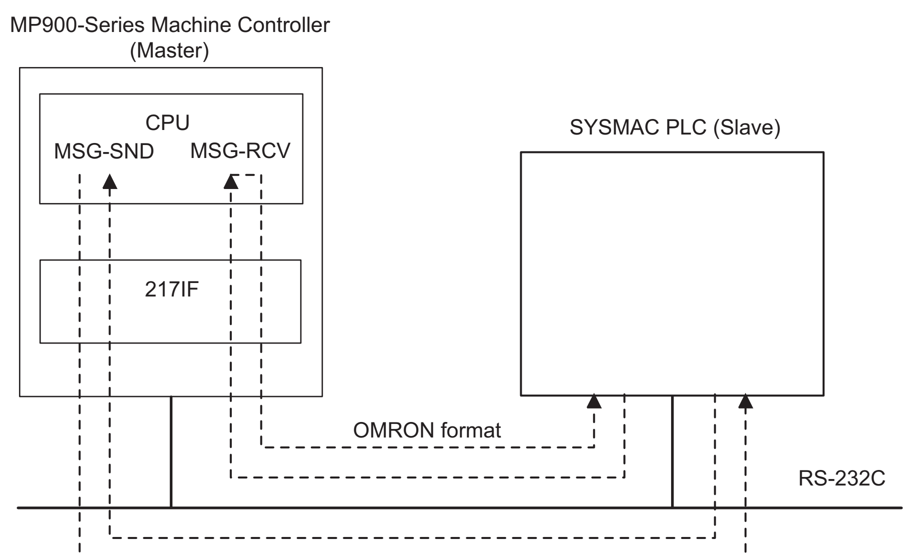


Fig. 3.4 OMRON Format Message Flow
Between a Controller and OMRON PLC

■ OMRON Commands Supported by the 217IF

The following table shows the OMRON SYSMAC commands that are supported as MEMO-BUS commands by the 217IF Module.

Table 3.5 List of OMRON Commands

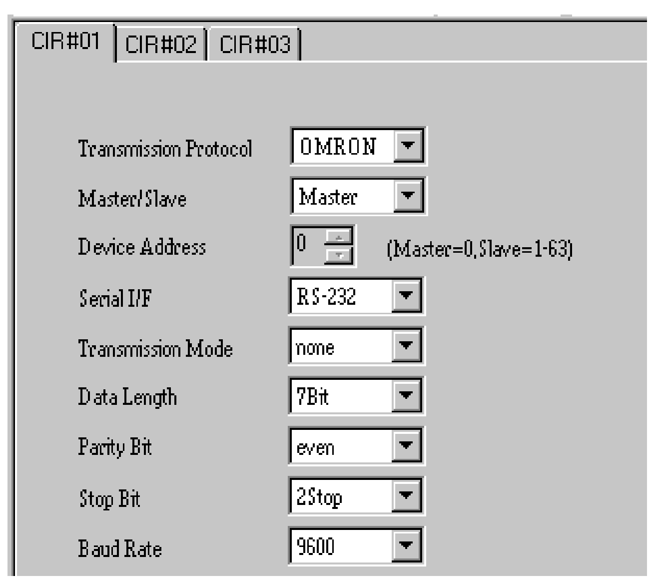
MEMOBUS Command	OMRON Header Code	Description	No. of Words	Remarks
01H	RR	Reads IR/CIO and AR Area words	256 words	–
03H	RD	Reads DM area words	2,000 words	–
0FH	WR	Writes IR/CIO and AR Area words	252 words	–
10H	WD	Writes DM area words	2,000 words	–
08H	TS	Test	–	–
Master Function	IC	Undefined command error (response only)	–	–

3

■ Transmission Parameter Settings

The following diagram shows the Transmission Parameter Settings Window in which the OMRON protocol is specified.

When using the OMRON protocol, specify “OMRON” as the communications protocol in the CP-217 Transmission Settings Window.



3.2.5 No Protocol Mode (Through Mode)

■ Overview

With the no protocol mode, consecutive data in the Controller's holding registers (MW registers) is transferred as it is.

■ No Protocol Functions

Function Code	Function	Qty	Remarks
–	Receives messages in word units.	–	Message function PRO_TYP = 2
–	Receives messages in byte units.	–	Message function PRO_TYP = 3

■ Transmission Parameter Setting Example

The following Connection Parameter Settings Window is displayed when the Through Mode is used.

When using the Through Mode, specify "None" in the protocol type column in the Connection Parameter Window.

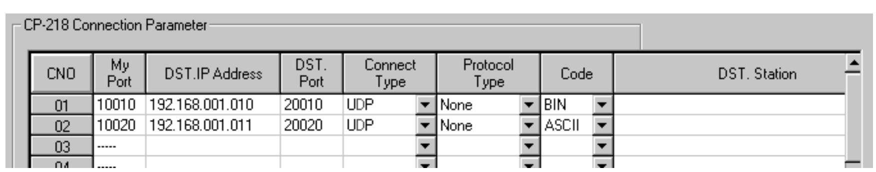


Fig. 3.5 Connection Parameter Window

■ Communications Programs

Through Mode communications can be performed by specifying No-protocol 1 (value = 2) or No-protocol 2 (value = 3) as protocol type PRO-TYP in the MSG-SND and MSG-RCV functions in the user program. With No-protocol 1 communications, data is transferred in word units. With No-protocol 2 communications, data is transferred in byte units.

Refer to *Appendix A System Functions* for information on using the MSG-SND and MSG-RCV functions.

3.3 Sample Programming Example

This section shows an example of a ladder logic program used to implement the message function. It also explains the relationship between the communications protocol and the message function.

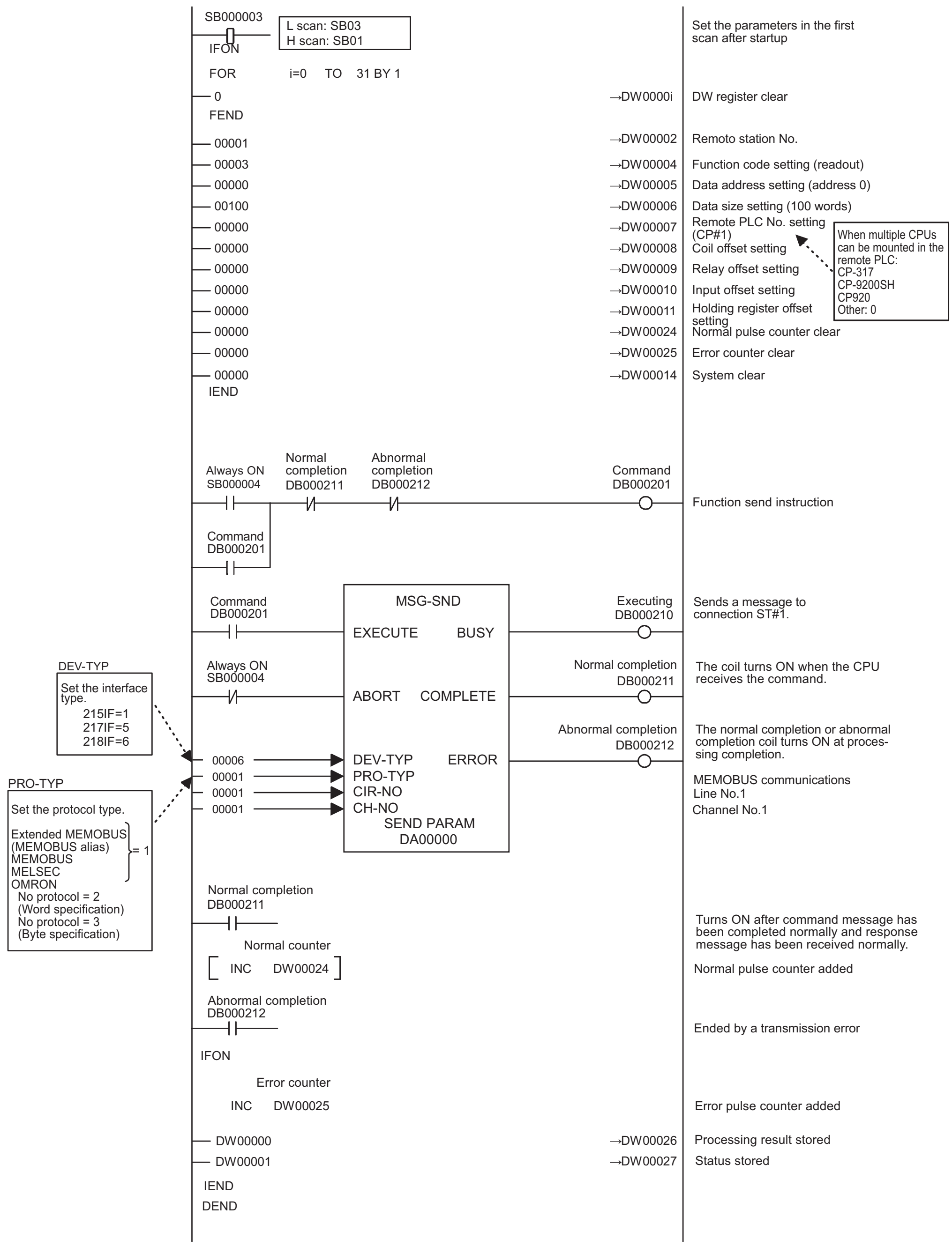
For message transfers, it is necessary to clearly recognize whether the system operates as a Master or Slave. In the sample program given below, only the basic part of the ladder logic program used for the system functions is coded.

Refer to *Appendix A System Functions* for the detailed function parameters.

3.3.1 Master Function

The Master uses the send message function (MSG-SND). Messages are sent to the Slave, and a response is received.

■ MSG-SND Program



In the top half, the Master function (MSG-SND) parameters are set in the first scan after startup.

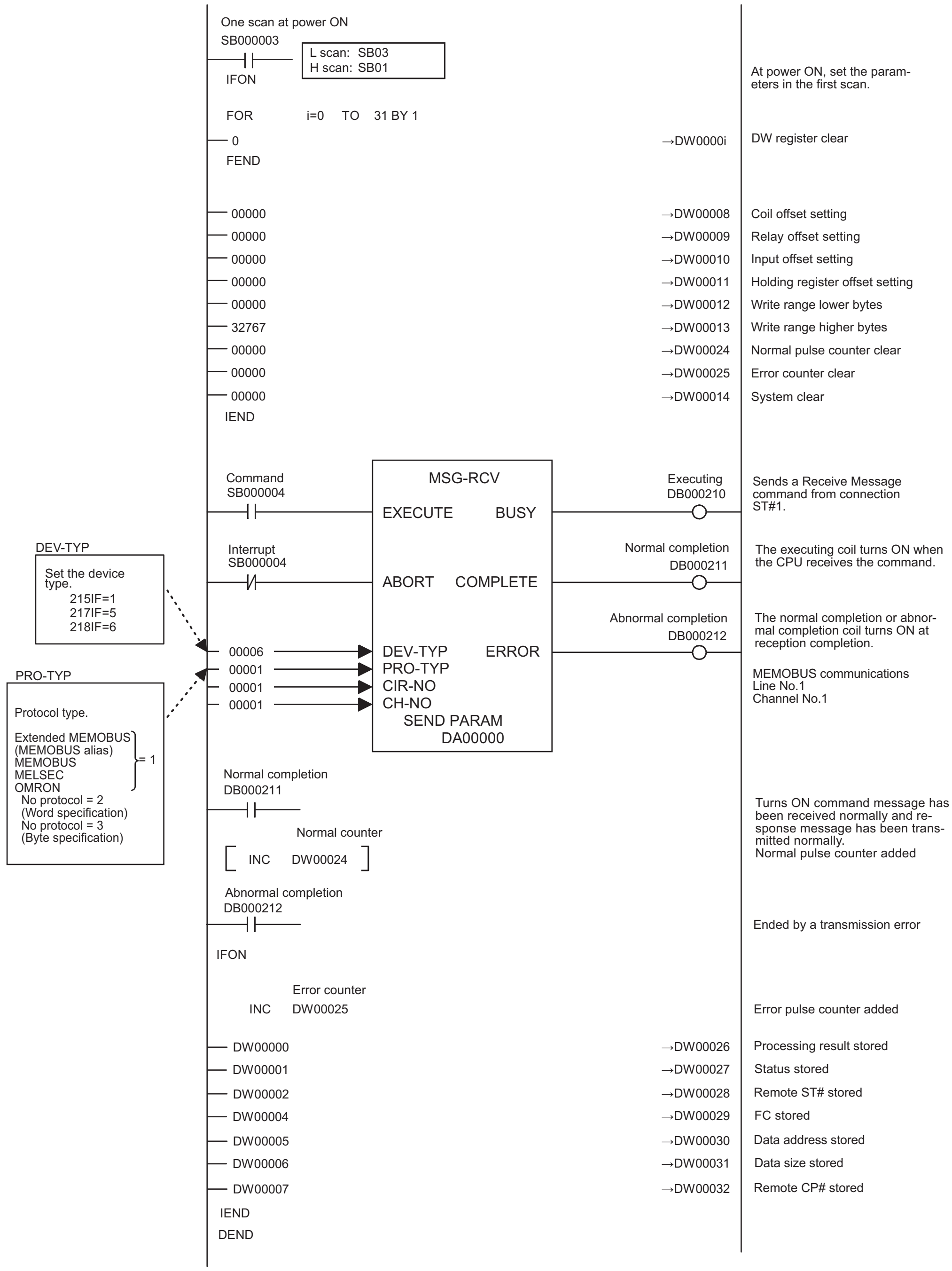
In the lower half, messages are transmitted. At this time, the Communications Module type and the protocol type are set in the device type (DEV-TYP) and protocol type (PRO-TYP), respectively, as the Master function inputs.

With the protocol type, the setting of the Extended MEMOBUS, MEMOBUS, MELSEC, and OMRON protocols is 1. This value is specified in the transmission parameter setting of each Communications Module. See the section on the transmission definitions for individual Communications Module.

3.3.2 Slave Function

A Slave uses the receive message function (MSG-RCV). Because it is a Slave, it does not send its own messages. When a message is received from the Master, it returns a response message.

■ MSG-RCV Program



In the top half, the Slave function (MSG-RCV) parameters are set in the first scan after startup.

In the lower half, messages are transmitted. At this time, the Communications Module type and the protocol type are set in the device type (DEV-TYP) and protocol type (PRO-TYP), respectively, as the Master function inputs.

With the protocol type, the setting value of the Extended MEMOBUS, MEMOBUS, MELSEC, and OMRON protocols is 1. This value is specified in the transmission parameter setting of each Communications Module. See the section on the transmission definitions for each Communications Module.

4

Communications Process

This section explains the communications process that needs to be set on the Programming Device (personal computer).

4.1 Communications Process

This section gives an overview of the communications process and explains how to open it.

4.1.1 Overview

The communications process is provided in the communications software on the Programming Device that is required when performing engineering to connect a MPE720 Programming Device and Machine Controllers. The method of setting the communications process varies according to the communications port on the Machine Controller to which the Programming Device is connected.

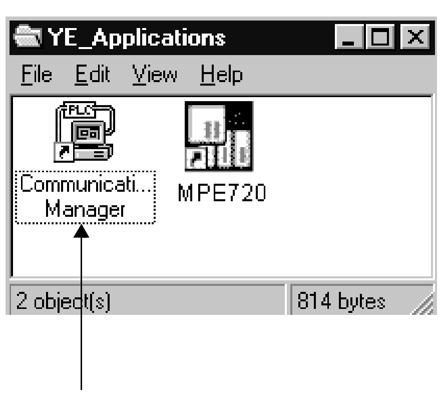
Programming Device	Settings	Communications Port to be Connected
Communications Process	Realtime core network settings	215IF
	RS-232C settings	217IF
	Ethernet settings	218IF
	RS-232C settings	Standard serial

With the communications process, the communications conditions must be set once after the MPE720 Programming Software has been installed. Once they have been set, the settings are stored as system information and the communications conditions will thus be automatically set from the next startup.

The conditions must be reset if the communications destination changes.

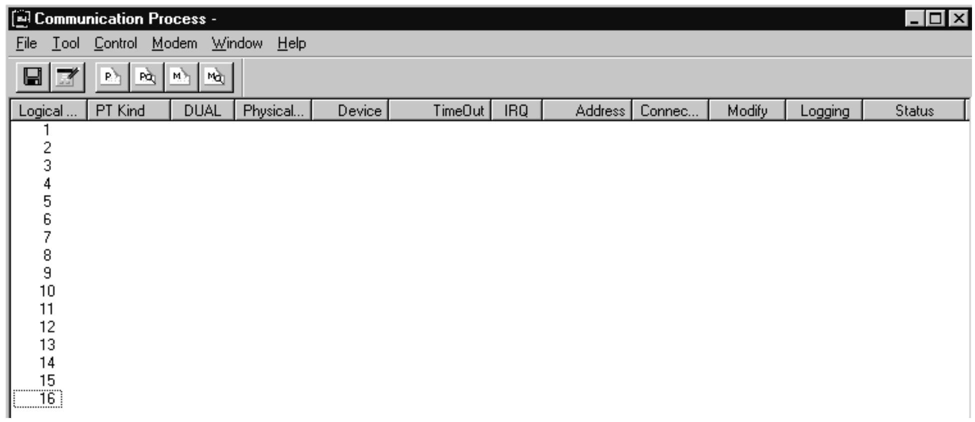
4.1.2 Opening the Communications Process

Double-click the communications process icon called **Communications Manager** in the **YE_Applications** program folder.



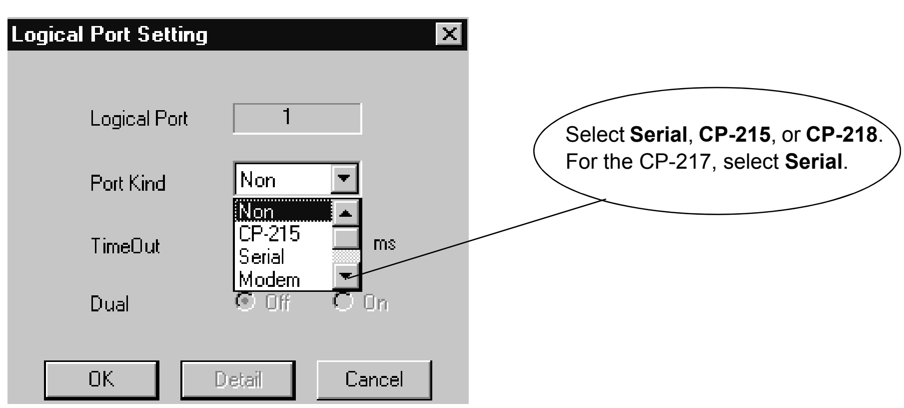
Double-click this icon.

The Communications Process Window will be displayed. The communications process can operate logical ports for up to 16 channels. Select and set the first unused logical port from the top.



Double-click the logical port (PT) number. Alternatively, select the logical port (PT) first, and click ***File*** and then ***Setting***. The following Window shows that logical port number 1 has been selected.

The following Logical Port Setting Window will be displayed when a logical port is selected. Select the appropriate communications interface under **Port Kind** and then make the relevant settings.



IMPORTANT

Do not set the logical port as a communications device (such as a CP-215) that is not installed in the Programming Device. The hardware may become unstable.

4.2 Communications Port Settings

This section explains the method of setting the various types of communications port.

4.2.1 Serial Communications Ports

Serial communications ports are set when engineering is performed with the MPE720 via the 217IF Module or the serial ports on the Machine Controller CPU Module.

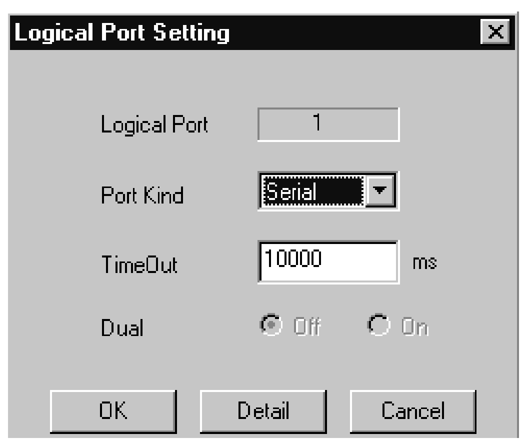
IMPORTANT

Only the CN1 serial port can be used as an engineering port with the 217IF.

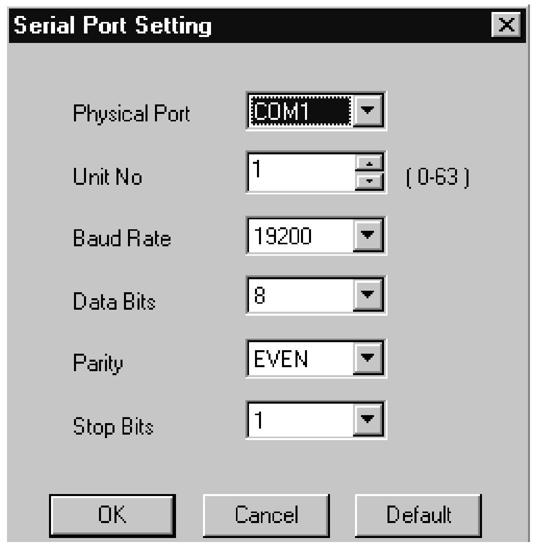
■ Setting Procedure

Use the following procedure to set a serial communications port.

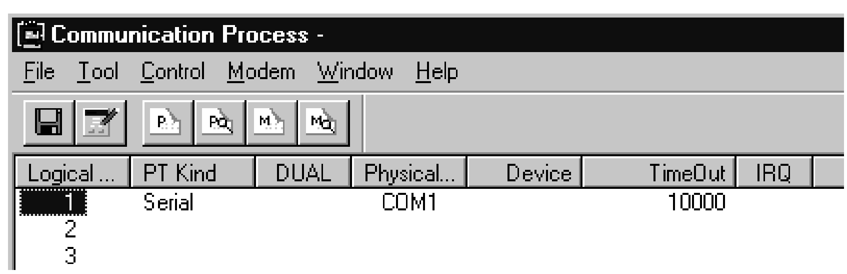
1. Select **Serial** under **Port Kind** on the Logical Port Setting Window and click the **Detail** button.



2. The setting information will be displayed when the **Detail** button is clicked. Set the serial port parameters and click **OK**. Normally, the following default values will be displayed. After checking the settings, click **OK**.



3. The Logical Port Setting Window will be displayed again. Click **OK** once more. The display will return to the Communications Process Window. Check that logical port 1 has been allocated as a serial port.



The serial port parameter settings are now completed.

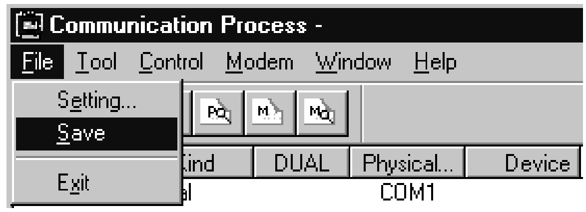
The settings must now be saved in a file.

■ Saving the Communications Port Settings

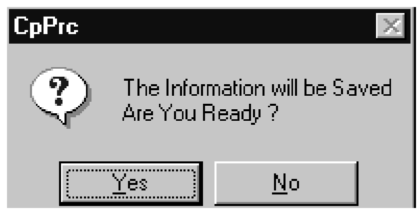
The communications port settings are saved in a file. When the communications process is subsequently activated, these settings will be used as the communications port information.

Use the following procedure to save the communications port settings.

1. Click **File** and then **Save**.

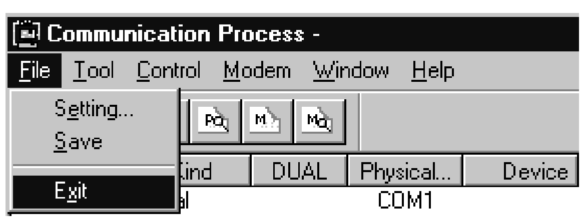


2. The Communications Process Window will be displayed to confirm that the information is to be saved. Click **Yes** to save the information.



■ Exiting the Communications Process

Select **File** and then **Exit** to close the Communications Process Window.



4.2.2 CP-215 Communications Port Settings

■ Setting CP-215PC/AT Cards

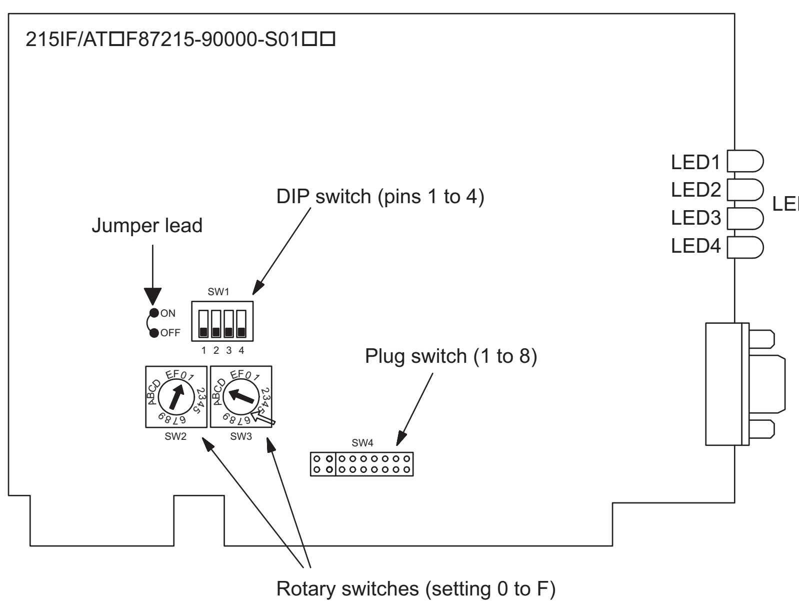
CP-215 PC/AT Cards are set when engineering is performed with the MPE720 via the 215IF.

Install the card in an unused ISA slot of the personal computer.

Refer to the setting example given below.

Setting Example

Shared memory address: 0CC000H
Interrupt level: IRQ11



0 C C 0 0 0 H

DIP switch pins 1 and 2:
Higher-place 2 bits of third digit of shared memory address ("1" when OFF) *1
DIP switch pins 3 and 4: See *2

SW2: First digit of shared memory address (0 to F)
SW3: Second digit of shared memory address (0 to F)
SW4: Interrupt level
-1 = IRQ10 -5 = IRQ3
-2 = IRQ11 -6 = IRQ4
-3 = IRQ12 -7 = IRQ5
-4 = IRQ15 -8 = Not used

* 1. Specify the value of the third digit of the shared memory address according to the combinations of pins 1 and 2 of the DIP switch as shown below.

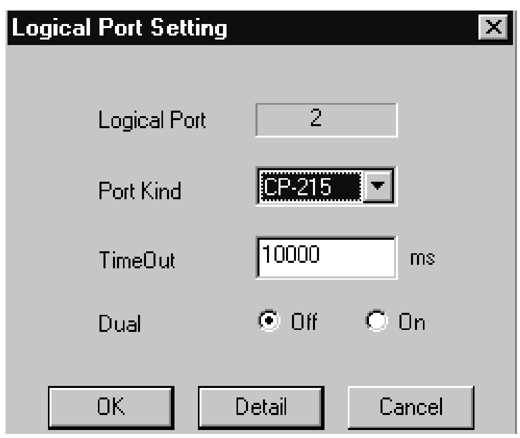
Shared Memory Address	Pin 1	Pin 2
(□□0000-□□3FFF) H	ON	ON
(□□4000-□□7FFF) H	ON	OFF
(□□8000-□□BFFF) H	OFF	ON
(□□C000-□□FFFF) H	OFF	OFF

* 2. When the CP-215PC/AT Card is model 90000 (87215-90000-S01□□), be sure that the jumper lead connecting CH0 and CH1 and the DIP switch (SW1) are set as follows:
Pin 3: ON
Pin 4: OFF
Jumper lead: Has been cut
When the Card is model 90001 (87215-90001-S01□□), there is no jumper lead. Set the DIP switch (SW1) to the following values:
Pin 3: OFF
Pin 4: ON

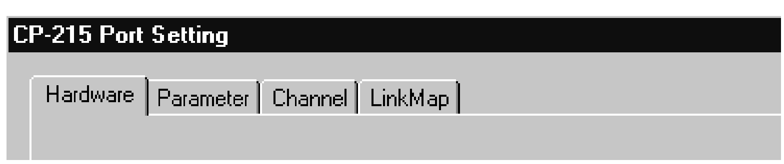
■ Setting Procedure

Use the following procedure to set a CP-215 communications port.

1. Select **CP-215** under **Port Kind** on the Logical Port Setting Window and click the **Detail** button.



2. The CP-215 Port Setting Window will be displayed when the **Detail** button is clicked. Four tabs will be displayed. Set the CP-215 parameters on the Hardware, Parameter, and Channel Tabs in that order. No settings are required on the Link Map Tab.



a) Hardware Tab Page

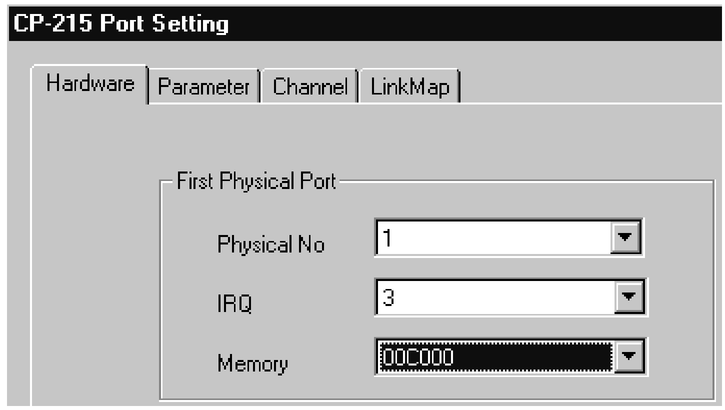
Set the operating conditions for the CP-215PC/AT Card installed in the Programming Device.

- Physical No. (Physical port No.)
  Set the I/O port number. Set this to **1** if there is only one CP-215PC/AT Card. If more than one CP-215PC/AT Card is to be used, allocate ports 2, 3, and 4 in that order.
- IRQ (Interrupt level)
  Select an unused hardware interrupt number on the Programming Device being used.

4

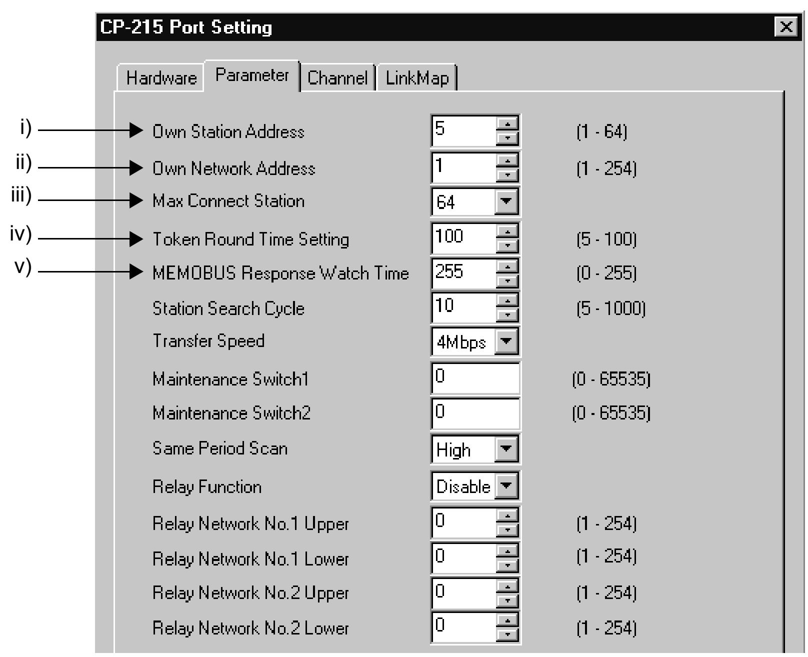
- Memory (Shared memory)

  Set the communications buffer address. This is normally set to an unused memory address in the UMB.



b) Parameter Tab Page

Set the CP-215 transmission parameters. Set the first five parameters: from **Own Station Address** to **MEMOBUS Response Watch Time**. Leave the other parameters on their default settings.



i) Own Station Address (Station No.)

Set the MPE720 station number.

TERMS

■ UMB

UMB: Upper Memory Block.

UMB is one method of expanding DOS memory. Specify the unused area in the area from 640 KB to 1 MB.

ii) Own Network Address (Network No.)

Set the number of the network to which the MPE720 is connected. Set the network number to **1** when there is only one network segment.

iii) Max Connect Station (Maximum Number of Stations Connected)

Set the number of CP-215 network stations. The number of stations is the number of 215IF Modules installed in all the Machine Controllers plus the number of Programming Devices with 215 IF/AT Cards installed.

iv) Token Round Time Setting (Token Cycle Time)

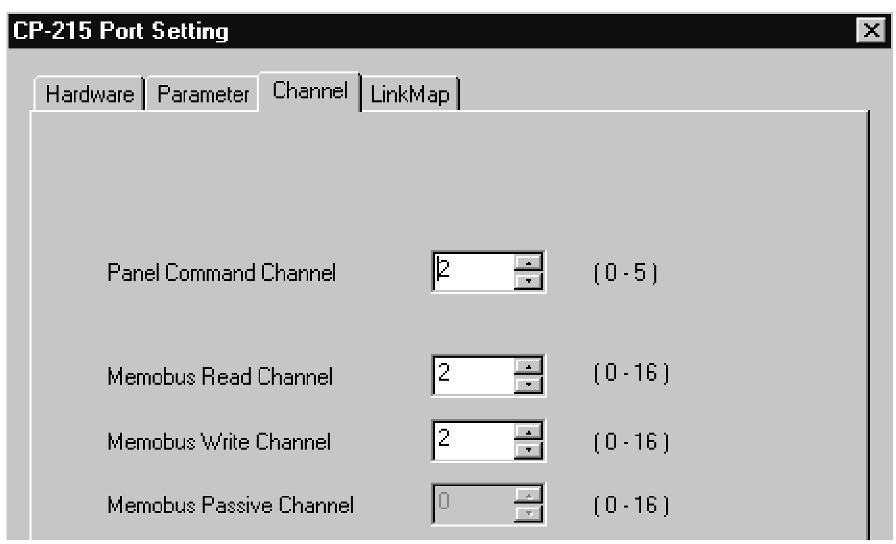
Set to **100** for the target time from when each station receives the token until the next time the token is received.

v) MEMOBUS Response Watch Time (MEMOBUS Response Monitoring Time)

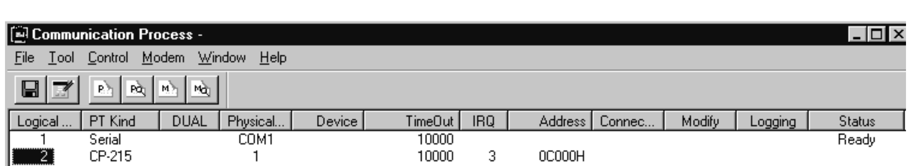
Set to **255** for the time from when a message is transmitted until a response is received.

c) Channel Tab Page

Set the number of panel command channels to **2**. Leave the other parameters on their default settings, as they are not used by the MPE720. Click the **OK** button when the settings have been completed.



3. The Logical Port Setting Window will be displayed again. Click the **OK** button once more. The display will return to the Communications Process Window. Check that CP-215 has been allocated to logical port 2.



The CP-215 parameter settings are now completed.

The settings must now be saved in a file.

■ Saving the Communications Port Settings and Exiting the Communications Process

Refer to *4.2.1 Serial Communications Ports*.

4.2.3 CP-218 Communications Port Settings

CP-218 Communications Ports are set when 10Base Ethernet engineering is performed via a 218IFA Module installed in the Machine Controller. In this case, a general-purpose Ethernet Card or a PCMCIA Ethernet Card must be installed in the personal computer used as the MPE720.

■ Installing the Ethernet Card

Use a general-purpose Ethernet Card or a PCMCIA Ethernet Card.

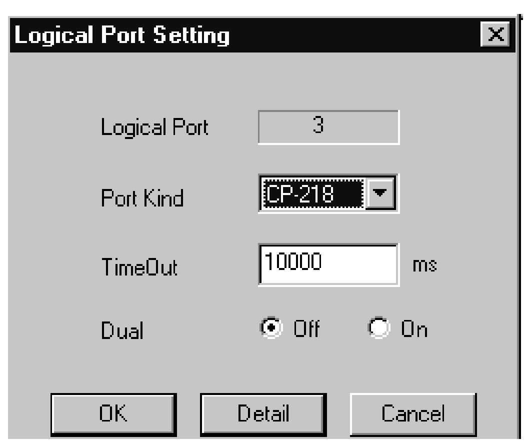
The driver attached to the Ethernet Card must be installed separately.

4

■ Setting Procedure

Use the following procedure to set a CP-218 communications port.

1. Select **CP-218** under **Port Kind** on the Logical Port Setting Window and click the **Detail** button.

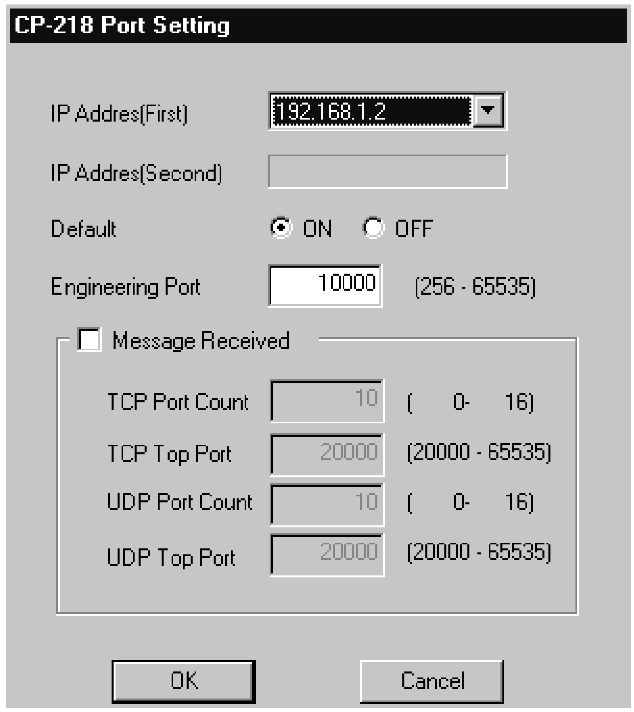


2. The CP-218 Port Setting Window will be displayed when the **Detail** button is clicked. Set the IP address here.

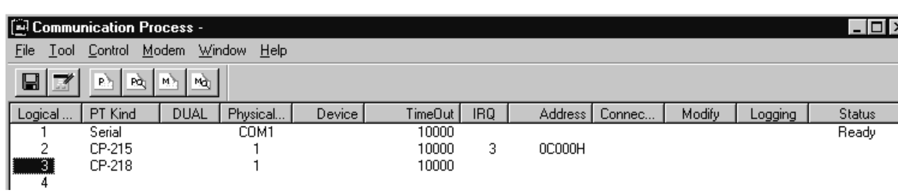
   Set the IP address allocated by Windows to the Ethernet Interface Card installed in the Programming Device. In this case, set **Default** to **OFF**.

   At initial startup of the 218IF (see *7.2.2 Setting Switches*), set **Default** to **ON**. In this case, the IP address will be set to 192.168.1.2. The Windows IP address must also be changed to 192.168.1.2.

Determine the IP address setting according to instructions from the network administrator. All IP addresses, including those for Machine Controllers, must be managed.



3. The Logical Port Setting Window will be displayed again. Click the **OK** button once more. The display will return to the Communications Process Window. Check that CP-218 has been allocated to logical port 3.



The CP-218 parameter settings are now completed.

The settings must now be saved in a file.

■ Saving the Communications Port Settings and Exiting the Communications Process

Refer to *4.2.1 Serial Communications Ports*.

4.3 Setting the Logical Port Numbers

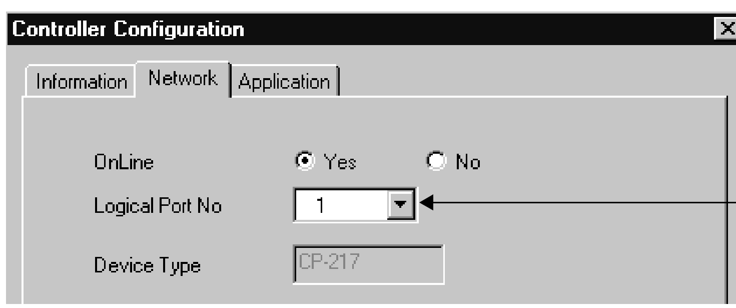
This section explains the logical port number settings.

4.3.1 Setting the MPE720 Logical Port Numbers

Up to 16 logical ports can be registered for the communications process. The logical port to be used must be specified when engineering a Machine Controller using the MPE720.

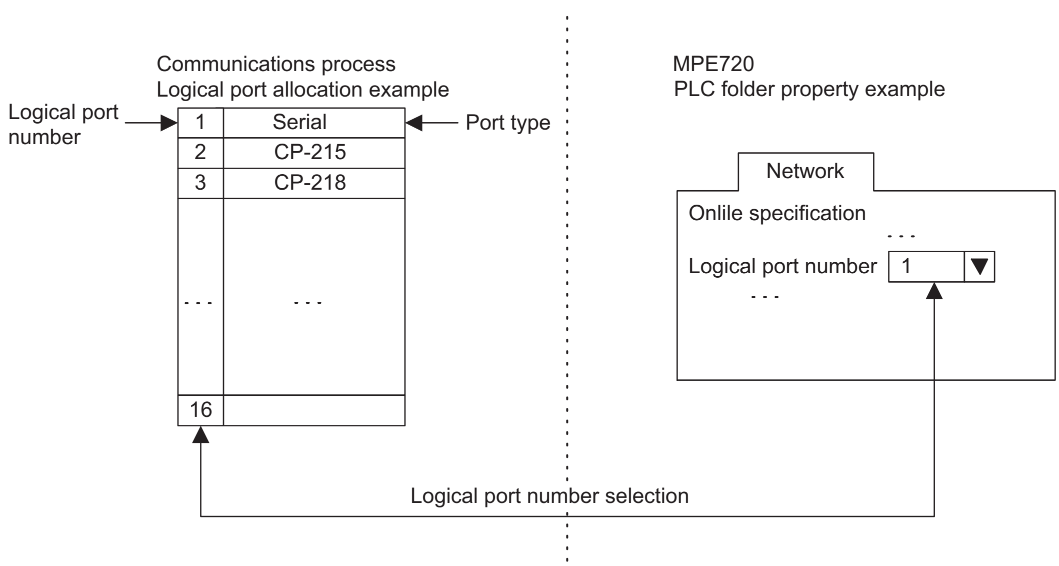
The logical port to be used can be set for each Machine Controller and is normally set when registering a new Machine Controller under the File Manager. (Refer to *2.2.4 Creating New PLC Folders* in the *MP900/MP2000 Series Machine Controller Programming Software MPE720 User's Manual*.)

The following window will be displayed when registering a new PLC folder or opening the property window for an existing PLC folder. Open the Network Tab Page.



This number corresponds to the **Logical Port No.** in the Communications Process Window.

Set the **Logical Port No.** box in this window to the logical port number to be used.



5

215IF Module

This chapter explains information on 215IF Module ranging from the system configuration to the definition window parameter settings used as the operating conditions.

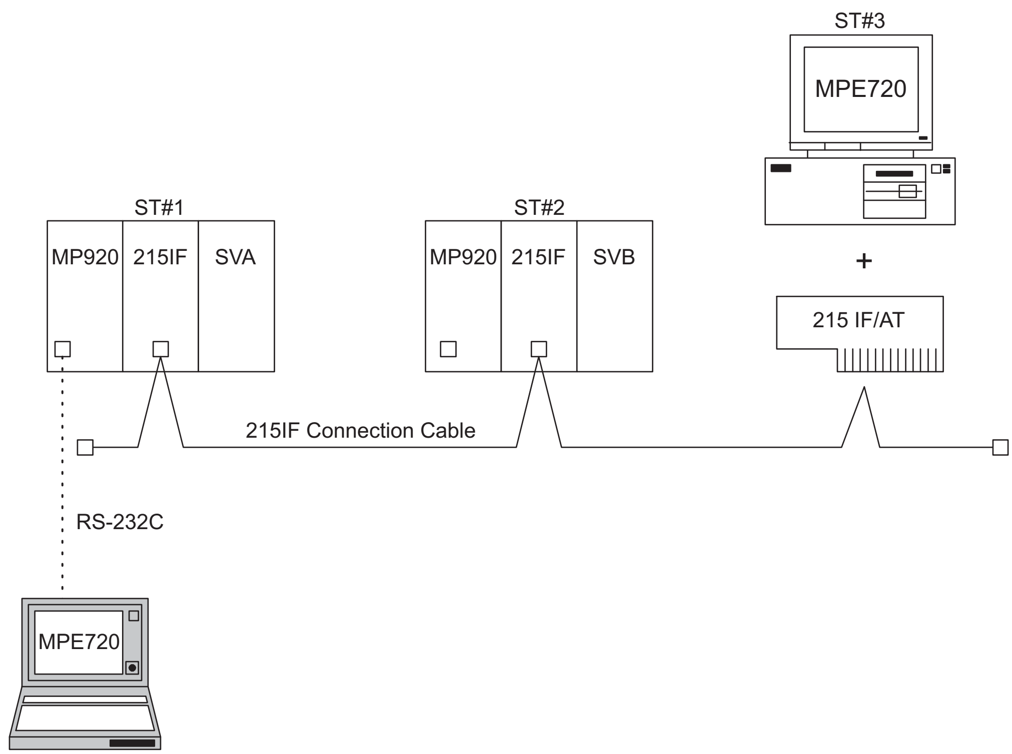
5.1 System Configuration

This section gives an overview of the system configuration with 215IF Modules.

5.1.1 Standard System Configuration

Shown below is a simple system example in which a single network is configured for a 215IF System.

The following diagram shows an example of a MPE720 Programming Device with two MP920 Units and a 215IF Card installed, connected by a 215IF Connection Cable. The Programming Device can also be connected using the serial port of an MP920 CPU Module.



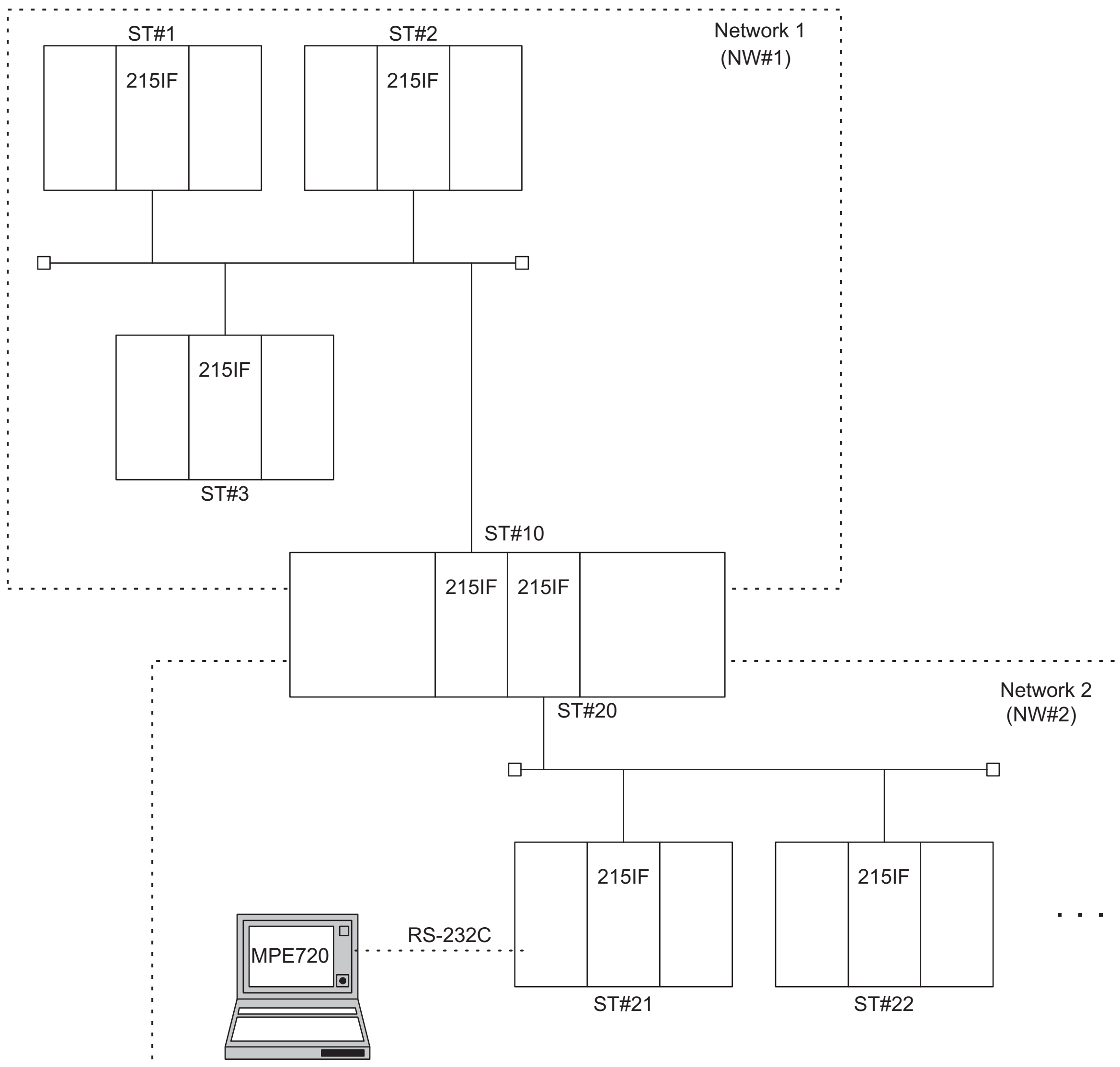
The 215IF Modules are managed using station numbers (ST#n). A different station number must be assigned to each Module. The Modules cannot be linked if the same station number is assigned to more than one Module.

5

5.1.2 System Configuration Using the Relay Function

The following diagram shows an example of a system in which two networks are linked using 215IF Modules.

When the 215IF Module relay function is used, information can be exchanged with the Controllers connected to a different network segment, and the entire system can be managed and controlled by the MPE720 Programming Device.



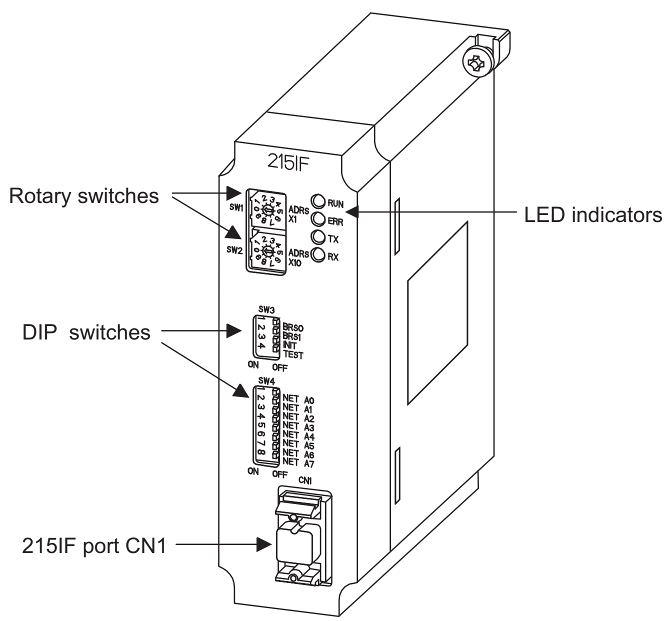
Data can be transferred between Network 1 and Network 2 via ST#10 and ST#20. Information about all the Controllers can be managed from the MPE720 Programming Device using the network numbers and station numbers.

5.2 Part Names

This section explains the LED indicators and switch settings for the 215IF Module.

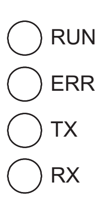
5.2.1 215IF Module External Appearance

■ External Appearance



■ LED Indicators

While the Module is operating normally, the RUN LED indicator will be lit and the ERR LED indicator will not be lit. If a failure occurs, the RUN LED indicator will turn OFF and the ERR LED indicator will light or flash. The TX LED indicator and RX LED indicator will light when sending/receiving data.



Label	Name	Color	Status when Lit
RUN	Run	Green	Operating normally
ERR	Error	Red	Error occurred (See next page.)
TX	215 TX	Green	CP-215 sending data
RX	215 RX	Green	CP-215 receiving data

The following table describes the operation of the LED indicators when a failure has occurred.

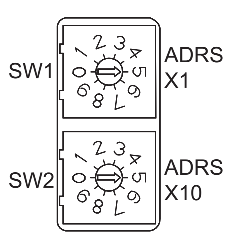
Failure	Meaning	LED Indicators			
		RUN	ERR	TX	RX
PROM Checksum Error	A PROM checksum error was detected during online self-diagnosis.	Not lit	Flashing (1)	Not lit	Not lit
Module Hardware Error	A hardware error was detected during online self-diagnosis.	Not lit	Flashing (2)	Not lit	Not lit
CPU Interface Error	A data transmission error was detected between Module and CPU during online self-diagnosis.	Not lit	Flashing (3)	Not lit	Not lit
Transmission Error	A normal transmission error was detected.	Lit	Lit	Lit	Lit
Watchdog Timer Error	A watchdog timer error was detected.	Not lit	Flashing (15)	Not lit	Not lit

Note: The number in parentheses ( ) after "Flashing" indicates the number of flashes.

5.2.2 Setting Switches

■ Rotary Switches (SW1, SW2)

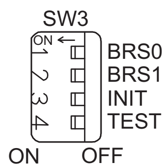
SW1 and SW2 set the address for 215IF Module communications. SW1 sets the first digit; SW2 sets the second digit. Station addresses are numbered 1 to 64. These switches are effective only when the INIT switch is ON.



Label	Name	Setting	Operation
ADRS × 1	Address × 1	1 to 10	The first digit of the station address
ADRS × 10	Address ×10	1 to 10	The second digit of the station address

■ DIP Switch (SW3)

SW3 sets the operation modes such as transmission speed and the self-diagnosis system. The pins are all set to OFF (right) before shipment.



<table>
<tr><th>Indicator name</th><th>Name</th><th>Status</th><th colspan="5">Function</th></tr>
<tr><td rowspan="2">BRS0</td><td rowspan="2">Transmission speed Select 0</td><td>ON</td><td colspan="5">Transmission speed setting
(Effective only when the INIT switch is ON)</td></tr>
<tr><td>OFF</td><td>Trans-mission speed (bps)</td><td>4M</td><td>2M</td><td>1M</td><td>-</td></tr>
<tr><td rowspan="2">BRS1</td><td rowspan="2">Transmission speed Select 1</td><td>ON</td><td>BRS0</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
<tr><td>OFF</td><td>BRS1</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td rowspan="2">INIT</td><td rowspan="2">Initial</td><td>ON</td><td colspan="5">SW1, SW2, and BRS0 and BRS1 of SW3 are effective.</td></tr>
<tr><td>OFF</td><td colspan="5">Uses CPU transmission parameter setting (software settings).</td></tr>
<tr><td rowspan="2">TEST</td><td rowspan="2">Test</td><td>ON</td><td colspan="5">Offline self-diagnosis mode</td></tr>
<tr><td>OFF</td><td colspan="5">Normal operating mode</td></tr>
</table>

INFO

■ INIT Switch

Normally, leave the INIT switch turned OFF. The 215IF Module will perform link communications or the message communications with the settings in the MPE720 Module configuration definition.

At this time, the settings of SW1, SW2, SW3 (BRS0 and BRS1), and SW4 will be ignored.

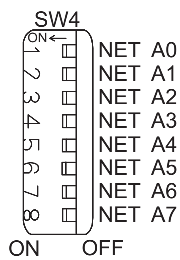
Turn the INIT switch ON to operate the MP900-series Controller with the MPE720 using 215IF Module communications, when the Module definition is not set or CPU memory is cleared.

At this time, message communications will be performed according to the SW1 and SW2 station address, SW3 transmission speed setting (BRS0 and BRS1), and SW4 network address.

When the INIT switch is ON, link communications will not be performed, and data will not be relayed.

■ DIP Switch (SW4)

SW4 sets the network No. for 215IF communications. The networks are numbered 1 to 254. This switch is effective only when the INIT switch is ON. The pins are all set to OFF (right) before shipment.



Indicator Name	Name	Status	Function
NET A0	Network Address 0	ON	See the following table for settings.
		OFF	
NET A1	Network Address 1	ON	
		OFF	
NET A2	Network Address 2	ON	
		OFF	
NET A3	Network Address 3	ON	
		OFF	
NET A4	Network Address 4	ON	
		OFF	
NET A5	Network Address 5	ON	
		OFF	
NET A6	Network Address 6	ON	
		OFF	
NET A7	Network Address 7	ON	
		OFF	

Network No.	1	2	3	. . .	254
A0	ON	OFF	ON	. . .	OFF
A1	OFF	ON	ON	. . .	ON
A2	OFF	OFF	OFF	. . .	ON
A3	OFF	OFF	OFF	. . .	ON
A4	OFF	OFF	OFF	. . .	ON
A5	OFF	OFF	OFF	. . .	ON
A6	OFF	OFF	OFF	. . .	ON
A7	OFF	OFF	OFF	. . .	ON

The settings of A0 to A7 may be considered as bit settings as shown below. The network number thus can be set easily if you think of it as a binary number.

A7	A6	A5	A4	A3	A2	A1	A0	
0	0	0	0	0	0	0	1	Setting for network 1
0	0	0	0	0	0	1	0	Setting for network 2

5.3 Module Specifications

This section provides the 215IF Module specifications.

5.3.1 Hardware Specifications

The following table shows the hardware specifications for the 215IF Module.

Item	Specifications
Name	215IF Communications Module
Model Number	JEPMC-CM220
Description	215IF
Dimensions	40 × 130 × 105 mm (W × H × D)
Approximate Mass	Board: 165 g, Case: 165 g
Power Supply	Supplied from Base Module +5 V, 375 mA

5.3.2 Communications Specifications

The following table shows the communications specifications for the 215IF Module.

Table 5.1 215IF Module Communications Specifications

Item	Specifications
Transmission Line Form	Electrical bus
Transmission Line	Electrical bus YS-IPEV-SB, 1P × 0.3 mm^2 (75Ω) YS-IPEV-SB, 3P × 0.3 mm^2 (75Ω) YS-IPEV-S (Cu), 1P × 1.25 mm^2 (75Ω)
Transmission Distance*	Total distance With 4 Mbps: 170 m With 2 Mbps: 270 m With 1 Mbps: 420 m Can be extended to 600 m max. (with 4 Mbps) by connecting a Repeater.
Transmission Speed	1, 2, or 4 Mbps (software switchable)
Access Method	Token passing
Frame Format	Conforms to HDLC
Maximum Number of Nodes	30/segment
Communications Mode	Link communications, message communication: 1,024 words/10 ms, engineering communication
Maximum Number of Transmission Words	Link communications: 2,048 words Message communications and engineering communications: 512 words
Communications Protocol	MEMOBUS (Master/Slave), no protocol

Table 5.1 215IF Module Communications Specifications (cont'd)

Item	Specifications
Maximum Number of Connections*	Total number of stations: 30 max. (Up to 64 stations can be connected by expanding repeaters)
Connection Configuration	N:N
Error Detection Control	CRC check, count for data words, timer

* See *5.4.2 Precautions on Wiring Communications* for the transmission distance and the number of stations that can be connected.

5.4 Cables

This section explains the cable specifications for 215IF Module communications.

5.4.1 215IF Connection Cables

■ 215IF Connector Pin Layout (CN1/215)

No.	Signal Name	Function	No.	Signal Name	Function
1	SRD-	Sending and receiving data (-)	5	N.C.	Not connected
2	N.C.	Not connected	6	N.C.	Not connected
3	N.C.	Not connected	7	N.C.	Not connected
4	N.C.	Not connected	8	SRD+	Sending and receiving data (+)

MR-8RFA4 (G) connector (manufactured by Honda Communication Industries Co., Ltd.) is used on the Module. Use an MR-8M (G) (case: MR-8L) connector on the cable.

■ Calculation Example of Maximum Transmission Distance

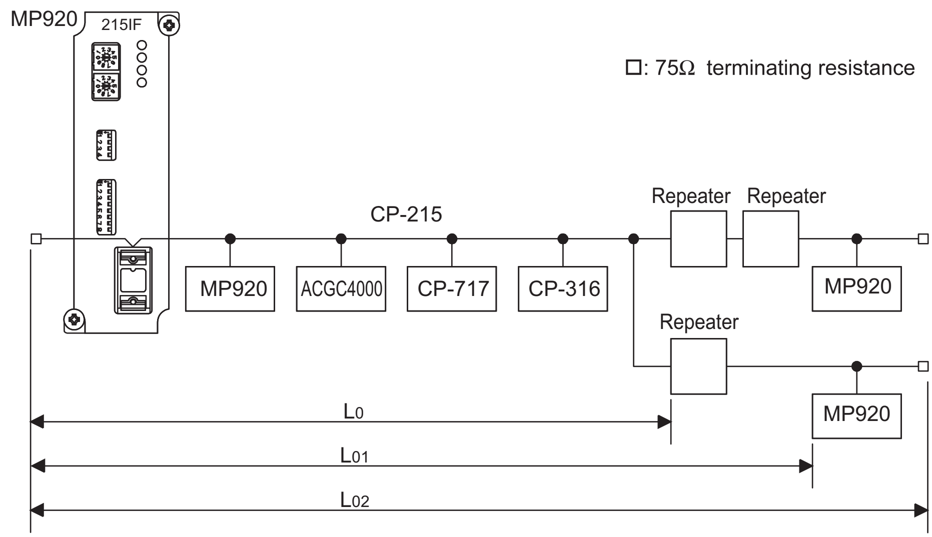
The following table shows a calculation example for the maximum transmission distance when 32 stations are connected.

Transmission Speed	Cable Length between Control Panels L_0: No Repeaters	Total Wiring Distance	
		L_{01}: One Repeater	L_{02}: Two Repeaters
4 Mbps	170 m or less	600 m	1,100 m
2 Mbps	270 m or less	900 m	1,550 m
1 Mbps	420 m or less	1,400 m	2,350 m

Note: 1. L_0 is when the total length of the cables inside the control panel is about 55 m and 20 JC215-01 Junction Boxes are used.
2. L_{01} and L_{02} are when 16 stations are connected on both sides of the Repeater.

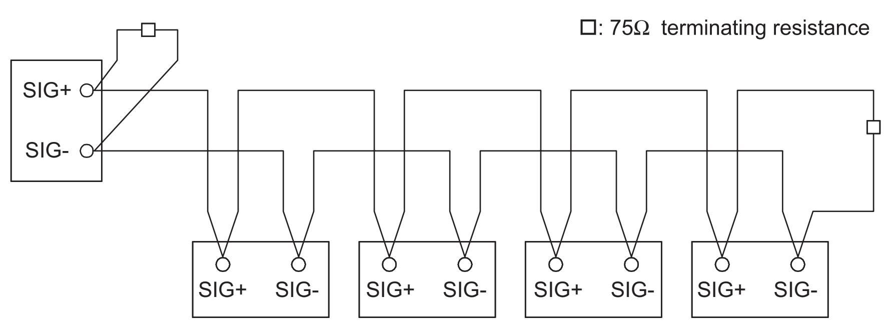
■ System Configuration Example

The following diagram shows a system configuration example.



■ CP-215 Wiring Example

The following diagram shows a wiring example for the CP-215.



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5.4.2 Precautions on Wiring Communications

Following are some precautions on 215IF Modules.

■ Precautions

- The power system, control system, and electrical system must be wired separately.
- Provide terminating resistance at both ends of the transmission line.
- Use a YS-IPEV-S (Cu) 1P × 1.25 mm^2 (75 Ω) cable (manufactured by Fujikura Corporation) for the wiring between control panels.
- With long wires, also ground the Repeater(s).
- Any restrictions in communication performance must also be considered in connection with the number of stations. See *2.2 Link Communications*.

■ Calculating the Transmission Distance

The panel-to-panel transmission distance for the CP-215 communications system depends on the baud rate, the number of stations connected, the number of JC215-01 and JC215-02 Junction Boxes connected, and the length of the transmission cables inside the control panels. In general, the maximum transmission distances of the cables between control panels are as follows:

- Maximum transmission distance with 4 Mbps = 520 - 4.5N - 3.0L_1 - 5.0M (m)
- Maximum transmission distance with 2 Mbps = 727 - 8.48N - 2.58L_1 - 6.06M (m)
- Maximum transmission distance with 1 Mbps = 1041 - 14.0N - 2.08L_1 - 8.33M (m)

Note: N: Number of stations and Repeaters connected
L1: Cable length inside the control panels (m)
M: Number of JC215-01 and JC215-02 Junction Boxes connected. (The input side and output side of the JC215-01 may be counted together as one Junction Box.)

5.4.3 Token Passing

The CP-215 transmission access method known as token passing is explained below.

In token passing, data of a specific pattern, called a token, circulates continuously on the transmission line. The token represents the right to send, and the station that has this token has the right to send data.

As shown in the following diagram, the token is circulated from the lowest to the highest station address (ST#). The stations need not be physically installed in numerical order.

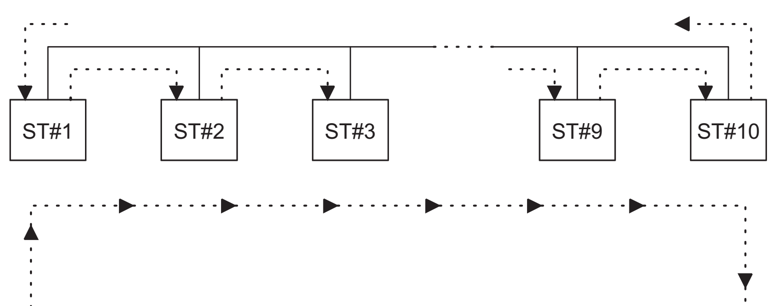


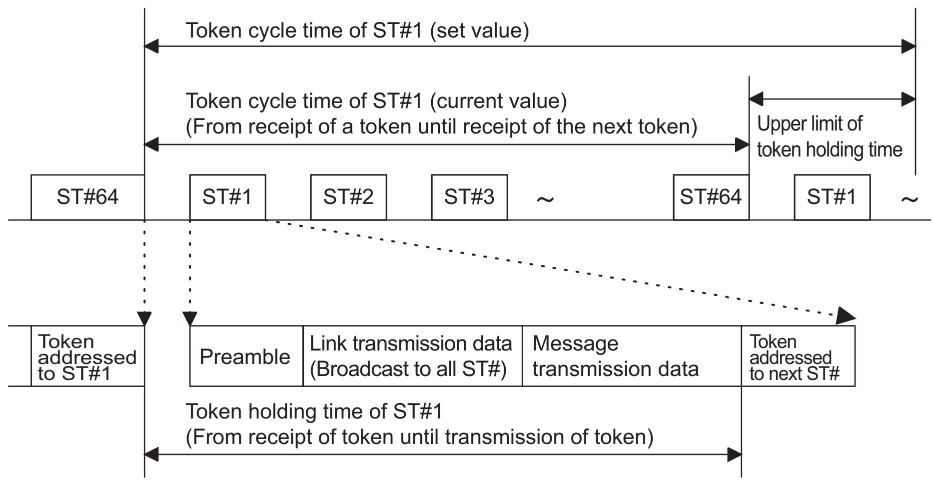
Fig. 5.1 Token Passing

Each time a station with transmission data obtains the token, it transmits the data within the token holding time. The token holding time is specified in the 215IF parameter settings. A station with no transmission data immediately passes the token to the next station.

5.4.4 Tokens

■ Overview of the Communications

The time from when a token is received until the next time the token is received is called the token cycle time. The time during which the right to send is obtained, that is, the time from when the token is received until the token is transmitted, is called the token holding time.



215IF communications operate with the upper limit of the token holding time being the difference in time between the token cycle time (set value) set in the transmission parameter and the token cycle time (current value) measured at each receipt of the token. Link transmission data is transmitted even when this upper limit is exceeded, whereas message transmission data is not transmitted but is held if there is any possibility that the upper limit may be exceeded.

■ Estimation of the Token Cycle Time

The token cycle time at each station can be estimated using the equations given below.

In each equation, the message transmission margin refers to the time margin for message transmission from a station included in the token cycle time. A minimum message transmission of 1.2 ms for 4 Mbps, 2.4 ms for 2 Mbps, or 4.8 ms for 1 Mbps should be guaranteed.

If this value is increased, the message transmission efficiency will increase, but link transmission data exchanges will become slower.

- Transmission speed: 4 Mbps
  Transmission cycle (ms)
  = 0.16 × station No. + 0.004 × total number of link transmission words
  + message transmission margin (≥ 1.2 ms)
- Transmission speed: 2 Mbps
  Transmission cycle (ms)
  = 0.23 × station No. + 0.008 × total number of link transmission words
  + message transmission margin (≥ 2.4 ms)

- Transmission speed: 1 Mbps
  Transmission cycle (ms)
  $= 0.31 \times$ station No. $+ 0.016 \times$ total number of link transmission words
  + message transmission margin (≥ 4.8 ms)

  Note: 1. The token cycle time does not guarantee data transmission in any specific cycle or a fixed cycle.
  2. Do not set the token cycle time to a value less than the value calculated using the above equations. Engineering from the MPE720 may no longer be possible.
  3. Each parameter in the above equations depends on the hardware and software version number of the transmission interface board, the system configuration, and other factors in the system. The values should be used only as a guide for system design.

■ Estimation of the Maximum Number of CP-215 Stations Connected

By modifying the above equations, the maximum number of stations that can be connected can be estimated for the token cycle time. The results are shown in the following table.

Table 5.2 Estimation of the Maximum Number of Stations Connected

Number of Link Transmission Words	Transmission Cycle (ms)	Transmission Speed		
		4 Mbps	2 Mbps	1 Mbps
1,024 Words	10	30 stations	–	–
	20	64 stations	40 stations	–
	30	64 stations	64 stations	28 stations
	50	64 stations	64 stations	64 stations
	100	64 stations	64 stations	64 stations
2,048 Words	10	–	–	–
	20	64 stations	5 stations	–
	30	64 stations	48 stations	–
	50	64 stations	64 stations	40 stations
	100	64 stations	64 stations	64 stations

Note: The number of stations connected is restricted not only by the transmission performance, but also by electrical conditions, such as the number of stations connected and the transmission distance.

5.5 CP-215 Transmission Definitions

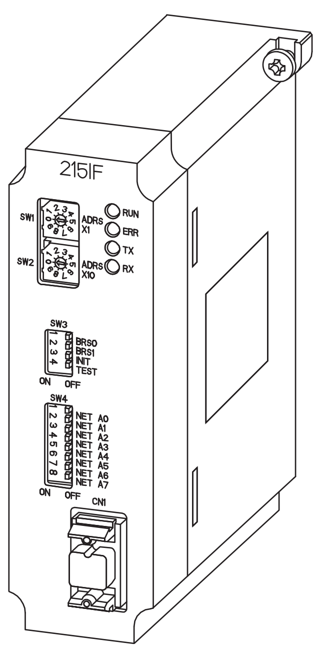
This section explains how to set the parameters for the CP-215 transmission system.

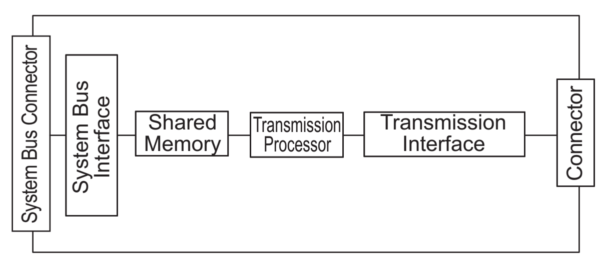
5.5.1 Overview of CP-215 Transmissions

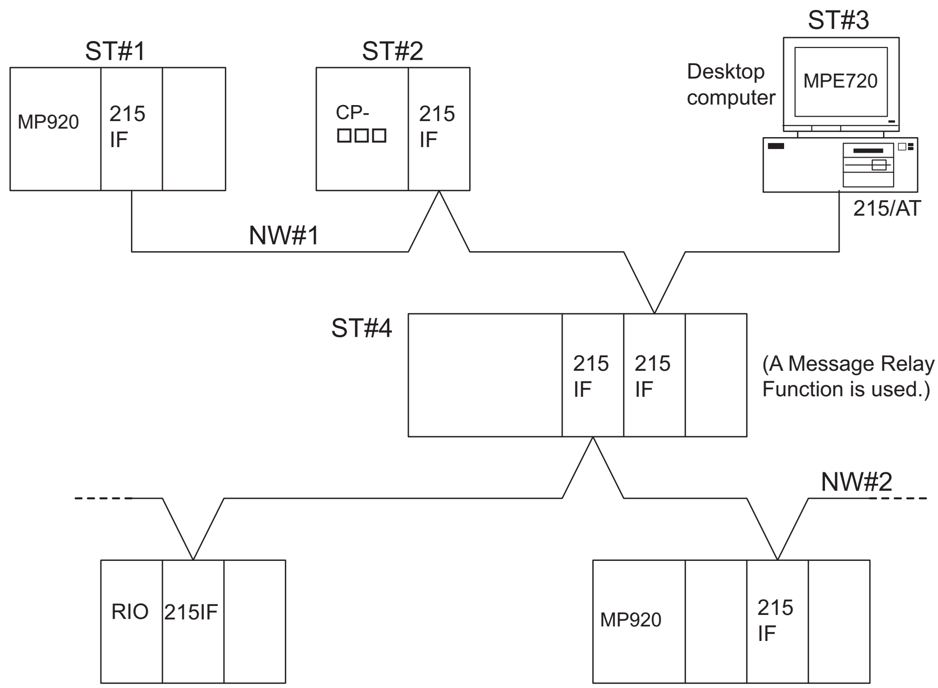
The CP-215 transmission system is a unique real-time Yaskawa network with a baud rate of 4 Mbps. Twisted-pair cable is used for the transmission lines, so an inexpensive but highly reliable transmission system can be constructed.

The settings required for CP-215 transmissions are divided into four tab pages: the **Parameter Settings**, **Link Assignments**, **I/O Map**, and **Status** Tabs.

There are two kinds of transmissions in a CP-215 Transmission System: Link transmissions and message transmissions. The required settings for the link transmissions are made here. Link transmissions are repeated every cycle according to the settings made here. Message transmissions are programmed in DWG/function programs using the MSG-SND and MSG-RCV functions.







Note: 1. The network is composed of two segments: Network #1 and Network #2.
2. Station 4 (ST#4) uses the CP-215's Message Relay Function to exchange data between Network #1 and Network #2.
3. A 215PC/AT Card is required in the desktop computer.

Fig. 5.2 CP-215 Network Configuration Example

5.5.2 Opening the CP-215 Transmission Definitions Window

When the CP-215 Transmission Definitions Window is opened in Online Mode, the CP-215 parameters stored in the Machine Controller will be opened. When the Window is opened in Offline Mode, the MPE720 parameters stored in the hard disk on the MPE720 will be opened.

Open the CP-215 Transmission Definitions Window from the Module Definitions Window.

INFO

When the CP-215 Transmission Definitions Window is opened and the CP-215 parameters are being set for the first time, a confirmation message box will be displayed indicating that a new file will be created. Click the **OK** button to proceed to the next operation.

5.5.3 The CP-215 Transmission Definitions Window Menus

The following table shows the functions of the menu commands in the CP-215 Transmission Definitions Window.

Menu Command		Function
File (F)		
	File Manager (F)	Opens the MPE720 File Manager.
	Open (O)	Opens the window for each function
	Close (C)	Closes the CP-215 Transmission Definitions Window.
	Save (S)	Saves the CP-215 parameter settings.
	Delete (D)	Deletes the CP-215 parameter settings.
	Print (P)	Prints MPE720 document definition data.
	Exit (X)	Closes the MPE720.
Edit (E)		
	Default (S)	Sets default values.
	Assignment Delete (D)	Deletes assignment data.
Set (L)		
View (V)		
	Tool Bar (T)	Displays the Tool Bars.
	Status Bar (S)	Displays the Status Bar.
Window (W)		
	Cascade (C)	Stacks windows in the display.
	Tile (T)	Lines up windows in the display.
	Arrange Icons (A)	Lines up icons.
Help (H)		
	About App... (A)	Displays the version information.

5

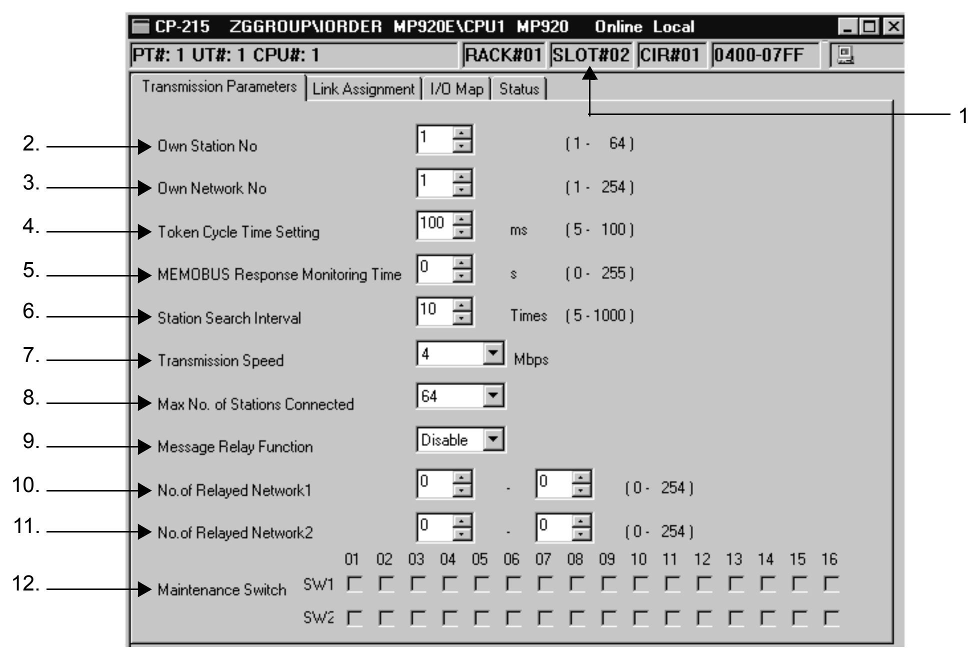
5.5.4 Setting CP-215 Transmission Definitions

The CP-215 Transmission Definitions Window is composed of four tab pages: The **Transmission Parameters**, **Link Assignments**, **I/O Map**, and **Status** Tabs. The following table shows the settings grouped in each tab page.

Tab Name	Function
Transmission Parameters	Sets the CP-215 transmission parameters.
Link Assignment	Sets the CP-215 link transmission parameters.
I/O Map	Displays or changes the I/O map for the link assignment registers.
Status	Displays the link transmission status.

■ Transmission Parameter Settings

The **Transmission Parameters** Tab contains the various parameters required to use the CP-215 transmission system.



1. Configuration Information

   Displays the CP-215 configuration information that was set in the Module Definition Window.

   - Rack#: Displays the rack number of the rack in which the 215IF is defined.
   - Slot#: Displays the slot number of the slot in which the 215IF is defined.
   - Cir#: Displays the 215IF circuit number.
   - Register Range: Displays the I/O register range.

The following table shows the relationship between the circuit number and I/O register range.

Machine Controller	Circuit Number	Register Range
MP920	01 to 08	0000 to 13FF Hex

2. Own Station No

   Input the local station number (1 to 64) of the 215IF.

3. Own Network No

   Input the network number (1 to 254) of the network in which the 215IF is connected.

4. Token Cycle Time Setting

   Input the desired time (5 to 100) for the interval between receptions of the token.

5. MEMOBUS Response Monitoring Time

   Input the time to wait (0 to 255) for a response after sending a MEMOBUS command by executing the MSG-SND function.

   If the time is set between 1 and 255, a timeout will occur after the time setting × 2 s and the MSG-SND function will return an error.

   If the time is set to 0, the MSG-SND function will wait indefinitely for a response without returning an error.

6. Station Search Interval

   Input the number of cycles (5 to 1,000) between each search for a new station. A station search will be performed at this interval (once every 5 to 1,000 token cycles) to determine whether a new station has been started.

7. Transmission Speed (Mbps)

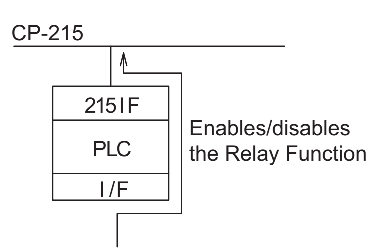
   Select the CP-215 transmission speed (1, 2, or 4 Mbps).

8. Max No. of Stations Connected

   Input the maximum number of stations that can be connected (16, 32, 48, or 64). This setting is used as an upper limit value during station searches. Input a value higher than the local station number shown in the “Own Station No” box.

9. Message Relay Function

   This setting determines whether the 215IF will receive messages from another transmission interface and relay that message through the 215IF interfaces, i.e., this setting enables or disables the Message Relay Function. (0: Disable, 1: Enable)



Message Relay Function

10. No. of Relayed Network 1

When the Message Relay Function is enabled (set to 1: Enable), this setting specifies the range of network numbers (0 to 254) that can be relay destinations. Messages will not be relayed to networks that are outside of the specified range. The network number in the No. of Relayed Network 1 setting is ORed with the network number in the No. of Relayed Network 2 setting. The Relay Function will be disabled if both settings are “0.”

For details, refer to *5.6 Relay Function*.

11. No. of Relayed Network 2

See the explanation for the No. of Relayed Network 1 setting, above.

12. Maintenance Switch

These settings are all OFF during operation. These software switches are used for Yaskawa maintenance. Do not change the settings.

■ Reverting to Defaults

The transmission parameters can be reset to their default values without inputting each parameter, by selecting **Edit (E)** and then **Default (S)** from the menu in the CP-215 Transmission Definitions Window.

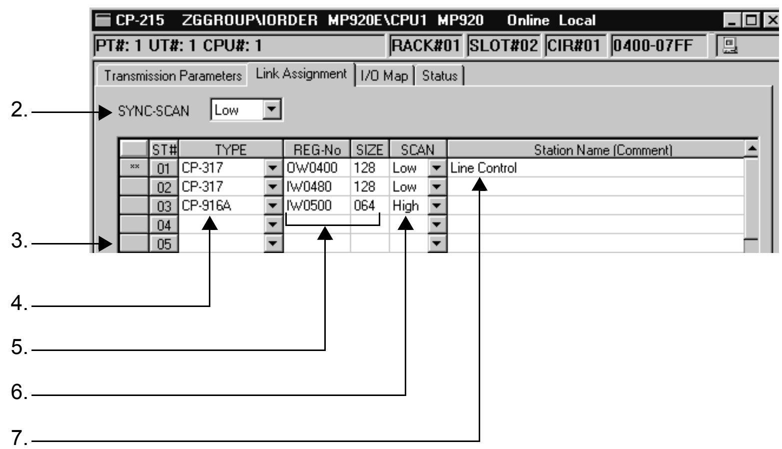
Table 5.3 Default Values of Transmission Parameters

Parameter	Default
Own Station No	0
Own Network No	0
Token Cycle Time Setting	100
MEMOBUS Response Monitoring Time	0
Station Search Interval	0
Transmission Speed	4
Max No. of Stations Connected	16
Message Relay Function	0
No. of Relayed Network 1	0
No. of Relayed Network 2	0
Maintenance Switches SW1 SW2	All OFF

■ Link Assignments

Assignment Data Settings

Assign the I/O registers to be linked between the stations connected to the CP-215 network. Set the station number, controller type, and I/O register number of each station to be linked.



1. Configuration Information

   Displays the 215IF configuration information that was set in the Module Definition Window.

2. SYNC-SCAN

   The 215IF performs regular transmissions. This setting determines whether the transmission data refresh cycle of the 215IF transmission is synchronized with the HIGH or LOW scan cycle of the Machine Controller.

   - HIGH: High-speed scan
   - LOW: Low-speed scan

3. ST#

   Displays the station number. Two asterisks (**) will be displayed for the local station number. The local station number is determined by the number input in the Transmission Parameter Tab's Own Station Number Box. The station number displays only the number input in the Transmission Parameter Tab's Max No. of Stations Connected Box.

4. TYPE

   Select a name for the I/O device connected to each station. The following table shows the I/O devices that can be selected.

Selected Item	I/O Device Name
CP-3500H	CP-3500H
CP-316	CP-316
CP-916A	CP-916A
CP-9200SH	CP-9200SH
CP-317	CP-317

(cont'd)

Selected Item	I/O Device Name
CP-316H	CP-316H
CP-916G	CP-916G
ACGC4000	ACGC4000
CP-517	CP-517
MP920	MP920
CP-902	CP-902
215IF/INV	215IF/INV
RIO-05	RIO-05
RIO-2000	RIO-2000
RIO-120	RIO-120

5. REG-No., SIZE

   Set the leading register number (I register number) and amount of I/O data. Input an O register number for the local station.

   Be sure that the registers set for each station does not overlap with the register numbers for another station.

6. SCAN

   Select the transmission processing scan that services I/O.

   - HIGH: High-speed scan
   - LOW: Low-speed scan

7. Station Name (Comment)

   Comments up to 32-characters long can be input for each station.

Deleting Assignment Data

Use the following procedure to delete the assignment data for one station.

1. Move the cursor to the desired row.

	ST#	TYPE	REG-No	SIZE	SCAN	Station Name (Comment)
**	01	CP-317	OW0400	128	Low	Line Control
	02	CP-317	IW0480	128	Low	
	03	CP-916A	IW0500	064	High	
	04					

2. Click ***Edit (E)*** and then ***Assignment Delete (D)*** on the menu. The assignment data selected in step **1.** will be deleted.

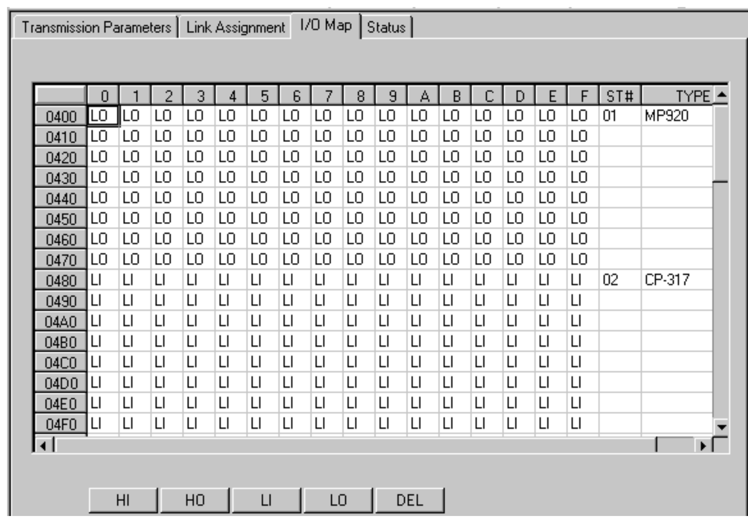
	ST#	TYPE	REG-No	SIZE	SCAN	Station Name (Comment)
**	01					
	02	CP-317	IW0480	128	Low	
	03	CP-916A	IW0500	064	High	
	04					

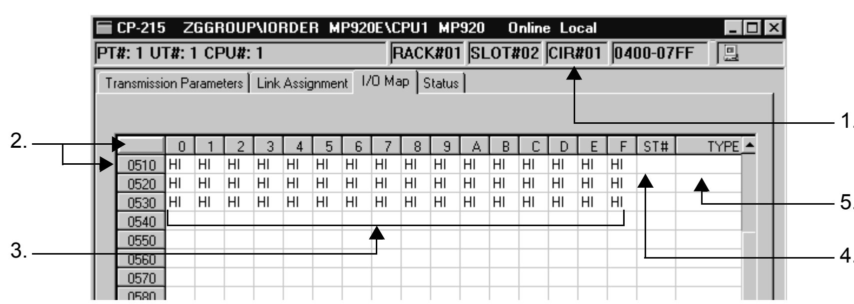
■ Assigning the I/O Map

The following window displays in bit units the I/O map assignment area from the leading I/O register number to the end I/O register number that are set in the 215IF Module Definition Window.

The station number and controller name that are set in the Link Assignment Tab are displayed in the corresponding register number row.

Only the amount of scan information in the I/O map assignment area that is set in the SIZE column of the Link Assignment Tab is displayed. The remaining space is left blank.



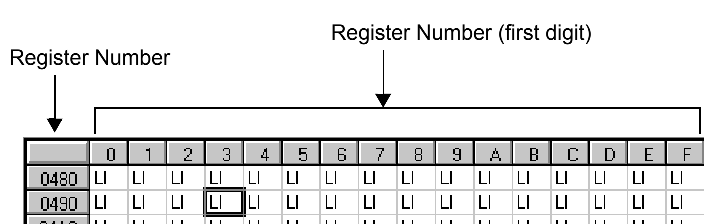


1. CIR# (Circuit Number)

   Displays the circuit number and range of I/O registers that are being mapped.

2. Register Number

   Each column in the table represents the first digit in the register numbers displayed on the left side of the table. In the following diagram, the cursor is positioned over IW0493.



3. I/O Assignments

   Assign bits to I/O for high-speed or low-speed scan.

   - HI: Input set for a high-speed scan.
   - HO: Output set for a high-speed scan.
   - LI: Input set for a low-speed scan.
   - LO: Output set for a low-speed scan.

   To assign I/O, move the cursor to the desired position and click ***HI***, ***HO***, ***LI***, or ***LO*** at the bottom of the display. An I/O assignment can be deleted by moving the cursor to the desired position and clicking ***DEL*** at the bottom of the display.

4. ST#

   Displays the station number set in the I/O Assignment Tab.

5. TYPE

   Displays the I/O device name set in the I/O Assignment Tab.

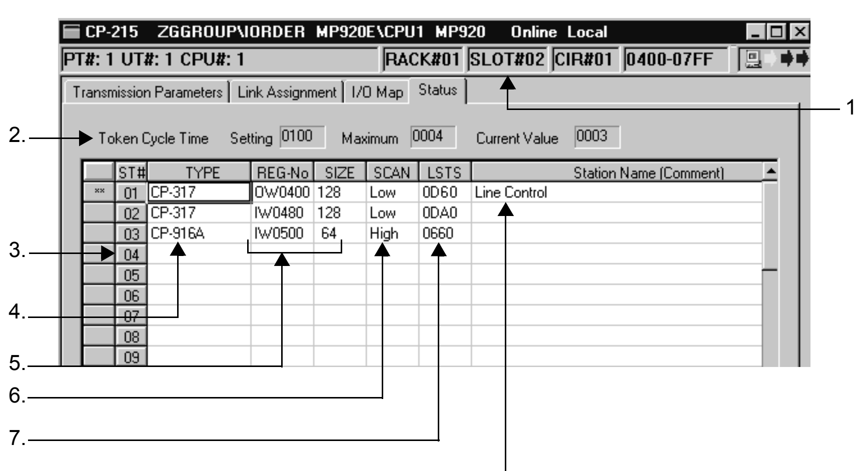
Limitations on Changing I/O Map Assignments

The settings made in advance in the Link Assignment Tab are assigned as defaults for the high-speed scan I/O and low-speed scan I/O. The following limitations apply when changing I/O assignments.

- I/O assignments can be deleted. (For example, “LI” can be changed to “.”)
- The scan speed designation can be changed. (For example, “LI” can be changed to “HI.”)
- The I/O designation cannot be changed. (For example, “LI” cannot be changed to “LO.”)

■ Displaying the Link Status

The Status Tab displays the data that the 215IF is actually handling in link transmissions. The tab only displays the settings; the settings cannot be changed.



1. Configuration Information

   Displays the CP-215 configuration information.

2. Token Cycle Time, Setting, Max. Value, Current Value

   Displays the Token Cycle Time Setting set in the Transmission Parameter Tab, as well as the actual maximum and current values. In Offline Mode, data will not be displayed in the “Max. Value” and “Current Value” boxes.

3. ST#

   Displays the station number. Two asterisks (**) will be displayed for the local station number. The local station number is determined by the number input in the Transmission Parameter Tab’s Own Station Number Box. The station number displays only the number input in the Transmission Parameter Tab’s Max. No. of Stations Connected Box.

4. TYPE

   Displays the I/O device name set in the Link Assignment Tab.

5. REG-No., SIZE

   Displays the leading register number and amount of I/O data set in the Link Assignment Tab.

6. SCAN

   Displays the transmission mode set in the Link Assignment Tab.

7. LSTS

   In Online Mode, the 215IF link status data is displayed in hexadecimal. In Offline Mode, nothing will be displayed.

   The following diagrams show the meaning of the link status data for other stations and the local station.

   a) Link Status Data for Other Stations

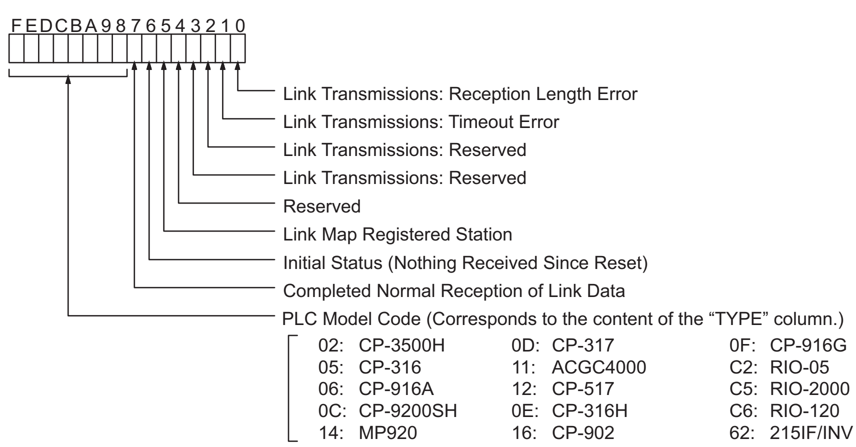


Fig. 5.3 Link Status Data (Other Stations)

b) Link Status Data at the Local Station

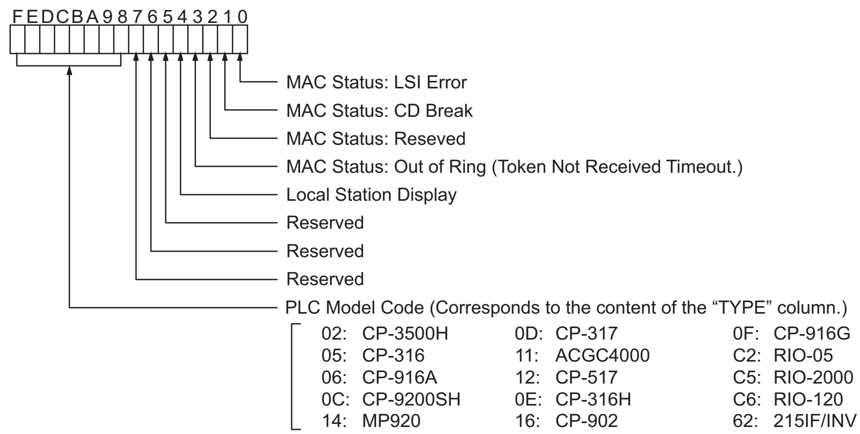


Fig. 5.4 Link Status Data (Local Station)

8. Station Name (Comment)

   Displays the station name set in the Link Assignment Tab.

5.5.5 Saving CP-215 Transmission Definitions Data

Use the following procedure to save the CP-215 Transmission Definitions data.

In Online Mode, the settings are saved in the Machine Controller and the hard disk on the computer. In Offline Mode, the settings are saved in the hard disk on the computer.

1. Click ***File (F)*** and then ***Save (S)*** on the CP-215 Transmission Definition Window’s menu.
2. Verify the message in the message box and click the **Yes** button.
3. Verify the message in the message box and click the **OK** button.

5.5.6 Deleting CP-215 Transmission Definitions Data

Use the following procedure to delete all of the CP-215 Transmission Definitions data. In Online Mode, the data will be deleted from the Machine Controller and the hard disk on the computer. In Offline Mode, the data will be deleted from the hard disk on the computer.

1. Click ***File (F)*** and then ***Delete (D)*** on the CP-215 Transmission Definition Window’s menu.
2. Verify the message in the message box and click the **Yes** button to delete the data.

5.6 Relay Function

This section explains the Relay Function between the network segments of 215IF Modules. The Relay Function is used to transfer messages between Machine Controllers across multiple 215IF networks.

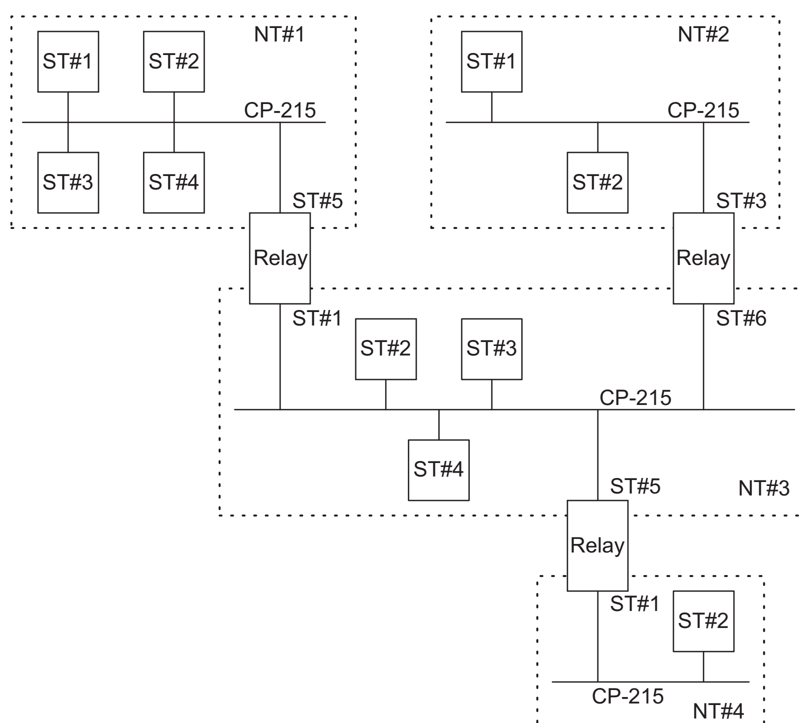
5.6.1 Relays Between Networks

A unique network number (NW#nn) is allocated to each network segment in the system. A unique station number (ST#nn) is also allocated to the 215IF Module in each network segment.

All the units connected to the entire network can be uniquely identified by identifying the combinations of these network numbers and station numbers as network addresses.

The Relay Function facilitates message communications between such networks.

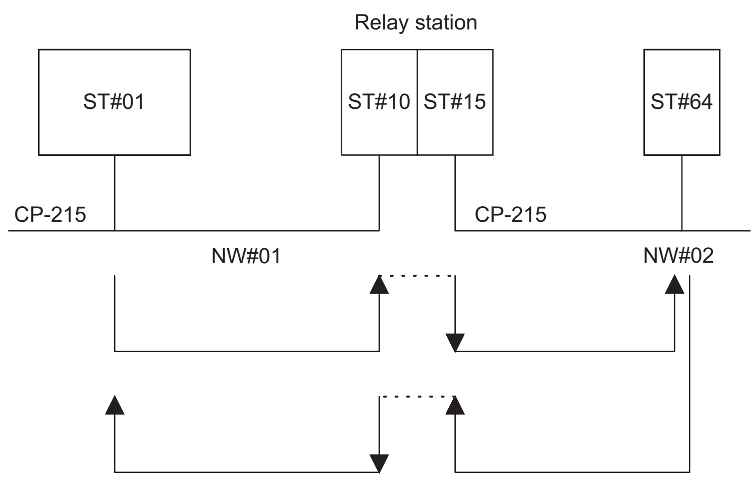
To use the Relay Function effectively, the relay destination network number must be specified in the 215IF parameter settings. See the transmission definitions for details.



5.6.2 Relay Processing Flow

When, for example, a message is sent from ST#01 to ST#64, the relay destination address is automatically allocated by the system, and the message is sent to ST#64 via the relay station.

With the MEMOBUS protocol, a response message is sent from ST#64 to ST#01 via the relay station.



5.6.3 Example of a Network Configuration Using the Relay Function

The Network Relay Function basically consists of a MPE720 Programming Device that is connected to a single station and is used to perform engineering, plus a system configuration to relay data over 215IF lines.

■ Transmission Definition Parameters

The following transmission definition parameters are used for the Relay Function.

Message Relay Function

This parameter specifies whether or not the Message Relay Function is to be used.

- Yes: The Message Relay Function can be used.
- No: The Message Relay Function cannot be used.

No. of Relayed Network 1 (Relay Destination Networks 1)

This parameter is valid for the Message Relay Function, and specifies the relay destination networks for messages.

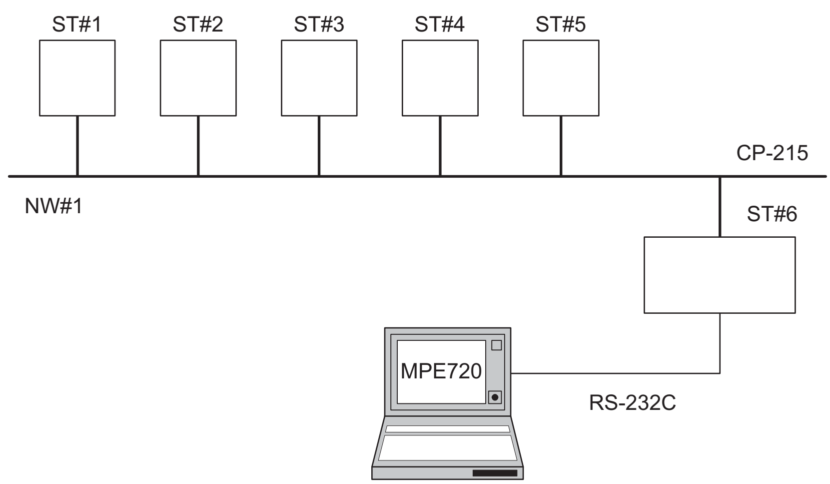
The numbers of the networks to relay messages from the 215IF line are specified here. The numbers of all networks connected to this local line should normally be specified.

No. of Relayed Network 2 (Relay Destination Networks 2)

This parameter is valid with the Message Relay Function, and specifies the relay destination networks for messages.

- Any network whose number has been specified in either Relay Destination Network 1 or Relay Destination Network 2 will be valid.

■ 215IF Network Configuration 1



Settings

The 215IF relay settings for ST#1 to ST#6 will be the same.

- Message Relay Function: Yes
- No. of Relayed Network 1: 1 to 1
- No. of Relayed Network 2: Not set

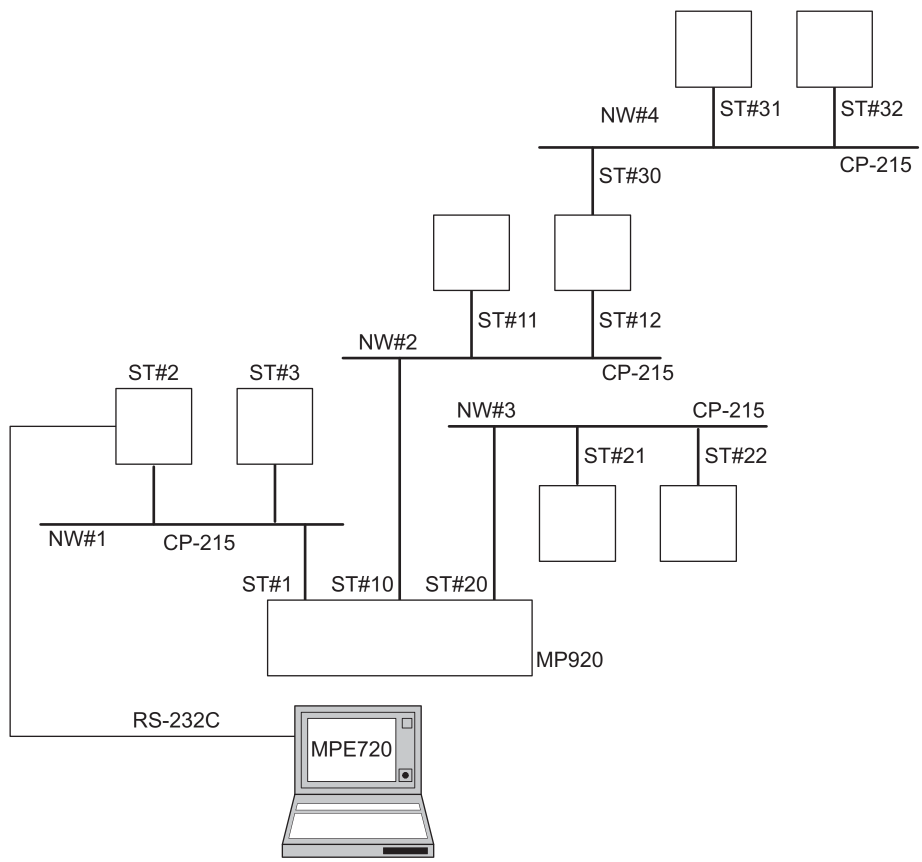
With the above settings, any Machine Controller at ST#1 to ST#6 can be accessed from the MPE720.

Remarks

- The CP-215 Relay Function must be set in order to access a Machine Controller (ST#1 to ST#5 in the above diagram) that is not directly connected via a CP-215 from the MPE720.
- With a single network configuration, set the Relay Function for all stations. Set the local network number as the relay destination network number.

■ 215IF Network Configuration 2

In the following example, three 215IF Modules are mounted to one MP920 Controller.



Settings

1. NW#1 ST#1
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 1 to 1
   - No. of Relayed Network 2: Not set
2. NW#2 ST#10
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 2 to 1
   - No. of Relayed Network 2: 4 to 4
3. NW#3 ST#20
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 3 to 3
   - No. of Relayed Network 2: Not set

4. NW#2 ST#12
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 1 to 3
   - No. of Relayed Network 2: Not set
5. NW#4 ST#30
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 4 to 4
   - No. of Relayed Network 2: Not set
6. NW#1 ST#2 to ST#3
   NW#2 ST#11
   NW#3 ST#21 to ST#22
   NW#4 ST#31 to ST#32
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 1 to 4
   - No. of Relayed Network 2: Not set

Remarks

With a configuration of two or more networks, be sure that the Machine Controller that performs network relaying is linked to only one station in each network.

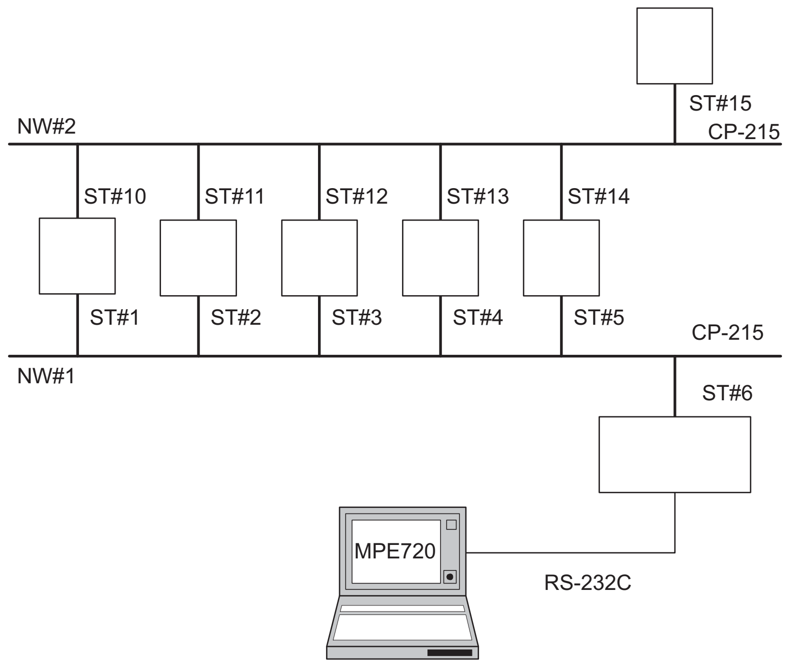
In the example given above, the following five stations conform to this requirement.

- NW#1: ST#1
- NW#2: ST#10 and ST#12
- NW#3: ST#20
- NW#4: ST#30

INFO

A Machine Controller that performs network relaying is an MP920 Machine Controller with two or more 215IF Modules with ports connected to different networks to transfer data between the networks.

■ 215IF Network Configuration 3



Settings

1. NW#1 ST#6
   NW#2 ST#15
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 1 to 2
   - No. of Relayed Network 2: Not set
2. NW#1 ST#2 to ST#5
   NW#2 ST#11 to ST#14
   - Message Relay Function: No
   - No. of Relayed Network 1: Not set
   - No. of Relayed Network 2: Not set
3. NW#1 ST#1
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 1 to 1
   - No. of Relayed Network 2: Not set
4. NW# ST#10
   - Message Relay Function: Yes
   - No. of Relayed Network 1: 2 to 2
   - No. of Relayed Network 2: Not set

Remarks

In the example given above, only one Machine Controller that performs network relaying can be set in each network, as shown under the *Remarks* for ■*215IF Network Configuration 2*. Therefore, Network Relay is set to“Yes” only for the following two stations.

- NW#1 ST#1
- NW#2 ST#10

The 215IF uses only one port for the two Machine Controllers ST#6 (NW#1) and ST#15 (NW#2). Therefore, the setting will be Network Relay: Yes.

5

5.7 CP-215 Repeaters

This section describes CP-215 Repeaters.

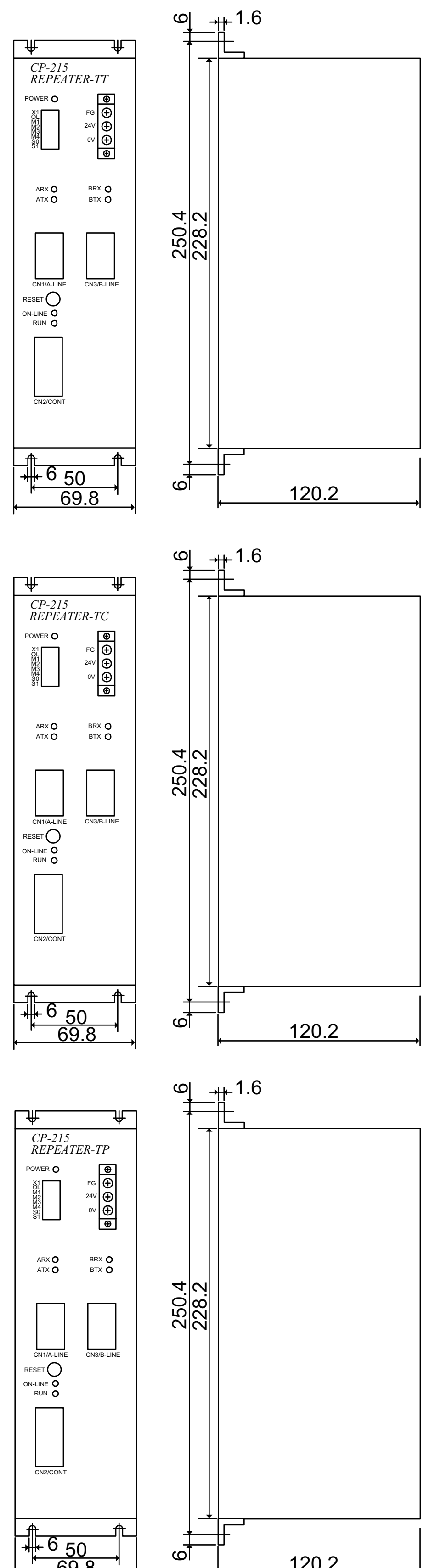
5.7.1 CP-215 Repeaters

CP-215 Repeaters are used to extend the CP-215 transmission distance. Different CP-215 Repeater models are available for use with twisted-pair, coaxial, and optical fiber cables. The best system can be constructed according to the transmission distance.

For applicable cables and other installation details, refer to the appendixes and the *FDS System Installation Manual*.

Table 5.4 CP-215 Repeaters

Name	Product Code	Details
CP-215 Repeater-TT	87215-1100□	Repeater between twisted-pair cables (Power supply: 24 VDC)
CP-215 Repeater-TT (100 VAC, 200 VAC, 100 VDC)	87215-1110□	Repeater between twisted-pair cables (Power supply: 100 VAC, 200 VAC, 100 VDC)
CP-215 Repeater-TC	87215-1200□	Repeater between twisted-pair and coaxial cables (Power supply: 24 VDC)
CP-215 Repeater-TC (100 VAC, 200 VAC, 100 VDC)	87215-1210□	Repeater between twisted-pair and coaxial cables (Power supply: 100 VAC, 200 VAC, 100 VDC)
CP-215 Repeater-TP	87215-1300□	Repeater between twisted-pair and H-PCF optical fiber cables (850 m) (Power supply: 24 VDC)
CP-215 Repeater-TP (100 VAC, 200 VAC, 100 VDC)	87215-1310□	Repeater between twisted-pair and H-PCF optical fiber cables (850 m) (Power supply: 100 VAC, 200 VAC, 100 VDC)
CP-215 Repeater-TS2	87215-1400□	Repeater between twisted-pair and crystal optical fiber cables (2 km) (Power supply: 24 VDC)
CP-215 Repeater-TS2 (100 VAC, 200 VAC, 100 VDC)	87215-1410□	Repeater between twisted-pair and crystal optical fiber cables (2 km) (Power supply: 100 VAC, 200 VAC, 100 VDC)
CP-215 Repeater-TS5	87215-1500□	Repeater between twisted-pair and crystal optical fiber cables (5 km) (Power supply: 24 VDC)
CP-215 Repeater-TS5 (100 VAC, 200 VAC, 100 VDC)	87215-1510□	Repeater between twisted-pair and crystal optical fiber cables (5 km) (Power supply: 100 VAC, 200 VAC, 100 VDC)



Units: mm

Fig. 5.5 CP-215 Repeater Dimensions

5.7.2 System Configuration

■ Standard System Configuration

The standard system configuration for an Electrical Repeater is shown below.

System Configuration for Electrical Repeater-TT

The following example shows the standard system configuration using one Electrical Repeater. In this example, an Electrical Repeater-TT is connected between the main bus and branch bus in order to connect 60 stations.

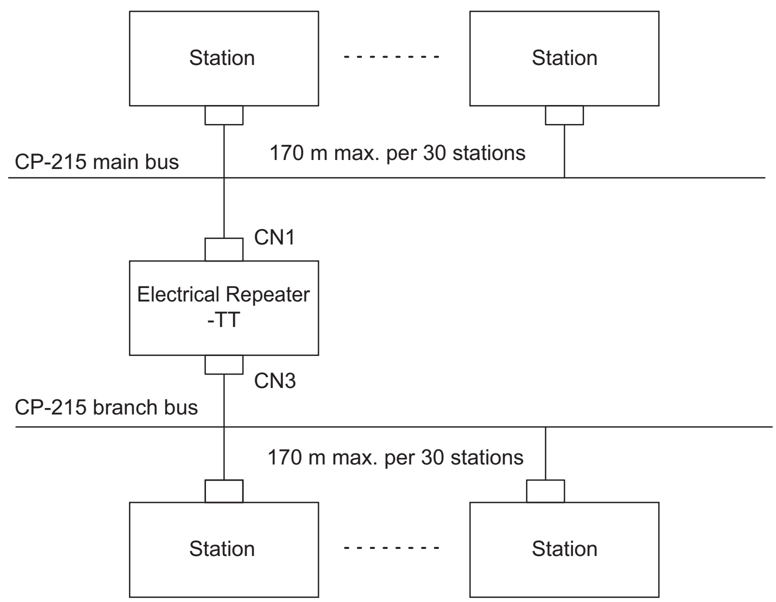


Fig. 5.6 System Configuration for Electrical Repeater-TT

Standard System Configuration for Electrical Repeater-TT and Repeater-TC

The following example shows the standard system configuration using two Electrical Repeaters.

Use two Electrical Repeaters-TT/-TC when the transmission distance is long. These Electrical Repeaters can be connected using twisted-pair cables or coaxial cables.

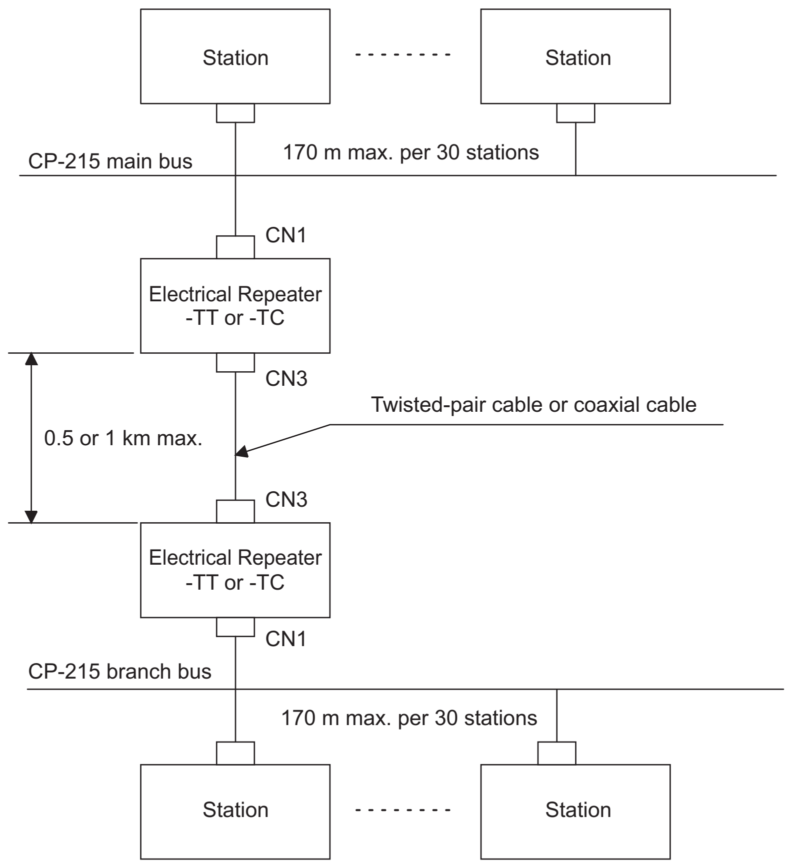


Fig. 5.7 Standard System Configuration for Electrical Repeaters-TT and -TC

5

■ Standard System Configuration for Optical Repeaters

The following example shows the standard system configuration for Optical Repeaters.

Standard System Configuration for Optical Repeater-TP

Use Optical Repeaters where there is a risk of noise due to a long transmission distance. These Optical Repeaters can be connected using the designated two-core optical fiber cables and optical connectors.

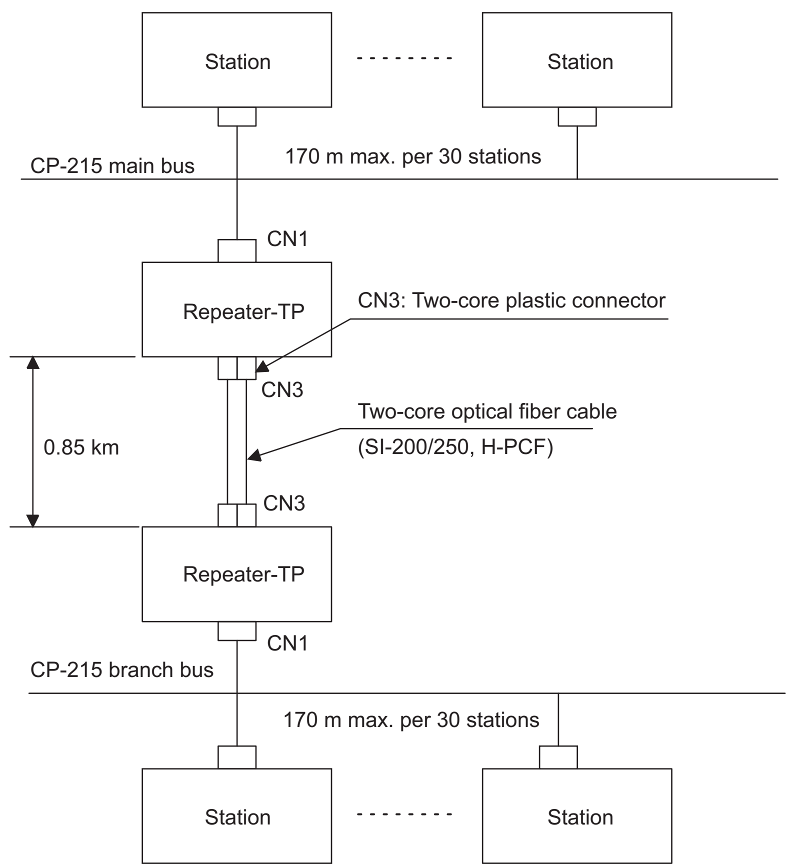


Fig. 5.8 Standard System Configuration for Optical Repeater-TP

Standard System Configuration for Optical Repeater-TS

The following example shows the standard system configuration using two Optical Repeaters.

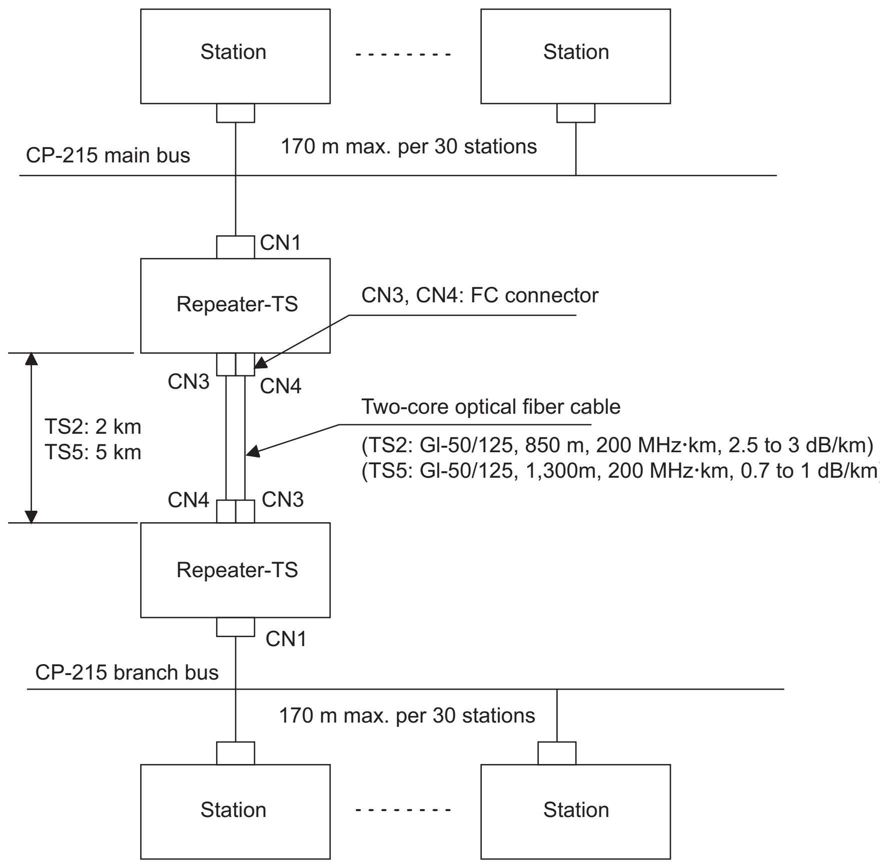


Fig. 5.9 Standard System Configuration for Optical Repeater-TS

■ Dual System Configuration

The following example shows a Dual system configuration for Repeaters.

If the CP-215 transmission line consists of a simplex system, the respective Repeaters on the upstream side of systems A and B can be switched to primary or standby Repeaters by using the system A/B changeover contact input signal (CN2). Switch the current primary Repeaters to standby Repeaters first, then switch the current standby Repeaters to primary Repeaters. Be sure to follow this switching sequence. Set the system A/B changeover contact input signal for the Repeaters on the downstream side to ON all the time, or turn ON pin 7 of SW1.

When the Repeaters and transmission cables in the primary system fail, the standby system will switch to the primary system to recover transmissions. A transmission error will exist from the time the failure occurs until the standby system switches to the primary system.

The difference in the Repeater-to-Repeater cable length between systems A and B must be less than 2 km.

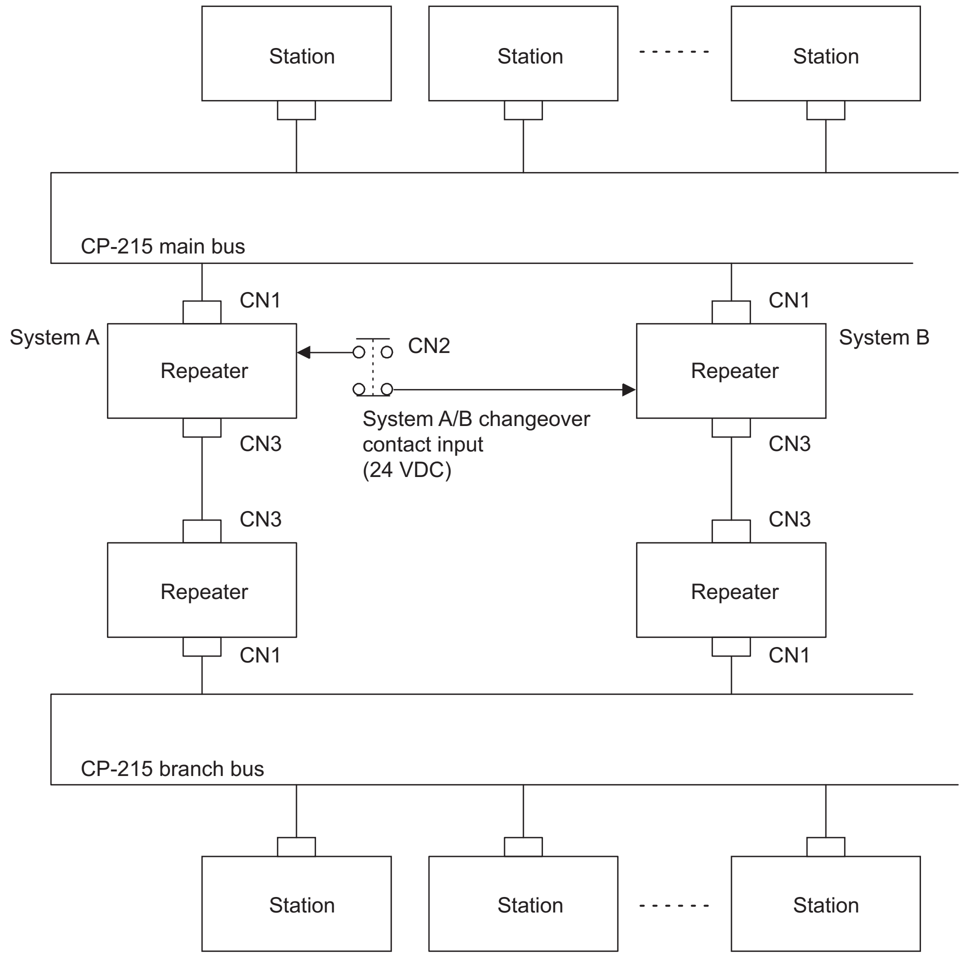


Fig. 5.10 Dual System Configuration for Repeaters

■ System Configuration with Maximum Number of Repeaters

System Configuration Using Cascade Connections

The following example shows a system configuration with the maximum number of Repeaters.

Up to eight Repeaters can be connected between two stations. If the number of Repeater exceeds eight, use the star connection method in conjunction with the cascade connection method to reduce the number of Repeaters between any two stations to eight or less.

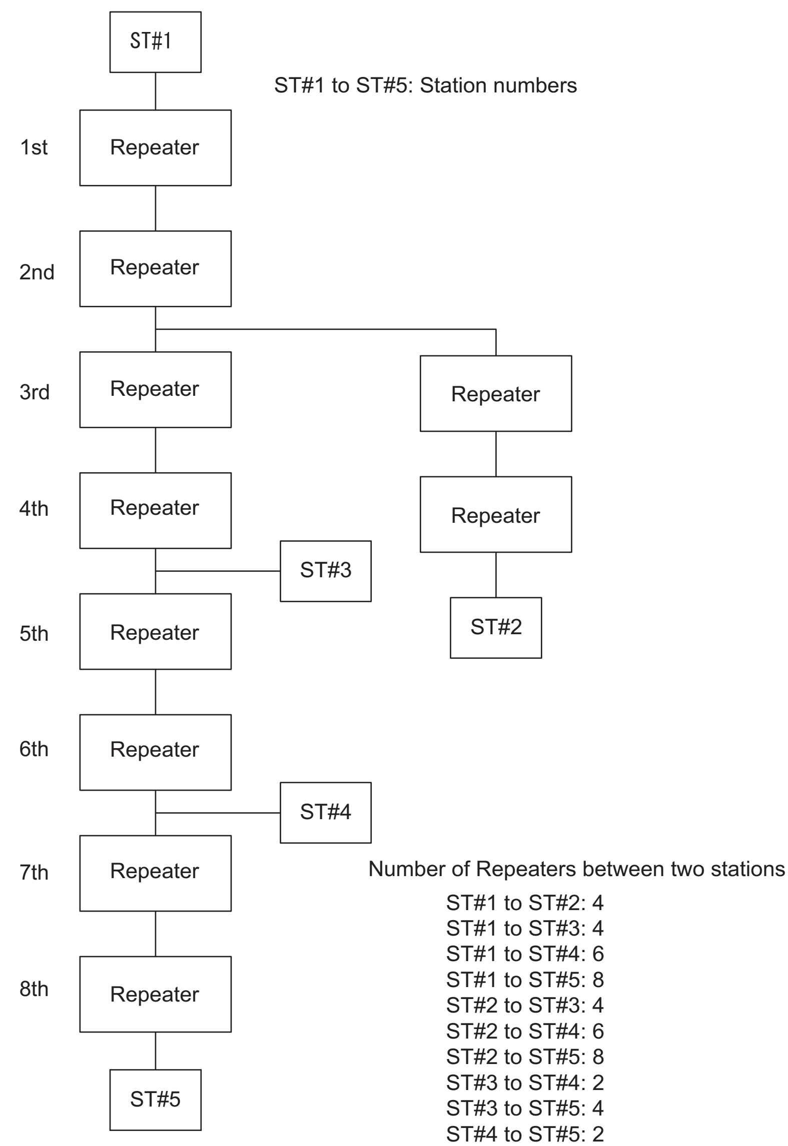


Fig. 5.11 System Configuration with Maximum Number of Repeaters (Cascade Connections)

System Configuration Using Star Connections

The following example shows a system configuration using star connections.

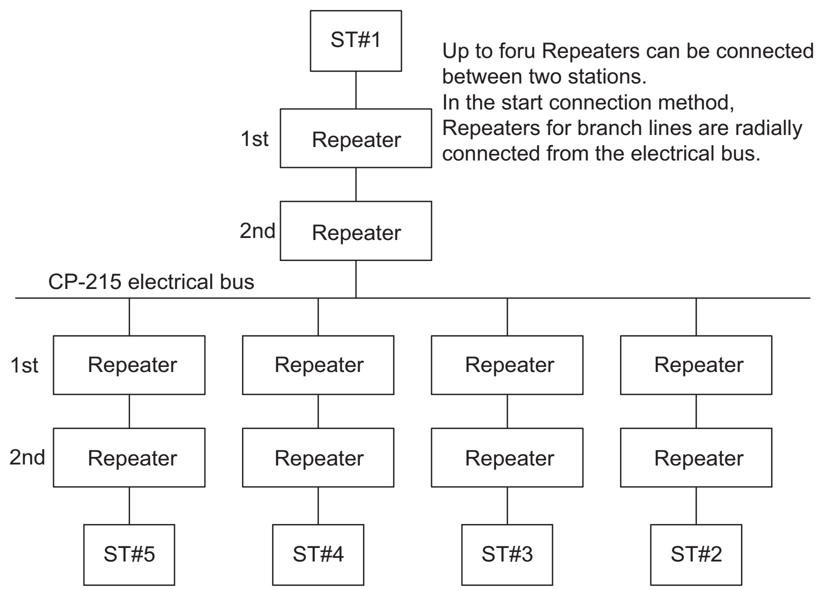


Fig. 5.12 System Configuration Using Star Connections

5.7.3 Specifications Common to All CP-215 Repeaters

■ Power Supply

Item		Specifications
Rated Input Voltage	24-VDC Models	24 VDC ±20% (19.2 to 28.8 VDC)
	100-VAC, 200-VAC, 100-VDC Models	100/115 VAC ±15% (85 to 132 VAC, 47 to 63 Hz) 100 VDC -10%, +40% (90 to 140 VDC) 200 VAC ±15% (170 to 230 VAC, 47 to 63 Hz)
Power Consumption	24-VDC Models	5 W
	100-VAC, 200-VAC, 100-VDC Models	10 W
Input Inrush Current	24-VDC Models	5 A peak at 24 VDC
	100-VAC, 200-VAC, 100-VDC Models	15 A peak at 100 VDC 15 A peak at 100 VAC 30 A peak at 200 VAC
Overcurrent Protection	24-VDC Models	With built-in 1-A fuse
	100-VAC, 200-VAC, 100-VDC Models	With built-in 2-A fuse
Holding Time		10 ms or less

■ Environmental Conditions

Item	Specifications
Operating Temperature	0 to 55°C
Operating Humidity	5 to 95%RH (no condensation)
Storage Temperature	-25 to + 85°C
Storage Humidity	5 to 95% (no condensation)
Vibration Resistance	Conforming to JIS B 3502: 10 to 150 Hz with single-amplitude of 0.075 mm 57 to 150 Hz with fixed acceleration of 9.8 m/s^2 (1G)
Shock Resistance	Conforming to JIS B 3502: Peak acceleration of 147 m m/s^2 (15G) twice for 11 ms each in the ±X, ±Y, and ±Z directions
Ground	Ground to 100 Ω max.

■ Structure

Item	Specifications
Ground	Panel mount type (mounting screws: M5× 4)
Dimensions	69.8 × 262.4 × 120.2 mm (W × H × D)
Cooling Method	Natural cooling
Mass	1.6 kg

■ Maximum Number of Repeaters that Can Be Connected

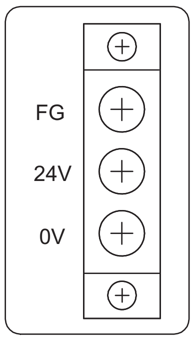
The maximum number of Repeaters that can be connected is as follows:

- For CP-215 communications: 8 Repeaters or less (Total transmission distance: 12 km max.)
- For CP-216 communications : 2 Repeaters or less
  (Total transmission distance for 1 Repeater: 600 m max. at 4 Mbps)
  (Total transmission distance for 2 Repeaters: 350 m max. at 4 Mbps)

5

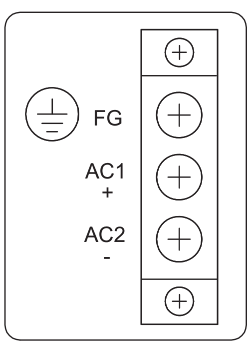
■ Terminal Blocks

24-VDC Models



Terminal Name	Function
FG	Protective ground terminal
24 V	24 VDC positive terminal
0 V	24 VDC negative terminal

100-VAC, 200-VAC, 100-VDC Models



Terminal Name	Function
FG	Protective ground terminal
AC1/+	AC input or 100 VDC positive terminal
AC2/-	AC input or 100 VDC negative terminal

■ Connectors

CN1: CP-215 Electrical Bus Port

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance	170 m per 30 stations (4 Mbps)
Twisted-pair Cable	Inside control panel: YS-IPEV-S (CU), 1P × 0.3 mm^2, 75 Ω *1 Outside control panel: YS-IPEV-S (CU), 1P × 1.25 mm^2, 75 Ω *1
Applicable Connector	MR-8LM (G) *2
Transmission Level	68.9 dBm (2.8 Vp)
Reception Level	53.5 dBm (0.475 Vp)

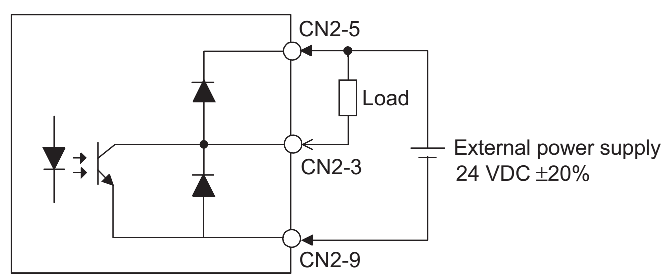
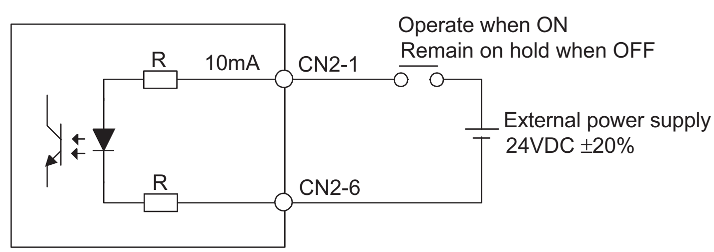
* 1. Manufactured by Fujikura Corporation
* 2. Manufactured by Honda Communication Industries Co., Ltd.

Connector Signal Assignments

No.	Signal Name	No.	Signal Name
1	SRD-	5	RT2*
2	Not used.	6	Not used.
3	Not used	7	Not used
4	RT1*	8	SRD+

* Short-circuiting the RT1 and RT2 terminals connects the internal 75 Ω terminating resistance.

CN2: Operating Status I/O Connector (D-sub 9-pin)

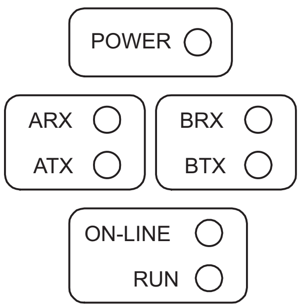
Name	Specifications
DO	RUN output (open collector output) Allowable output capacity: 24 VDC, 50 mA or less Turned OFF when the power is shut OFF or the reception carrier sense time is exceeded for approximately one second or more. Automatically restored when operation becomes normal. 
DI	Dual switching input (24 VDC, 10 mA) 

Note: For external connectors, use the D-sub 9-pin male connector: 17JE-23090-02 (D8B) manufactured by Daiichi Electronic Industries Co., Ltd. This connector is equipped with a case and M3 mounting screws.

5

■ Indicators

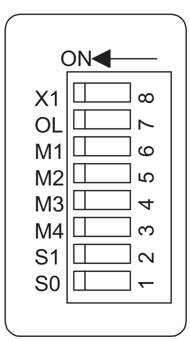
The CP-215 Repeater-TT displays the operating status using the following indicators.



Terminal Name	Status	Description
POWER	Lit	Power is turned ON.
	Not lit	Power is turned OFF.
ARX BRX	Lit	Port is receiving data.
	Not lit	Port is not receiving data.
ATX BTX	Lit	Port is sending data.
	Not lit	Port is not sending data.
ON-LINE	Lit	Repeater is operating. (DI input or SW1-7 is ON.)
	Not lit	Repeater is on standby. (DI input and pin 7 of SW1 are OFF.)
RUN	Lit	Reception line is normal.
	Not lit	Reception line is abnormal.

■ Setting Switch

Operating Mode Setting Switch (SW1)



Terminal Name	Pin Name	Setting	
X1	Not used.		
OL	Dual Mode	ON	Can operate when Dual switching DI input is OFF.
		OFF	Can operate when Dual switching DI input is ON.
M1	215/216 Mode Switching	See *Table* *1 below.	
M2			
M3			
M4			
S1	Transmission Speed	See *Table* *2 below.	
S0			

* 1. 215/216 Mode Switching

	CP-215 Communications	CP-216 Communications	Setting Disabled
M1	ON	ON	OFF
M2	ON	ON	OFF
M3	ON	OFF	-
M4	ON	OFF	-

* 2. Transmission Speed

Transmission Speed	1 Mbps	2 Mbps	4 Mbps	Invalid
S1	OFF	ON	ON	OFF
S0	ON	OFF	ON	OFF

RESET Pushbutton

This pushbutton is used to reset (OFF → ON) the RUN output from CN2.

5.7.4 CP-215 Repeater-TT

The CP-215 Repeater-TT is an electrical Repeater that relays CP-215 or CP-216 transmission signals using twisted-pair cables.

There are two models of CP-215 Repeater-TT.

- 24-VDC model
- 100/115-VAC, 200-VAC, 100-VDC model

The transmission distance can be extended to a maximum of 500 m.

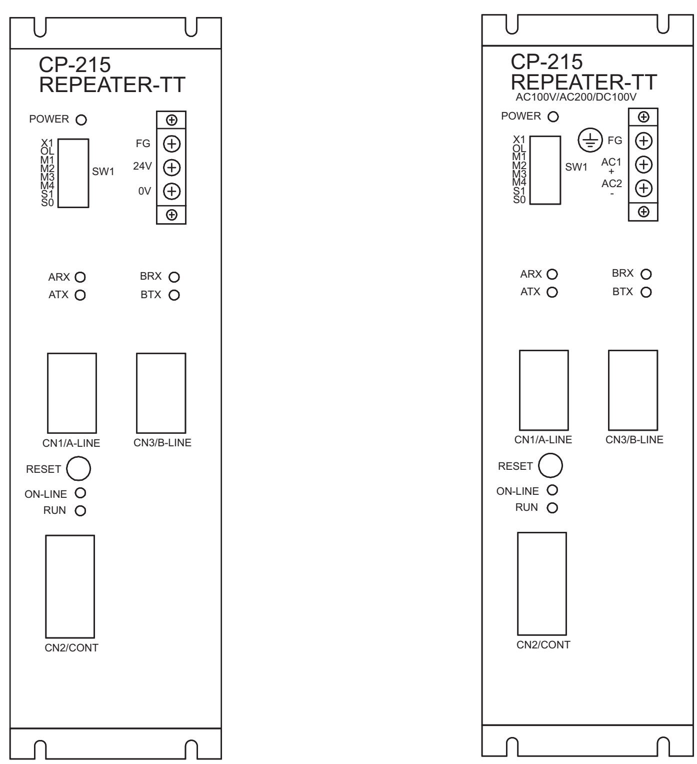


Fig. 5.13 Front View of CP-215 Repeater-TT

■ Repeater-to-Repeater Connector (CN3/B-LINE)

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance*1	500 m between Repeaters (4 Mbps)
Twisted-pair Cable	Inside control panel: YS-IPEV-S (CU), 1P × 0.3 mm^2, 75 Ω *2 Outside control panel: YS-IPEV-S (CU), 1P × 1.25 mm^2, 75 Ω *2
Applicable Connector	MR-8LM (G) *3
Transmission Level	68.9 dBm (2.8 Vp)
Reception Level	53.5 dBm (0.475 Vp)

* 1. Refer to ■*System Configuration with Maximum Number of Repeaters* under *5.7.2 System Configuration* for the specifications for the maximum number of Repeaters connected and the total transmission distance.
* 2. Manufactured by Fujikura Corporation
* 3. Manufactured by Honda Communication Industries Co., Ltd.

■ Connector Signal Assignments

No.	Signal Name	No.	Signal Name
1	SRD-	5	RT2*
2	Not used	6	Not used
3	Not used	7	Not used
4	RT1*	8	SRD+

* Short-circuiting the RT1 and RT2 terminals connects the internal 75 Ω terminating resistance.

5.7.5 CP-215 Repeater-TC

The CP-215 Repeater-TC is an electric Repeater that relays CP-215 or CP-216 transmission signals using coaxial cables.

There are two models of CP-215 Repeater-TC.

- 24-VDC model
- 100/115-VAC, 200-VAC, 100-VDC model

The transmission distance can be extended to a maximum of 100 m.

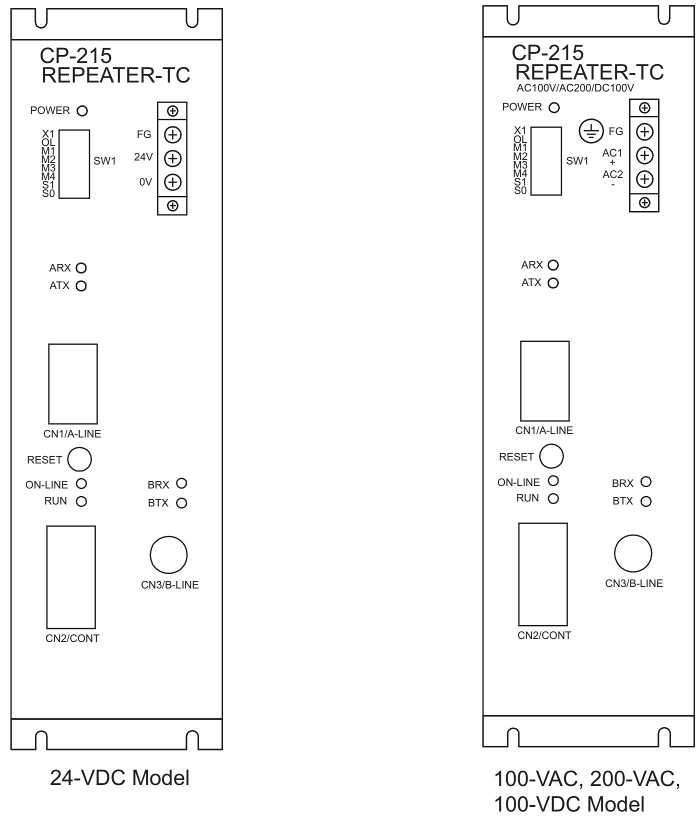


Fig. 5.14 Front View of CP-215 Repeater-TC

■ Repeater-to-Repeater Connector (CN3/B-LINE)

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance*	1 km between Repeaters (7C-FB, 4 Mbps)
Coaxial Cable	75 Ω
Applicable Connector	Inside control panel: BNC type Outside control panel: F type
Transmission Level	68.9 dBm (2.8 Vp)
Reception Level	53.5 dBm (0.475 Vp)

* Refer to ■*System Configuration with Maximum Number of Repeaters* under *5.7.2 System Configuration* for the specifications for the maximum number of Repeaters connected and the total transmission distance.

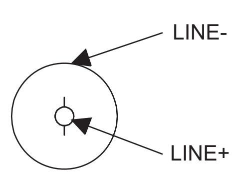


Fig. 5.15 BNC Coaxial Connector

5.7.6 CP-215 Repeater-TP

The CP-215 Repeater-TP is an optical Repeater that relays CP-215 or CP-216 transmission signals using H-PCF optical fiber cables.

There are two models of CP-215 Repeater-TP.

- 24-VDC model
- 100/115-VAC, 200-VAC, 100-VDC model

The transmission distance can be extended to a maximum of 850 m.

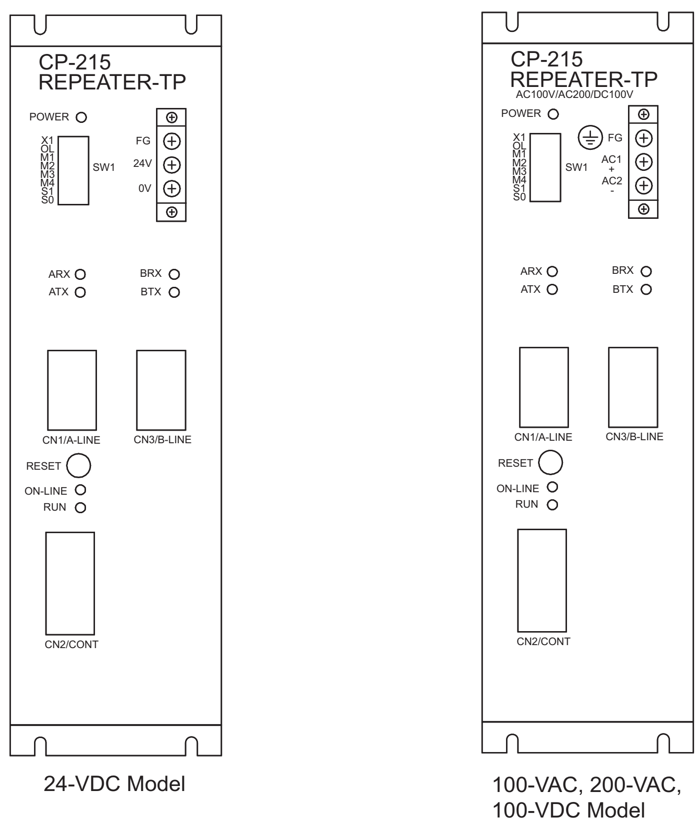


Fig. 5.16 Front View of CP-215 Repeater-TP

■ Repeater-to-Repeater Connector (CN3/B-LINE)

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance*	0 to 650 m with crimp connections 650 to 850 m with adhesive connections
Optical Fiber	H-PCF, SI-200/250, wavelength λ = 850 nm, loss = 7 dB/km, bandwidth = 14.5 MHz · km
Applicable Connector	Two-core plastic connector DL-92 or DL-92H (conforming to JIS C 5977 F08)
Optical Transmission Level	-14 to -18 dBm
Optical Reception Level	-14 to -28 dBm

* Refer to ■*System Configuration with Maximum Number of Repeaters*

under *5.7.2 System Configuration* for the specifications for the maximum number of Repeaters connected and the total transmission distance.

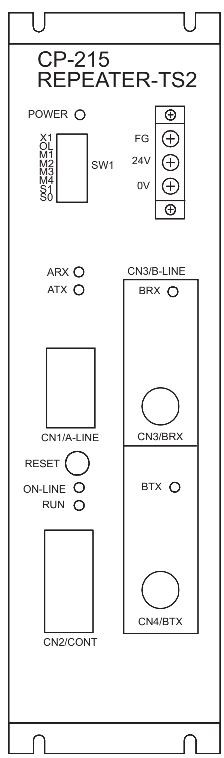
5.7.7 CP-215 Repeater-TS2

The CP-215 Repeater-TS2 is an optical Repeater that relays CP-215 or CP-216 transmission signals using crystal glass optical fiber cables.

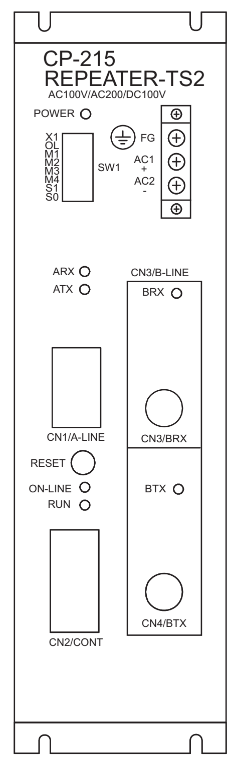
There are two models of CP-215 Repeater-TS2.

- 24-VDC model
- 100/115-VAC, 200-VAC, 100-VDC model

The transmission distance can be extended to a maximum of 2 km.



24-VDC Model



100-VAC, 200-VAC,
100-VDC Model

Fig. 5.17 Front View of CP-215 Repeater-TS2

5

■ Repeater-to-Repeater Connector (CN3/BRX, CN4/BTX)

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance*	0 to 2 km
Optical Fiber	Crystal glass optical fiber, GI-50/125, wavelength λ = 850 nm, loss = 3 dB/km or less, bandwidth = 200 MHz · km
Applicable Connector	FC (conforming to JIS C 5970 F01)
Optical Transmission Level (CN4)	-18 dBm
Optical Reception Level (CN3)	-15 to -28 dBm

* Refer to ■*System Configuration with Maximum Number of Repeaters* under *5.7.2 System Configuration* for the specifications for the maximum number of Repeaters connected and the total transmission distance.

5.7.8 CP-215 Repeater-TS5

The CP-215 Repeater-TS5 is an optical Repeater that relays CP-215 or CP-216 transmission signals using crystal glass optical fiber cables.

There are two models of CP-215 Repeater-TS5.

- 24-VDC model
- 100/115-VAC, 200ñVAC, 100-VDC model

The transmission distance can be extended to a maximum of 5 km.

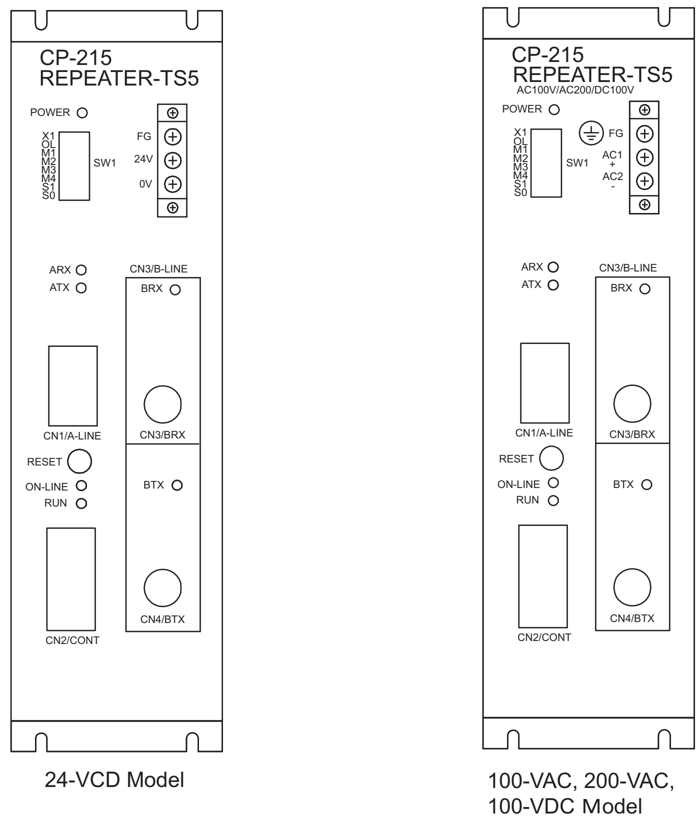


Fig. 5.18 Front View of CP-215 Repeater-TS5

■ Repeater-to-Repeater Connector (CN3/BRX, CN4/BTX)

Item	Specifications
Transmission Speed	1 Mbps, 2 Mbps, 4 Mbps (can be set with SW1)
Transmission Distance*	0 to 5 km
Optical Fiber	Crystal glass optical fiber, GI-50/125, wavelength λ = 1300 nm, loss = 1 dB/km or less, bandwidth = 200 MHz · km
Applicable Connector	FC (conforming to JIS C 5970 F01)
Optical Transmission Level (CN4)	-22 dBm
Optical Reception Level (CN3)	-16 to -29 dBm

* Refer to ■*System Configuration with Maximum Number of Repeaters* under *5.7.2 System Configuration* for the specifications for the maximum number of Repeaters connected and the total transmission distance.

6

217IF Module

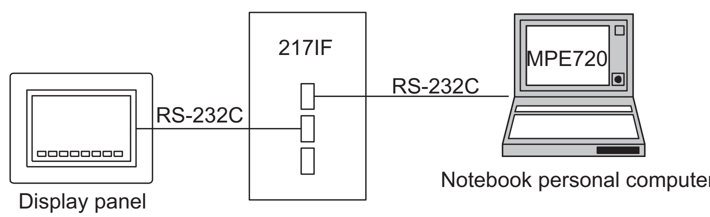
This chapter explains information on 217IF Module ranging from the system configuration to the definition window parameter settings used as the operating conditions.

6.1 System Configuration

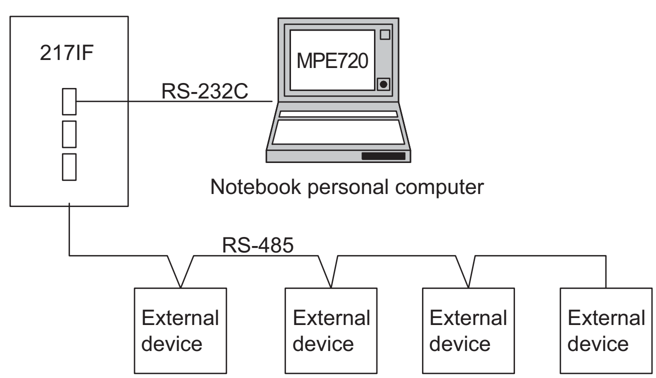
This section gives an overview of the system configuration used for MP900-Series 217IF Modules.

6.1.1 Standard System Configuration

The following diagram shows an example in which a MPE720 Programming Device and a display panel are connected by a 217IF Module.

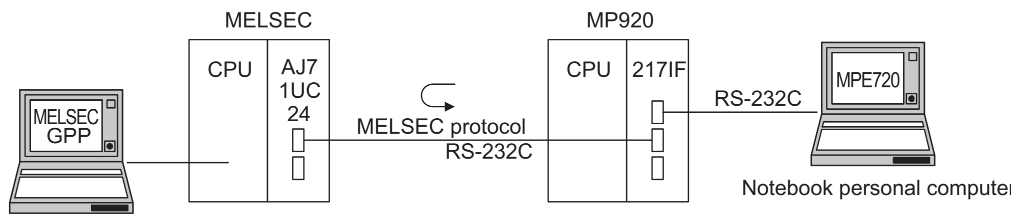


The following diagram shows an example of a branched connection from the RS-485 ports of a 217IF Module to external devices.

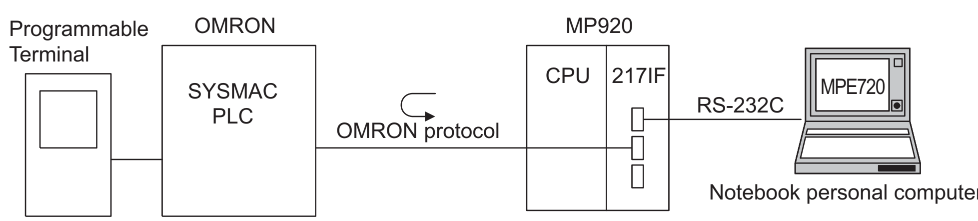


6.1.2 System Configuration with Controllers Manufactured by Other Companies

The following diagram shows an example of a MELSEC Controller (manufactured by Mitsubishi Electric Corporation) and an MP920 connected by a serial line.



The following diagram shows an example of a SYSMAC PLC (manufactured by OMRON Corporation) and an MP920 connected by a serial line.

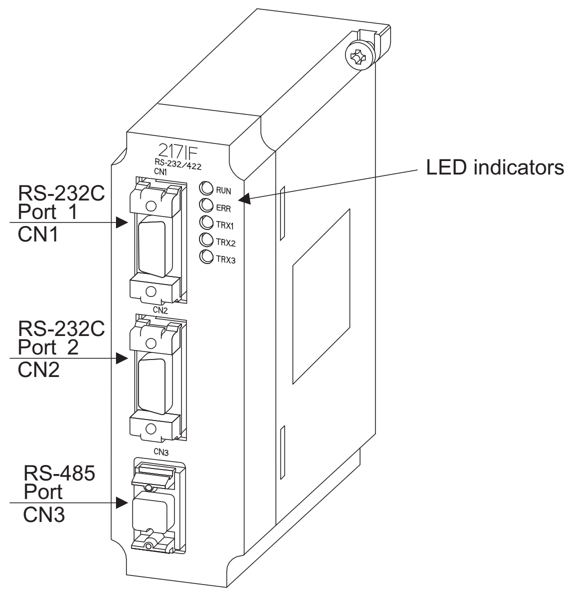


6

6.2 Part Names

This section explains the LED indicators and switch settings for the 217IF Module.

6.2.1 217IF Module



■ LED Indicators

While the Module is operating normally, the RUN LED indicator will be lit and the ERR LED indicator will not be lit. If a failure occurs, the RUN LED indicator will turn OFF and the ERR LED indicator will light or flash. The TX1 LED, TX2 LED, and TX3 LED indicators will light when sending/receiving data.

○ RUN
○ ERR
○ TX1
○ TX2
○ TX3

Indicator Name	Name	Color	Status when Lit
RUN	Run	Green	Operating normally
ERR	Error	Red	Failure occurred (See next page.)
TX1	CN1TX/RX	Green	CP-217 CN1 sending/receiving data
TX2	CN2TX/RX	Green	CP-217 CN2 sending/receiving data
TX3	CN3TX/RX	Green	CP-217 CN3 sending/receiving data

The following table describes the operation of the LED indicators when a failure has occurred.

Failure	Meaning	Indicators			
		RUN	ERR	TX	RX
PROM Checksum Error	A PROM checksum error was detected during online self-diagnosis.	Not lit	Flashing (1)	Depends on the circumstances	
SRAM Error in Module	A hardware error was detected during online self-diagnosis.	Not lit	Flashing (2)	Not lit	Not lit
CPU Interface Error	A data transmission error was detected between Module and CPU during online self-diagnosis.	Not lit	Flashing (3)	Not lit	Not lit
Transmission Error	A normal transmission error was detected.	Lit	Lit	Depends on the circumstances	
Watchdog Timer Error	A watchdog timer error was detected.	Not lit	Lit	Depends on the circumstances	

Note: The number in parentheses ( ) under “Flashing” indicates the number of flashes.

Connector Pin Layout

Table 6.1 RS-232C Connectors (CN1/RS-232C, CN2/RS-232C)

Number	Signal Name	Function	Number	Signal Name	Function
1	FG	Protective ground	6	N.C.	Not connected
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	N.C.	Not connected
4	RTS	Request to send	9	N.C.	Not connected
5	CS	Clear to send			

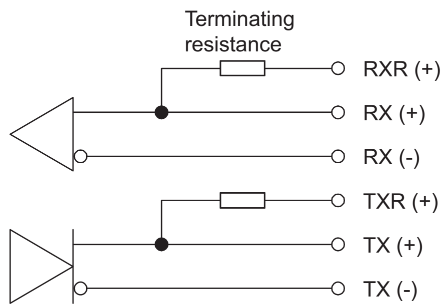
A 17LE-13090-27 (D2AC) D-sub 9-pin female connector (manufactured by Daiichi Electronic Industries Co., Ltd.) is used as the connector on the Module.

A 17JE-23090-02 (D8B) D-sub 9-pin male connector (manufactured by Daiichi Electronic Industries Co., Ltd.) is used as the connector on the cable.

Table 6.2 RS-422/485 Connectors (CN3/RS-422)

Number	Signal Name	Function	Number	Signal Name	Function
1	RX (-)	Receive data (-)	5	TRX (+)	*
2	RX (+)	Receive data (+)	6	TX (-)	Send data (-)
3	N.C	Not connected	7	TX (+)	Send data (+)
4	RXR (+)	*	8	SG	Signal ground

* The terminating resistance is put on the positive (+) side.



When the terminating resistance is inserted, connect to the RXR (+) and RX (-) signal terminals, and the TXR (+) and TX (-) signal terminals.
When the terminating resistance is not inserted, connect to the RX (+) and RX (-) signal terminals, and the TX (+) and TX (-) signal terminals.

An MR-8RFA4 (G) (manufactured by Honda Communication Industries Co., Ltd.) is used as the connector on the Module.

Use an MR-8M (G) (case: MR-8L) as the connector on the cable.

6.3 Module Specifications

This section explains the 217IF Module specifications.

6.3.1 Hardware Specifications

Item	Specifications
Name	217IF Communications Module (Serial Communications Module)
Model	JEPMC-CM200
Description	217IF
Dimensions	40 × 130 × 105 mm (W × H × D) (Size for one option slot of MP920)
Approximate Mass	Base: 200 g, Case: 165 g
Power Supply	Supplied from Base Module +5 V, 300 mA

6.3.2 Communications Specifications

The following table shows the communications specifications for the 217IF Module.

Table 6.3 217IF Module Communications Specifications

Item	Specifications
Interface	RS-232C: Two lines RS-422/485: One line
Connector	RS-232C (CN1): D-sub 9-pin (female) RS-232C (CN2): D-sub 9-pin (female) RS-422/485 (CN3): MR-8 (female)
Transmission Distance	RS-232C: 15 m max. RS-422/485: 300 m max.
Transmission Speed	RS-232C (CN1/CN2): 300 bps to 19.2 kbps RS-422/485 (CN3): 2400 bps to 76.8 kbps* (300/600/1200/2400/4800/9600/14400/19200/28800/38400/48000/ 57600/64000/76800 bps)
Access Method	Non-synchronous (start-stop synchronization)
Communications Mode	Message communications, engineering communications
Communications Protocol	MEMOBUS (Master/Slave), MELSEC Communications, OMRON Communications
Connection Configuration	RS-232C: 1:1 RS-422: 1:1 RS-485: 1:N
Transmission Format (Can be Set)	Data bit length: 7 or 8 bits Stop bits: 1 or 2 bits Parity bit: Even/Odd/None

* The maximum baud rate of the RS-422/485 (CN3) depends on the CN1 and CN2 baud rates. If 19.2 kbps is set for CN1 and CN2, then the maximum transmission speed for CN3 will be 19.2 kbps.

6.3.3 Time Required for Communications

This section explains the time required for signal transmissions between a Master and a Slave, using the MEMOBUS protocol as an example.

■ Overview

The time required for communications between a Master and a Slave in a MEMOBUS system may be roughly calculated from the time required for the following seven items:

- Transmission processing time by the Master for query message
- Delay time of the modem at the Master
- Transmission time for query message
- Processing time of the Slave
- Delay time of the modem at the Slave
- Transmission time for response message
- Processing time by the Master for response message

For the overall time required when multiple Slaves are connected to the port of the same Master, calculate the time required for each Slave and then add these times.

■ Estimation of the Time Required for Each Item

The time required for each of the above seven items will now be explained in more detail.

Transmission Processing Time by the Master for Query Message

- This is the time it takes a computer to prepare a query message at the MEMOBUS port.
- The time taken depends on the processing time of each Master. With a Machine Controller, the time depends on the scan time, and is normally one scan.

Delay Time of the Modem at the Master

- This is the time it takes the modem at the Master to return a clear to send (CTS) signal to the Master once the request to send (RTS) signal has been received from the Master.
- With a Yaskawa Modem, this time can largely be ignored because it is less than 5 ms. There is no delay time if a modem is not used.

Transmission Time for Query Message

- This is the time it takes the communications port of the Master to transmit the query message.
- This time depends on the length of the query message and the baud rate, and can be calculated using the following equation:

$$\text{Transmisson time} = \frac{\text{No. of characters in query message} \times \text{No. of bits per character} \times 1000}{\text{Baud rate}} \ (\text{ms})$$

- The number of bits per character is the number of data bits (8 or 7) plus the number of start bits (1), the number of stop bits (1 or 2), and the number of parity bits (1 or 0).

Processing Time of the Slave

- This is the time it takes a Slave to process the message once a query message has been received from the Master, and to prepare a response message to the Master at the MEMOBUS port.
- This time is related to the Machine Controller scan time, the number of items, such as the coils or registers specified in the query message, and the number of items that can be processed in one scan by the Machine Controller.
- With the MP920, all functions can be processed in one scan. Therefore, this time will be the time required for one MP920 scan.

Delay Time of the Modem at the Slave

- This is the time it takes the modem at the Slave to return a clear to send (CTS) signal to the Slave once the request to send (RTS) signal has been received from the Slave.
- With a Yaskawa modem, this time can largely be ignored because it is less than 5 ms.
- There is no delay time if a modem is not used.

Transmission Time for Response Message

- This is the time it takes the communications port of the Slave to transmit the query message. In the same way as for the query message, the time can be calculated using the following equation:

$$\text{Transmisson time} = \frac{\text{No. of characters in query message} \times \text{No. of bits per character} \times 1000}{\text{Baud rate}} \text{ (ms)}$$

- The number of bits per character is the number of data bits (8 or 7) plus the number of start bits (1), the number of stop bits (1 or 2), and the number of parity bits (1 or 0).

Processing Time by the Master for Response Message

- This is the time it takes a Master, such as a computer, to process the response message once it has been received from the Slave.
- The time taken depends on the processing time of the Master.
- The time depends on the scan time of the Machine Controller, and is normally one or two scans.

6

6.4 Cables

This section explains the cable specifications for communications using the 217IF Module.

6.4.1 RS-232C Interface Cables

IMPORTANT

1. The power system, control system, and electrical system, as well as the transmission system, must be wired separately.
2. There are two D-sub 9-pin (CN1, CN2) connectors for the RS-232C interface on the 217IF Module.
3. The maximum length of the RS-232C cable is 15 meters. This cable should be as short as possible.
4. The RS-232C interface of the 217IF Module is not isolated. A malfunction may sometimes occur due to noise from the connected terminals. If noise is a problem, use a shielded cable or a modem to reduce the noise.

The following table shows the 217IF RS-232C transmission line connections of 217IF Module.

Table 6.4 217IF RS-232C Transmission Line Connections

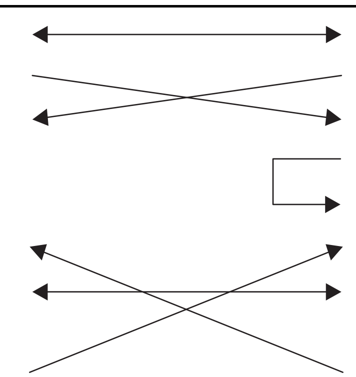
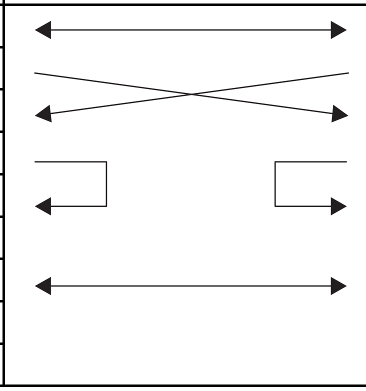
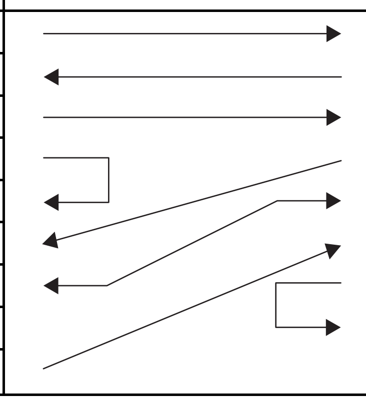
MP920 217IF (CN1, CN2)		Cable Connection and Signal Direction	Remote Station (D-sub 25-pin)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS (CTS)
DR (DSR)	6		6	DSR (DR)
SG	7		7	SG
CD	8		8	CD
ER (DTR)	9		20	DTR (ER)

Table 6.5 217IF RS-232C Transmission Line Connections

MP920 217IF (CN1, CN2)		Cable Connection and Signal Direction	Remote Station (D-sub 9-pin) (Yaskawa Specifications)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS (CTS)
DR (DSR)	6		6	DR (DSR)
SG	7		7	SG
CD	8		8	CD
ER (DTR)	9		9	ER (DTR)

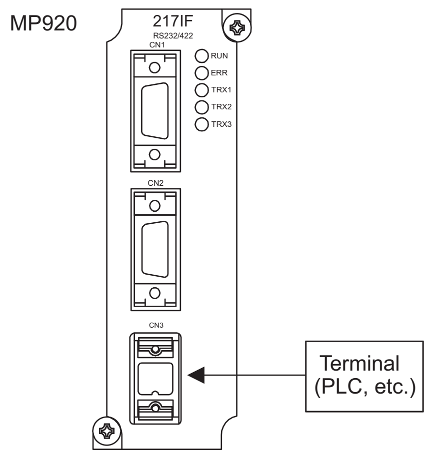
MP920 217IF (CN1)		Cable Connection and Signal Direction	PC/AT Compatible Personal Computer	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS (CTS)
DR (DSR)	6		6	DR (DSR)
SG	7		7	SG
CD	8		8	CD
ER (DTR)	9		9	ER (DTR)

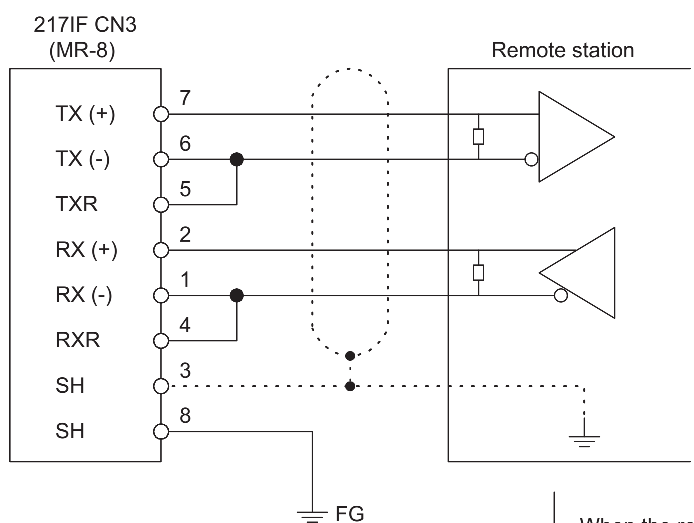
6.4.2 RS-422/485 Interface Cables

IMPORTANT

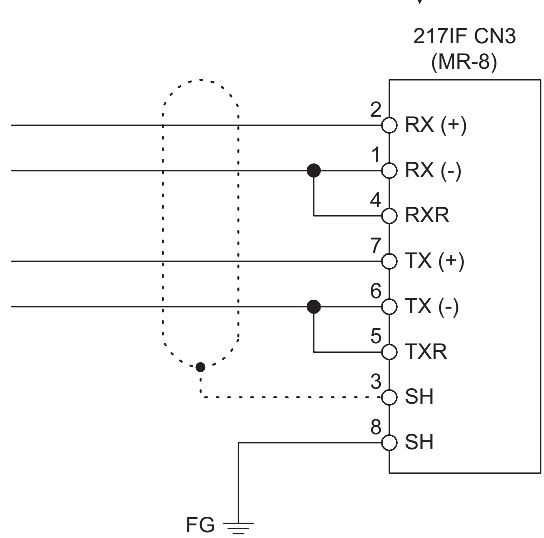
- The power system, control system, and electrical system, as well as the transmission system, must be wired separately.
- The RS-422/485 interface of the 217IF Module is an MR-8-pin connector (CN3).
- The maximum length of the RS-422/485 cable is 300 meters. This cable should be as short as possible.
- The RS-422/485 interface of the 217IF Module is not isolated. A malfunction may sometimes occur, due to noise from the connected terminals. If noise is a problem, use a shielded cable or a modem to reduce the noise.
- With the RS-422, insert terminating resistances as required. Be sure to insert terminating resistance at the ends of the line.
- With the RS-485, use terminating resistances at both end stations of the transmission line.

■ RS-422 Wiring

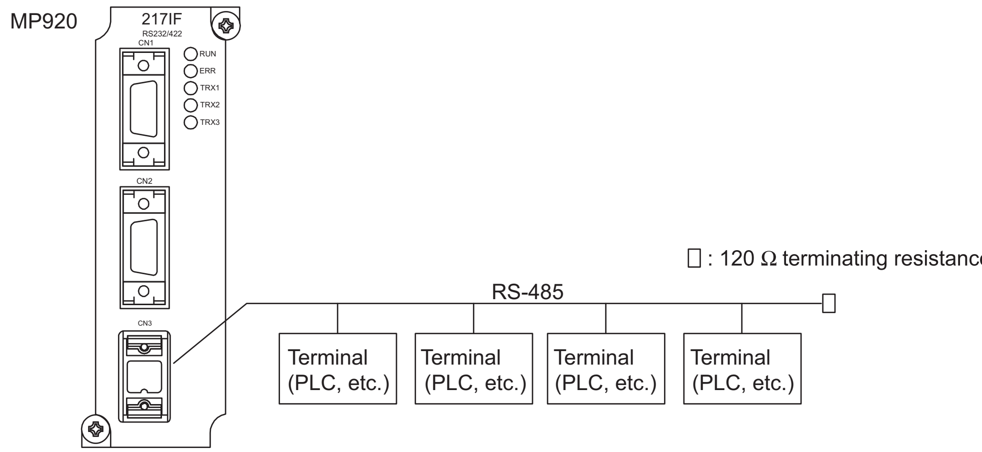


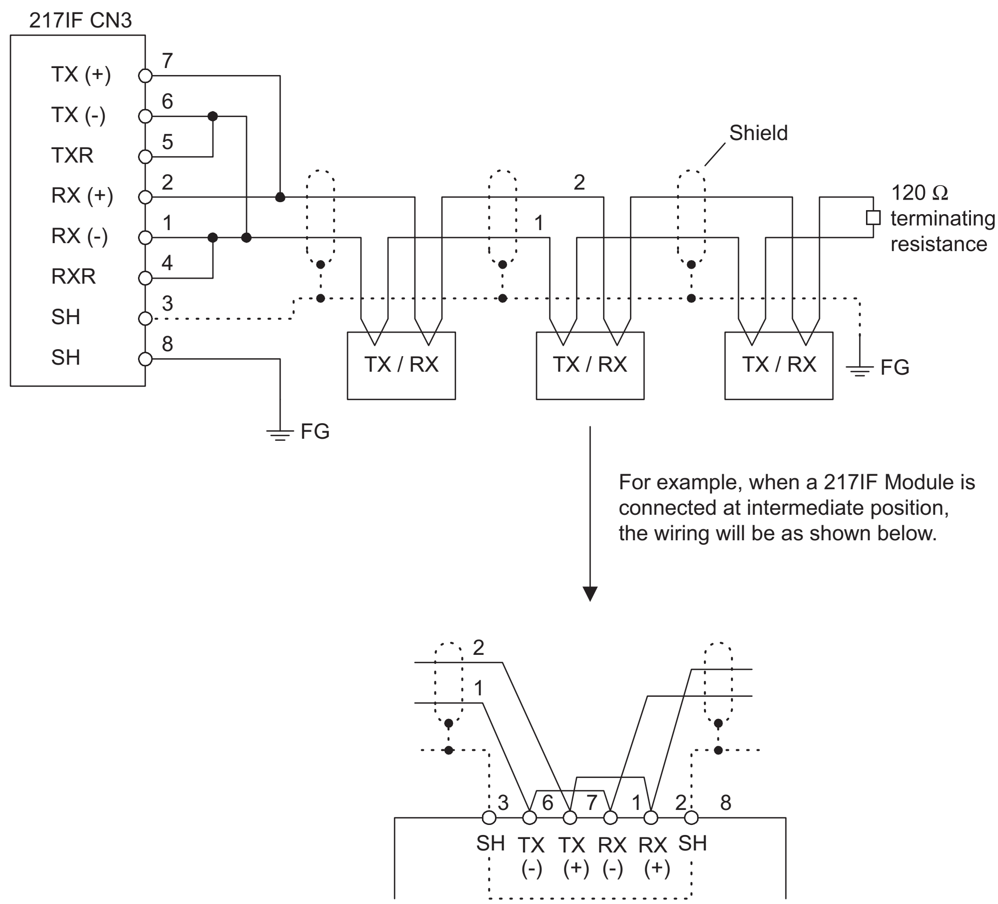


When the remote station is also a 217IF Module, the wiring will be as shown below.



■ RS-485 Wiring

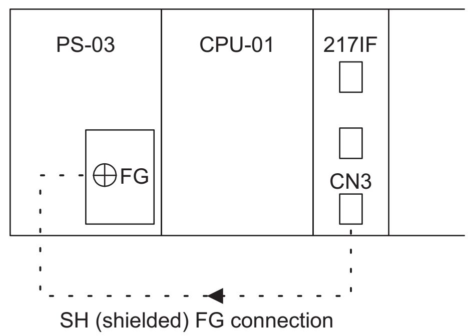




Note: 1. The terminating resistance will be enabled by connecting terminals 5 and 6, and terminals 1 and 4 at the CN3 interface.

2. Connect the 217IF CN3 FG connection to the FG terminal of the Power Supply Module, using a lead wire.

6


PS-03
CPU-01
217IF
FG
CN3
SH (shielded) FG connection

6.5 CP-217 Transmission Definitions

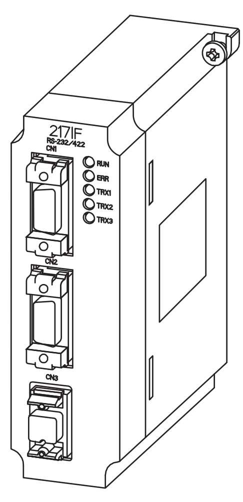
This section explains how to set the parameters for the CP-217 Transmission System.

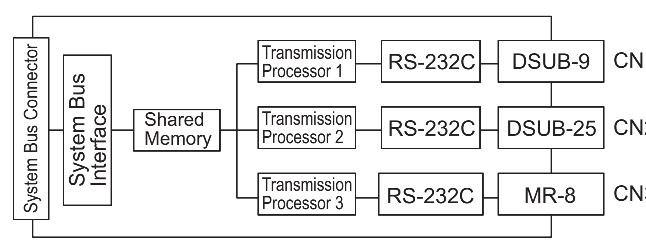
6.5.1 Overview of CP-217 Transmissions

The 217IF Module is a Serial Transmission Interface Module equipped with two RS-232C circuits and one RS-422/485 interface circuit. Each interface supports various transmission protocols, beginning with Yaskawa's own MEMOBUS transmission protocol. The RS-232C CN1 D-sub 9-pin connector can be used as an engineering port. The MPE720 Programming Device can be connected to perform MP920 engineering.

This section explains the hardware and software settings that must be made for CP-217 transmissions (serial transmissions). These settings allow the Machine Controller to operate as a Master or a Slave conforming to each transmission protocol.

CP-217 transmissions can send and receive data using MSG-SND and MSG-RCV functions programmed in drawing or function programs.





6

6.5.2 Opening the CP-217 Transmission Definitions Window

When the CP-217 Transmission Definitions Window is opened in online mode, the CP-217 parameters stored in the Machine Controller will be loaded. When the Window is opened in offline mode, the CP-217 parameters stored in the hard disk on the MPE720 will be loaded.

Open the CP-217 Transmission Definitions Window from the Module Definitions Window.

INFO

When the CP-217 Transmission Definitions Window is opened and the CP-217 parameters are being set for the first time, a confirmation message box will be displayed indicating that a new file will be created. Click the **OK** button to proceed to the next operation.

6.5.3 The CP-217 Transmission Definitions Window Menus

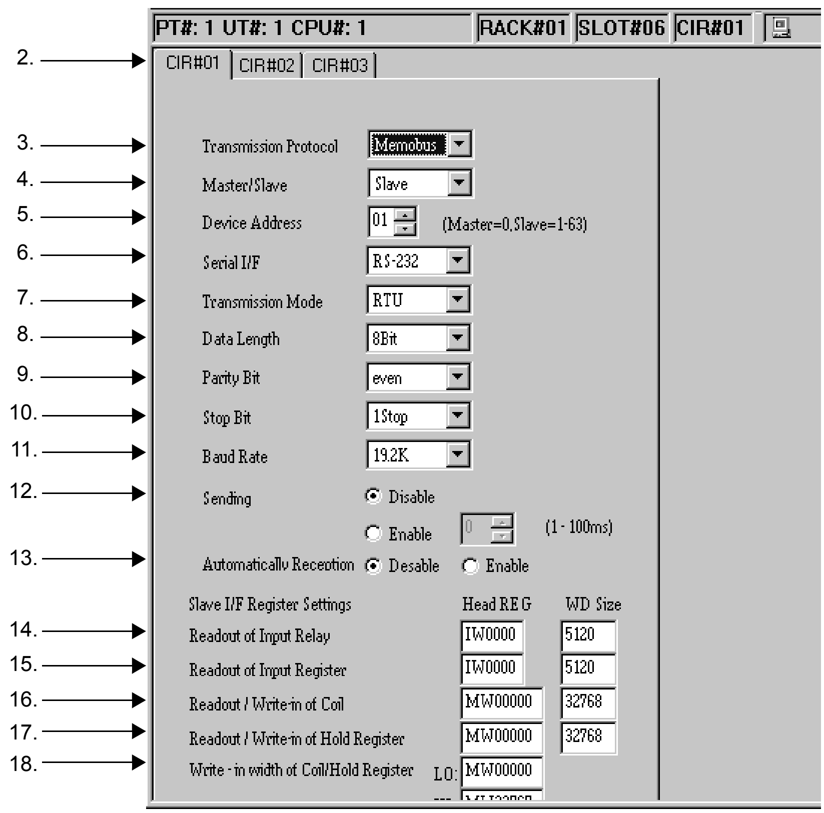
The following table shows the functions of the menu commands in the CP-217 Transmission Definitions Window.

Menu Command	Function
File (F)	
File Manager (F)	Opens the MPE720 File Manager.
Open (O)	Opens the window for each function
Close (C)	Closes the CP-217 Transmission Definitions Window.
Save (S)	Saves the CP-217 parameter settings.
Delete (D)	Deletes the CP-217 parameter settings.
Print (P)	Prints the MPE720 document.
Exit (X)	Closes the MPE720.
View (V)	
Tool Bar (T)	Displays the Tool Bars.
Status Bar (S)	Displays the Status Bar.
Window (W)	
Cascade (C)	Stacks windows in the display.
Tile (T)	Lines up windows in the display.
Arrange Icons (A)	Lines up icons.
Help (H)	
About App.. (A)	Displays the version information.

6.5.4 Setting CP-217 Transmission Definitions Data

This section explains the various parameters required to use the CP-217 transmission system.

The CP-217 has tabs for the current circuit and the next two circuits. Click another circuit's tab to switch to that circuit's Transmission Parameters Window.



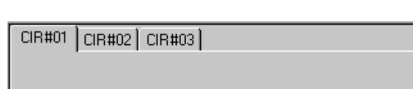
CP-217 Transmission Definitions

1. Configuration Information

   Displays the CP-217 configuration information that was set in the Module Definition Window.

   - Rack#: Displays the rack number of the rack in which the CP-217 is defined.
   - Slot#: Displays the slot number of the slot in which the CP-217 is defined.

2. CIR# (Circuit Numbers)



The numbers displayed in the tabs at the top of the window (CIR#nn) are the CP-217 circuit numbers. Each 217IF Module requires 3 circuits and the same circuit number must not be used more than once.

Machine Controller	Circuit Numbers
MP920	1 to 24

3. Transmission Protocol

   Select the desired protocol.

   - MEMOBUS: Yaskawa's standard MEMOBUS protocol.
   - MELSEC: Mitsubishi's special protocol (control protocol type 1) for use with general-purpose sequencers and computer links.
   - OMRON: OMRON's SYSMAC C-series Host Link protocol.
   - No protocol: Data can be transferred at any time by the user application program.

4. Master/Slave

   When the Transmission Protocol has been set to MEMOBUS, MELSEC, or OMRON, select whether the Machine Controller will operate as a Master or a Slave.

5. Device Address

   Select the device address. When the Machine Controller is being used as a Master, set the device address to 0. When the Machine Controller is being used as a Slave, set the device address to a unique value between 1 and 63.

6. Serial I/F (Serial Interface)

   Select the serial interface.

7. Transmission Mode

   Select the transmission mode.

   - RTU: Specifies RTU mode when the Transmission Protocol is set to MEMOBUS.
   - ASCII: Specifies ASCII mode when the Transmission Protocol is set to MEMOBUS.
   - None: Use for MELSEC, OMRON, and no-protocol communications.

8. Data Length

   Select the number of bits in one character.

   - 8Bit: 8 bits
   - 7Bit: 7 bits

9. Parity Bit

   Specify whether or not the parity bit will be used.

   - Even: Even parity
   - Odd: Odd parity
   - None: No parity check

10. Stop Bits

    Select whether there will be one or two stop bits after each byte.

    - 1stop: 1 stop bit

- 2stop: 2 stop bits

11. Baud Rate

    Select the transmission speed (bps).

12. Sending (Send Delay Setting)

    When ***Enable*** is selected, a delay until the beginning of transmissions (1 to 100 ms) can be set.

    - Master Station:
      The delay will be included between execution of the MSG-SND function and the transmission of the command.
    - Slave Station:
      The delay will be included between reception of a command by the MSG-RCV function and the transmission of the response.

Settings 13 through 18 specify the ranges of relays, registers, and coils that are checked when a response is sent automatically after a request is received from the Master Station.

It is not necessary to make these settings when messages are not being transmitted between the Master and Slave. Also, if a ladder logic program is being used that transmits responses with the MSG-RCV function, the processing will be duplicated so the MSG-RCV function will be disabled.

When the system defaults are used, responses are transmitted with the parameters set to the ranges shown below.

13. Automatically Reception (Automatic Reception)

    Specify whether to automatically respond to a query from the master.

14. Readout of Input Relay (Input Relay Read)

    Sets the leading register number and range of input relays that can be read through general-purpose serial transmissions. See *Table 6.6* for settings.

15. Readout of Input Register (Input Register Read)

    Sets the leading register number and range of input registers that can be read through general-purpose serial transmissions. See *Table 6.6* for settings.

16. Readout/Write-in of Coil (Coil Read/Write)

    Sets the leading register number and range of coils that can be read/written through general-purpose serial transmissions. See *Table 6.6* for settings.

17. Readout/Write-in of Hold Register (Holding Register Read/Write)

    Sets the leading register number and range of holding registers that can be read/written through general-purpose serial transmissions. See *Table 6.6* for settings.

18. Write-in width of Coil/Hold Register (Coil/Holding Register Write Range)

    Sets the overall range of coils and holding registers that can be written.

Table 6.6 Leading Register Numbers and Number of Words

Setting		Machine Controller					
		MP920	CP−316	CP-316H	CP-916A	CP-916G	RIO-05
Input Relay Read	Head REG (Leading Register)	IW0000	IW0000	IW0000	IW0000	IW0000	IW0000
	WD Size (Number of Words)	5120	6400	6400	2304	2304	2304
Input Register Read	Head REG (Leading Register)	IW0000	IW0000	IW0000	IW0000	IW0000	IW0000
	WD Size (Number of Words)	5120	6400	6400	2304	2304	2304
Coil Read/Write	Head REG (Leading Register)	MW00000	MW00000	MW00000	MW00000	MW00000	MW00000
	WD Size (Number of Words)	32768	8192	16384	3072	3072	3072
Holding Register Read/Write	Head REG (Leading Register)	MW00000	MW00000	MW00000	MW00000	MW00000	MW00000
	WD Size (Number of Words)	32768	8192	16384	3072	3072	3072

6.5.5 Saving CP-217 Transmission Definitions Data

Use the following procedure to save the CP-217 Transmission Definitions data settings.

In online mode, the settings are saved in the Machine Controller and the computer's hard disk.
In offline mode, the settings are saved on the computer's hard disk.

1. Click ***File (F)*** and then ***Save (S)*** on the CP-217 Transmission Definition Window's menu.
2. Verify the message in the message box and click the **Yes** button.
3. Verify the message in the message box and click the **OK** button.

6.5.6 Deleting CP-217 Transmission Definitions Data

Use the following procedure to delete all of the CP-217 Transmission Definitions data settings.

In online mode, the data will be deleted from the Machine Controller and the computer's hard disk. In offline mode, the data will be deleted from the computer's hard disk.

1. Click ***File (F)*** and then ***Delete (D)*** on the CP-217 Transmission Definition Window's menu.
2. Verify the message in the message box and click **Yes** to delete the data.

INFO

When the Delete operation is executed, the CP-217 Transmission Definitions data settings for all 3 circuits will be deleted.

6.6 217IF Communications Protocols

The 217IF Module supports Yaskawa's standard MEMOBUS communications protocol, as well as various other communications protocols.

As standard functions, the MELSEC communications protocol is provided for connection with controllers manufactured by Mitsubishi Electric Corporation, and the OMRON communications protocol is provided for connection with Programmable Controllers manufactured by OMRON Corporation.

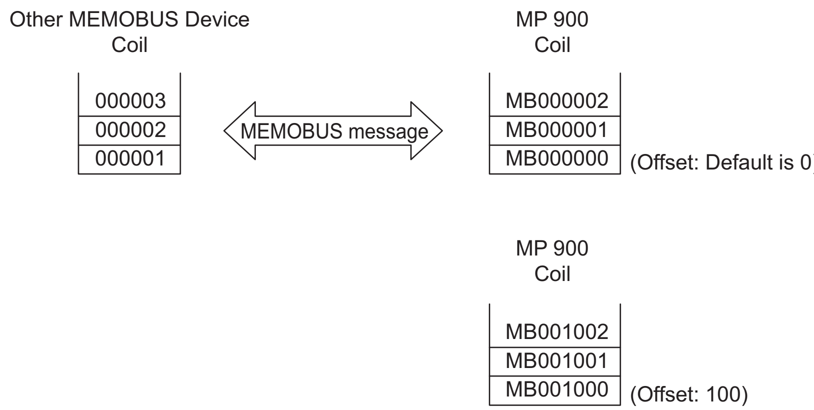
6.6.1 MEMOBUS Communications

MEMOBUS communications are message transmissions using the MEMOBUS protocol. The following table shows the correspondences between the MEMOBUS commands and registers.

Table 6.7 Correspondences between MEMOBUS Reference and Register Numbers

Type	MEMOBUS Reference No.*1	MEMOBUS Command*2	MP9□□	
			Leading No.*3	Register No.*4
Coil	000001 to 0□□□□□	01H, 05H, 0FH	000000 and higher	MB000000 and higher
Input Relays	100001 to 1□□□□□	02H	00000 and higher	IB00000 and higher
Input Registers	300001 to 3□□□□□	04H	00000 and higher	IW0000 and higher
Holding Registers	400001 to 4□□□□□	03H, 10H	00000 and higher	MW00000 and higher

* 1. MEMOBUS Reference No.
  This is the leading number used by a standard Yaskawa MEMOBUS protocol message. The leading number in the above range is allocated to coils, input relays, input registers, and holding registers. The first digit is the register type, and the remaining digits is the leading number beginning from 1.
* 2. MEMOBUS Command
  This is the command number set in the MEMOBUS protocol.
* 3. Leading No.
  This is the leading number used by the MP900. All numbers start from 0 (zero).
* 4. Register No.
  This is the number of each register corresponding to the leading number. Register number offsets can be specified for coils, input relays, input registers, and holding registers by the MSG-SND and MSG-RCV system functions.
  For example, with Yaskawa MP-series:



6.6.2 MELSEC Communications

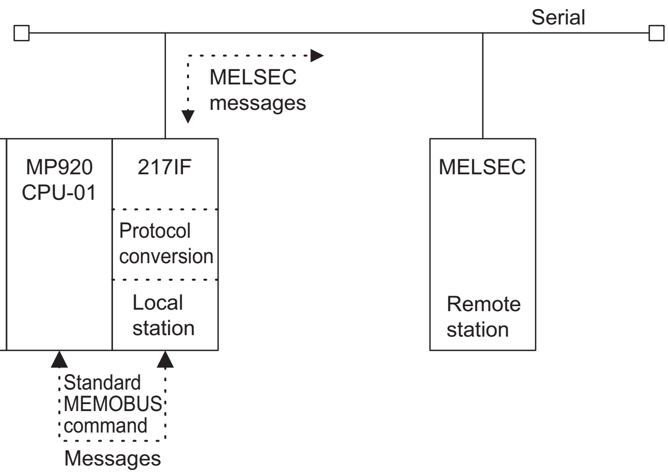
■ MELSEC Communications Specifications

The following table shows the general specifications for MELSEC communications, and which of these specifications are supported by the MP900.

Table 6.8 MELSEC Communications Specifications

<table>
<tr><th>Item</th><th colspan="3">General MELSEC Specifications</th><th>MELSEC Specifications Supported by the MP900</th></tr>
<tr><td>Transmission Method</td><td colspan="3">RS-232C: Half-duplex, full-duplex
RS-422: Half-duplex</td><td>RS-232C: Full-duplex
(Half-duplex for procedural)
RS-485: Half-duplex</td></tr>
<tr><td>Synchronization</td><td colspan="3">Start-stop synchronization</td><td>Start-stop synchronization</td></tr>
<tr><td>Transmission Speed</td><td colspan="3">300/600/1200/2400/4800/9600/19200 bps</td><td>1200/2400/4800/9600/19200 bps</td></tr>
<tr><td>Data Format</td><td colspan="3">Data: 8 or 7 bits
Parity: Odd, even, none
Stop bits: 1 or 2 bits</td><td>Data: 8 or 7 bits
Parity: Odd, even, none
Stop bits: 1 or 2 bits</td></tr>
<tr><td>Error Detection</td><td colspan="3">With or without checksum</td><td>With checksum</td></tr>
<tr><td>DTR/DSR (ER/DR) Control</td><td colspan="2">Yes/No (RS-232C only)</td><td rowspan="2">Both controls are possible.</td><td rowspan="2">None</td></tr>
<tr><td>DC1/DC3, DC2/DC4 Control</td><td colspan="2">Yes/No</td></tr>
<tr><td rowspan="7">Transmission Protocol</td><td colspan="3">Special protocol</td><td rowspan="7">Only protocol type 1 is supported.</td></tr>
<tr><td>Type 1</td><td colspan="2" rowspan="4">(1:1, 1:N, N:N)</td></tr>
<tr><td>Type 2</td></tr>
<tr><td>Type 3</td></tr>
<tr><td>Type 4</td></tr>
<tr><td colspan="3">No protocol (1:1, 1:N)</td></tr>
<tr><td colspan="3">Full duplex (1:1)</td></tr>
</table>

■ Message Flow



All standard MEMOBUS messages are exchanged between the MP920 and the 217IF Module.

The 217IF communicates with the MELSEC Controller and performs standard MEMOBUS and MELSEC message conversion processing. There is no need for the MELSEC message configuration to be recognized by the user application. The user can easily communicate with the MELSEC Controller by using the MSG-SND and MSG-RCV functions and specifying MELSEC as the transmission protocol in the 217IF parameter settings.

Due to MELSEC protocol-specific restrictions or MELSEC sequencer-specific restrictions in MEMOBUS to MELSEC format conversion, there are stricter restrictions than in the MEMOBUS protocol, such as the number of words read from a register. Carefully read the manuals relating to the devices being connected.

Also be sure to refer to the manual relating to MELSEC protocol type 1 commands.

■ MELSEC Commands

The following table shows the MELSEC ACPU commands that are supported by the 217IF Module, and the corresponding MEMOBUS command codes.

Table 6.9 MELSEC ACPU Commands

Command	Description	Qty	217IF Support*	MEMOBUS Command
BR	Reads bit devices in 1-point units	256 points	No	–
WR	Reads bit devices in 16-point units	32 words (512 points)	Yes	01H/02H
	Reads word devices in 1-point units	64 points	Yes	03H/04H
BW	Writes bit devices in 1-point units	160 points	No	–
WW	Writes bit devices in 16-point units	10 words (160 points)	Yes	0FH
	Writes word devices in 1-point units	64 points	Yes	10H
BT	Randomly specifies, sets, and resets bit devices and device numbers in 1-point units	20 points	No	–
WT	Randomly specifies, sets, and resets bit devices and device numbers in 16-point units	10 words (160 points)	No	–
	Randomly specifies, sets, and resets word devices and device numbers in 1-point units	10 points	No	–
BM	Sets the bit devices to be monitored in 1-point units	40 points	No	–
WM	Sets the bit devices to be monitored in 16-point units	20 words (320 points)	No	–
	Sets the word devices to be monitored in 1-point units	20 points	No	–
MB	Monitors devices for which monitor data registration has been performed (in bit units)	–	No	–
MN	Monitors devices for which monitor data registration has been performed (in word units)	–	No	–
ER	Reads extension file registers in 1-point units	64 points	No	–
EW	Writes extension file registers in 1-point units	64 points	No	–
ET	Randomly specifies block numbers and device numbers, and writes to the extension file registers in 1-point units	10 points	No	–
EM	Registers the extension file registers to be monitored in 1-point units	20 points	No	–
ME	Monitors extension file registers for which monitor data registration has been performed	–	No	–
CR	Reads the data in the buffer memory	64 words	No	–
CW	Writes the data in the buffer memory	64 words	No	–
TR	Reads the contents of the buffer memory of the special function unit	64 words	No	–
TW	Writes data to the buffer memory of the special function unit	64 words	No	–
MR	Reads the main sequence program	64 steps	No	–
SR	Reads the sub-sequence program	64 steps	No	–
MW	Writes the main sequence program	64 steps	No	–
SW	Writes the sub-sequence program	64 steps	No	–

Table 6.9 MELSEC ACPU Commands (cont'd)

Command	Description	Qty	217IF Support*	MEMOBUS Command
UR	Reads the main microcomputer program	128 bytes	No	–
VR	Reads the sub-microcomputer program	128 bytes	No	–
UW	Writes the main microcomputer program	128 bytes	No	–
VW	Writes the sub-microcomputer program	128 bytes	No	–
KR	Reads the comment data	128 bytes	No	–
KW	Writes the comment data	128 bytes	No	–
PR	Reads the parameter contents	128 bytes	No	–
PW	Writes the parameter contents	128 bytes	No	–
PS	Recognizes and checks the rewritten parameter contents	–	No	–
RR RS	Requests for remote RUN/STOP	–	No	–
PC	Reads the PLC model name	–	No	–
GW	Turns a global signal ON/OFF	1 point	No	–
On demand	Issues a request to send from the sequencer CPU	1,760 words max.	No	–
TT	Loopback test	254 characters	Yes	08H

* Yes: Command supported by the 217IF Module.
No: Command not supported by the 217IF Module.

Note: Special AnACPU commands are not supported. Use the common ACPU commands for AnACPU access. The AnACPU expansion registers cannot be accessed.

6

■ MELSEC Devices

The table below shows the MELSEC bit devices and word devices that can be accessed from the MP900.

The MP900 register numbers corresponding to the MELSEC device range and the MEMOBUS commands used are also shown in the table.

Table 6.10 MELSEC Bit Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Leading No.	Register No.*
X	X0000 to X07FF	Hexadecimal	02H: Input relays	0 to 2047	MB000000 to MB00127F
Y	Y0000 to Y07FF	Hexadecimal	01H/0FH: Coils	0 to 2047	MB000000 to MB00127F
M	M0000 to M2047	Decimal	01H/0FH: Coils	2048 to 4095	MB001280 to MB00255F
L	L0000 to L2047				
S	S0000 to S2047				
M	M9000 to M9255	Decimal	01H/0FH: Coils	4096 to 4351	MB002560 to MB00271F
B	B0000 to B03FF	Hexadecimal	01H/0FH: Coils	4352 to 5375	MB002720 to MB00335F
F	F0000 to F0255	Decimal	01H/0FH: Coils	5376 to 5631	MB003360 to MB00351F
TS	TS000 to TS255	Decimal	02H: Input relays	2048 to 2303	MB001280 to MB00143F
TC	TC000 to TC255	Decimal	02H: Input relays	2304 to 2559	MB001440 to MB00159F
CS	CS000 to CS255	Decimal	02H: Input relays	2560 to 2815	MB001600 to MB00175F
CC	CC000 to CC255	Decimal	02H: Input relays	2816 to 3071	MB001760 to MB00191F

* Register number offsets can be specified for both input relays and coils by the MSG-SND and MSG-RCV system functions.

Table 6.11 MELSEC Word Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Leading No.	Register No.*
TN	TN111 to TN255	Decimal	04H: Input registers	0 to 255	MW00000 to MW00255
CN	CN000 to CN255	Decimal	04H: Input registers	256 to 511	MW00256 to MW00511
D	D0000 to D1023	Decimal	03H/10H: Holding registers	0 to 1023	MW00000 to MW01023
D (Special)	D9000 to D9255	Decimal	03H/10H: Holding registers	1024 to 1279	MW01024 to MW01279
W	W0000 to W03FF	Hexadecimal	03H/10H: Holding registers	1280 to 2303	MW01280 to MW02303
R	R0000 to R8191	Decimal	03H/10H: Holding registers	2304 to 10495	MW02304 to MW10495

* Register number offsets can be specified for both input registers and holding registers by the MSG-SND and MSG-RCV system functions.

6.6.3 OMRON Communications

■ OMRON Communications Specifications

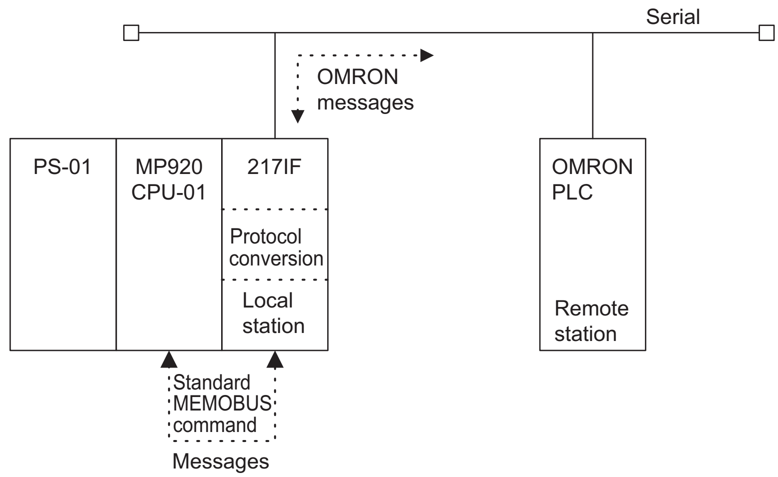
The following table shows the general specifications for OMRON communications, and which of these specifications are supported by the 217IF Module.

Table 6.12 OMRON Communications Specifications

	General OMRON Specifications	OMRON Specifications Supported by the 217IF
Transmission Method	RS-232C	RS-232C
Synchronization	Start-stop synchronization	Start-stop synchronization
Transmission Speed	300/600/1200/2400/4800/9600 bps	1200/2400/4800/9600/19200 bps
Data Format	Data: 7-bit ASCII 8-bit JIS Parity: Odd, even, none Stop bits: 1 or 2 bits	Data: 7-bit ASCII 8-bit JIS Parity: Odd, even, none Stop bits: 1 or 2 bits
Error Detection	Frame check sequence (FCS)	Frame check sequence (FCS)
RTS/CTS Control	Yes/No	Yes
Communications Protocol	Host Link	Supported
	Uploading or downloading of user memory	Not supported
	No protocol (ASCII I/O mode)	No protocol

6

■ Message Flow



All standard MEMOBUS messages are exchanged between the MP920 and the 217IF Module.

The 217IF communicates with the OMRON PLC and performs standard MEMOBUS and OMRON message conversion processing. There is no need for the OMRON message configuration to be recognized by the user application. The user can easily communicate with the OMRON PLC by using the MSG-SND and MSG-RCV functions and specifying OMRON as the communications protocol in the 217IF parameter settings.

Due to OMRON protocol-specific restrictions or OMRON sequencer-specific restrictions in MEMOBUS to OMRON format conversion, there are stricter restrictions than those in the MEMOBUS protocol, such as the number of words read from a register. Therefore, carefully read the manuals relating to the devices connected.

Also be sure to refer to the manual relating to the OMRON communications protocol.

The multi-block transmission protocol stipulated in the OMRON protocol is used. Set the upper limit for the number of words that can be accessed at the one time by a command to 125 words for reading DM words and 100 words for writing DM words (MEMOBUS protocol restriction).

■ OMRON Commands

The following table shows the OMRON SYSMAC Host Link commands that are supported as MEMOBUS commands by the 217IF Module.

Table 6.13 List of OMRON Commands

Header Code	Description	No. of Words	217IF Support*	MEMOBUS Command
RR	IR/CIO Area Read	256 words	Yes	01H
RL	LR Area Read	64 words	No	–
RH	HR Area Read	100 words	No	–
RC	Timer/Counter Present Value Read	512 words	No	–
RG	Timer/Counter Completion Flag Read	512 words	No	–
RD	DM Area Read	2,000 words	Yes	03H
RJ	AR Area Read	28 words	No	–
WR	IR/CIO Area Write	252 words	Yes	0FH
WL	LR Area Write	64 words	No	–
WH	HR Area Write	100 words	No	–
WC	Timer/Counter Present Value Write	512 words	No	–
WG	Timer/Counter Completion Flag Write	512 words	No	–
WD	DM Area Write	2,000 words	Yes	10H
WJ	AR Area Write	28 words	No	–
R#	Set Value Read 1	–	No	–
R$	Set Value Read 2	–	No	–
W#	Set Value Change 1	–	No	–
W$	Set Value Change 2	–	No	–
MS	Status Read	–	No	–
SC	Status Write	–	No	–
MF	Error Log Read	–	No	–
KS	Force Set	–	No	–
KR	Force Reset	–	No	–
FK	Multi-point Forced Set/Reset	–	No	–
FR	Multi-point Forced Status Read	–	No	–
KC	Forced Status Release	–	No	–
MM	Model Version Read	–	No	–
TS	Test	–	Yes	08H
PR	Program Read	–	No	–
WP	Program Write	–	No	–
XZ	Aborts/Initializes (command only)	–	No	–
IC	Undefined Command Error (response only)	–	Yes	Master Function
QQ	Compound Command	–	No	–

* Yes: Command supported by the 217IF.
No: Command not supported by the 217IF.

6

■ OMRON Devices

The table below shows the OMRON devices (bits and data memory) that can be accessed from the MP900.

The MP900 register numbers corresponding to the OMRON device range and the MEMOBUS commands used are also shown in the table.

Table 6.14 List of OMRON Addresses

Name	Words	Bits	MEMOBUS Command*1	Leading No.	Register No.*2
I/O Relay	000 to 039	00000 to 03915	01H/0FH	0 to 639	MB000000 to MB00039F
Internal Auxiliary Relay	040 to 246	04000 to 24615	01H/0FH	640 to 3951	MB000400 to MB00246F
Special Auxiliary Relay	247 to 255	24700 to 25507	01H/0FH	3952 to 4088	MB002470 to MB002557
Data Memory	0000 to 9999	DM 0000 to DM 9999	03H/10H	0000 to 9999	MW00000 to MW09999

* 1. MEMOBUS Command 01H/0FH: Coils
03H/10H: Holding registers

* 2. Register number offsets can be specified for both input registers and holding registers by the MSG-SND and MSG-RCV system functions.

7

218IF Module

This chapter explains information on 218IFA Module ranging from the system configuration to the definition window parameter settings used as the operating conditions.

7.1 System Configuration

This section gives an overview of the system configuration used for 218IFA Modules.

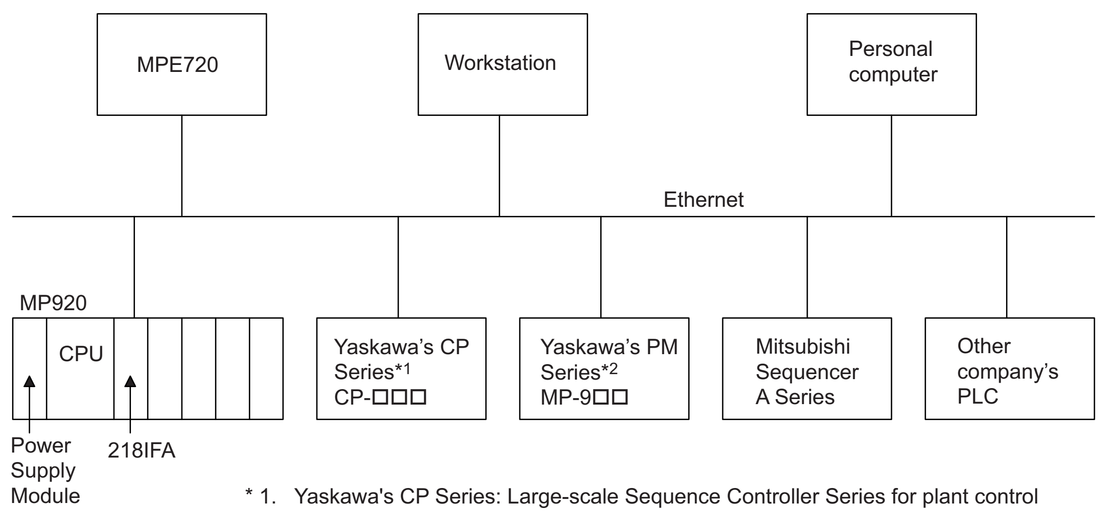
The 218IFA Module is the Interface Module used to connect an MP900-Series Machine Controller to an Ethernet network.

The use of this Module enables communications with other nodes on the network using the Transmission Control Protocol/Internet Protocol (TCP/IP) or User Datagram Protocol/Internet Protocol (UDP/IP).

7.1.1 Standard System Configuration

The following diagram shows a system conceptual configuration using Ethernet.

As shown in the following diagram, communications between different Controllers are possible via an open Ethernet transmission line.



* 1. Yaskawa's CP Series: Large-scale Sequence Controller Series for plant control
* 2. Yaskawa's MP Series: Machine Controller Series

INFO

Efficiency is not necessarily improved with the Ethernet transmission mode. If it is desired to transmit and receive control signals using applications that require good realtime performance, then Ethernet cannot be recommended. With applications that require good realtime performance, it is recommended that you use the 215IF network system provided by Yaskawa.

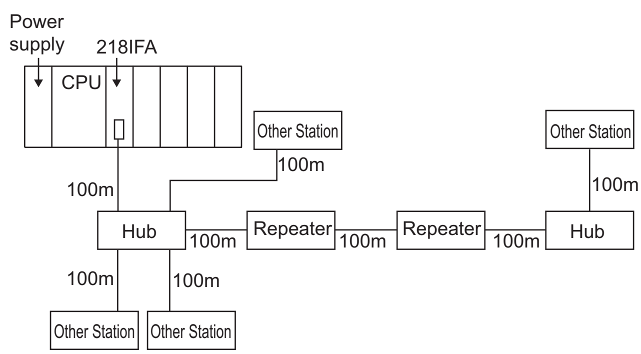
7

7.1.2 10Base-T Connection

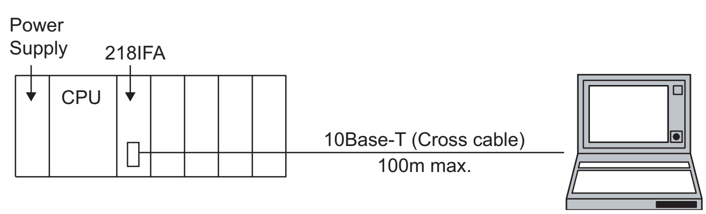
The following diagram shows an example of a 10Base-T connections.

■ Connection Example 1

In this example, the total distance between the nodes on both end of the network is 500 m and the maximum number of nodes is 5.



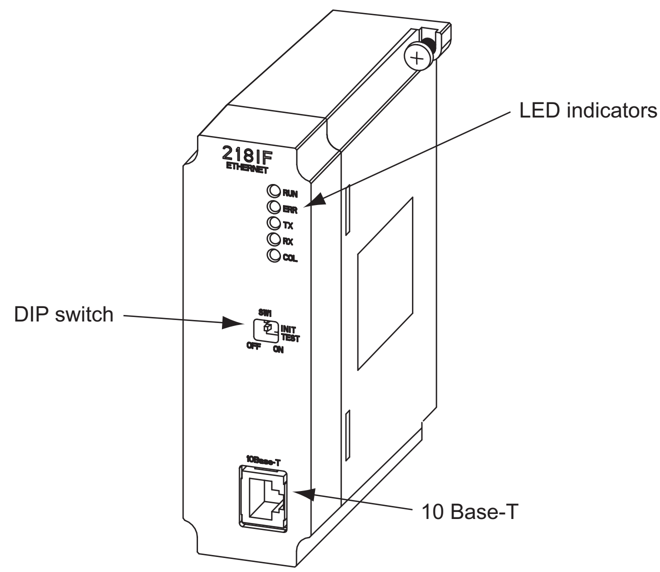
■ Connection Example 2



7.2 Part Names

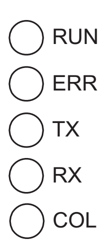
This section explains the LED indicators and switch settings for the 218IFA Module.

7.2.1 218IF Module



■ LED Indicators

When the Module is operating normally, the RUN LED indicator will be lit and the ERR LED indicator will not be lit. If a failure occurs, the RUN LED indicator will turn OFF and the ERR LED indicator will light or flashes. The TX LED indicator and RX LED indicator will light when sending/receiving data.



Label	Name	Color	Status when Lit
RUN	Run	Green	Operating normally
ERR	Error	Red	Failure occurred (See next page.)
TX	218TX	Green	218IF sending data
RX	218RX	Green	218IF receiving data
COL	Collision	Green	218IF detecting collision

The following table describes the operation of the LED indicators when a failure has occurred.

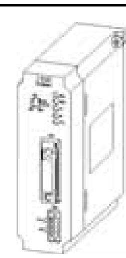
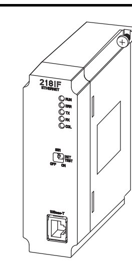
Table 7.1 Indicator Displays for Errors

Failure	Error Description	Indicators			
		RUN	ERR	TX	RX
PROM Checksum Error	A PROM checksum error was detected during online self-diagnosis.	Not lit	Flashing (1)	Depends on the circumstances.	
SRAM Error in Module	A hardware error was detected during online self-diagnosis.	Not lit	Flashing (2)	Not lit	Not lit
CPU Interface Error	A data transmission error was detected between Module and CPU during online self-diagnosis.	Not lit	Flashing (3)	Not lit	Not lit
Transmission Error	Transmission data error	Lit	Lit	Depends on the circumstances.	
Watchdog Timer	Watchdog timer error	Not lit	Flashing (15)	Depends on the circumstances.	

Note: The number in parentheses ( ) under “Flashing” indicates the number of flashes.

INFO

The table below shows differences between 218IF Module and 218IFA Module.

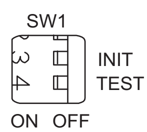
Description	218IF	218IFA
Model Number	JEPMC-CM210	JEPMC-CM210A
External Appearance		
Specifications	• 10Base-5 • Requires a conversion transceiver to be externally connected for conversion to 10Base-T	• 10Base-T
Connector 1	• AUI Connector (15 pin D-sub)	• Modular jack
Connector 2	• BL3.5/2F-AU (Weidmuller) For +12-VDC power supply	• None

7.2.2 Setting Switches

DIP Switch (SW1)

The DIP Switch is used for the self-diagnosis.

The pins are all set to OFF (right) prior to shipment.



Indicator Name	Name	Status	Function
–	Not used.		
–	Not used.		
INIT	Initial start-up	ON	Starts up with the default IP address and the engineering port number.*
		OFF	Starts up with the IP address set at MPE720 and the engineering port number.
TEST	Test	ON	Self-diagnosis (Performs self-diagnosis when started at status ON.)

* The default values are shown below.
IP address: 192.168.1.1
Engineering port No.: 10000 (UDP)
The 218IFA Module can perform only engineering communications with the MPE720 at initial start-up.

7

7.3 Module Specifications

This section provides the 218IFA Module specifications.

7.3.1 Hardware Specifications

The following table shows the specifications for the 218IFA Module.

Item	Specifications
Name	218IF Communications Module (Ethernet Communications Module)
Model	JEPMC-CM210A
Description	218IFA
Dimensions	40 × 130 × 105 mm (W × H × D) (Size for one option slot of MP920)
Approximate Mass	Base: 220 g, Case: 220 g
Power Supply	Supplied from Base Module +5 V, 450 mA

7.3.2 Communications Specifications

The following table shows the communications specifications for the 218IFA Module.

Table 7.2 218IFA Module Communications specifications

Item	Specifications
Interface	10Base-T: RJ-45
Transmission Distance	100 m/segment Total distance: 500 m (when using four repeaters)
Transmission Speed	10 Mbps
Transmission Method	IEEE 802.3 CSMA/CD
Frame Format	Ethernet Ver.2 (DIX specifications)
Communications Protocol	TCP, UDP, IP, or ARP
Maximum Number of Nodes	Depends on the hub that is used and the network.
Communications Mode	Message communications
Maximum Number of Transmission Words	512 words (1,024 bytes)
Communications Protocol	MEMOBUS (Master/Slave), MELSEC Communications, Extended MEMOBUS
Maximum Number of Connections	20 connections (Not more than 10 connections at the same time. By switching connections using the main program, 20 connections can be used.)
Transmission Media	Twisted pair cables, category 3

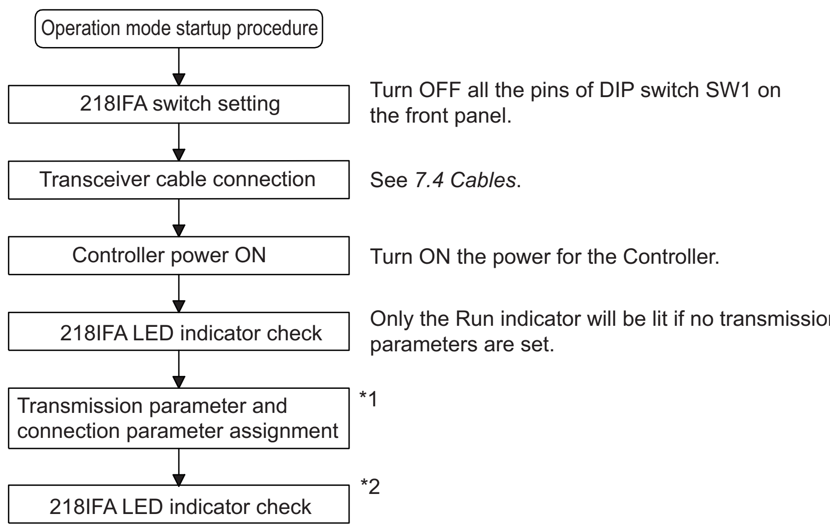
Note: 218IF module is comatible with 218IFA module in 10Base-T communication.

7.3.3 Module Startup

This section explains the system start-up procedure and setting method for each of the following two modes in a system that uses the 218IFA Module.

- Operation mode
- Diagnostic mode

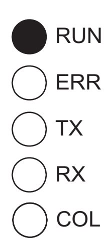
■ Settings and Procedure Before Operation



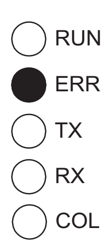
* 1. Transmission parameter and connection parameter assignment
Set the 218IFA parameters and connection parameters, or load the programs. See *7.5 CP-218 Transmission Definitions* for the method of setting the parameters.

* 2. LED indicator check
Check the RUN, ERR, 218TX, and 218RX LED indicators on the front panel of the 218IFA Module.

- The RUN LED indicator is lit during normal operation.

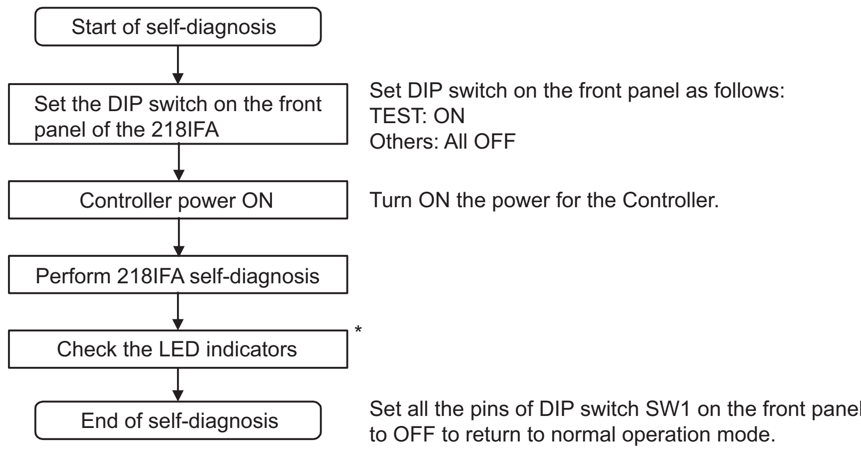


- The ERR LED indicator lights when an error occurs.

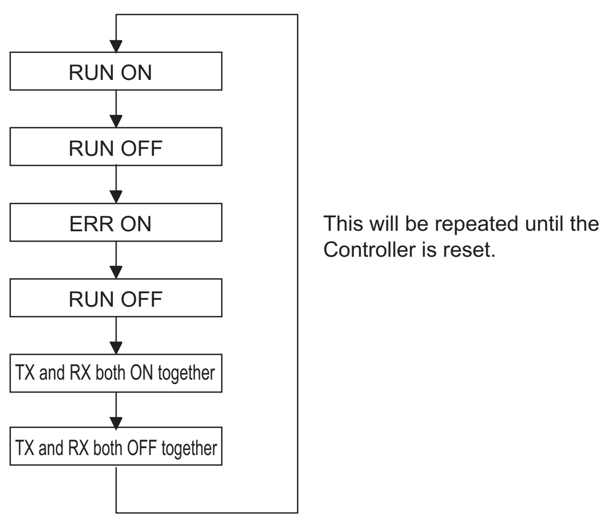


■ Performing Self-Diagnosis

When first using the 218IFA Module, use the following procedure to perform self-diagnosis. Start operation after checking that the 218IFA Module is operating normally.



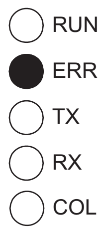
* LED indicator check
During normal operation, the indicators on the front panel of the 218IFA Module light as shown below. Visually check that these indicators light correctly.



When a hardware error is detected during self-diagnosis, the ERR LED indicator will light or flash as shown below.

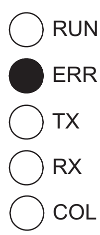
PROM Diagnostic Error

The ERR LED indicator remains lit.



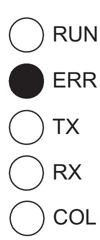
SRAM Diagnostic Error

The ERR LED indicator flashes.



LAN Interface Diagnostic Error

The ERR LED indicator flashes twice, and continues flashing.



7.4 Cables

This section explains the cable specifications for communications using the 218IFA Module.

7.4.1 218IF Connection Cables

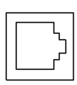
■ 218IF Connector Pin Layout (CN1/AUI)

The 218IFA Ethernet port is a 10Base-T communications port.

The connector for this port is RJ-45 (Modular Jack).

The following table shows the pins, layout, and signal names of the 218IFA Ethernet connectors.

Table 7.3 218IFA 10Base-T Connector (CN1)



No.	Signal Name	Remarks	No.	Signal Name	Remarks
1	TXD+	Send data (+)	5	N.C.	Not connected
2	TXD-	Send data (-)	6	RXD-	Receive Data (-)
3	RXD+	Receive Data (+)	7	N.C.	Not connected
4	N.C.	Not connected	8	N.C.	Not connected

7.5 CP-218 Transmission Definitions

This section explains how to set the parameters for the CP-218 transmission system.

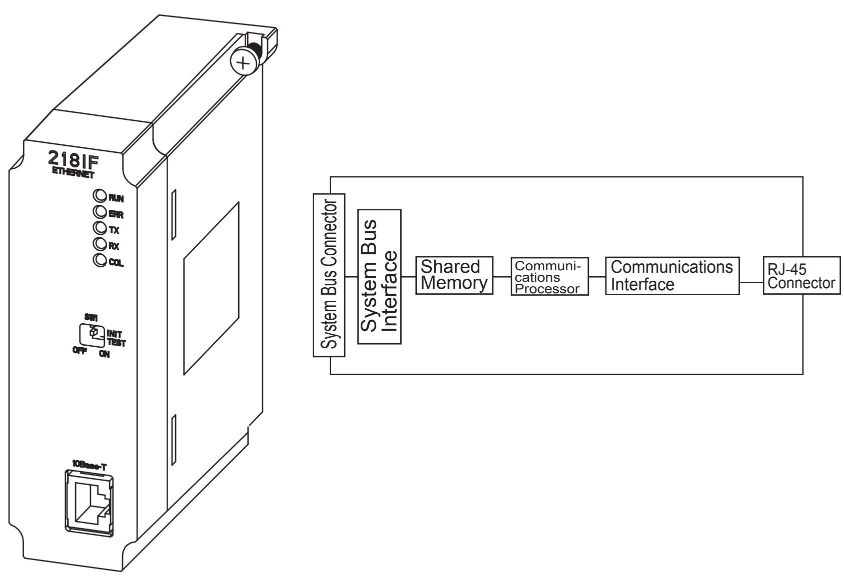
7.5.1 Overview of CP-218 Transmissions

The 218IFA Module is used to connect a building-block MP900-Series Machine Controller to CP-218 related devices. The 218IFA is equipped with one 10Base-T communications port and can be connected to an Ethernet line.

The CP-218 communications system can be connected to an international standard Ethernet network, and controllers manufactured by other companies and personal computers can be easily connected. The MPE720 can be connected to perform MP920 engineering.

To define CP-218 transmissions, the required data must be set (or referenced) using two tab pages: **Transmission Parameters** and **Status**.

Mounting a 218IFA Module enables the Machine Controller to transmit data through an Ethernet transmission line. Only message communication are possible in the 218IF communications system. Specify the MSG-SND and MSG-RCV functions in drawing or function programs for CP-218 transmissions.



7.5.2 Opening the CP-218 Transmission Definitions Window

When the CP-218 Transmission Definitions Window is opened in Online Mode, the CP-218 parameters stored in the Machine Controller will be opened. When the Window is opened in Offline Mode, the CP-218 parameters stored in the hard disk on the MPE720 will be opened.

Open the CP-218 Transmission Definitions Window from the Module Definitions Window.

INFO

When the CP-218 Transmission Definitions Window is opened and the CP-218 parameters are being set for the first time, a confirmation message box will be displayed indicating that a new file will be created. Click the **OK** button to proceed to the next operation.

7.5.3 The CP-218 Transmission Definitions Window Menu

The following table shows the functions of the menu commands in the CP-218 Transmission Definitions Window.

Menu Command	Function
File (F)	
File Manager (F)	Opens the MPE720 File Manager.
Open (O)	Opens the window for each function
Close (C)	Closes the CP-218 Transmission Definitions Window.
Save (S)	Saves the CP-218 parameter settings.
Delete (D)	Deletes the CP-218 parameter settings.
Print (P)	Prints MPE720 :document definition data.
Exit (X)	Exits the MPE720.
Edit (E)	
My Port: TCP/IP Settings (M)	Sets the local station and TCP/IP.
Ethernet Address Setting (A)	Sets the Ethernet address of the remote station.
Transmission Parameters Default Settings (D)	Sets the transmission parameter default values.
Assignment Delete (C)	Deletes the allocation data.
View (V)	
Tool Bar (T)	Displays the Tool Bars.
Status Bar (S)	Displays the Status Bar.
Window (W)	
Cascade (C)	Stacks windows in the display.
Tile (T)	Lines up windows in the display.
Arrange Icons (A)	Lines up icons.
Help (H)	
About App.. (A)	Displays the version information.

7.5.4 Setting CP-218 Transmission Definitions

The CP-218 Transmission Definitions Window is composed of two tab pages: The **Transmission Parameters** and **Status** Tabs.

Tab Name	Function
Transmission Parameters	Sets the CP-218 transmission parameters.
Status	Displays the communications status.

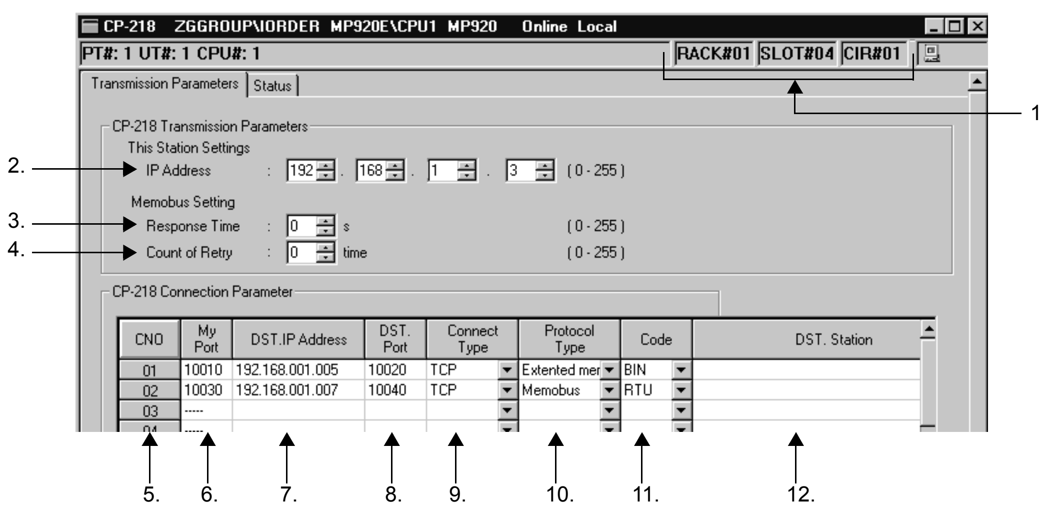
7.5.5 Transmission Parameter Settings

Set the parameters required to use the CP-218 communications system.

Setting these parameters enables data communications by user programs using the MSG-SND and MSG-RCV system functions.

■ Parameter Settings

Set the transmission parameters and the connection parameters on the **Transmission Parameters** Tab.



1. Configuration Information

   Displays the CP-218 configuration information that was set in the Module Definition Window.

   - Rack#: Displays the rack number of the rack in which the 218IF is defined.
   - Slot#: Displays the slot number of the slot in which the 218IF is defined.
   - Cir#: Displays the 218IF circuit number.

   When using more than one 218IF Modules, allocate 1, 2, 3, and so on, in that order. Be sure that the same line numbers is not set for more than one Machine Controller. If they are duplicated, an error will occur when the data is saved.

   The following table shows the range of 218IF line numbers that can be allocated for one Machine Controller.

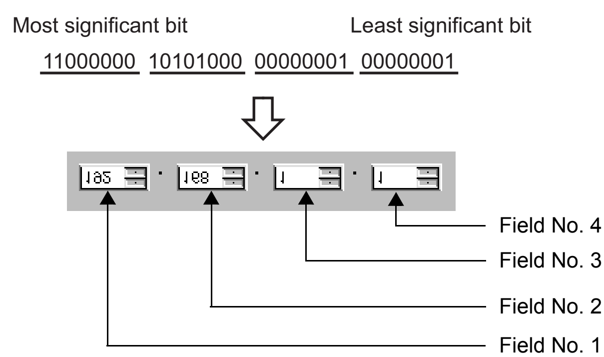
Machine Controller	Line Number
MP920	01 to 08

Transmission Parameter Settings

2. Local Station's IP Address

   Enter the local station's IP address. Do not use the same IP address for another node in the Ethernet system.

   An address consists of 32 bits, as shown in the following diagram. A period (.) separates each 8-bit segment of the address, and each segment is entered in decimal.



- The range of data to be entered differs for each field of the IP address.
- Field No. 1: 0 to 255 (except 127)
- Field No. 2: 0 to 255
- Field No. 3: 0 to 255
- Field No. 4: 1 to 254

INFO

IP addresses 192.168.1.1 to 192.168.1.254 are recommended as private addresses. Check with the network administrator.

3. Response Time (Response Check Monitoring Time)

   Enter the time (0 to 255) that the CP-218 will wait for a response to be returned after transmitting a command using a system function (the MSG-SND function). If a response is not returned and a timeout occurs, the transmission will be retried, but only for the number of times set in parameter 4.

   The **Count of Retry** parameter will be invalid if 0 is set in the **Response Time** parameter.

INFO

Enter 0 for the **Response Time** if the **Count of Retry** is set to 0 (and MEMOBUS is set in the **Protocol Type** column of the CP-218 Connection Parameter Window).

4. Count of Retry (Number of Retries)

   Enter the number of retries (0 to 255) to be attempted when a timeout is detected for a system function (the MSG-SND function). An error will be returned for the MSG-SND function if a response is not returned after the set number of retries.

INFO

The **Count of Retry** parameter is not required if only the TCP protocol is used. Set parameters 3 and 4 to 0.

CP-218 Connection Parameters (Connection Parameter Settings)

5. CNO (Connection Number)

   Shows the connection number (1 to 20).

   When communications are performed using an Ethernet Module, the remote stations are identified by a connection number in the range from 1 to 20.

   This CNO corresponds to “Remote Connection #” (parameter 02) of the MSG-SND and MSG-RCV system functions.

6. My Port (Local Station’s Port Number)

   Enter the local station’s port number (256 to 65,534) for each connection. Be sure to enter a port number that is not used for another connection or for diagnostics. If 0 is entered for this parameter, the data for that connection number will be cleared and “- - - -” will be displayed in the **My Port** column.

7. DST. IP Address (Remote Station’s IP Address)

   Enter the remote station’s IP address for each connection.

   The range of data to be entered differs for each field of the DST. IP Address.

   - Field No. 1: 0 to 255 (except 127)
   - Field No. 2: 0 to 255
   - Field No. 3: 0 to 255
   - Field No. 4: 1 to 254

   For the impassive open mode, enter 0 in all four fields.

TERMS

■ Connection

A “connection” involves a series of operations used to perform reciprocal transmission checks and data transfer so that one-to-one communications can be performed between local station programs and remote station programs. With connection protocols, there are procedures such as arrival checks, error detection and actions, sequence number checks, and controls on the amount of transmission data, thus ensuring highly reliable communications. With non-connection protocols, there are no procedures for guaranteeing the quality of communications, and data is transmitted in one direction only. Unlike connection protocols, there are no complicated procedures, and processing is simple, thus enabling high-speed communications, but the reliability of communications is reduced. TCP is a connection protocol, and UDP is a non-connection protocol. In general, TCP should be selected when the reliability of communications is important, and UDP should be selected when the speed of communications is important.

8. DST. Port (Remote Station's Port Number)

   Enter the remote station's port number (0 or 256 to 65,535) for each connection. Be sure that the DST. IP Address and DST. Port combination are not the same as those for another connection.

INFO

1. As shown below, if the DST. IP address and DST. Port are both set to 0, the following will result:
   - DST. IP Address: 000.000.000.000
   - DST. Port: 0

   The connection will be in unpassive open mode, and will be made to a station that has accessed that connection number.

   If more than one station accesses a connection number in unpassive open mode, the station that first transmitted a connection request will be connected. If a connection request is transmitted from another station while the connection is being established, the connection that was first established will be disconnected, and the connection will be made with the next station that issued a connection request.
2. If the IP address and the port number do not match when the remote station's IP address and port number are set, a connection cannot be made with the TCP protocol. The TCP connection is temporarily made, but the connection will be disconnected by the 218IF.

   When setting the remote station's IP address and port number, execute a bind ( ) system call for the socket interface of the personal computer or workstation. After allocating the port number set for the remote station's port number to the socket, execute a connect ( ) system call and make the TCP connection.

   If the IP address and the port number do not match when the UDP protocol is used, the data in the 218IF will be discarded. As with the TCP protocol, first execute the bind ( ) system call to allocate the port number set for the remote station's port number in the socket on the personal computer or workstation side, and then transmit the data.

---

9. Connect Type (Connection Type)

   Select the transport-layer protocol.
   - TCP: Communications are performed using TCP (Transmission Control Protocol).
   - UDP: Communications are performed using UDP (User Datagram Protocol).

   Both the TCP and UDP protocols are supported by the transport-layer protocol.
10. Protocol Type

    For each connection, select an application-layer protocol that is supported by the remote station.

TERMS

■ Port Number

The port number is used to identify the target program at the remote station. There is a one-to-one correspondence between the port number and the communications program. The port number is attached to the data header, together with the IP address and other data. The remote station is identified by the DST. IP Address, and data is transferred to the target program. The port number at the local station also enables each local station and remote station communications service program to be identified.

■ Impassive open mode

This mode enables a connection to be established with any station that has issued a connection request.

Protocol Type	Remarks
Extended MEMOBUS	Yaskawa Extended MEMOBUS protocol.
MEMOBUS	Yaskawa Standard MEMOBUS protocol.
MELSEC	Mitsubishi Electric's Ethernet Interface protocol for use with general-purpose sequencers.
No protocol	General-purpose message communications. Data is transmitted and received without being processed into consecutive MW registers.

11. Code

Handle the code for the data to be transferred at each connection according to the code set at the remote station.

- RTU: Specifies RTU mode when the MEMOBUS protocol is being used.
- ASCII: Specifies ASCII mode.
- BIN: Specifies binary mode.

The codes that can be selected depend on the data in the **Protocol Type** column.

Table 7.4 Selectable Codes

Protocol Type	Code		
	RTU	ASCII	BIN
Extended MEMOBUS	No	Yes	Yes
Extended MEMOBUS	No	Yes	Yes
MEMOBUS	Yes	Yes	No
MELSEC	No	Yes	Yes
No protocol	No	Yes	Yes

Note: Yes: Selectable, No: Not selectable

12. DST. Station (Remote Station's Name)

Enter a connection comment of up to 32characters.

7

■ Setting Default Values

The transmission parameters can be set to their default values without entering each parameter, by clicking **Edit (E)** and then **Transmission Parameters Default Settings (D)** on the CP-218 Transmission Definitions menu. The following table shows the default values for each transmission parameter.

Table 7.5 Default Values for Transmission Parameters

Transmission Parameter	Default Value
IP Address	192.168.001.001
Response Time	0
Count of Retry	0
Subnet Mask	000.000.000.000
Gateway IP Address	000.000.000.000
System Port No. (DIAG. Port No./Engineering Port)	10,000
TCP Zero Window Timer Value	3
TCP Retry Time	500
TCP Close Time	60
IP Assemble Time	30
MAX. Packet Length	1,500

INFO

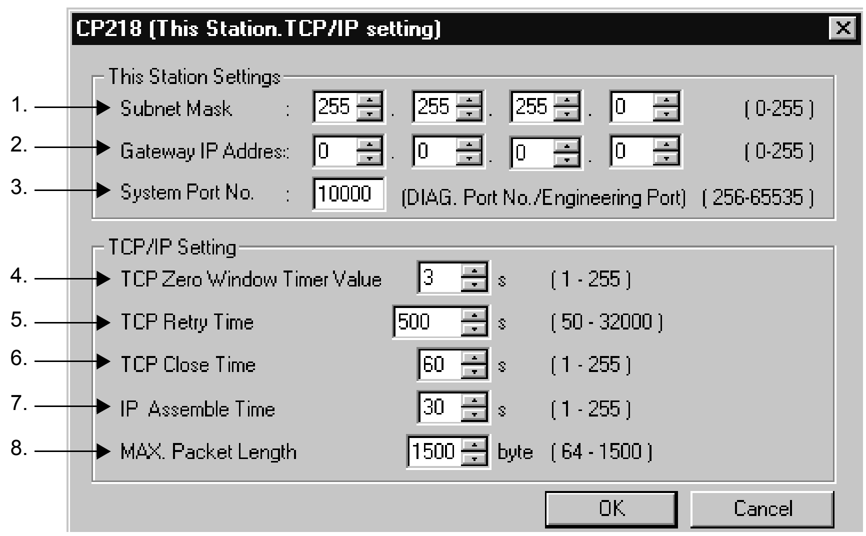
This operation does not return the remote stations' Ethernet addresses or the connection parameters to their default settings.

■ Local Station and TCP/IP Settings

Local Station and TCP/IP Setting Procedure

The local station and TCP/IP setting procedure is shown below.

1. Click **Edit (E)** and then **This Station Settings** and **TCP/IP Setting (M)** on the CP-218 Transmission Definitions menu.
2. Set each item in the dialog box and then click the **OK** button.



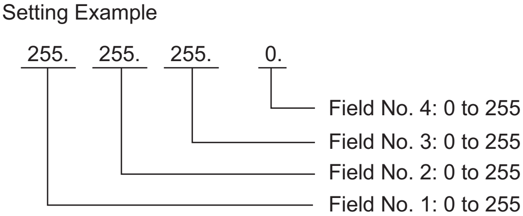
Local Station Settings

1. Subnet Mask

   Enter a subnet mask for the local station's IP address. When a subnet mask is not being used, enter 0 in fields 1 to 4.

   The IP address consists of a 32-bit string. A period (.) separates each of the four 8-bit segments of the address, and each segment is expressed in decimal.

Setting Example



TERMS

■ Subnet Mask

A subnet mask is a bit pattern used to define the number of valid bits in the network address shown in the IP address. Check with the network administrator.

7

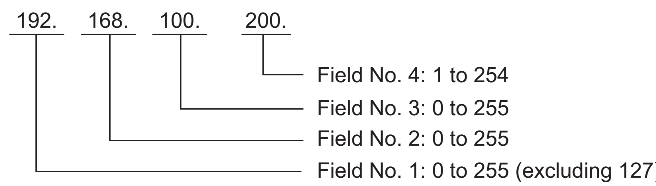
2. Gateway IP Address

   Enter the gateway's IP address when communicating with other networks that are connected through a gateway (router).

   The IP address consists of a 32-bit string. A period (.) separates each of the four 8-bit segments of the address, and each segment is expressed in decimal.

   The range of data to be entered differs for each field of the Gateway IP Address.

Setting Example



   If a gateway is not being used, enter 0 in all four fields of the Gateway IP Address. Be sure not to enter the same value as that of any other IP address or gateway IP address.

3. System Port No.

   Enter the Port No./Engineering Port (256 to 65535) that receives diagnostic commands from the diagnostic terminal. The default is 10000.

TCP/IP Settings

4. TCP Zero Window Timer Value

   Enter the time (1 to 255) before resending the Transmission Window confirmation packet when the TCP Transmission Window size is set to 0. The default value is 3 seconds.

5. TCP Retry Time

   Enter the time (50 to 32000) before resending data if an ACK (acknowledgement) is not received after opening a TCP connection or transmitting data. The default value is 500 milliseconds.

6. TCP Close Time

   Enter the wait time (1 to 255) for the remote station to close the connection normally when a TCP connection is being closed. The default value is 60 seconds.

7. IP Assemble Time

   Enter the wait time (1 to 255) for the next fragment of data after the IP has received fragmented data. The default value is 30 seconds.

8. MAX. Packet Length

   Enter the maximum packet length (64 to 1500) in the 218IF. The default is 1500.

TERMS

■ Gateway IP Address

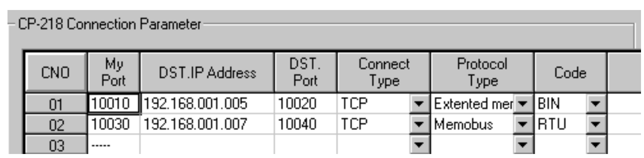
The IP address of the gateway unit (router) that acts as an intermediary when communications are performed between multiple network segments. Check with the network administrator.

> **INFO** When the maximum packet length set is less than the default value (1,500 bytes) and no protocol is set as the application protocol, set a value at least 40 bytes more than the number of data items (bytes) to be transmitted.

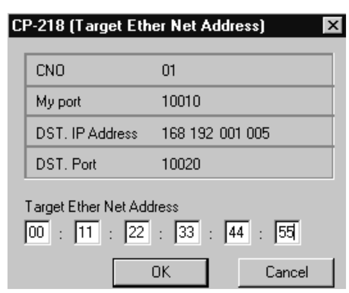
■ Setting a Remote Station's Ethernet Address

When a remote station does not have the ARP (Address Resolution Protocol) function, use the following procedure to set the remote station's Ethernet address:

1. Move the cursor to the connection where the remote station's Ethernet address is to be set.



2. Click **Edit (E)** and then **Ethernet Address Settings (A)** on the CP-218 Transmission Definitions menu.
3. Set each item in the dialog box and then click the **OK** button.



■ Precautions on Setting the Connection Parameters

The following restrictions apply to the input values of connection parameters:

- Duplication of the Local Station's Port Number

  The local station port number and connection type combination set in the connection parameters must not be used for any other connection parameters.

- Duplication of the System Port

  When **Connect Type** is set to TCP in the connection parameters, the local station's port number must not be the same as the diagnostic port number.

- Open Mode

  When DST. IP Address is set to all zeroes in the connection parameters, DST. Port must be set to zero and Target Ethernet Address must be set to all zeroes.

- Duplication of a Remote Station

  A DST. IP Address, DST. Port, and Connect Type combination set in the connection parameters must not be used for any other connection. This restriction does not apply to connections in which both the DST. IP Address and DST. Port are set to all zeroes.

- Ethernet Address

  The DST. IP Address settings must be the same when the same Ethernet address has been set in the connection parameters. This restriction does not apply when the Ethernet address is set to all zeroes.

- Protocol Type and Code

  The following table shows the possible combinations of protocol types and codes in each connection parameter.

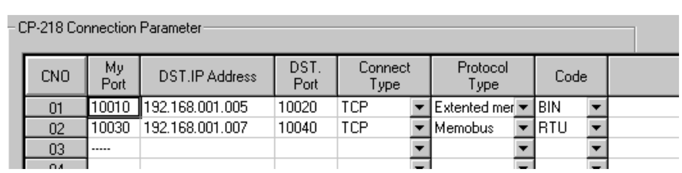
Table 7.6 Combinations of Protocol Types and Codes

Protocol Type	Code
Extended MEMOBUS	Binary or ASCII
MEMOBUS	RTU or ASCII
MELSEC	Binary or ASCII
General-purpose	Binary or ASCII

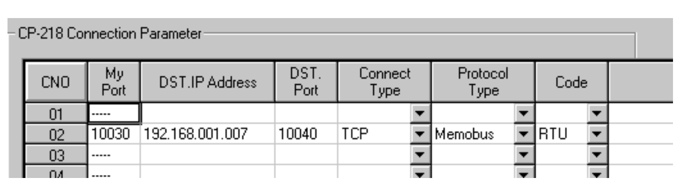
■ Deleting Assignment Data

Use the following procedure to delete the assignment data for one connection.

1. Move the cursor to the connection to be deleted.



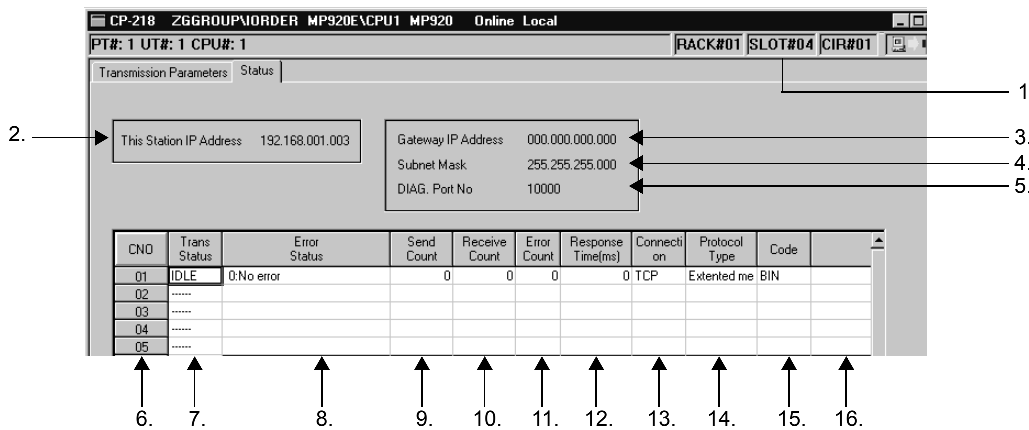
2. Click **Edit (E)** and then **Assignment Delete (C)** on the CP-218 Transmission Definitions menu. The assignment data selected in step **1.** will be deleted.



INFO The definition data can be deleted even if 0 was entered in the **My Port** column.

■ Displaying the Status

The Status Tab displays the data that the 218IF is actually handling in link transmissions. The tab only displays the settings; the settings cannot be changed. All the data will be displayed in online mode. No data will be displayed in offline mode.



1. Configuration Information

   Displays the 218IF configuration information.

2. This Station IP Address (Local Station's IP Address)

   Displays the local station's IP address set in the **Transmission Parameters** Tab.

3. Gateway IP Address

   Displays the gateway (router) IP address set in the **Transmission Parameters** Tab.

4. Subnet Mask

   Displays the subnet mask set in the **Transmission Parameters** Tab.

5. DIAG. Port No

   Displays the system port number (diagnostic/engineering port number) set in the **Transmission Parameters** Tab.

6. CNO

   Displays the connection number (1 to 20).

7. Trans Status (Transmission Status)

   Displays the status of each connection in online mode. The following table lists each possible status.

Status	Meaning
"IDLE"	Idle status
"WAIT"	Wait status (waiting for connection)
"CONNECT"	Connected status (data transfer possible)
" "	Unused connection

7

8. Error Status

Displays the error details when an error has occurred in the transmission status.

Table 7.7 Error Status

Status	Meaning	Remarks
No Error	No error	-
Socket Generation Error	System error	Socket generation failure
Local Station Port Number Error	Local station port number setting error. (Binds the same address during disconnection of the TCP connection.)	1. Binding error: Port number duplication 2. When the ABORT function was executed, a binding error occurred during disconnection. ABORT → COMPLETE → after 1 minute → Error occurs if EXECUTE sequence is executed within 1 minute. 3. The same connection was executed by another function before Connect completion.
Socket Attribute Change Error	System error (with TCP settings)	An error occurred while the socket attributes were being set.
Connection Error (M-SND)	Connection error (When active open mode was used in the TCP settings, the connection was rejected by a remote station.)	1. This error occurs when M-SND → Connect → Reset. 2. This error occurs if a retry is performed when the line is disconnected, and after one minute (default) the next retry also fails.
Connection Error (M-RCV)	Connection error (When passive open mode is used in the TCP settings)	M-RCV accept error
System Error	System error	A socket polling (select) error occurred during data reception.
Data Sending Error (TCP)	Data sending error (There is no remote station in the TCP settings, or the remote station has not been started up.)	A response transmission error occurred with M-RCV. This also occurred with M-SND. There is no transmission destination, or TCP only when the transmission destination is rebooted.
Data Sending Error (UDP)	Data sending error (with UDP settings)	A request to send was issued by a non-existent socket.
Data Receiving Error (TCP)	Data receiving error (A request to disconnect the connection was received from the remote station in the TCP settings.)	The connection was disconnected by the remote station. (Normally, this also occurs after close processing is performed.)
Data Receiving Error (UDP)	Data receiving error (with UDP settings)	Receive From was executed for a non-existent socket.
Socket Option Change Error	System error	An error occurred while the socket option was being changed.
Data Conversion Error	Data conversion error (Data conversion failed in MEMOBUS and MELSEC-A communications.)	Protocol conversion error

9. Send Count (Transmission Line Counter)

Displays the amount of data (number of packets) transmitted to the remote station.

10. Receive Count (Reception Path Counter)

Displays the amount of data (number of packets) received from the remote station.

11. Error Count (Error Counter)

    Displays the number of times an error has occurred in each connection.

12. Response Time [ms]

    Displays the time (ms) taken for a response to be received after a command has been transmitted with the MSG-SND function.

13. Connection Type

    Displays the Connect Type (TCP or UDP) connection parameter set in the **Transmission Parameters** Tab.

14. Protocol Type

    Displays the Protocol Type (MEMOBUS, Extended MEMOBUS, MELSEC, or no protocol) connection parameter set in the **Transmission Parameters** Tab.

15. Code

    Displays the Code (ASCII, Binary, or RTU) connection parameter set in the **Transmission Parameters** Tab.

16. DST. Station (Remote Station's Name)

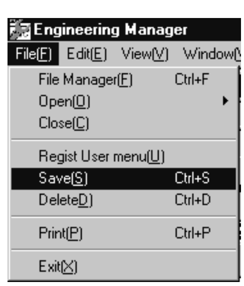
    Displays the DST. Station connection parameter set in the **Transmission Parameters** Tab.
    The all data are displayed on the Online Mode. In Offline Mode, nothing will be displayed.

7.5.6 Saving CP-218 Transmission Definitions Data

Use the following procedure to save the CP-218 Transmission Definitions data.

In Online Mode, the settings are saved in the Machine Controller and the hard disk on the computer. In Offline Mode, the settings are saved in the hard disk on the computer.

1. Click ***File (F)*** and then ***Save (S)*** on the CP-218 Transmission Definition Window's menu.



2. Verify the message in the message box and click the **Yes** button.
3. Verify the message in the message box and click the **OK** button.

7

IMPORTANT

1. The connection parameters cannot be saved unless the parameter input values pass a consistency check. See ■*Precautions on Setting the Connection Parameters* under *7.5.5 Transmission Parameter Settings* for details.
2. An error detection message box will be displayed if the save operation fails. See *Appendix A System Functions* for a list of error messages, correct the cause of the error, and try to save the data again.

7.5.7 Deleting CP-218 Transmission Definitions Data

Use the following procedure to delete all of the CP-218 Transmission Definitions data. In Online Mode, the data will be deleted from the Machine Controller and the hard disk on the computer. In Offline Mode, the data will be deleted from the hard disk on the computer.

1. Click ***File (F)*** and then ***Delete (D)*** on the CP-218 Transmission Definition Window's menu.
2. Verify the message in the message box and click the **Yes** button to delete the data.

7.6 Connecting 218IF Modules

This section explains the internal operations with the 218IF communications protocol and provides some programming examples.

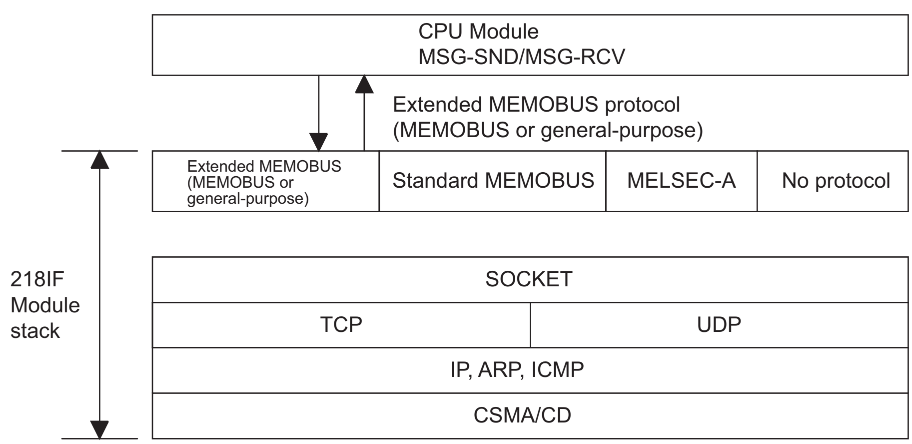
7.6.1 218IF Communications Protocols

■ Overview of the Communications Protocols

With the 218IF Module, the four protocols shown in the following table are implemented in the application layer of the TCP/IP protocol.

Protocol	Remarks
Extended MEMOBUS Protocol	The MEMOBUS mode and general-purpose message mode are available.
Standard MEMOBUS Protocol	Yaskawa standard MEMOBUS protocol. (Slave function only)
MELSEC-A Protocol	A subset of Mitsubishi Electric's general-purpose sequencer protocol.
No protocol	Used for general-purpose message communications.

All messages between MP900-Series CPU Modules and 218IF Modules are transferred using the Extended MEMOBUS protocol.



Application Protocols

IMPORTANT

When using the TCP protocol in no protocol (through) mode, note the following points:

Because the TCP protocol is a byte-stream protocol, complicated byte-stream processing must generally be created in the Controller's ladder logic program.

As a general rule, with the TCP protocol, the transmission data will be stored as far as possible in a send buffer, and as much data as possible should be transmitted in the same packet.

For example, when data is transmitted continuously, it is not clear from the timing of the transmissions how may data items have been transmitted in one packet.

With no protocol, there is no field showing the send data length. Therefore, the receiving end does not know how much data has been transmitted from the remote station.

It is best to avoid such situations.

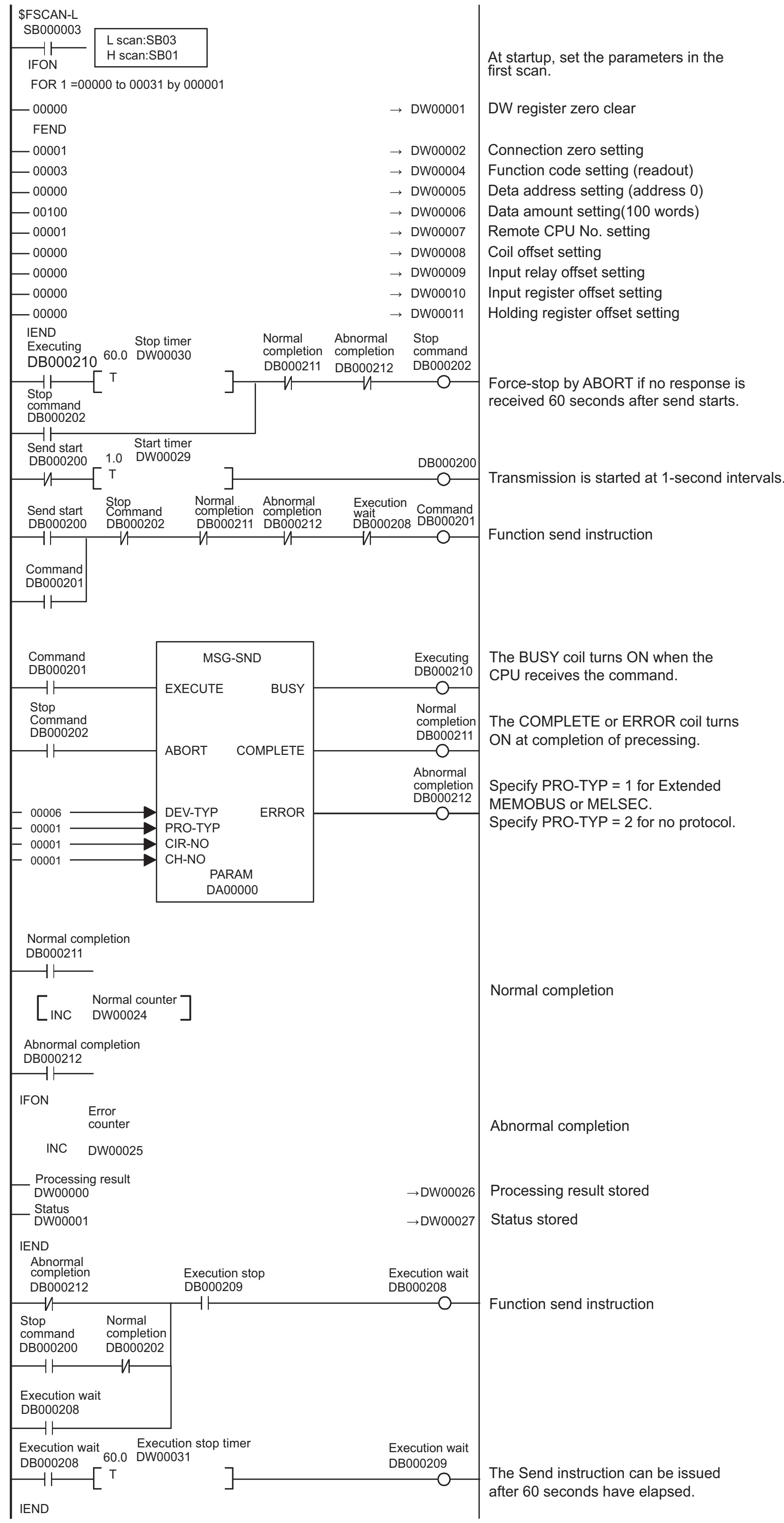
In any case, when using the TCP protocol, be sure that the TCP packets are not transmitted continuously. Either leave an interval (at least 1 second is recommended) between each packet, or use a command/response application protocol. This will remove the need to create complicated byte-stream processing.

7.6.2 Communications Ladder Logic Programming

This section gives examples of ladder logic programming for message transmission and reception with 218IF devices.

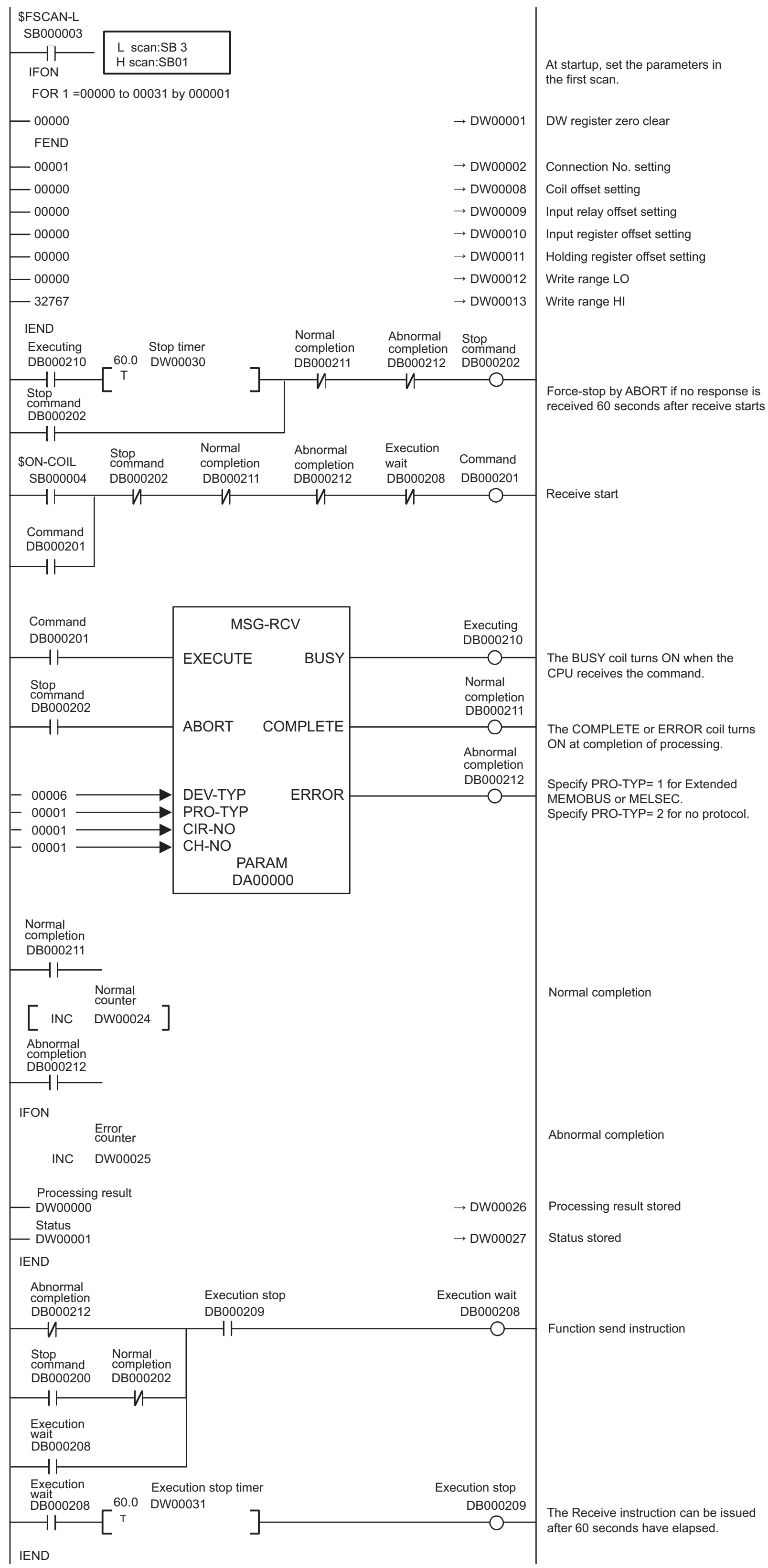
■ Ladder Logic Program to Send Messages (MSG-SND)

The following diagram shows an example of a master function (MSG-SND) ladder logic program.



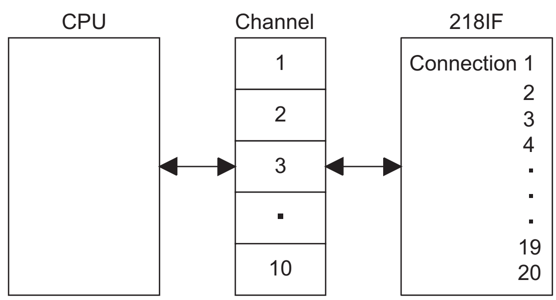
■ Ladder Logic Programming to Receive Messages (MSG-RCV)

The following diagram shows an example of a slave function (MSG-RCV) ladder logic program.



■ Programming Precautions

Care is required when one 218IF Module is communicating with 11 stations (11 connections) or more. This is because there are only 10 channels of shared memory between the CPU and the 218IF, and these channels will be used until the system function has been completed. In other words, the 218IF cannot communicate with 10 stations at the same time. When the 218IF is communicating with 11 stations or more, one channel must be used by two stations and the communications destination must be switched using the ladder logic program so that the 218IF communicates with the second station only after it has finished communicating with the first station. In this case, the EXECUTE system function must not be set to ON (SB04) all the time.



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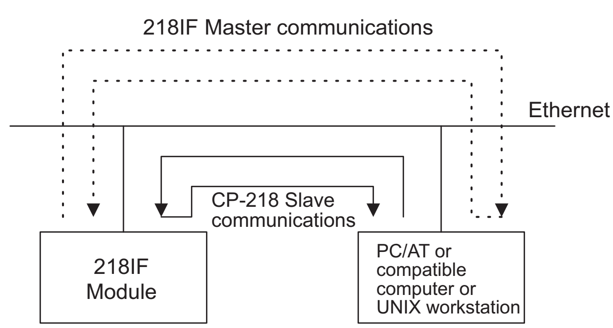
7.7 Connection with Devices Manufactured by Other Companies

This section explains the connection of the 218IF with devices manufactured by other companies.

The network configuration between an Ethernet Interface installed in a PC/AT or compatible computer or UNIX workstation and a 218IF Module is shown below.

The original application can be opened using the socket function in the personal computer or other device.

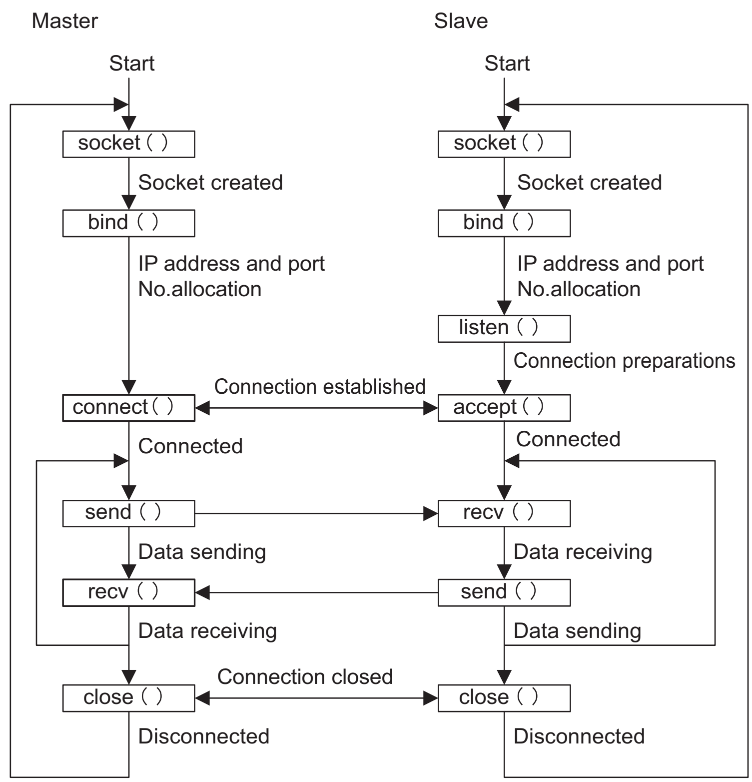
7.7.1 System Configuration



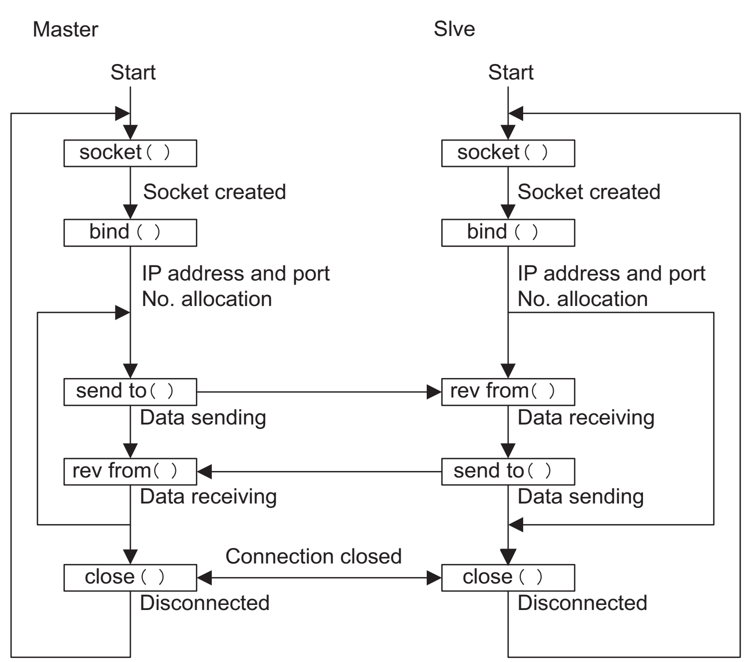
7.7.2 Socket Communications Flow

The following diagram shows the logical programming flow using a socket interface.

■ TCP



■ UDP



Note: With the 218IF Module, the sequence in the Master is automatically performed by the MSG-SND system function, and the sequence in the Slave is automatically performed by the MSG-RCV system function.

7.7.3 Data Format

The following diagram shows the data format when the 10 words of data from holding registers 0 to 9 are read by the SFC09 Holding Register Read (Extended) command, which is one of the Extended MEMOBUS commands.

MEMOBUS Command (8 . . . . 0)

000	Command Type	: 0× 11	218 header
001	Identification No.		218 header
002	Destination channel	: 0×00	218 header
003	Source channel	: 0×00	218 header
004	Not used	: 0×00	218 header
005	Not used	: 0×00	218 header
006	Data length	: 0×16 (L)	218 header
007		: 0×00	218 header
008	Not used	: 0×00	218 header
009	Not used	: 0×00	218 header
00A	Not used	: 0×00	218 header
00B	Not used	: 0×00	218 header
00C	Length	: 0×08 (L)	Extended MEMOBUS packet
00D		: 0×00 (H)	Extended MEMOBUS packet
00E	MFC	: 0×20	Extended MEMOBUS packet
00F	SFC	: 0×09	Extended MEMOBUS packet
010	CPU No.	: 0×00	Extended MEMOBUS packet
011	Not used	: 0×00	Extended MEMOBUS packet
012	Reference No.	: 0×00 (L)	Extended MEMOBUS packet
013		: 0×00 (H)	Extended MEMOBUS packet
014	Number of registers	: 0×0A (L)	Extended MEMOBUS packet
015		: 0×00 (H)	Extended MEMOBUS packet

MEMOBUS Respones (8 . . . . 0)

000	Command Type	: 0×19
001	Identification No.	:
002	Destination channel	: 0×00
003	Sourece channel	: 0×00
004	Not used	: 0×00
005	Not used	: 0×00
006	Data length	: 0×28 (L)
007		: 0×00
008	Not used	: 0×00
009	Not used	: 0×00
00A	Not used	: 0×00
00B	Not used	: 0×00
00C	Length	: 0×1A (L)
00D		: 0×00 (H)
00E	MFC	: 0×20
00F	SFC	: 0×09
010	CPU No.	: 0×00
011	Not used	: 0×00
012	Number of references	: 0×0A (L)
013		: 0×00 (H)
014	Data (MW0)	: (L)
015		: (H)
016	Data (MW1)	: (L)
017		: (H)
~		~
026	Data (MW9)	: (L)
027		: (H)

7.7.4 Precautions on Creating Data Using a Personal Computer

■ Using Personal Computer as a Master

MEMOBUS Command Data

- Set the identification number each time communications are performed, using the following data order: 0□00 → 00□ff → 0□00.
- Specify 0 for the destination channel.
- Specify 0 for the source channel.
- When the remote station has more than one CPU, set the CPU number as follows:

Bit	7 – 4	3 – 0
	Dest. CPU No.	Source. CPU No.

Note: Destination CPU No.: Specify the CPU number of the Machine Controller.
Source CPU No.: Set to 0.

MEMOBUS Response Data

- Copy the identification number set in the MEMOBUS command data.
- Copy the leading source channel number set in the MEMOBUS command data is copied as the leading destination channel.
- A unique Machine Controller value is added for the source channel. It can therefore be ignored at the personal computer.
- Reverse the upper 4 bits and the lower 4 bits of the CPU numbers in the MEMOBUS command data and set is as the CPU numbers. If it is not required at the personal computer, it can be ignored.

■ Using the Personal Computer as a Slave

MEMOBUS Response Data

- Set the number that is set in the MEMOBUS command data for the identification number.
- Set the source channel number in the MEMOBUS command data for the destination channel.
- Set the destination channel number in the MEMOBUS command data for the source channel.
- Reverse the upper 4 bits and the lower 4 bits of the CPU numbers in the MEMOBUS command data and set is as the CPU numbers.

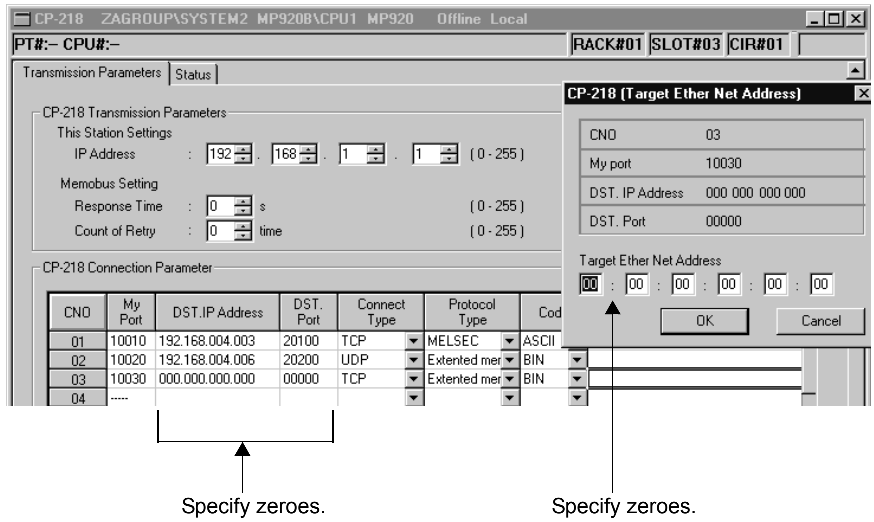
■ Sample Program

Appendix C C Language Sample Programs shows a sample program for the personal computer.

7.7.5 Programming Precautions

When a Master program is created with TCP, its own IP address or port number may not always be allocated by the bind ( ) function. This depends on the application. In this case, the system will automatically allocate an unused port number when the connect ( ) function is called.

When the DST. IP Address and the DST. Port are set in the **Transmission Parameters** Tab on the CP-218 Connection Parameter Window, the connection will be rejected if the IP address and the port number do not match. Use the method shown below to avoid this situation.

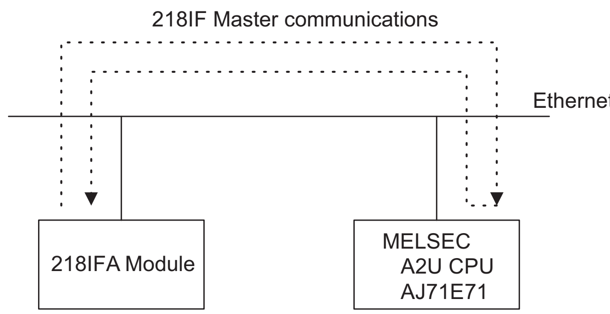


As shown in the above diagram, a connection request can be received from any station by specifying zeroes for both the DST. IP Address and the DST. Port in the CP-218 Connection Parameter Window. In this case, also set zeroes for the remote station’s Ethernet address.

7.8 Connections with MELSEC

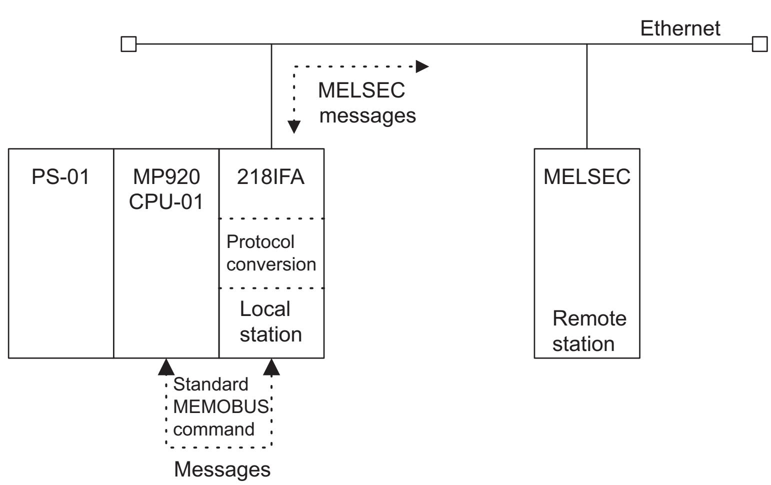
This section gives an example of a system configuration in which an MP900-Series 218IFA Module and MELSEC are connected by Ethernet.

7.8.1 System Configuration



Note: Make the 218IFA Module the Master, and make the MELSEC Controller the Slave.

7.8.2 Message Flow



Extended MEMOBUS messages are exchanged between the MP920 and the 218IFA, and MELSEC messages are exchanged between the 218IFA and MELSEC.

INFO

For MELSEC communications, check the operation when the A2U CPU and AJ71E71 are used in combination.

7

7.8.3 Programming

■ 218IFA Programming Suggestions

The 218IFA communicates with the MELSEC Controller that performs Extended MEMOBUS and MELSEC message conversion processing. Thus there is no need for the MELSEC message configuration to be recognized by the user application. The user can easily communicate with the MELSEC Controller by using the MSG-SND function to specify MELSEC under Protocol Type in the 218IFA Connection Parameter Window.

Refer to the list of MELSEC commands for the commands that are used by the MSG-SND function, and the MEMOBUS commands corresponding to the MELSEC commands.

For example, MEMOBUS command 01 or 02 will correspond to MELSEC command 00 (reads bit devices in 1-bit units).

■ MELSEC Programs

The Ethernet Module (AJ71E71) must be initialized by the MELSEC ladder logic program.

Refer to the procedure for refreshing other nodes in the MELSEC manual, and create a ladder logic program for initial processing.

7.8.4 MELSEC Commands

The following table shows the common MELSEC ACPU commands that are supported by the MP900-Series 218IFA Module, and the corresponding MEMOBUS command numbers.

Table 7.8 Common MELSEC ACPU Commands

Command	Description	Qty	218IFA Support*	MEMOBUS Command
00H	Reads bit devices in 1-point units	256 points	Yes	01H/02H
01H	Reads bit devices in 16-point units	128 words (2,048 points)	No	–
	Reads word devices in 1-point units	256 points	Yes	03H/04H/ 09H/0AH
02H	Writes bit devices in 1-point units	256 points	Yes	05H/0FH
03H	Writes bit devices in 16-point units	40 words (640 points)	No	–
	Writes word devices in 1-point units	256 points	Yes	06H/0BH/10H
04H	Randomly specifies, sets, and resets bit devices and device numbers in 1-point units	80 points	No	–
05H	Randomly specifies, sets, and resets bit devices and device numbers in 16-point units	40 words (640 points)	No	–
	Randomly specifies, sets, and resets word devices and device numbers in 1-point units	40 points	Yes	0EH
06H	Sets the bit devices to be monitored in 1-point units	40 points	No	–

Table 7.8 Common MELSEC ACPU Commands (cont'd)

Command	Description	Qty	218IFA Support*	MEMOBUS Command
07H	Sets the bit devices to be monitored in 16-point units	120 words (326 points)	No	–
	Sets the word devices to be monitored in 1-point units	20 points	No	–
08H	Monitors devices for which monitor data registration has been performed (in bit units)	–	No	–
09H	Monitors devices for which monitor data registration has been performed (in word units)	–	No	–
17H	Reads extension file registers in 1-point units	256 points	No	–
18H	Writes extension file registers in 1-point units	256 points	No	–
19H	Randomly specifies block numbers and device numbers, and writes to the extension file registers in 1-point units	40 points	No	–
1AH	Registers the extension file registers to be monitored in 1-point units	20 points	No	–
1BH	Monitors extension file registers for which monitor data registration has been performed	–	No	–
3BH	Reads extension file registers by directly specifying them in 1-point units	256 points	No	–
3CH	Writes extension file registers by directly specifying them in 1-point units	256 points	No	–
0EH	Reads the contents of the buffer memory of the special function unit	256 bytes (128 words)	No	–
0FH	Writes data to the buffer memory of the special function unit	256 bytes (128 words)	No	–
0AH	Reads the main sequence program	256 steps	No	–
0BH	Reads the sub-sequence program	256 steps	No	–
0CH	Writes the main sequence program	256 steps	No	–
0DH	Writes the sub-sequence program	256 steps	No	–
1EH	Reads the main microcomputer program	256 bytes	No	–
1FH	Reads the sub-microcomputer program	256 bytes	No	–
20H	Writes the main microcomputer program	256 bytes	No	–
21H	Writes the sub-microcomputer program	256 bytes	No	–
1CH	Reads the comment data	256 bytes	No	–
1DH	Writes the comment data	256 bytes	No	–
39H	Reads extended comment data	256 bytes	No	–
3AH	Writes extended comment data	256 bytes	No	–
10H	Reads the parameter contents	256 bytes	No	–
11H	Writes the parameter contents	256 bytes	No	–
12H	Recognizes and checks the rewritten parameter contents	–	No	–
13H	Requests for remote RUN/STOP	–	No	–
14H				
15H	Reads the PC model name	–	No	–
16H	Loopback test	256 bytes	Yes	08H
60H	Fixed buffer communications	507 words	Yes	31H

7

Table 7.8 Common MELSEC ACPU Commands (cont'd)

Command	Description	Qty	218IFA Support*	MEMOBUS Command
61H	Reads random access buffer communications	508 words	Yes	32H
62H	Writes random access buffer communications	508 words	Yes	33H

* Yes: Command supported by the 218IFA Module.
No: Command not supported by the 218IFA Module.

Note: Special AnACPU commands are not supported. Use the common ACPU commands for AnACPU access. The AnACPU expansion registers cannot be accessed.

7.8.5 MELSEC Devices

The table below shows the MELSEC bit devices and word devices that can be accessed from the 218IF Module.

The MP900-Series register numbers corresponding to the MELSEC device range and the MEMOBUS commands used are also shown in the table.

Table 7.9 MELSEC Bit Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Leading No.	Register No.*
X	X0000 to X07FF	Hexadecimal	02H: Input relays	0 to 2047	MB000000 to MB00127F
Y	Y0000 to Y07FF	Hexadecimal	01H/0FH: Coils	0 to 2047	MB000000 to MB00127F
M	M0000 to M2047	Decimal	01H/05H/0FH: Coils	2048 to 4095	MB001280 to MB00255F
M	M9000 to M9255	Decimal	01H/05H/0FH: Coils	4096 to 4351	MB002560 to MB00271F
B	B0000 to B03FF	Hexadecimal	01H/05H/0FH: Coils	4352 to 5375	MB002720 to MB00335F
F	F0000 to F0255	Decimal	01H/05H/0FH: Coils	5376 to 5631	MB003360 to MB00351F
TS	TS000 to TS255	Decimal	02H: Input relays	2048 to 2303	MB001280 to MB00143F
TC	TC000 to TC255	Decimal	02H: Input relays	2304 to 2559	MB001440 to MB00159F
CS	CS000 to CS255	Decimal	02H: Input relays	2560 to 2815	MB001600 to MB00175F
CC	CC000 to CC255	Decimal	02H: Input relays	2816 to 3071	MB001760 to MB00191F

* Register number offsets can be specified for both input relays and coils by the MPE720 Programming Device.

Table 7.10 MELSEC Word Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Leading No.	Register No.*
TN	TN000 to TN255	Decimal	04H/0AH: Input registers	0 to 255	MW00000 to MW00255
CN	CN000 to CN255	Decimal	04H/0AH: Input registers	256 to 511	MW00256 to MW00511
D	D0000 to D1023	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding registers	0 to 1023	MW00000 to MW01023
D (Special)	D9000 to D9255	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding registers	1024 to 1279	MW01024 to MW01279
W	W0000 to W03FF	Hexadecimal	03H/06H/09H/0BH/0EH/ 10H: Holding registers	1280 to 2815	MW01280 to MW02303
R	R0000 to R8191	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding registers	2816 to 3071	MW02304 to MW10495

* Register number offsets can be specified for both input registers and holding registers by the MSG-SND and MSG-RCV system functions.

7

7.8.6 MP900-Series Machine Controller and MELSEC Register Maps

The following table shows the correspondences between MP900-Series Machine Controllers and MELSEC devices. Each MELSEC device is allocated to an MP900-Series Machine Controller M register (holding register, input register, input relays, or coils). The MW registers correspond to holding and input registers, and the MB registers correspond to input relays and coils.

Data address MW/MB/IW/IB	Holding registers F・・・・・・・・・0	Input registers F・・・・・・・・・0	Input relays F・・・・・・・・・0	Coils F・・・・・・・・・0
0000 – 0127	Data register Device code: D	Timer current value Device code: TN	Input Device code: X	Output Device code: Y
0128 – 0143	Data register Device code: D	Timer current value Device code: TN	Timer contact Device code: TS	Internal relay Device code: M
0144 – 0159	Data register Device code: D	Timer current value Device code: TN	Timer coil Device code: TC	Internal relay Device code: M
0160 – 0175	Data register Device code: D	Timer current value Device code: TN	Counter contact Device code: CS	Internal relay Device code: M
0176 – 0191	Data register Device code: D	Timer current value Device code: TN	Counter coil Device code: CC	Internal relay Device code: M
0192 – 0255	Data register Device code: D	Timer current value Device code: TN		Internal relay Device code: M
0256 – 0271	Data register Device code: D	Counter current value Device code: CN		Internal relay Device code: M
0272 – 0335	Data register Device code: D	Counter current value Device code: CN		Link relay Device code: B
0336 – 0351	Data register Device code: D	Counter current value Device code: CN		Annunciator Device code: F
0352 – 0511	Data register Device code: D	Counter current value Device code: CN		
0512 – 1023	Data register Device code: D			
1024 – 1279	Special register Device code: D			
1280 – 2303	Link register Device code: W			
2304 – 10495 (9999)	File register Device code: R			

Fig. 7.1 Register Correspondences

7.9 Troubleshooting

This section explains how to deal with problems that may occur with 218IF communications.

Problems and Action to be Taken

	Problem	Action
1	Bind ( ) is not specified for the TCP protocol. The connection cannot be established from the personal computer.	Set zeroes for the DST. IP Address and the DST. Port in the CP-218 Connection Parameter Window. Ensure that bind ( ) is performed by the application on the personal computer.
2	You wish to communicate in ASCII mode, but the data has not been sent to the Machine Controller.	The ASCII codes that can be handled by the 218IF Module are in the data range of 30H to 39H and 41H to 46H. Therefore, even if spaces (20H), CR (0DH), and other unsupported codes are transmitted, they cannot be converted, and the data is discarded. The only way to counter this is to use binary for the settings on the Machine Controller, and to perform code conversion with the ladder logic program once the data has been received.
3	The Endian of the received data is reversed.	The 218IF Module supports Little Endian. Therefore, if the remote station supports Big Endian, Endian conversion must be performed by one or the other. If conversion is performed by the Machine Controller, Endian conversion for the transmission and reception data must be performed by ladder logic programming.
4	You wish to perform command/response communications using the through mode.	Create such a ladder logic program that runs while switching MSG-SND and MSG-RCV for each connection. For example, if the Machine Controller is a Slave, the ladder logic program will use MSG-SND “complete” as a trigger and execute the next MSG-RCV. During execution, the program will not leave MSG-RCV turned ON all the time. When an error or timeout occurs, restart from MSG-SND.
5	Two connections have been established between the personal computer and the Machine Controller. One side is exclusively for transmission, and the other side is exclusively for reception, and you wish to access these connections using multiple ladder logic programs.	With TCP, if MSG-SND is executed at the same time from multiple ladder logic programs for one connection, all the data may be transmitted together in one packet. Control the ladder logic programs in such a way that a given ladder logic program executes MSG-SND for one connection only, and that no more than one MSG-SND is executed at the same time.

8

Example Communications Module Applications

This chapter describes Communication Module applications in order, including the connection of MP900-Series Machine Controller Communications Modules to specific control devices, cable setup, and ladder logic programming used for message transfer.

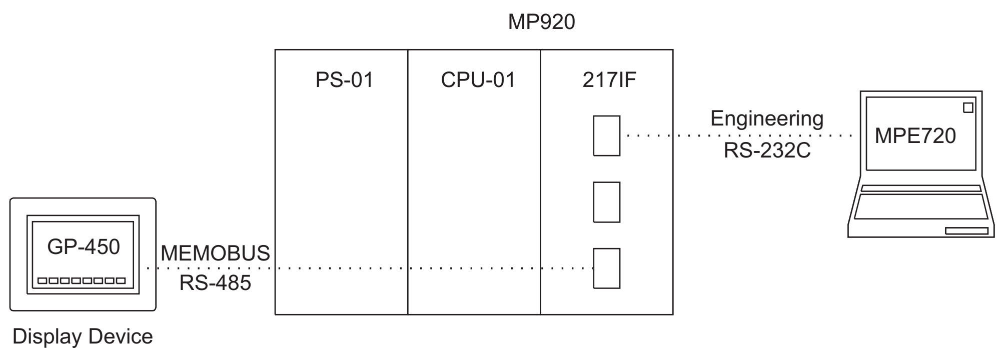
8.1 Connection to a Display Device

This section explains communications between a Display Device and a MEMOBUS Slave.

8.1.1 System Configuration

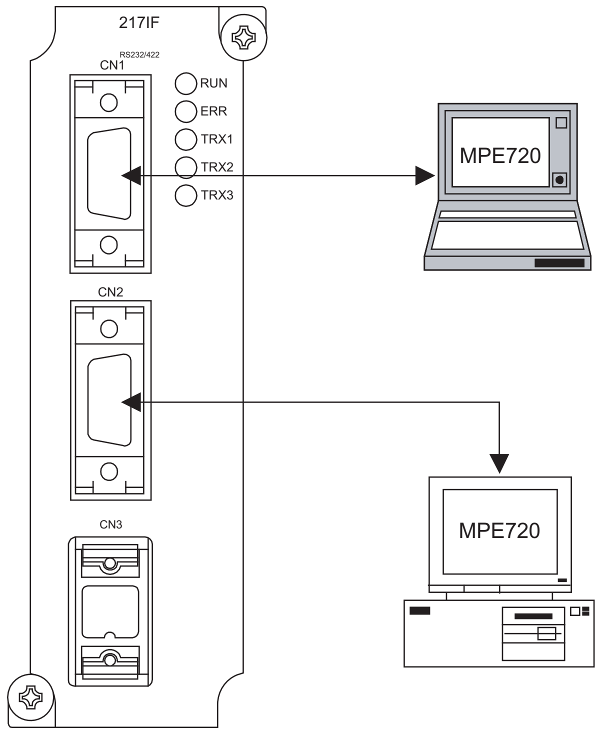
The commercially available GP-450 Display Device is connected to the RS-485 port of the 217IF Module to monitor the status of the MP920.

At the same time, the MPE720 Programming Device is connected to the RS-232C port of the 217IF Module to manage the engineering environment.



8.1.2 Cable Specifications

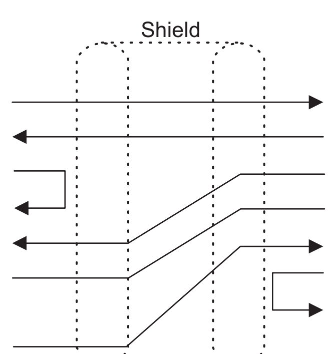
■ Connection Cables for PC/AT or Compatible Computers



CN1 and CN2 Cables

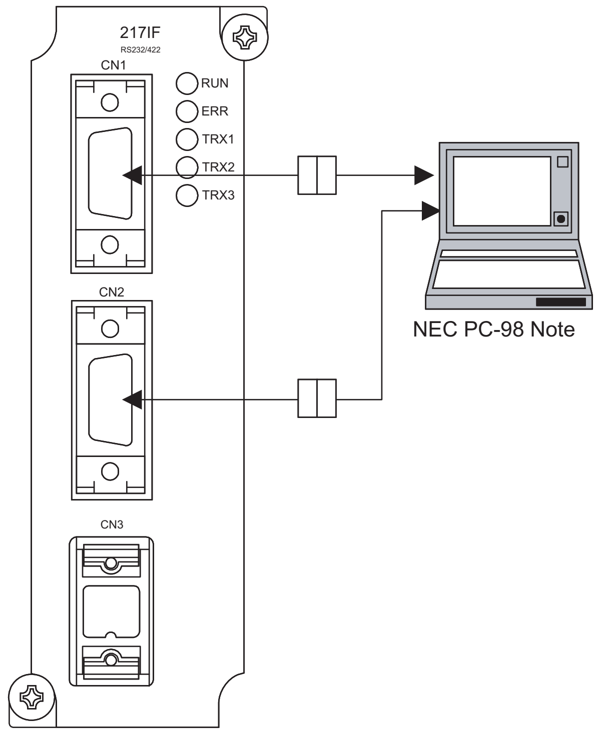
Cable model: 87751-90100

217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
N.C	8
DTR	9



PC/AT or Compatible Computer	
D-sub 9-pin (female)	
Pin No.	Signal Name
1	CD
2	RD
3	TD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	-

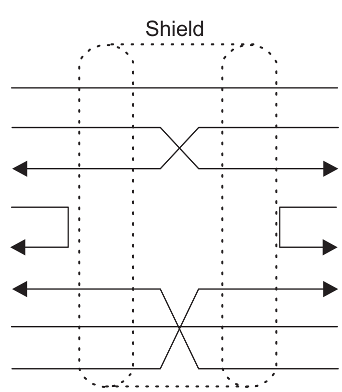
■ Connection Cable for NEC PC-98



CN1 and CN2 Cables

Cable model: JZMSZ-W1015-21

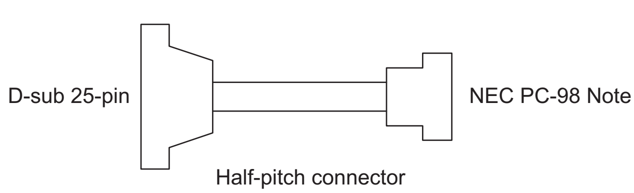
217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	9



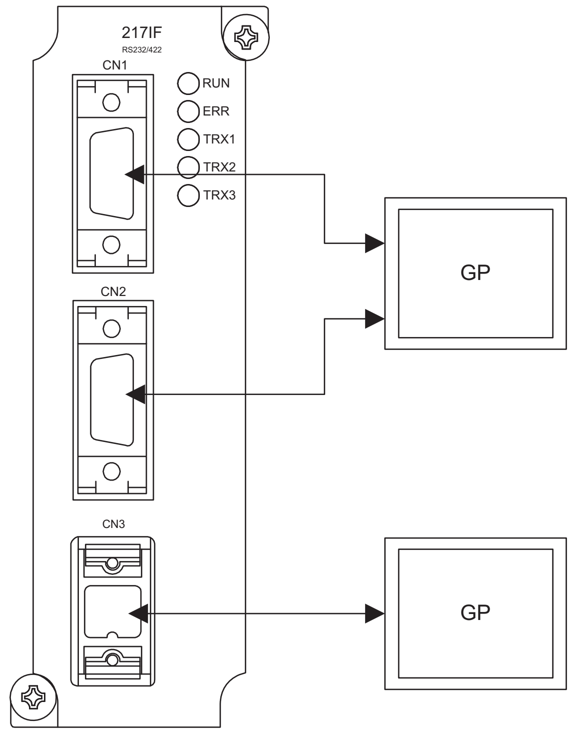
NEC PC-98	
D-sub 25-pin	
Pin No.	Signal Name
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

Relay Cable for NEC PC-98 Note

Cable model:

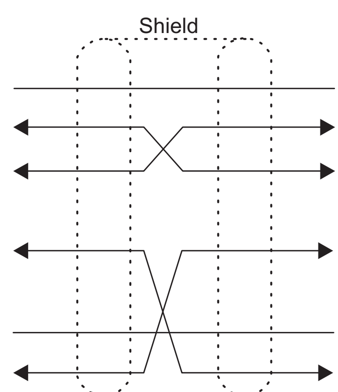


■ Connection Cables for GP-450 Display Devices



CN1 and CN2 Cables

217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	9

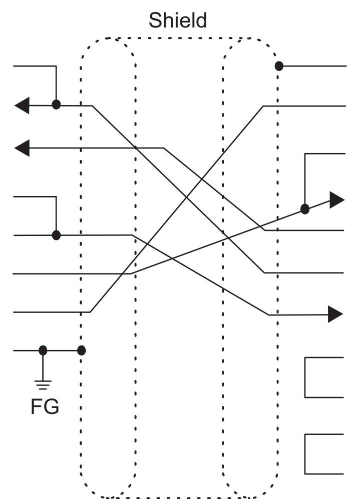


GP	
D-sub 25-pin	
Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
6	N.C.
7	SG
20	ER

Note: A JZMSZ-W1015-21 Cable can also be used.

CN3 Cables

217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3

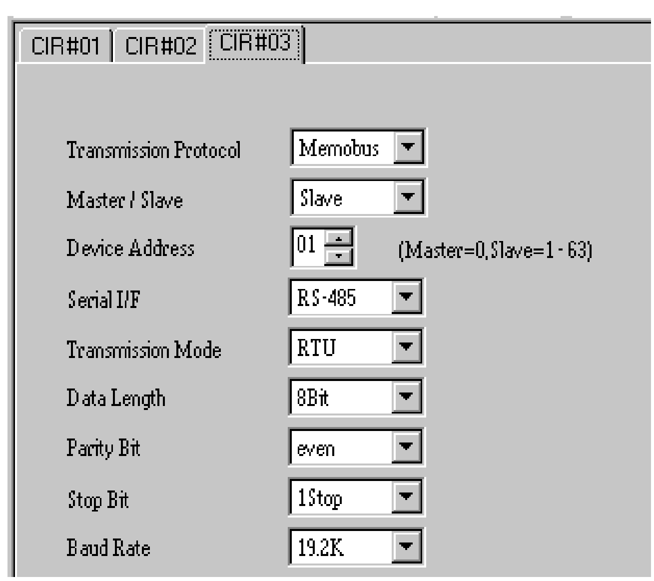


GP	
D-sub 25-pin	
Pin No.	Signal Name
1	FG
7	SG
9	
10	RD A
11	SD A
15	SD B
16	RD B
18	
19	
21	
22	

Note: Connect the cable so that the terminating resistance for 217IF Module is connected.

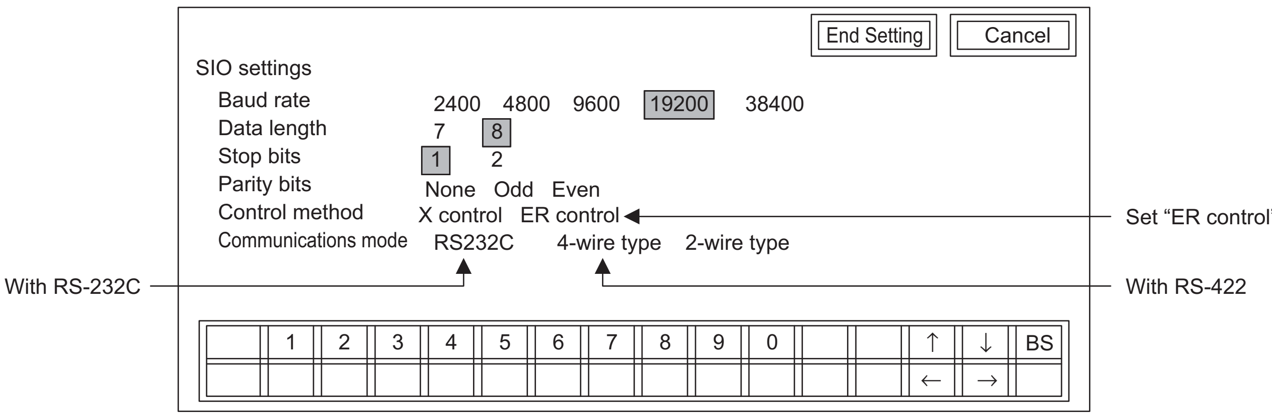
8.1.3 217IF Transmission Settings

The following figure shows the 217IF Transmission settings.



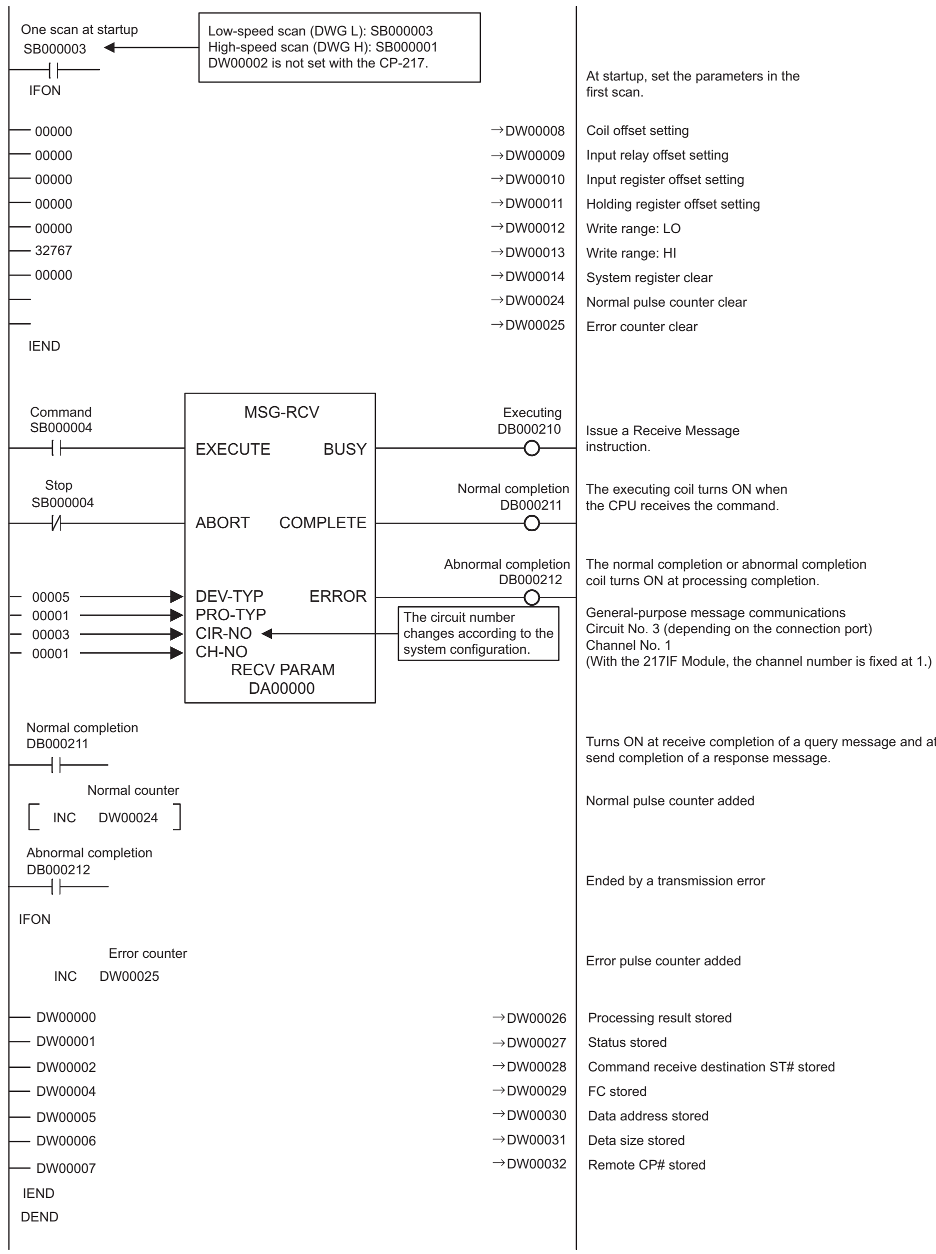
8.1.4 GP-450 Settings

The following figure shows the GP-450 settings.



8.1.5 MSG-RCV Function

The following diagram shows a MEMOBUS Slave MSG-RCV ladder logic program for the MP920 and CP-217.

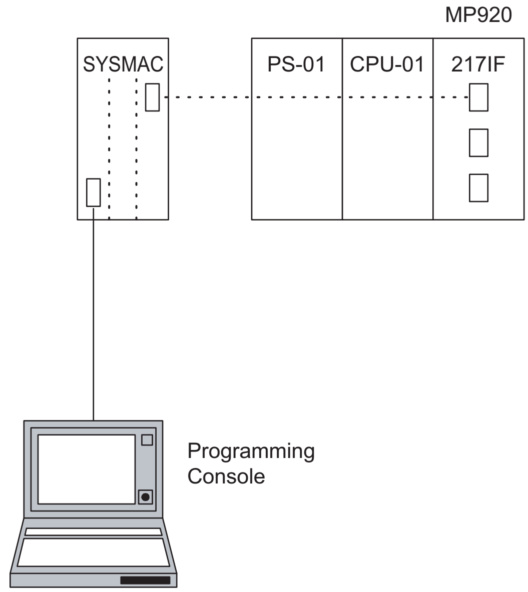


8.2 Connection to a SYSMAC PLC

This section explains master communications with an OMRON SYSMAC PLC.

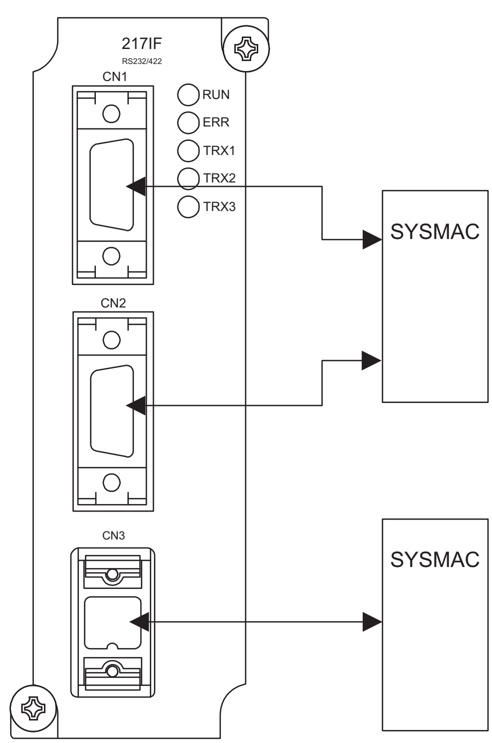
8.2.1 System Configuration

SYSMAC PLC data is referenced by connecting the RS-232C port of the 217IF Module to an OMRON SYSMAC PLC.



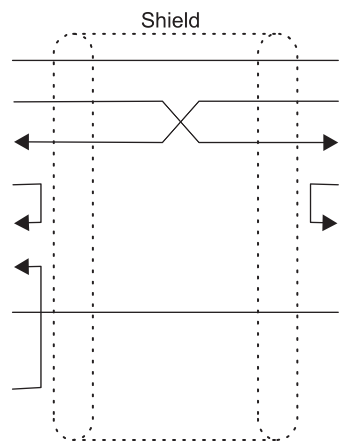
8.2.2 Cable Specifications

■ Connection Cables for SYSMAC PLC



CN1 and CN2 Cables

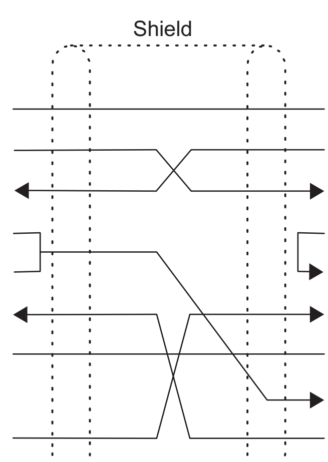
217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
N.C.	8
DRT	9



OMRON PLC	
D-sub 9-pin	
Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
6	5V
7	SG
8	N.C.
9	N.C.

Note: OMRON SYSMAC PLC Models:
C20H
C28H
C40H

217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
N.C.	8
DTR	9

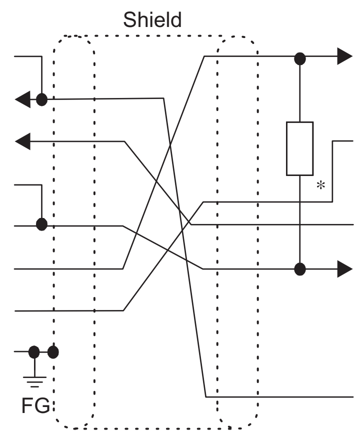


OMRON PLC	
D-sub 25-pin	
Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
6	DSK
7	SG
8	CD
20	DTR

Note: OMRON PLC Unit Models:
C200H-ASC02
C200H-LK201-V1
C500-LK201-V1
C120-LK201-V1

CN3 Cables

217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3



OMRON PLC	
D-sub 9-pin	
Pin No.	Signal Name
1	RD B
2	N.C.
3	SG
4	N.C.
5	SD B
6	RD A
7	FG
8	N.C.
9	SD A

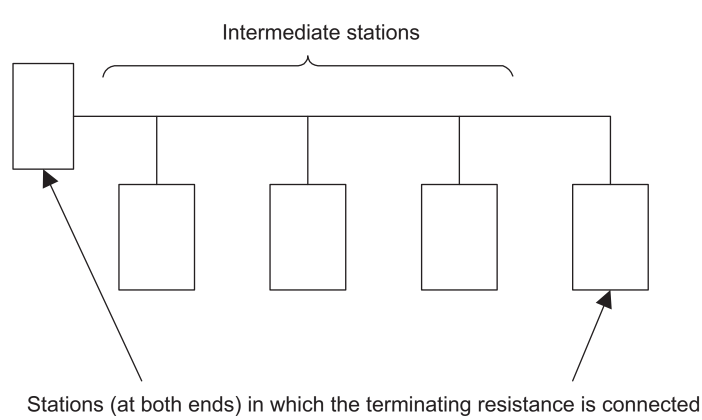
* Terminating resistance: 120 Ω

Note: 1. OMRON PLC Models:
C200H-LK202-V1
C500-LK201-V1
C120-LK202-V1

2. Connect the cable so that the terminating resistance for the 217IF Module is connected.

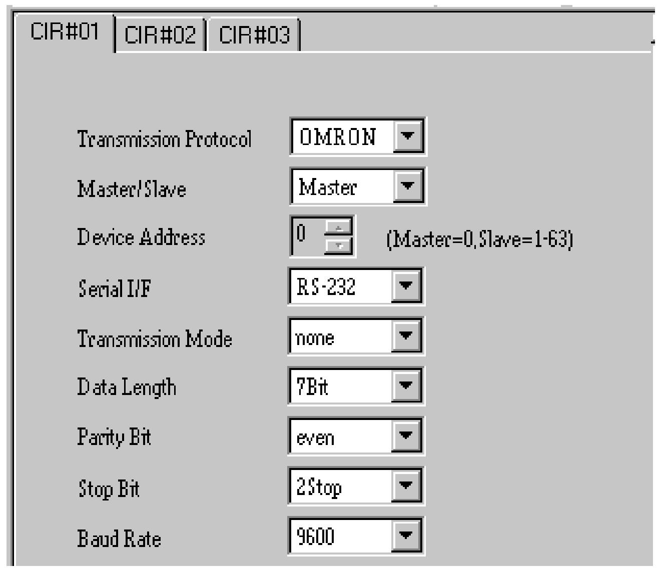
INFO

If the terminating resistance cannot be inserted in the Module, mount 120Ω terminating resistance at the end of the transmission line outside the Module. Insert the terminating resistance in the stations at both ends of the transmission line. Do not insert it in the intermediate stations.



8.2.3 217IF Transmission Settings

The following figure shows the CP-217 Transmission settings.



8.2.4 SYSMAC PLC Settings (C28H)

The following table shows operation examples for the C28□-Series PLCs. These settings do not apply to other models.

For the SYSMAC PLC settings, use a Programming Console to write to the PC Setup (DM 0920 to DM 0923).

Perform the registration operations shown in the flowchart on the next page to register the settings in the system.

8

■ SYSMAC PLC Setup

Word Address	Bit No.	Function	Recommended Setting
DM 0920 (DM 1920)	00 to 07	Standard settings for RS-232C interface communications conditions 00: Standard settings 01: Individual settings Standard settings: Transmission speed: 9,600 bps Start bits: 1 bit Data length: 7 bits Stop bits: 2 bits Parity: Even If individual settings are selected, the settings in DM 0921 are used.	00: Standard settings
	08 to 15	RS-232C interface port rate settings 00: Host Link 01: User memory download/upload mode 02: ASCII output mode	00: Host link mode
DM 0921 (DM 1921)	00 to 07	RS-232C interface baud rate settings (Valid when bits 00 to 07 of DM 0920 or DM 1920 are set to “01”) 00: 300 bps 01: 600 bps 02: 1,200 bps 03: 2,400 bps 04: 4,800 bps 05: 9,600 bps	00: 300 bps when “Individual settings” is selected
	08 to 15	See the following table. [*1]	00: Start bits: 1 Data length: 7 Stop bits: 2 Parity: Even
DM 0922 (DM 1922)	00 to 07	RS-232C transmission delay [00 to 99] × 10 ms (0 to 990 ms) (BCD)	0 ms
	08 to 15	RS-232C interface settings with or without RS/CS control 00: No control 01: With control	00: No control
DM 0923 (DM 1923)	00 to 07	Not used.	00
	08 to 15	Unit number settings for Host Link mode [00 to 31]: Unit number 00 to 31 (BCD)	Unit number 01[*2]

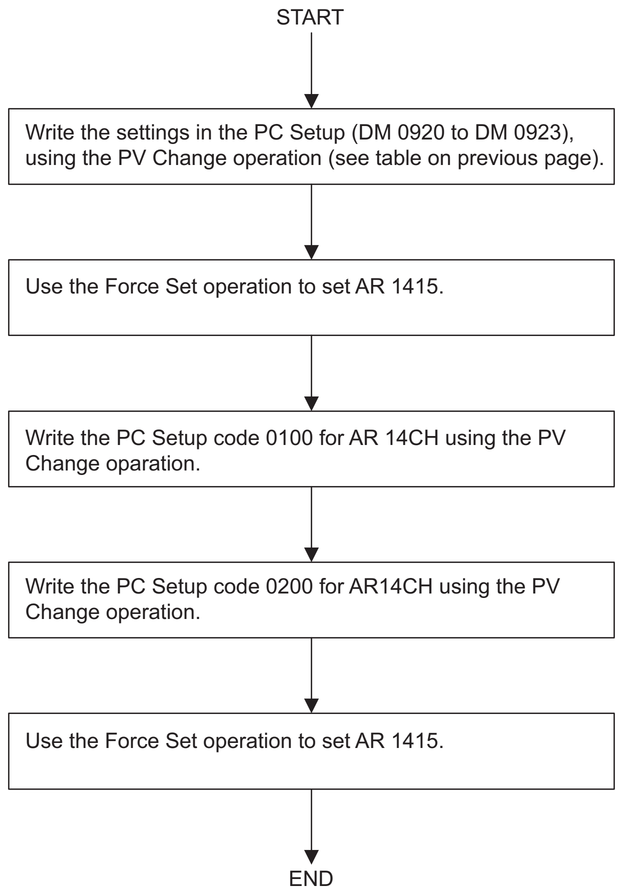
* 1. RS-232C frame format settings

(Valid when bits 00 to 07 of DM 0920 or DM 1920 are set to 01)

Value	Start Bits	Data Length	Stop Bits	Parity
00	1 bit	7 bits	2 bits	Even
01		7 bits	2 bits	Odd
02		8 bits	1 bit	None
03		8 bits	2 bits	None
04		8 bits	1 bit	Even
05		8 bits	1 bit	Odd

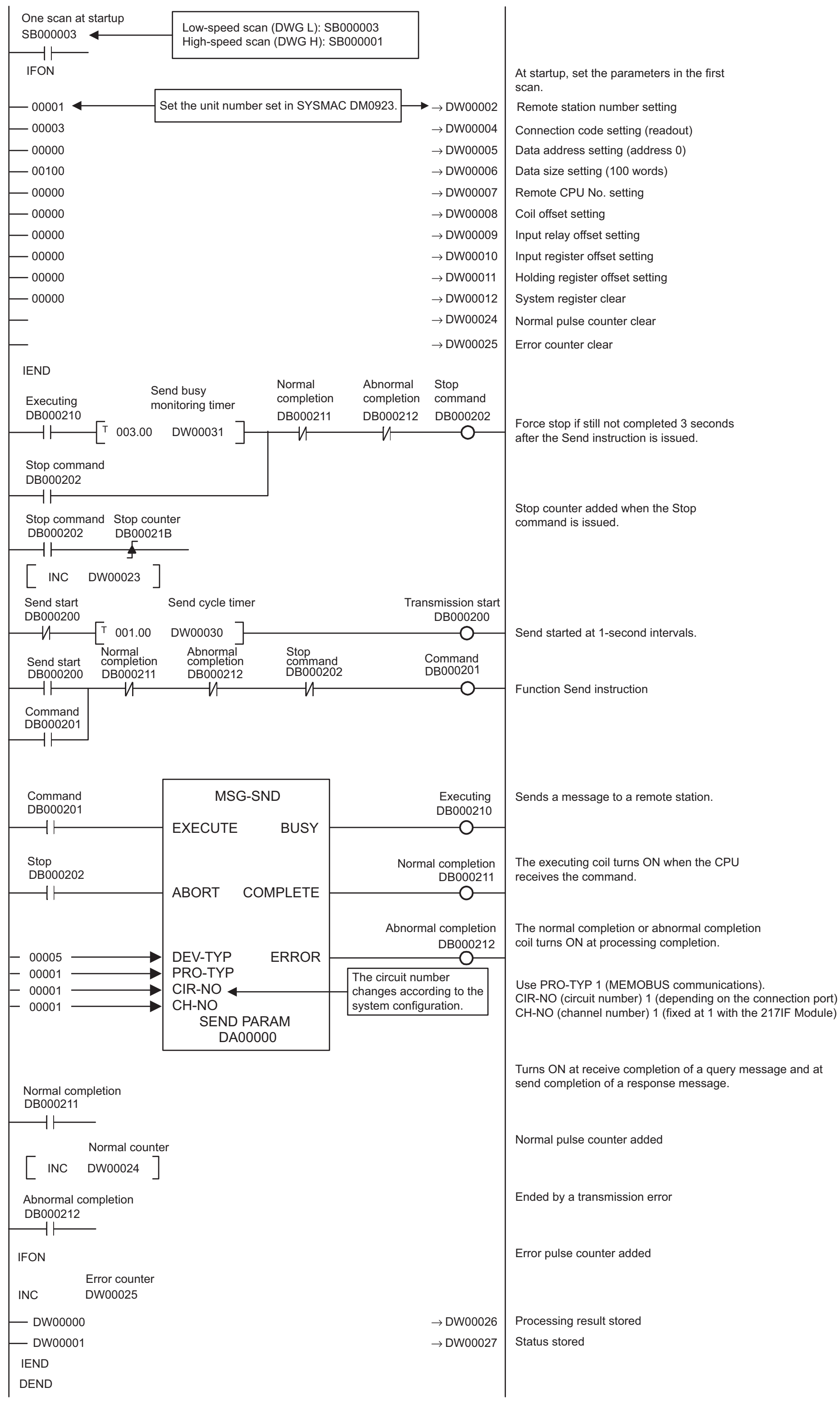
* 2. Because the default is 0, change the setting to a value other than 0 (such as 01) when connecting the 217IF Module.

■ System Settings and Registration Flow



8.2.5 MSG-SND Function

The following diagram shows an OMRON Master MSG-SND ladder logic program for the MP920 and CP-217.



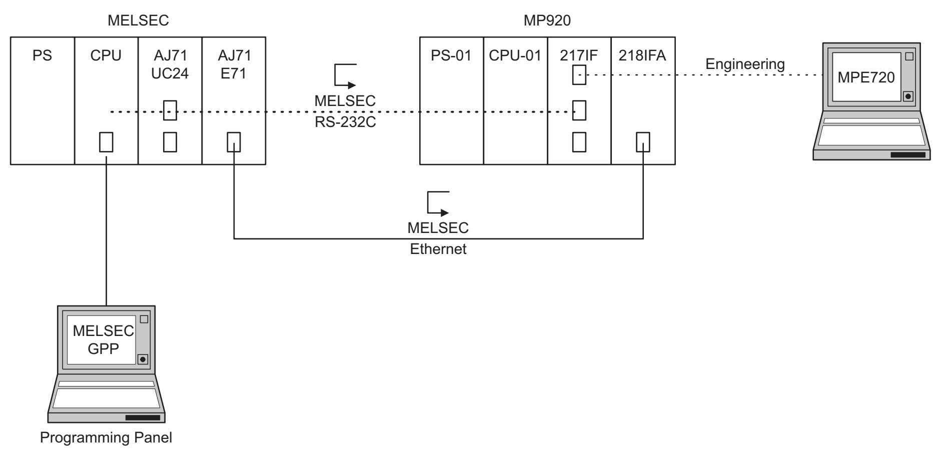
8.3 Connection with MELSEC

This section explains master communications with MELSEC Controller.

8.3.1 System Configuration

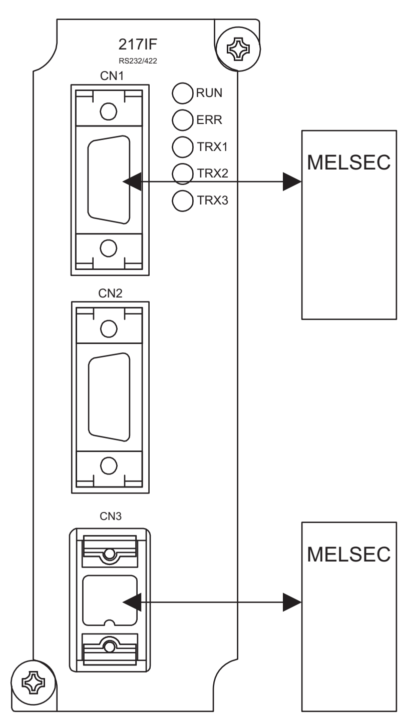
MELSEC data is referenced from the MP920 by connecting the RS-232C port and the Ethernet port of the MELSEC Controller (manufactured by Mitsubishi Electric Corporation) to the MP920 217IF (CN2) and 218IFA respectively.

The engineering environment is provided by connecting the MPE720 Programming Device to the RS-232C port (CN1) of the 217IF.



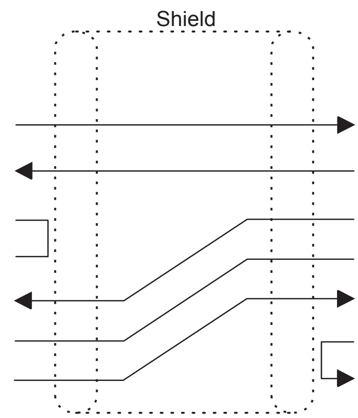
8.3.2 Cable Specifications

■ Connection Cables for MELSEC Controller



CN1 Cables

217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	9

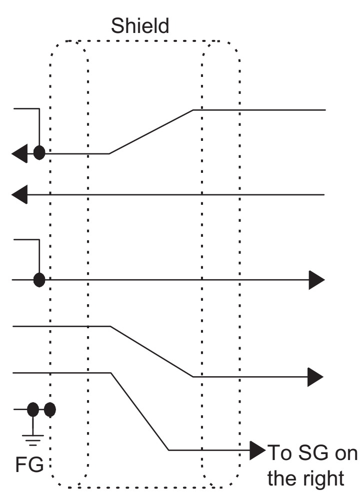


MELSEC Controller	
D-sub 9-pin	
Pin No.	Signal Name
1	CD
2	RD
3	SD
4	DTR
5	SG
6	DSR
7	RS
8	CS

Note: Mitsubishi Electric Controller model: A1SJ71C24

CN3 Cables

217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3



Screw Terminal Block *	
Signal Name	
Left	Right
SD A	SG
SD B	FG
RD A	N.C.
RD B	

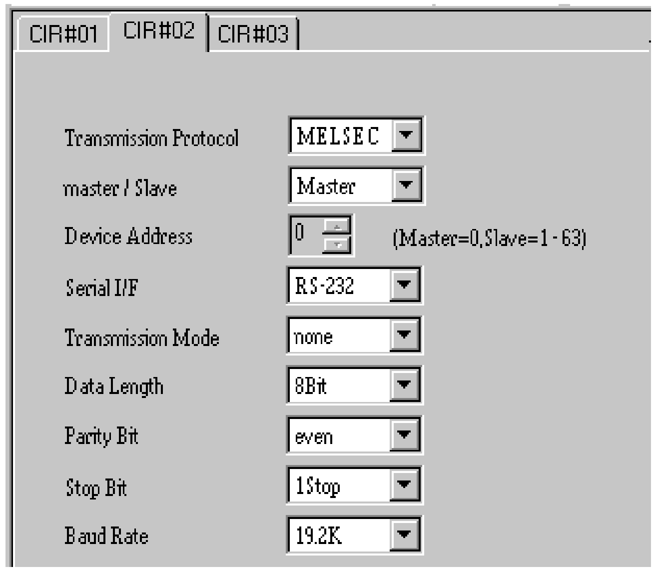
* For the AJ71UC24, switch SW24, which is used to connect the terminating resistance, must be set to ON (MELSEC).

Note: 1. Mitsubishi Electric Controller models:
A1SJ71C24
AJ71UC24
A171QC24
A1SJ71UC24-R4: R2 cannot be connected.
(This is because the RS-232C 1: 1 connection address is fixed at "0".)
2. Connect the cable so that the terminating resistance for the 217IF Module is connected.

INFO Refer to *8.1.2 Cable Specifications* for the MPE720 Programming Device connections.

8.3.3 217IF Transmission Settings

The following figure shows the 217IF Transmission settings.



8.3.4 MELSEC Settings (AJ71UC24 Example)

■ Buffer Memory Settings

Change the two settings shown in the following table.
The buffer memory is not backed up. It should therefore be set in the user program.

Address	Name	Default Value	→	Changed Value (Recommended Value)
10BH	RS-232C CD terminal check setting area	0 (Check)	→	1 (No check)
11AH	Transmission control specification area	0 (DTR control)	→	1 (No DTR control)

Note: 1. Leave the other addresses at their default setting.
2. The above addresses are used when the buffer memory is installed in slot 1. These addresses change when other slots are used.

8

■ Switch Settings

Station Number Setting Switches

Set 01 to 31, but not 0. (Recommended value: 01)

Switch Name	Setting	Set Value (Recommended Value)
× 10 (rotary switches 0 to 9)	The second digit for station number	0
× 1 (rotary switches 0 to 9)	The first digit for station number	1

Communications Specification Setting Switches (For AJ71UC24 Modules)

Switch Name	Setting Item	Setting Contents		Set Value
		ON	OFF	
SW11	Main channel setting	RS-422	RS-232C	OFF
SW12	Data bit setting	8 bits	7 bits	ON
SW13	Transmission Speed setting	See the following table. *1		OFF
SW14				ON
SW15				ON
SW16	Parity bit setting	Yes	No	ON
SW17	Even parity Odd parity	Even	Odd	ON
SW18	Stop bit setting	2 bits	1 bit	OFF
SW21	Checksum setting	Yes	No	ON
SW22	Write enable/disable setting during RUN	Enabled	Disabled	ON
SW23	Computer link Multi-drop	Computer link	Multi-drop link	ON *2
SW24	Not used.	-	-	OFF *3

Note: The shaded parts show setting examples.

* 1. The following table shows the settings of switches 13, 14 and 15.

bps	300	600	1,200	2,400	4,800	9,600	19,200
SW13	OFF	ON	OFF	ON	OFF	ON	OFF
SW14	OFF	OFF	ON	ON	OFF	OFF	ON
SW15	OFF	OFF	OFF	OFF	ON	ON	ON

* 2. With the AJ71C24-S8, the terminating resistance ON/OFF setting on the transmission side depends on the wiring.
* 3. With the AJ71C24-S8, the terminating resistance ON/OFF setting on the reception side depends on the wiring.

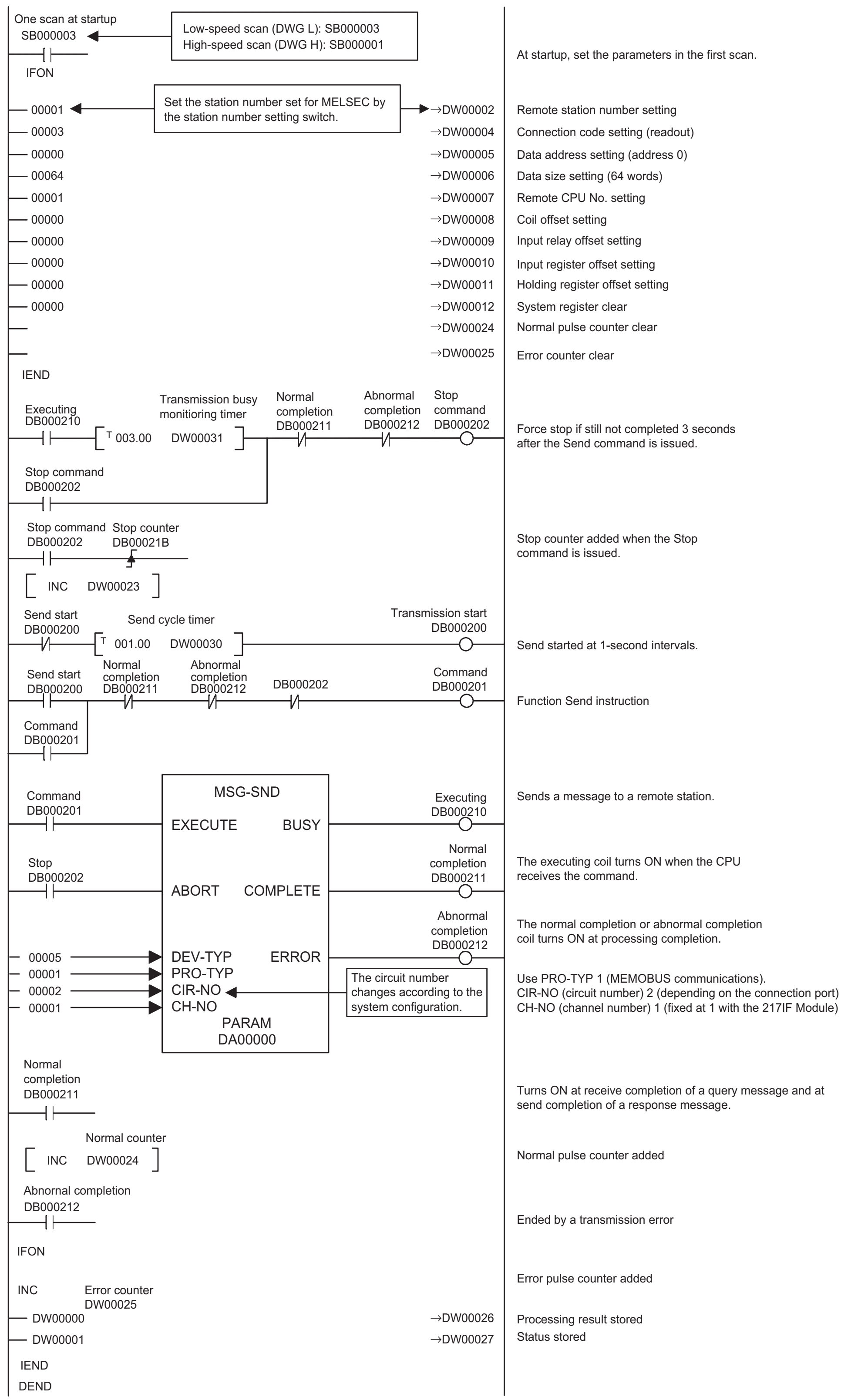
Mode Setting Switches

Switch Name	Setting Switch No.	Port Operation Mode		Set Value
		RS-232C Port	RS-422/485 Port	
MODE (Rotary Switches 0 to F)	0	Cannot be used.		• With RS-232C connection: 1 • With RS-422/485 connection: 5 If the above settings are used, 1 is set in this example.
	1	Type 1 protocol mode	No-protocol mode	
	2	Type 2 protocol mode	No-protocol mode	
	3	Type 3 protocol mode	No-protocol mode	
	4	Type 4 protocol mode	No-protocol mode	
	5	No-protocol mode	Type 1 protocol mode	
	6	No-protocol mode	Type 2 protocol mode	
	7	No-protocol mode	Type 3 protocol mode	
	8	No-protocol mode	Type 4 protocol mode	
	9	No-protocol mode ⇔	No-protocol mode	
	A	Type 1 protocol mode ⇔	Type 1 protocol mode	
	B	Type 2 protocol mode ⇔	Type 2 protocol mode	
	C	Type 3 protocol mode ⇔	Type 3 protocol mode	
	D	Type 4 protocol mode ⇔	Type 4 protocol mode	
	E	Cannot be used.		
	F	For unit test		

8

8.3.5 MSG-SND Function

The following diagram shows a MELSEC Master MSG-SND ladder logic program for the 217IF Module of the MP920.



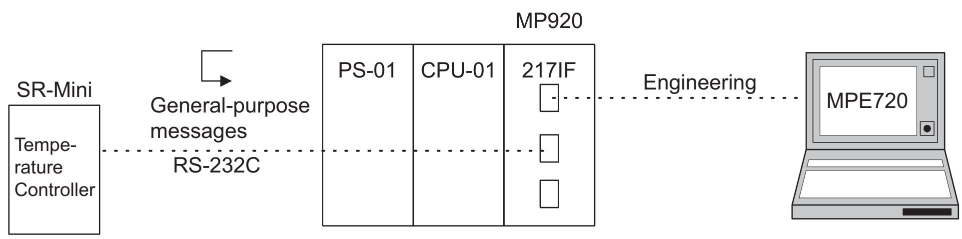
8.4 Connection to a Temperature Controller

This section explains no-protocol communications with a Temperature Controller.

8.4.1 System Configuration

Temperature data is read by connecting a Temperature Controller (SR-Mini) manufactured by RKC INSTRUMENT INC. to the RS-232C (Port 2) of the 217IF Module.

The engineering environment is provided by connecting the MPE720 Programming Device to the 217IF (CN1).



No-protocol Communications Between the MP920 217IF and a Temperature Controller Manufactured by RKC INSTRUMENT INC.

With this protocol, the SR-Mini temperature input values from CH0 to CH3 are stored in MW07030 and later registers.

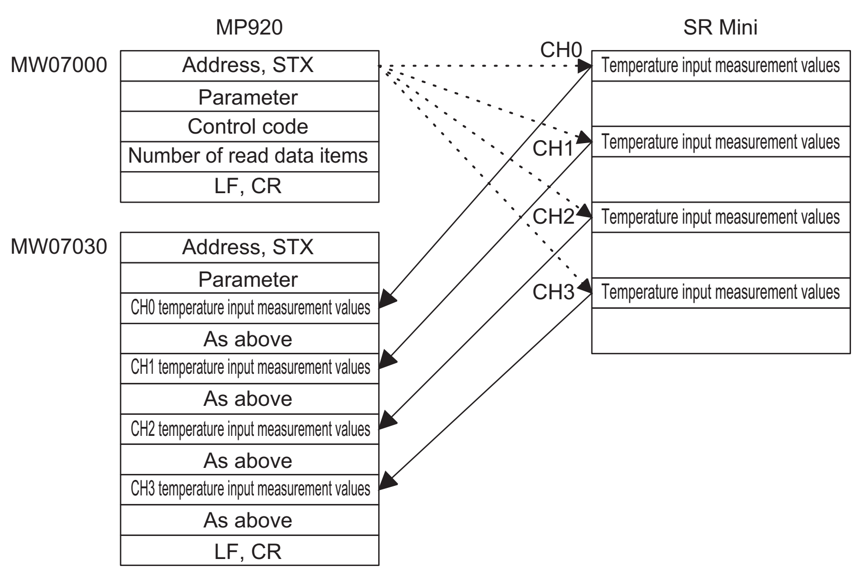
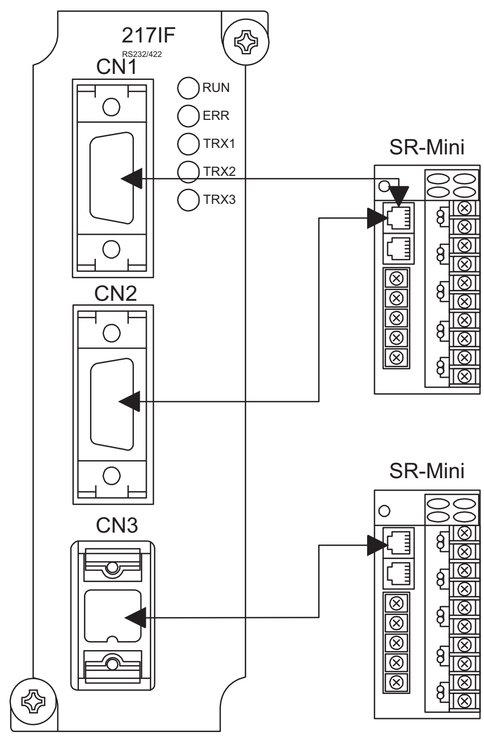


Fig. 8.1 Data Flow when a Sample Program is Used

8.4.2 Cable Specifications

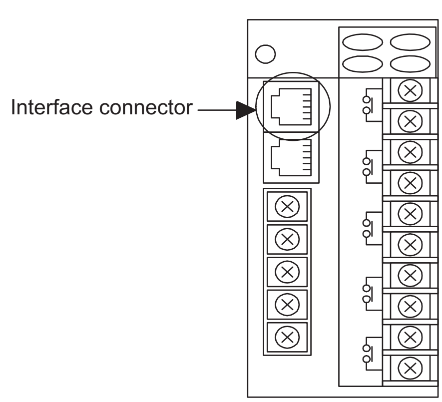
■ Connection Cables for SR-Mini Temperature Controller



■ SR-Mini PCP Module

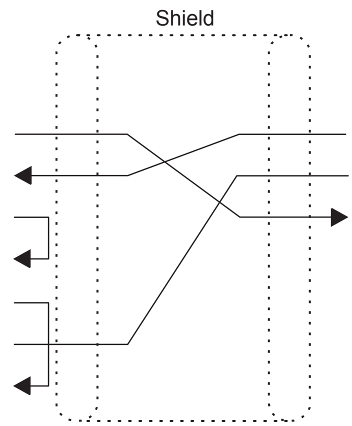
The three interfaces listed below are supported. Specify the desired one when ordering.

- RS-232C
- RS-422A
- RS-485



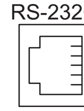
CN1 and CN2 Cables

217IF	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	9



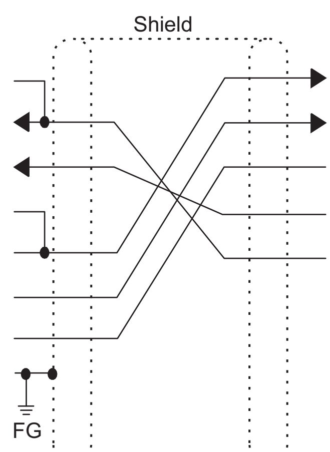
SR-Mini	
Modular (6-pin)	
Pin No.	Signal Name
1	N.C.
2	SD
3	SG
4	RD
5	N.C.
6	FG

RS-232C



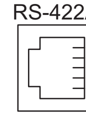
CN3 Cables

217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3



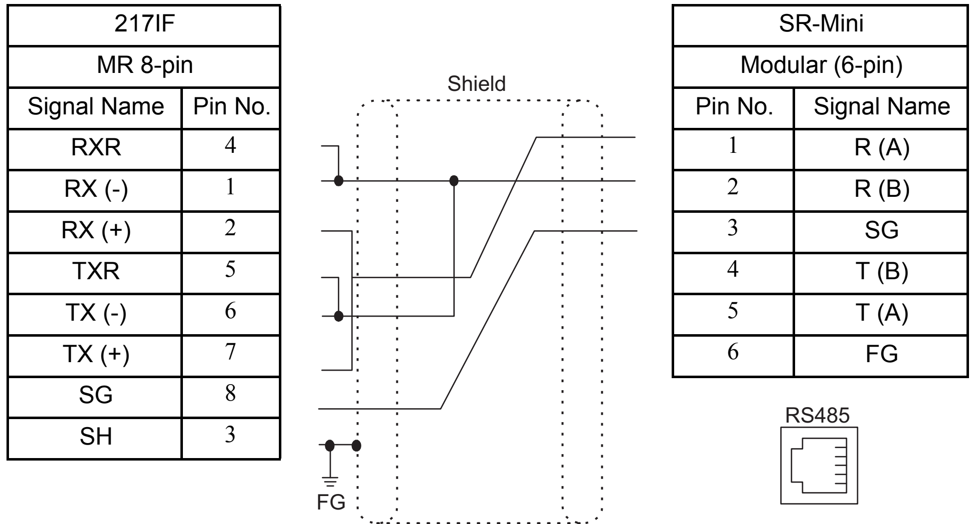
SR-Mini	
Modular (6-pin)	
Pin No.	Signal Name
1	R (A)
2	R (B)
3	SG
4	T (B)
5	T (A)
6	FG

RS-422A



8

Note: Connect the cable so that the terminating resistance for the 217IF is connected.



217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3

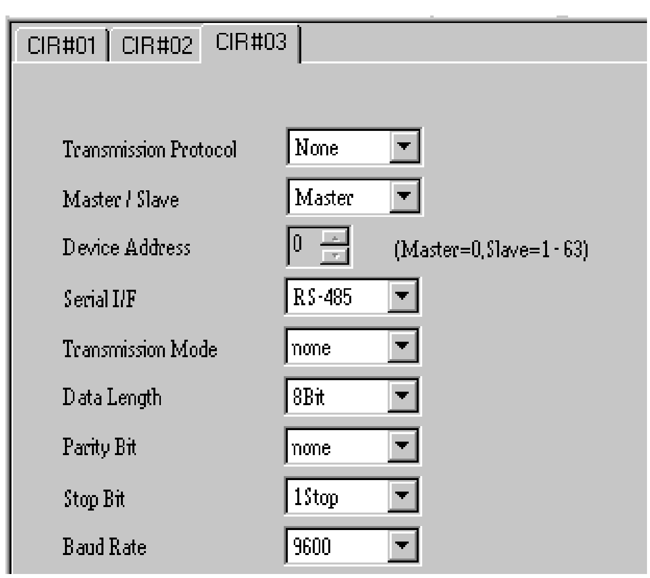
SR-Mini	
Modular (6-pin)	
Pin No.	Signal Name
1	R (A)
2	R (B)
3	SG
4	T (B)
5	T (A)
6	FG

Note: Connect the cable so that the terminating resistance for the 217IF is connected.

INFO Refer to *8.1.2 Cable Specifications* for the MPE720 Programming Device connections.

8.4.3 217IF Transmission Settings

The following figure shows the 217IF Transmission settings.



8.4.4 Temperature Controller Settings

The following table shows the switch settings for the SR-Mini Temperature Controller.

Bit 1	OFF	Always OFF
Bit 2	OFF	Always OFF
Bit 3	ON	Set according to the transmission speed
Bit 4	ON	Set according to the transmission speed

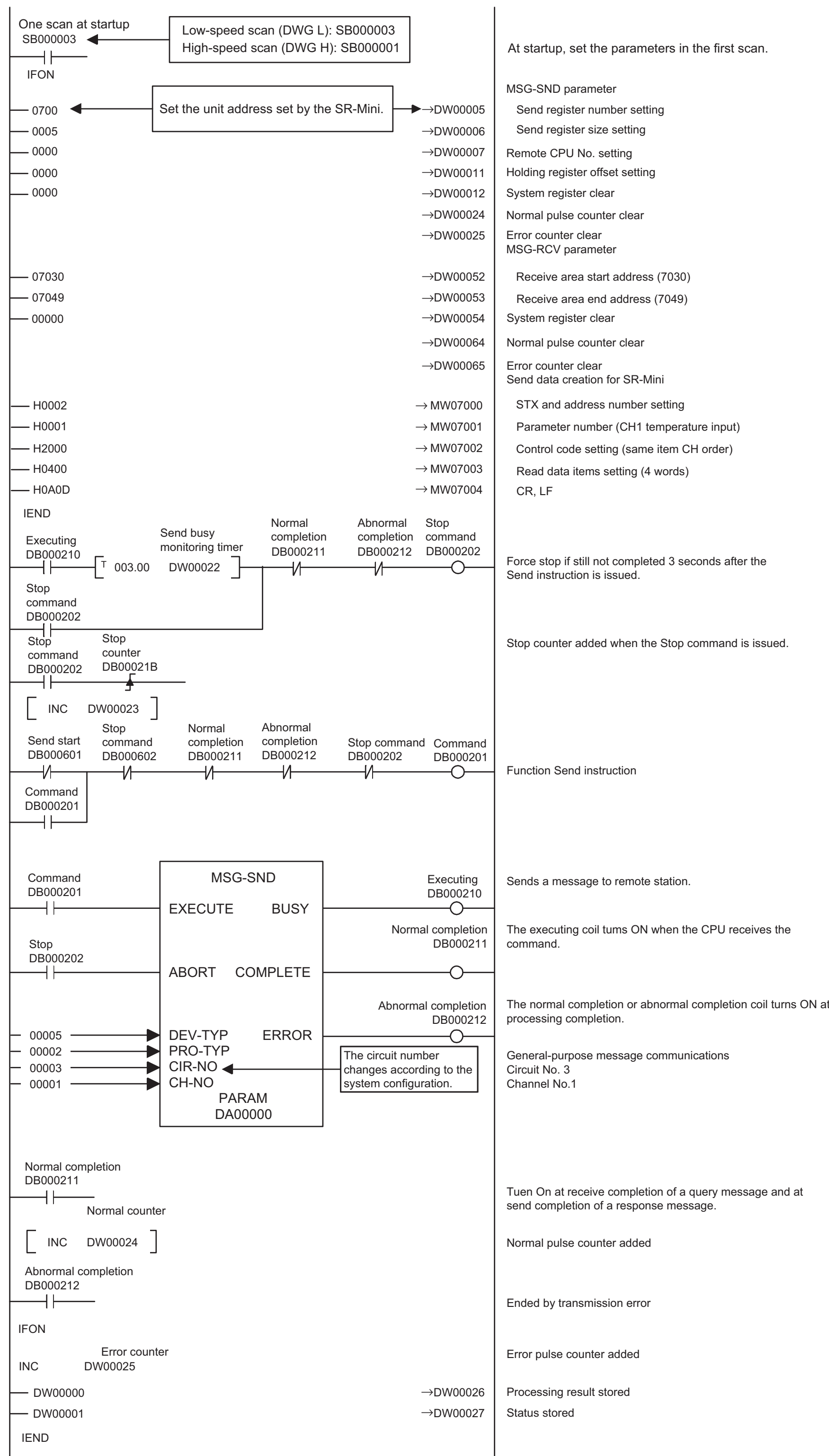
Bit 3	Bit 4	Transmission Speed
OFF	OFF	2,400 bps
OFF	ON	4,800 bps
ON	OFF	9,600 bps (factory default setting)
ON	ON	19,200 bps

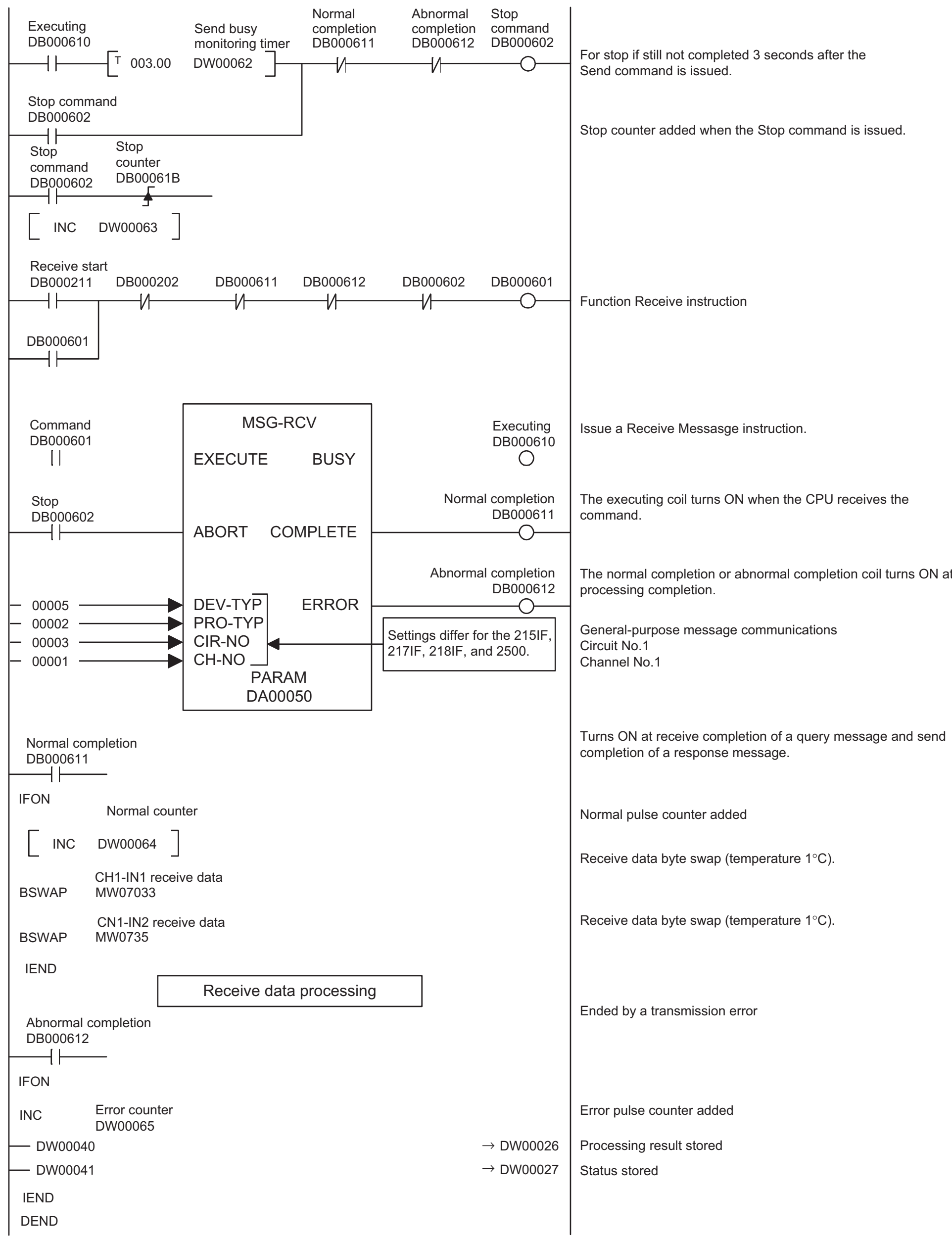
8

8.4.5 MSG-SND and MSG-RCV Functions

The following diagrams show the no-protocol MSG-SND and MSG-RCV ladder logic programs for a Temperature Controller and the 217IF Module.

■ MSG-SND and MSG-RCV




Executing
DB000610
T 003.00
Send busy
monitoring timer
DW00062
Normal
completion
DB000611
Abnormal
completion
DB000612
Stop
command
DB000602
For stop if still not completed 3 seconds after the Send command is issued.
Stop command
DB000602
Stop counter added when the Stop command is issued.
Stop
command
DB000602
Stop
counter
DB00061B
INC DW00063
Receive start
DB000211
DB000202
DB000611
DB000612
DB000602
DB000601
Function Receive instruction
DB000601
MSG-RCV
Command
DB000601
EXECUTE
BUSY
Executing
DB000610
Issue a Receive Messasge instruction.
Stop
DB000602
ABORT
COMPLETE
Normal completion
DB000611
The executing coil turns ON when the CPU receives the command.
Abnormal completion
DB000612
The normal completion or abnormal completion coil turns ON at processing completion.
00005
00002
00003
00001
DEV-TYP
PRO-TYP
CIR-NO
CH-NO
ERROR
PARAM
DA00050
Settings differ for the 215IF, 217IF, 218IF, and 2500.
General-purpose message communications
Circuit No.1
Channel No.1
Normal completion
DB000611
Turns ON at receive completion of a query message and send completion of a response message.
IFON
Normal counter
INC DW00064
Normal pulse counter added
BSWAP
CH1-IN1 receive data
MW07033
Receive data byte swap (temperature 1°C).
BSWAP
CN1-IN2 receive data
MW0735
Receive data byte swap (temperature 1°C).
IEND
Receive data processing
Abnormal completion
DB000612
Ended by a transmission error
IFON
INC
Error counter
DW00065
Error pulse counter added
DW00040
→ DW00026
Processing result stored
DW00041
→ DW00027
Status stored
IEND
DEND

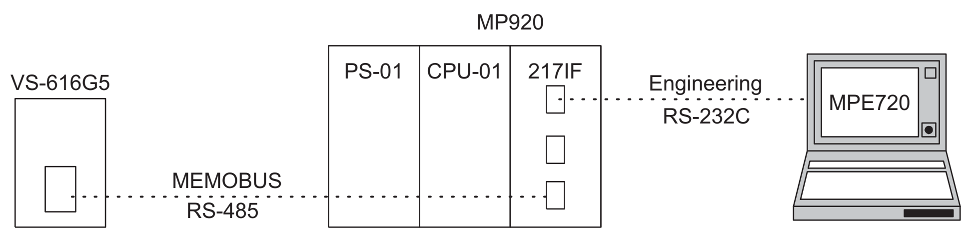
8.5 Connection to an Inverter

This section explains master communications with an inverter via RS-485 MEMOBUS.

8.5.1 System Configuration

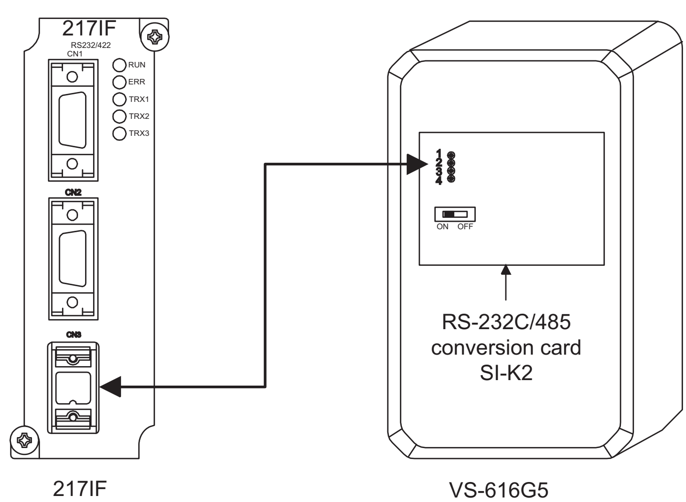
Connect the inverter (VS-616G5) to the RS-485 port of the 217IF Module to control the Inverter. This enables 1:N communications, thereby enabling multi-drop connections and control of multiple Inverters.

The engineering environment is provided by connecting the MPE720 Programming Device to the RS-232C port of the 217IF.



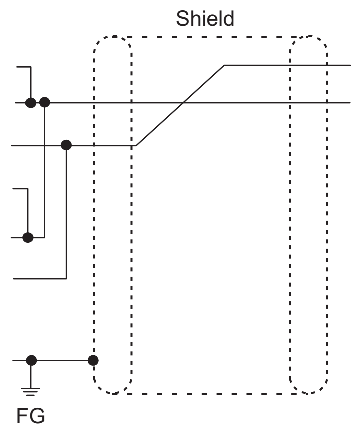
8.5.2 Cable Specifications

■ RS-485 Connection Cable for Inverter VS-616G5



CN3 Cables

217IF	
MR 8-pin	
Signal Name	Pin No.
RXR	4
RX (-)	1
RX (+)	2
TXR	5
TX (-)	6
TX (+)	7
SG	8
SH	3

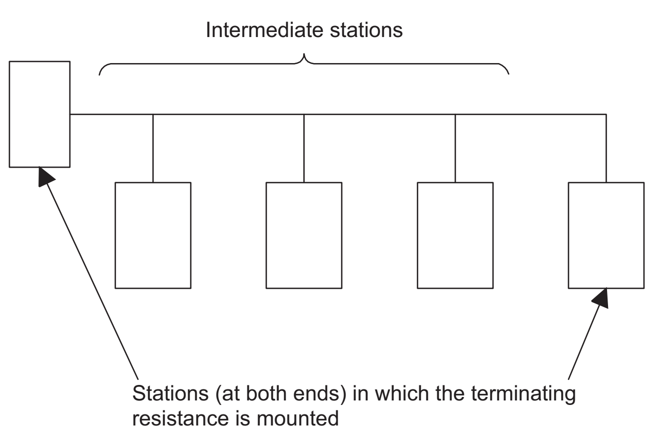


VS-616G5	
Screw Terminal	
Pin No.	Signal Name
1	SRD (+)
2	SRD (-)
3	SRD (+)
4	SRD (-)

Note: 1. Connect the cable so that the terminating resistance for the 217IF is connected.
2. Set the switch on the board to ON. For the RS-485 intermediate stations, set the switch on the board to OFF. (VS-616G5)

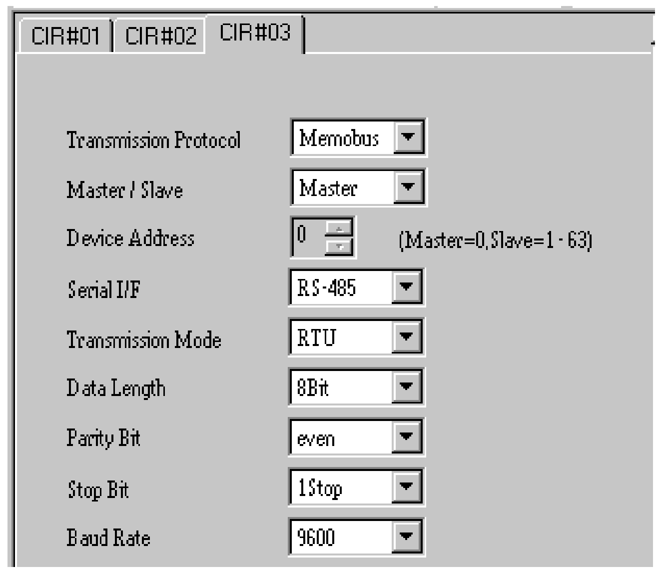
INFO

1. Refer to *8.1.2 Cable Specifications* for the MPE720 Programming Device connections.
2. If the terminating resistance cannot be inserted in the Module, mount 120 Ω terminating resistance at the end of the transmission line outside the Module. Insert the terminating resistance in the stations at both ends of the transmission path. Do not insert it in the intermediate stations.



8.5.3 217IF Transmission Settings

The following figure shows the 217IF Transmission settings.



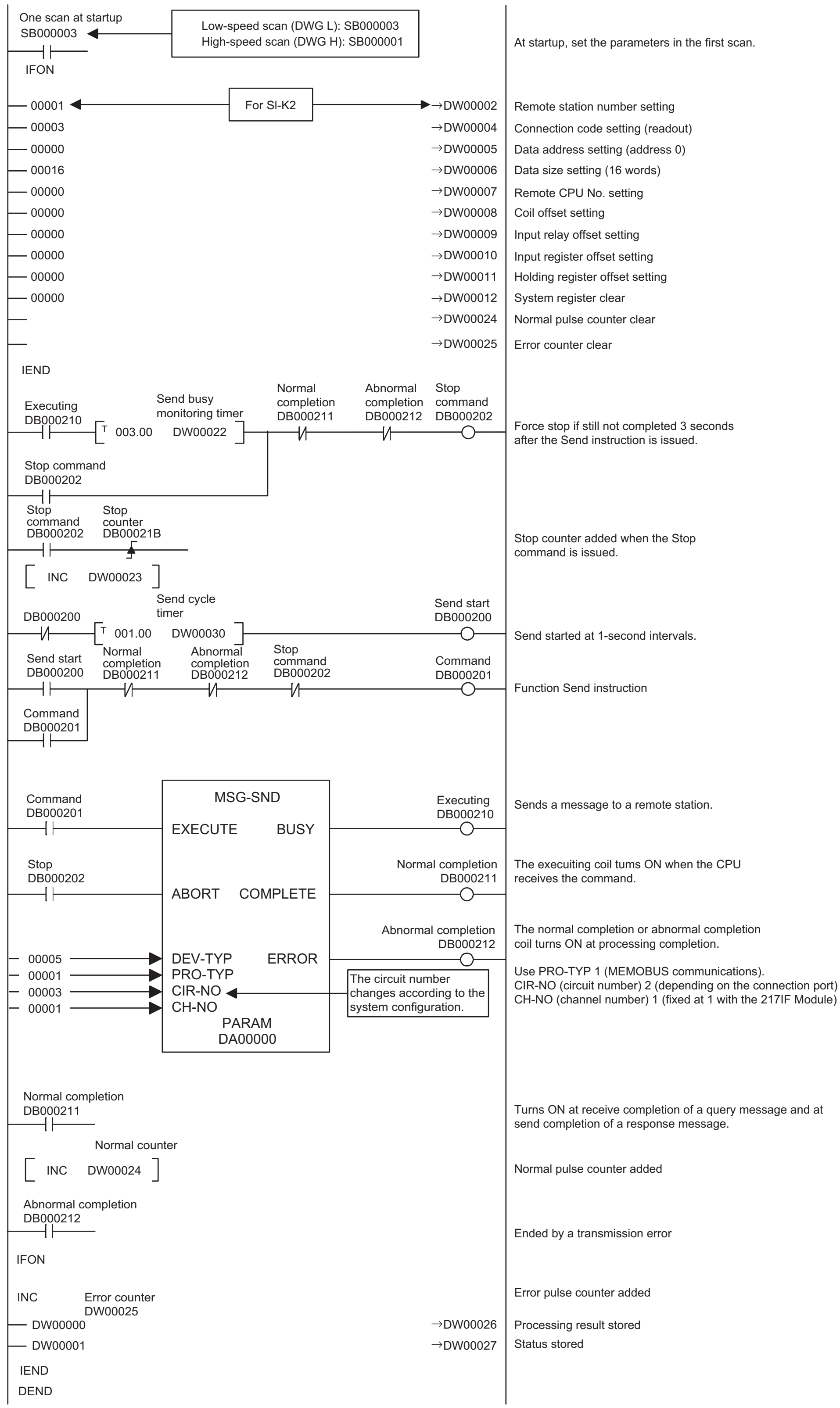
8.5.4 Inverter Constants Settings

The VS-616G5 constant settings are shown below.

- Transmission address: H5-01 ← 1
- Transmission speed: H5-02 ← 9,600 bps
- Transmission parity: H5-03 ← Even parity

8.5.5 MSG-SND Function

The following diagram shows a MEMOBUS Master MSG-SND ladder logic program for the MP920 and CP-217.



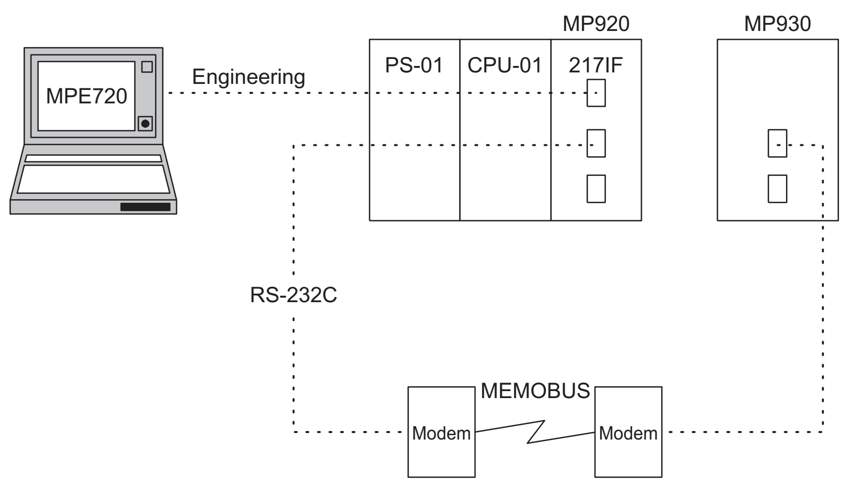
8.6 Modem-to-Modem Connection

This section explains MEMOBUS Master/Slave communications with two modems.

8.6.1 System Configuration

The standard serial port (Port 1) of an MP930 located a distance away from the 217IF Module is configured as a modem-to-modem system.

The engineering environment is provided by connecting the MPE720 Programming Device to the CN1 port of the 217IF.



8.6.2 Cable Specifications

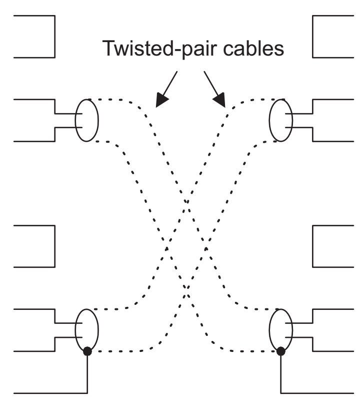
■ 217IF Module ↔ Modem
MP930 ↔ Modem Connection Cables

217IF Module	
D-sub 9-pin	
Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
N.C.	8
DTR	9

Modem	
D-sub 9-pin	
Pin No.	Signal Name
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
8	N.C.
9	DTR

■ Modem ↔ Modem Connection Cables

Modem	
External Connection Terminal	
Signal Name	Pin No.
•	•
•	•
•	•
•	•
TERM1	5
TERM1	6
SEND1	7
SEND2	8
SHIELD	9
TERM2	10
TERM2	11
RECV1	12
RECV2	13
SHIELD	14
•	•
•	•
•	•
•	•



Modem	
External Connection Terminal	
Pin No.	Signal Name
•	•
•	•
•	•
•	•
5	TERM1
6	TERM1
7	SEND1
8	SEND2
9	
10	TERM2
11	TERM2
12	RECV1
13	RECV2
14	SHIELD
•	•
•	•
•	•
•	•

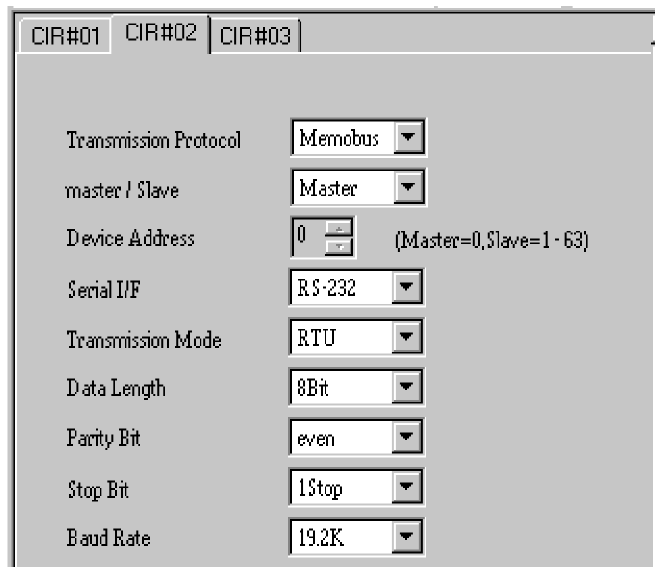
INFO

Refer to *8.1.2 Cable Specifications* for the MPE720 Programming Device connections.

8.6.3 217IF Transmission Master Settings

The following figure shows the 217IF Transmission Master settings.

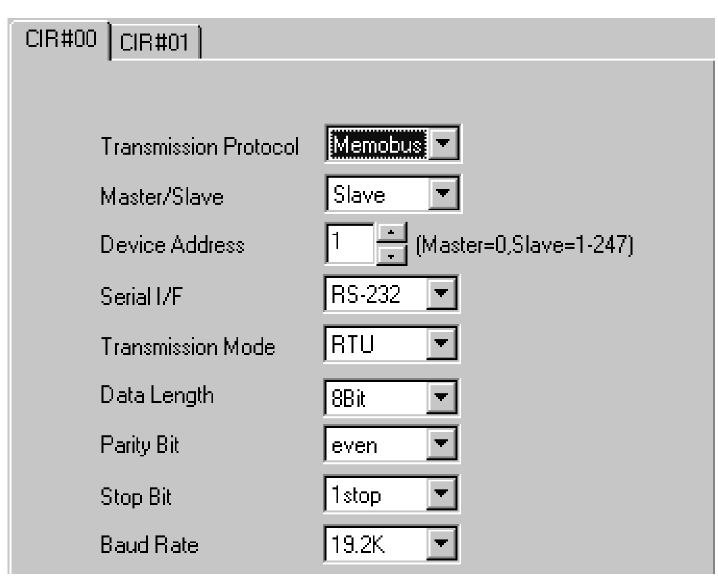
■ CIR#02



8.6.4 MP930 Slave Settings

The following figure shows the Slave settings for the MP930 standard serial port (Port 1).

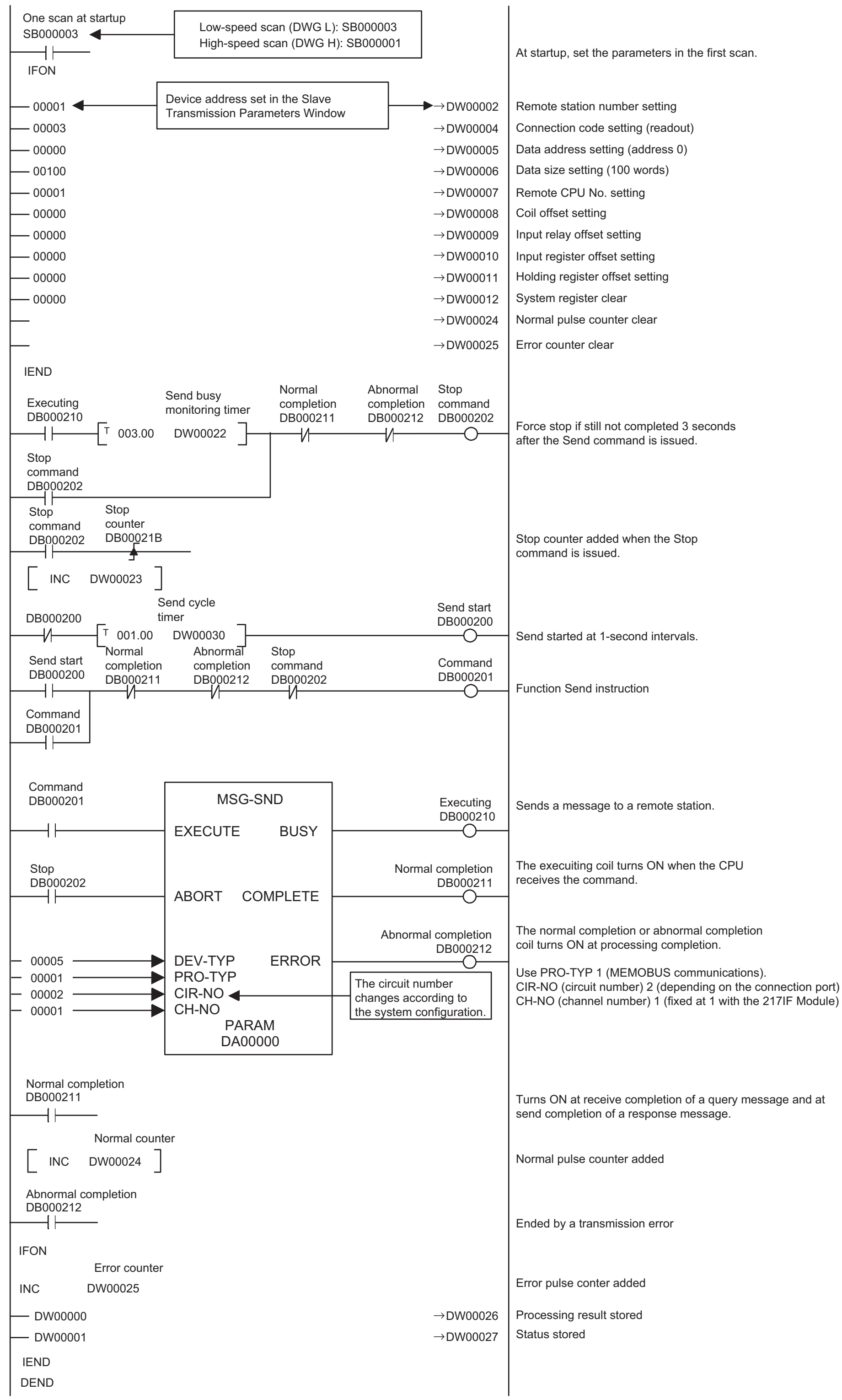
■ CIR#00



8.6.5 MSG-SND and MSG-RCV Functions (MEMOBUS Master)

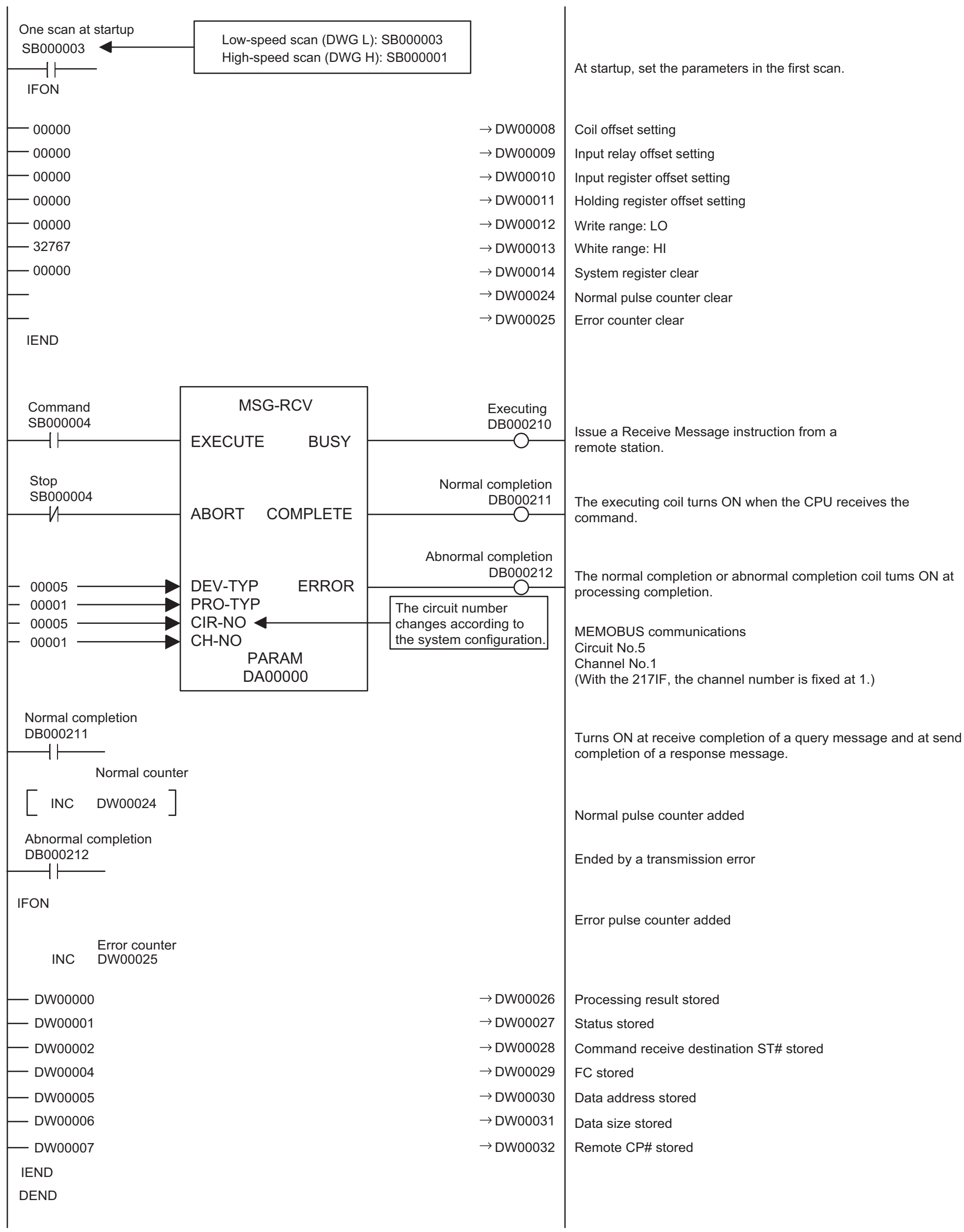
■ MSG-SND Function (MEMOBUS Master)

The following diagram shows a MEMOBUS Master MSG-SND ladder logic program for the 217IF Module of the MP920.



■ MSG-RCV Function (MEMOBUS Slave)

The following diagram shows a MEMOBUS Slave MSG-RCV ladder logic program for the 217IF Module of the MP920.



Appendix A

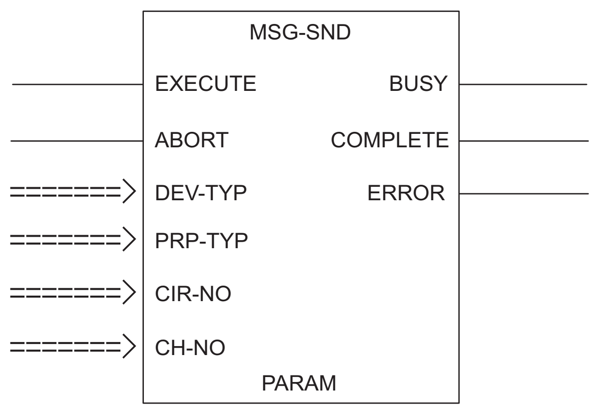
A

System Functions

This appendix describes how to use the SEND MESSAGE (MSG-SND) and RECEIVE MESSAGE (MSG-RCV) functions used in communications programs.

A.1 SEND MESSAGE Function (MSG-SND)

A.1.1 Basic Specifications

Function Name	MSG-SND
Function	Sends a message to the remote station on the line specified by the COMMUNICATIONS DEVICE TYPE command (DEV-TYP). Supports multiple protocols. The EXECUTION command (EXECUTE) must be held ON until COMPLETE or ERROR turns ON. Communications devices: 215IF, 217IF, 218IF, serial, SVB-01 Protocols: MEMOBUS, no-protocol
Function Definition	

I/O Definitions	No.	Name	I/O Designation	Description
Inputs	1	EXECUTE	B-VAL	SEND MESSAGE command
	2	ABORT	B-VAL	SEND MESSAGE ABORT command
	3	DEV-TYP	I-REG	Communications device type 215IF = 1, 217IF = 5, 218IF = 6, Serial = 8, SVB-01 = 11
	4	PRO-TYP	I-REG	Communications protocol MEMOBUS = 1* No-protocol 1 = 2 No-protocol 2 = 3
	5	CIR-NO	I-REG	Line number 215IF = 1 to 8, 217IF = 1 to 24 218IF = 1 to 8, Serial = 1 to 2
	6	CH-NO	I-REG	Transmission buffer channel number 215IF = 1 to 13, 217IF = 1 218IF = 1 to 10, Serial = 1
	7	PARAM	Address input	Leading address of setting data (MW, DW, #W)
Outputs	1	BUSY	B-VAL	Message is being sent.
	2	COMPLETE	B-VAL	Message transmission has been completed.
	3	ERROR	B-VAL	Error has occurred.

* Set the communications protocol (PRO-TYP) to MEMOBUS (=1) if transmission is to be performed using the MELSEC or OMRON protocol. Protocol is converted by the communications device (217IF or 218IF).

A

A.1.2 Parameter List (PARAM)

PARAM is one of the inputs and has a parameter list structure consisting of 17 words. The value in PARAM is the leading address of MW, DW, or #W registers.

The parameters are shown below. No setting is required for the parameters that are blank in the “No-protocol” column.

PARAM No.	IN/ OUT	Contents		Remarks
		MEMOBUS	No-protocol	
00*	OUT	Processing result	Processing result	
01	OUT	Status	Status	
02	IN	Remote station number	Remote station number	Connection number when DEV-TYP is set to CP-218.
03	SYS	Reserved by system.	Reserved by system.	
04	IN	Function code		
05	IN	Data address	Data address	
06	IN	Data size	Data size	
07	IN	Remote CPU number	Remote CPU number	
08	IN	Coil offset		
09	IN	Input relay offset		
10	IN	Input register offset		
11	IN	Holding register offset	Register offset	
12	SYS	For system use	For system use	
13	SYS	Reserved by system.	Reserved by system.	
14	SYS	Reserved by system.	Reserved by system.	
15	SYS	Reserved by system.	Reserved by system.	
16	SYS	Reserved by system.	Reserved by system.	

* PARAM00 is the leading address.

A.1.3 Parameter Details

■ Processing Result (PARAM00)

The processing result is output to the higher-place byte of PARAM00. The lower-place byte is for system analysis.

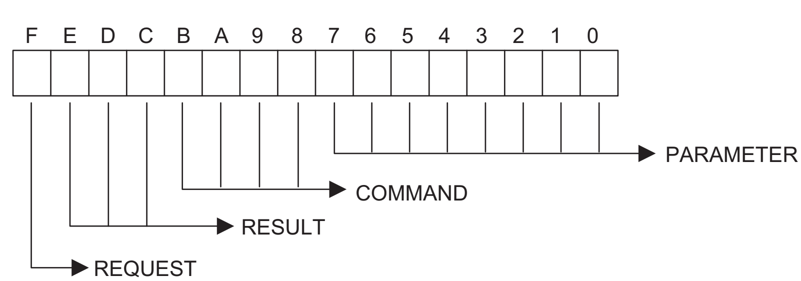
- 00□□: Processing in progress (BUSY)
- 10□□: Processing completed (COMPLETE)
- 8□□□: Error occurred (ERROR)

Error Code	Error	Details
81□□	Function code error	An attempt was made to send an undefined function code, or an undefined function code was received.
82□□	Address setting error	The data address, coil offset, input relay offset, input register offset, or holding register offset setting is outside the allowable range.
83□□	Data size error	The size of the sent or received data is outside the allowable range.
84□□	Line number setting error	The line number setting is outside the allowable range.
85□□	Channel number setting error	The channel number setting is outside the allowable range.
86□□	Station address error	The station number setting is outside the allowable range.
88□□	Communications unit error	An error response was returned from the communications unit. See ■ *Status (PARAM01)* below.
89□□	Device selection error	An unavailable device was selected.

■ Status (PARAM01)

PARAM01 contains the status of the communications unit.

1. Bit Assignments



2. COMMAND

Code	Symbol	Meaning
1	U_SEND	General-purpose message sent.
2	U_REC	General-purpose message received.
3	ABORT	Aborted.
8	M_SEND	MEMOBUS command sent: Processing completed upon receiving response.
9	M_REC	MEMOBUS command received: Followed by the sending response.
C	MR_SEND	MEMOBUS response sent.

3. RESULT

Code	Symbol	Meaning
1	SEND_OK	Send has been completed normally.
2	REC_OK	Receive has been completed normally.
3	ABORT_OK	Abort completed.
4	FMT_NG	Parameter format error
5	SEQ_NG, or INIT_NG	Command sequence error: The token has not been received yet. The communications system has not been connected.
6	RESET_NG, or O_RING_NG	Reset state: Out-of-ring. The token was not be received even after the token monitor time had elapsed.
7	REC_NG	Data receive error (error detected by a lower-level program)

4. PARAMETER

PARAMETER indicates one of the error codes shown in *Table A.1*. when RESULT is set to 4 (FMT_NG). Otherwise, it indicates the address of the remote station.

Table A.1 Error Codes

Code	Error
00	No errors.
01	Station address outside the allowable range.
02	MEMOBUS response receiving time error
03	Retry count setting error
04	Cyclic area setting error
05	Message signal CPU number error
06	Message signal register number error
07	Message signal word count error

5. REQUEST

1 = Request

0 = Acceptance completion report

■ Remote Station Number (PARAM02)

Remote Device	Remote Station Number	Meaning
CP-215	1 to 64	Message is sent to the designated station.
	00FFH	Message is sent to all stations (broadcasting).
CP-216 (MECHA-TROLINK)	1 to 30	Message is sent to the designated station. (Message can be sent only from the master station.)
	80H	Message is sent to the master station. (Message can be sent only from salve stations.)
CP-217 (Serial)	1 to 254	Message is sent to the station with the specified device address.
	0100H	“0100H” must be specified if the device address of the remote station is 0.
CP-218	1 to 20	Message is sent to the station with the specified connection number.

■ Function Code (PARAM04)

Set the MEMOBUS function code to be sent.

Function Code	Meaning	215IF, 218IF, MECHA-TROLINK*	217IF, Serial*
00H	Not used.	No	No
01H	Coil status read	Yes	Yes
02H	Input relay status read	Yes	Yes
03H	Holding register read	Yes	Yes
04H	Input register read	Yes	Yes
05H	Single coil status change	Yes	Yes
06H	Single holding register write	Yes	Yes
07H	Not used.	No	No
08H	Loopback test	Yes	Yes
09H	Holding register read (extended)	Yes	No
0AH	Input register read (extended)	Yes	No
0BH	Holding register write (extended)	Yes	No
0CH	Not used.	No	No
0DH	Discontinuous holding register read (extended)	Yes	No
0EH	Discontinuous holding register write (extended)	Yes	No
0FH	Multiple coil status change	Yes	Yes
10H	Multiple holding register write	Yes	Yes
11H to 20H	Not used.	No	No
21H to 30H	Reserved by system.	No	No
31H	MELSEC fixed buffer communications	218IF only	No
32H	MELSEC random buffer read	218IF only	No

(cont'd)

Function Code	Meaning	215IF, 218IF, MECHA-TROLINK*	217IF, Serial*
33H	MELSEC random buffer write	218IF only	No
34H to 3FH	Reserved by system.	No	No
40H to 4FH	Reserved by system.	No	No
50H or later	Not used.	No	No

* Yes: Can be set, No: Cannot be set

Note: Only MW (MB) registers can be used as sending/receiving registers during master operation.

MB, MW, IB, and IW registers can be used as coils, holding registers, input relays, and input registers during slave operation.

The extended MEMOBUS functions can be used for communications between CP-316, CP-317, CP-916A, and CP-916B via CP-215.

■ Data Address (PARAM05)

The data address setting differs according to the function code as shown below.

Function Code	Function	Data Address Setting Range			
		215IF, 218IF, MECHATROLINK		217IF, Serial	
00H	Not used.	Not valid.			
01H	Coil status read	0 to 65535 (0 to FFFFH)			1
02H	Input relay status read	0 to 65535 (0 to FFFFH)			1
03H	Holding register read	0 to 32767 (0 to 7FFFH)			2
04H	Input register read	0 to 32767 (0 to 7FFFH)			2
05H	Single coil status change	0 to 65535 (0 to FFFFH)			1
06H	Single holding register write	0 to 32767 (0 to 7FFFH)			2
07H	Not used.	Not valid.			
08H	Loopback test	Not valid.			
09H	Holding register read (extended)	0 to 32767 (0 to 7FFFH)	2	Not valid.	
0AH	Input register read (extended)	0 to 32767 (0 to 7FFFH)	2	Not valid.	
0BH	Holding register write (extended)	0 to 32767 (0 to 7FFFH)	2	Not valid.	
0CH	Not used.	Not valid.			
0DH	Discontinuous holding register read (extended)	0 to 32767 (0 to 7FFFH)	3	Not valid.	
0EH	Discontinuous holding register write (extended)	0 to 32767 (0 to 7FFFH)	3	Not valid.	
0FH	Multiple coil status change	0 to 65535 (0 to FFFFH)			1
10H	Multiple holding register write	0 to 32767 (0 to 7FFFH)			2
31H	MELSEC fixed buffer communications	0 to 32767 (0 to 7FFFH)			2
32H	MELSEC random buffer read	0 to 32767 (0 to 7FFFH)			2

(cont'd)

Function Code	Function	Data Address Setting Range		
		215IF, 218IF, MECHATROLINK	217IF, Serial	
33H	MELSEC random buffer write	0 to 32767 (0 to 7FFFH)		2

1. Read/write request for coils or relays: Set the leading bit address of the data.
2. Continuous read/write request for registers: Set the leading word address of the data.
3. Discontinuous read/write request for registers: Set the leading word address of the address table.

The following data address setting range is used for no-protocol transmissions.

F#	Function	Data Address Setting Range
-	-	0 to 32767 (0 to 7FFFH)

■ Data Size (PARAM06)

Set the size (number of bits or words) of the data to be read or written.

The setting range differs according to the function code.

Function Code	Function	Data Address Setting Range		
		215IF, 218IF	217IF, Serial	MECHATROLINK
00H	Not used.	Not valid.		
01H	Coil status read	Bits 1 to 2000 (1 to 07D0H)		
02H	Input relay status read	Bits 1 to 2000 (1 to 07D0H)		
03H	Holding register read	Words 1 to 125 (1 to 007DH)		
04H	Input register read	Words 1 to 125 (1 to 007DH)		
05H	Single coil status change	Not valid.		
06H	Single holding register write	Not valid.		
07H	Not used.	Not valid.		
08H	Loopback test	Not valid.		
09H	Holding register read (extended)	Words 1 to 508 (1 to 1FCH)	Not valid.	Words 1 to 252 (1 to 00FCH)
0AH	Input register read (extended)	Words 1 to 508 (1 to 1FCH)	Not valid.	Words 1 to 252 (1 to 00FCH)
0BH	Holding register write (extended)	Words 1 to 507 (1 to 1FBH)	Not valid.	Words 1 to 252 (1 to 00FBH)
0CH	Not used.	Not valid.		
0DH	Discontinuous holding register read (extended)	Words 1 to 508 (1 to 1FCH)	Not valid.	Words 1 to 252 (1 to 00FCH)
0EH	Discontinuous holding register write (extended)	Words 1 to 254 (1 to 0FEH)	Not valid.	Words 1 to 126 (1 to 007EH)
0FH	Multiple coil status change	Bits 1 to 800 (1 to 0320H)		
10H	Multiple holding register write	Words 1 to 100 (1 to 0064H)		

(cont'd)

Function Code	Function	Data Address Setting Range		
		215IF, 218IF	217IF, Serial	MECHATROLINK
31H	MELSEC fixed buffer communications	Words 1 to 507 (1 to 1FBH)	Not valid.	Not valid.
32H	MELSEC random buffer read	Words 1 to 508 (1 to 1FCH)	Not valid.	Not valid.
33H	MELSEC random buffer write	Words 1 to 508 (1 to 1FCH)	Not valid.	Not valid.

The following setting range is used for no-protocol transmissions.

	Data Address Setting Range		
	217IF	218IF	215IF
No-protocol 1	Words 1 to 254	Words 1 to 510	Words 1 to 510
No-protocol 2	Bytes 1 to 508	Bytes 1 to 1020	Bytes 1 to 1020

■ Remote CPU Number (PARAM07)

Set the remote CPU number.

When the transmission destination is the CP-317, CP-9200SH, or CP-9200, set 1 or 2. When the destination is the CP-3500H, set 1, 2, 3, or 4. In other cases, set 0.

■ Coil Offset (PARAM08)

Set the offset word address of the coils.

This parameter is valid when the function code is 01H, 05H, or 0FH.

■ Input Relay Offset (PARAM09)

Set the offset word address of the input relays.

This parameter is valid when the function code is 02H.

■ Input Register Offset (PARAM10)

Set the offset word address of the input registers.

This parameter is valid when the function code is 04H or 0AH.

■ Holding Register Offset (PARAM11)

Set the offset word address of the holding registers.

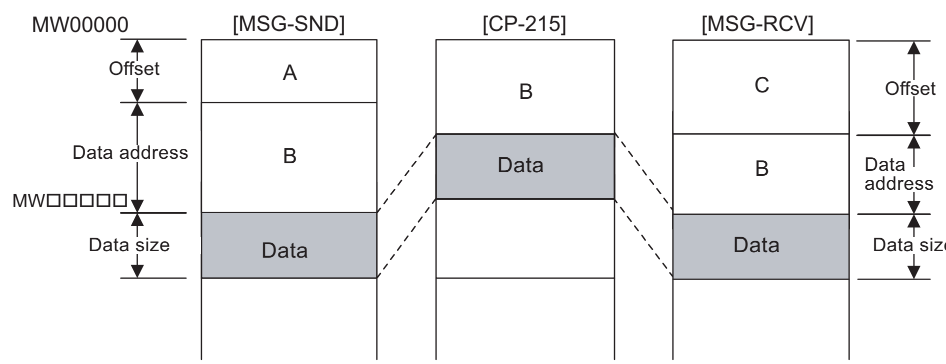
This parameter is valid when the function code is 03H, 06H, 09H, 0BH, 0DH, 0EH, or 10H.

■ For System Use (PARAM12)

This parameter retains the channel number currently being used. Make sure that this parameter is set to 0000H by the user program on the first scan after the power is turned ON. The parameter value must not be changed by the user program at any other time because the parameter is used by the system.

INFO

1. Relationship between the Data Address, Size and Offset



A = Sender offset address

B = Sender data address

C = Receiver offset address

2. When communications protocol is no-protocol:

   No setting is required for PARAM04, PARAM08, PARAM09, or PARAM10. Sending is possible for MW registers only.

A.1.4 Inputs

■ EXECUTE (SEND MESSAGE EXECUTION Command)

When EXECUTE turns ON, the message is sent.

■ ABORT (SEND MESSAGE ABORT Command)

The ABORT command aborts sending the message. It takes precedence over EXECUTE (SEND MESSAGE EXECUTION command).

■ DEV-TYP (Communications Device Type)

DEV-TYPE specifies the communications device type.

Device	Type Code
215IF	1
217IF	5
218IF	6
Serial	8
SVB-01	11

■ PRO-TYP (Communications Protocol)

PRO-TYP specifies the communications protocol.

When transmitting messages using the MELSEC or OMRON protocol, specify MEMOBUS protocol (=1). Protocol is converted by the communications device (217IF or 218IF).

- MEMOBUS: Setting = 1
- No-protocol 1: Setting = 2 (Data is sent or received in word units without using a protocol.)
- No-protocol 2: Setting = 3 (Data is sent or received in byte units without using a protocol.)

Note: For no-protocol transmissions, no response is received from the sender.

■ CIR-NO (Line No.)

CIR-NO specifies the line number.

Device	Line No.
215IF	1 to 8
217IF	1 to 24
218IF	1 to 8
Serial	1 or 2

■ CH-NO (Channel No.)

CH-NO specifies the channel number of a communications unit. Only one channel number can be set for the same line.

Device	Channel No.
215IF	1 to 13
217IF	1
218IF	1 to 10
Serial	1

■ PARAM (Parameter List Leading Address)

PARAM specifies the leading address of the parameter list. For details on settings, refer to *A.1.3 Parameter Details*.

Applicable Registers	Leading Address Examples
MW DW #W	MA00000, MA00100, … DA00000, DA00200, … #A00000, #A00300, …

A.1.5 Outputs

■ BUSY (Processing in Progress)

BUSY indicates that the processing is being executed. Keep EXECUTE set to ON.

■ COMPLETE (Processing Completed)

COMPLETE is turned ON for only 1 scan upon normal termination.

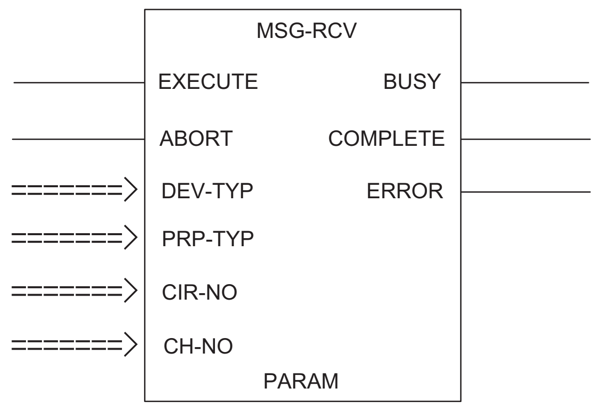
■ ERROR (Error Occurred)

ERROR is turned ON for only 1 scan when an error occurs.

For error causes, refer to PARAM00 (see under *A.1.3 Parameter Details*) and PARAM01 (see under *A.1.3 Parameter Details*).

A.2 RECEIVE MESSAGE Function (MSG-RCV)

A.2.1 Basic Specifications

<table>
<tr><td>Function Name</td><td colspan="4">MSG-RCV</td></tr>
<tr><td>Function</td><td colspan="4">Receives a message from the remote station on the line specified by the COMMUNICATIONS DEVICE TYPE command (DEV-TYP). Supports multiple protocol types.
The EXECUTION command (EXECUTE) must be held ON until COMPLETE or ERROR turns ON.
Communications devices: 215IF, 217IF, 218IF, serial, SVB-01
Protocols: MEMOBUS, no-protocol</td></tr>
<tr><td>Function Definition</td><td colspan="4">
</td></tr>
<tr><td>I/O Definitions</td><td>No.</td><td>Name</td><td>I/O Designation</td><td>Description</td></tr>
<tr><td rowspan="7">Inputs</td><td>1</td><td>EXECUTE</td><td>B-VAL</td><td>RECEIVE MESSAGE command</td></tr>
<tr><td>2</td><td>ABORT</td><td>B-VAL</td><td>RECEIVE MESSAGE ABORT command</td></tr>
<tr><td>3</td><td>DEV-TYP</td><td>I-REG</td><td>Communications device type:
215IF = 1, 217IF = 5, 218IF = 6, Serial = 8, SVB-01 = 11</td></tr>
<tr><td>4</td><td>PRO-TYP</td><td>I-REG</td><td>Communications protocol:
MEMOBUS = 1*
No-protocol 1 = 2
No-protocol 2 = 3</td></tr>
<tr><td>5</td><td>CIR-NO</td><td>I-REG</td><td>Line number:
215IF = 1 to 8, 217IF = 1 to 24
218IF = 1 to 8, Serial= 1 or 2</td></tr>
<tr><td>6</td><td>CH-NO</td><td>I-REG</td><td>Transmission buffer channel number
215IF = 1 to 13, 217IF = 1
218IF = 1 to 10, Serial = 1</td></tr>
<tr><td>7</td><td>PARAM</td><td>Address input</td><td>Leading address of setting data (MW, DW, #W)</td></tr>
<tr><td rowspan="3">Outputs</td><td>1</td><td>BUSY</td><td>B-VAL</td><td>Message is being received.</td></tr>
<tr><td>2</td><td>COMPLETE</td><td>B-VAL</td><td>Message receiving has been completed.</td></tr>
<tr><td>3</td><td>ERROR</td><td>B-VAL</td><td>Error has occurred.</td></tr>
</table>

* Refer to *A.1 SEND MESSAGE Function (MSG-SND)*.

A.2.2 Parameter Lists (PARAM)

PARAM is one of the inputs and has a parameter list structure consisting of 17 words. The value in PARAM is the leading address of a MW, DW, or #W register.

The parameters are shown below. No setting is required for the parameters that are blank in the “No-protocol” column.

PARAM No.	IN/ OUT	Contents		Remarks
		MEMOBUS	No-protocol	
00*	OUT	Processing result	Processing result	
01	OUT	Status	Status	
02	OUT *2	Remote station number	Remote station number	Remote connection number when DEV-TYPE is set to CP-218.
03	SYS	Reserved by system.	Reserved by system.	
04	OUT	Function code		
05	OUT	Data address	Data address	
06	OUT	Data size	Data size	
07	OUT	Remote CPU number	Remote CPU number	
08	IN	Coil offset		
09	IN	Input relay offset		
10	IN	Input register offset		
11	IN	Holding register offset	Register offset	
12	IN	Write range LO	Register offset	
13	SYS	Write range HI	Register offset	
14	SYS	Reserved by system.	Reserved by system.	
15	SYS	Reserved by system.	Reserved by system.	
16	SYS	Reserved by system.	Reserved by system.	

* 1. PARAM00 is the leading address.
* 2. “IN” when DEV-TYP is set to CP-218.

A.2.3 Parameter Details

■ Processing Result (PARAM00)

The processing result is output to the higher-place byte of PARAM00. The lower-place byte is for system analysis.

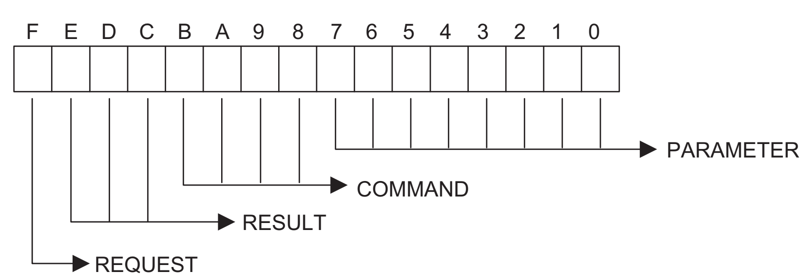
- 00□□:Processing in progress (BUSY)
- 10□□:Processing completed (COMPLETE)
- 8□□: Error occurred (ERROR)

Error Code	Error	Details
81□□	Function code error	An undefined function code was received.
82□□	Address setting error	The data address, coil offset, input relay offset, input register offset, or holding register offset setting is outside the allowable range.
83□□	Data size error	The size of the sent or received data is outside the allowable range.
84□□	Line number setting error	The line number setting is outside the allowable range.
85□□	Channel number setting error	The channel number setting is outside the allowable range.
86□□	Station address error	The station number setting is outside the allowable range.
88□□	Communications unit error.	An error response was returned from the communications unit. See ■ *Status (PARAM01)* below.
89□□	Device selection error	An unavailable device was selected.

■ Status (PARAM01)

PARAM01 outputs the status of the communications unit.

1. Bit Assignments



2. COMMAND

Code	Symbol	Meaning
1	U_SEND	General-purpose message sent.
2	U_REC	General-purpose message received.
3	ABORT	Aborted.
8	M_SEND	MEMOBUS command sent: Processing completed upon receiving response.
9	M_REC	MEMOBUS command received: Followed by the sending response.
C	MR_SEND	MEMOBUS response sent.

3. RESULT

Code	Symbol	Meaning
1	SEND_OK	Sending has been completed normally.
2	REC_OK	Receiving has been completed normally.
3	ABORT_OK	Abort completed.
4	FMT_NG	Parameter format error
5	SEQ_NG, or INIT_NG	Command sequence error: The token has not been received yet. The communications system has not been connected.
6	RESET_NG, or O_RING_NG	Reset state: Out-of-ring. The token was not be received even after the token monitor time had elapsed.
7	REC_NG	Data receive error (error detected by a lower-level program)

4. PARAMETER

PARAMETER indicates one of the error codes shown in *Table A.2.* when RESULT is set to 4 (FMT_NG). Otherwise, it indicates the address of the remote station.

Table A.2 Error Codes

Code	Error
00	No errors.
01	Station address outside the allowable range
02	MEMOBUS response receiving time error
03	Retry count setting error
04	Cyclic area setting error
05	Message signal CPU number error
06	Message signal register number error
07	Message signal word count error

5. REQUEST

1 = Request

0 = Acceptance completion report

■ Remote Station Number (PARAM02)

PARAM02 outputs the station number of the sender.

For 218IF, specify the connection number of the destination.

■ Function Code (PARAM04)

Set the MEMOBUS function code to be sent.

Function Code	Meaning	215IF, 218IF, MECHA-TROLINK*	217IF, Serial*
00H	Not used.	No	No
01H	Coil status read	Yes	Yes
02H	Input relay status read	Yes	Yes
03H	Holding register read	Yes	Yes
04H	Input register read	Yes	Yes
05H	Single coil status change	Yes	Yes
06H	Single holding register write	Yes	Yes
07H	Not used.	No	No
08H	Loopback test	Yes	Yes
09H	Holding register read (extended)	Yes	No
0AH	Input register read (extended)	Yes	No
0BH	Holding register write (extended)	Yes	No
0CH	Not used.	No	No
0DH	Discontinuous holding register read (extended)	Yes	No
0EH	Discontinuous holding register write (extended)	Yes	No
0FH	Multiple coil status change	Yes	Yes
10H	Multiple holding register write	Yes	Yes
11H to 20H	Not used.	No	No
21H to 30H	Reserved by system.	No	No
31H	MELSEC fixed buffer communications	218IF only	No
32H	MELSEC random buffer read	218IF only	No
33H	MELSEC random buffer write	218IF only	No
34H to 3FH	Reserved by system.	No	No
40H to 4FH	Reserved by system.	No	No
50H or later	Not used.	No	No

* Yes: Can be output, No: Cannot be output

MB, MW, IB, and IW registers can be used as coils, holding registers, input relays, and input registers during slave operation.

■ Data Address (PARAM05)

PARAM05 outputs the data address requested by the sender.

■ Data Size (PARAM06)

PARAM06 outputs the data size (number of bits or words) specified in the read or write request. For no-protocol 2, the number of bytes is output.

■ Remote CPU Number (PARAM07)

PARAM07 outputs the remote CPU number.

■ Coil Offset (PARAM08)

Set the offset word address of the coils.

This parameter is valid when the function code is 01H, 05H, or 0FH.

■ Input Relay Offset (PARAM09)

Set the offset word address of the input relays.

This parameter is valid when the function code is 02H.

■ Input Register Offset (PARAM10)

Set the offset word address of the input registers.

This parameter is valid when the function code is 04H or 0AH.

■ Holding Register Offset (PARAM11)

Set the offset word address of the holding registers.

This parameter is valid when the function code is 03H, 06H, 09H, 0BH, 0DH, 0EH, or 10H.

■ Write Range LO (PARAM12), Write Range HI (PARAM13)

Set the write-enable range for write requests. Any request outside this range will result in an error.

This parameter is valid when the function code is 0BH, 0EH, 0FH, or 10H.

0 ≤ write range LO ≤ write range HI ≤ maximum value of MW address

■ For System Use (PARAM14)

This parameter retains the channel number currently being used. Make sure that this parameter is set to 0000H by the user program on the first scan after the power is turned ON. The parameter value must not be changed by the user program at any other time because the parameter is used by the system.

A.2.4 Inputs

■ EXECUTE (RECEIVE MESSAGE EXECUTION Command)

When EXECUTE turns ON, the message is received. This command must be remained ON until COMPLETE (Processing Completed) or ERROR (Error Occurred) turns ON.

■ ABORT (RECEIVE MESSAGE ABORT Command)

The ABORT command aborts message reception. This takes precedence over EXECUTE (RECEIVE MESSAGE EXECUTION command).

■ DEV-TYP (Communications Device Type)

DEV-TYP specifies the communications device type.

Device	Type Code
215IF	1
217IF	5
218IF	6
Serial	8
SVB-01	11

■ PRO-TYP (Communications Protocol)

PRO-TYP specifies the communications protocol.

When transmitting messages with the MELSEC or OMRON protocol, specify MEMOBUS protocol (=1). Protocol is converted by the communications device (217IF or 218IF).

- MEMOBUS: Setting = 1
- No-protocol 1: Setting = 2 (Data is sent or received in word units without using a protocol.)
- No-protocol 2: Setting = 3 (Data is sent or received in byte units without using a protocol.)

Note: For no-protocol transmissions, no response is received from the sender.

■ CIR-NO (Line No.)

CIR-NO specifies the line number.

Device	Line No.
215IF	1 to 8
217IF	1 to 24
218IF	1 to 8
Serial	1 or 2

■ CH-NO (Channel No.)

CH-NO specifies the channel number of the communications unit. Only one channel number can be set for the same line.

Device	Channel No.
215IF	1 to 13
217IF	1
218IF	1 to 10
Serial	1

■ PARAM (Parameter List Leading Address)

PARAM specifies the leading address of the parameter list. For details on settings, refer to *A.2.3 Parameter Details*.

Applicable Registers	Leading Address Examples
MW DW #W	MA00000, MA00100, … DA00000, DA00200, … #A00000, #A00300, …

A.2.5 Outputs

■ BUSY (Processing in Progress)

BUSY indicates that the processing is being executed. Keep EXECUTE set to ON.

■ COMPLETE (Processing Completed)

COMPLETE is turned ON for only 1 scan upon normal termination.

■ ERROR (Error Occurred)

ERROR is turned ON for only 1 scan when an error occurs.

For error causes, refer to PARAM00 and PARAM01 described in *A.2.3 Parameter Details*.

Appendix B

218IF Messages

B

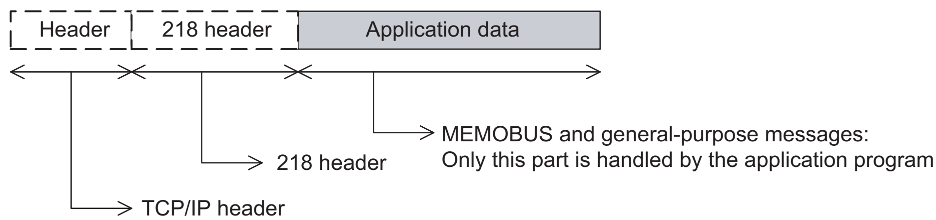
This appendix explains the communications protocol messages (the data formats transferred in message communications) for the MP-Series Machine Controllers.

B.1 Extended MEMOBUS Messages

B.1.1 Message Configuration

The message configuration shown below is for messages used by the 218IF Module. Refer to this when creating applications on a personal computer.

When data is transferred with the Extended MEMOBUS protocol, each message consists of three elements: A header, a 218 header, and application data.



The header is used for TCP/IP and UDP/IP. The user program need not be aware of this header because it is automatically added or deleted by the 218IF.

The 218 header is required when the Extended MEMOBUS protocol is used by the 218IF. The application program need not be aware of this 218 header because it is automatically added or deleted by the 218IF.

The actual data for the Extended MEMOBUS protocol is stored in the application data.

When communications are performed between the 218IF and a host computer, the 218 header must be added or deleted by the application on the host computer.

The application data part has the parameter structure shown below, according to the code that is used with the communications protocol.

No.	Communications Protocol	Code	Reference
1	MEMOBUS messages	BIN	*B.1.2*
2	MEMOBUS messages	ASCII	*B.1.3*
3	General-purpose messages (no protocol)	BIN	*B.1.4*
4	General-purpose messages (no protocol)	ASCII	*B.1.5*

■ 218 Header

With communications using the Extended MEMOBUS protocol, a 12-byte 218 header is added in front of the application data. This header is automatically added or deleted by the 218IF Module the data need not be set by the application program.

7 · · · · · · · · · · 0
Command type
Identification No.
Destination channel No.
Source channel No.
Not used
Data length (L) (H)
Not used
Not used

- Command type
  11H: MEMOBUS command
  19H: MEMOBUS response
  12H: General-purpose message
- Identification number
  This is the required serial number transmitted to each port.
  The identification number is set in the order 00H → FFH → 00H → FFH.
- Source channel number
  This is the source channel number (shared memory channel number).
  The number will be 00H when the channel is accessed from a device other than an MP-series device.
- Destination channel number
  Set the destination channel number (shared memory channel number).
- The number will be 00H when the channel is accessed from a device other than an MP-series device.
- Data length
  This is the total data length (number of bytes) of the 218 header and the application data.

■ List of Extended MEMOBUS Commands

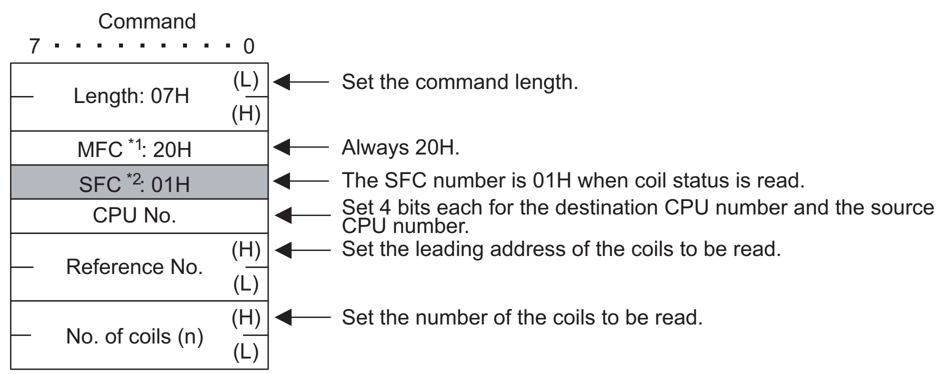
The commands that make up the Extended MEMOBUS messages are identified by a function code, and have the functions shown in the following table.

Function Code	Function	Extended MEMOBUS Protocol (BIN)	Extended MEMOBUS Protocol (ASCII)
01H	Coil status read	2,000 points	2,000 points
02H	Input relay status read	2,000 points	2,000 points
03H	Holding register read	125 words	125 words
04H	Input register read	125 words	125 words
05H	Single coil status change	1 point	1 point
06H	Single holding register write	1 word	1 word
08H	Loopback test	–	–
09H	Holding register read (extended)	508 words	508 words
0AH	Input register read (extended)	508 words	508 words
0BH	Holding register write (extended)	507 words	507 words
0DH	Discontinuous holding register read (extended)	508 words	508 words
0EH	Discontinuous holding register write (extended)	254 words	254 words
0FH	Multiple coil status change	800 points	800 points
10H	Multiple holding register write	100 words	100 words
31H	MELSEC fixed buffer communications	507 words	507 words
32H	MELSEC random buffer read	508 words	508 words
33H	MELSEC random buffer write	507 words	507 words

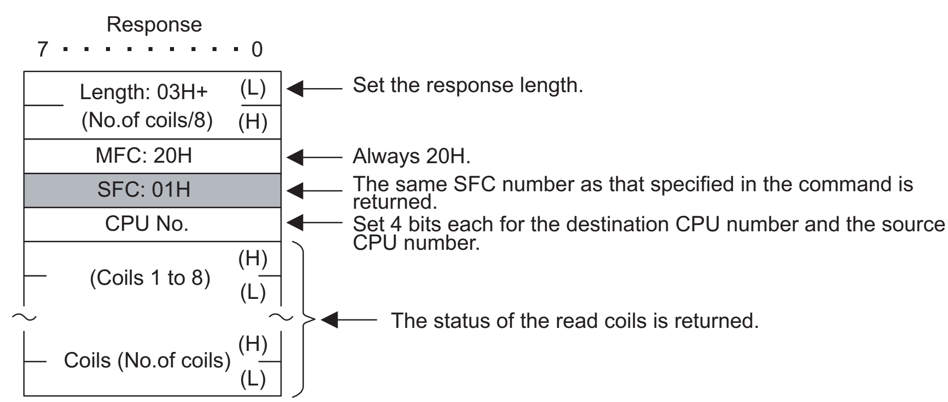
B.1.2 MEMOBUS Binary Mode

This mode is the binary mode format for MEMOBUS message transmission.

■ Coil Status Read



* 1. MFC: Major Function Code
* 2. SFC: Subfunction Code



■ Input Relay Status Read

Command

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 02H		The SFC number is 02H when the relay status is read.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the leading address of the relays to be read.
	(L)	
No. of relays (n)	(H)	Set the number of relays to be read.
	(L)	

Response

7 · · · · · · · · · · 0

Length: 03H+ (No.of coils/8)	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 02H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
(Relays 1 to 8)	(H)	The status of the relays is returned.
	(L)	
~		
Relays(No.of relays)	(H)	
	(L)	

■ Holding Register Read

Command

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 03H		The SFC number is 03H when the holding register contents are read.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the leading address of the holding registers to be read.
	(L)	
No. of registers (n)	(H)	Set the number of holding registers to be read.
	(L)	

Response

7 · · · · · · · · · · 0

Length: 03H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 03H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Data 1	(H)	The status of the read holding registers is returned.
	(L)	
~		
Data n	(H)	
	(L)	

■ Input Register Read

Command

7 · · · · · · · · · · 0		
Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 04H		The SFC number is 04H when the input register contents are read.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the leading address of input the input registers to be read.
	(L)	
No. of registers (n)	(H)	Set the number of input registers to be read.
	(L)	

Response

7 · · · · · · · · · · 0		
Length: 03H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 04H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Data 1	(H)	The status of the read input registers is returned.
	(L)	
~		
Data n	(H)	
	(L)	

■ Single Coil Status Change

Command

7 · · · · · · · · · · 0		
Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 05H		The SFC number is 05H when the status of a single coil is changed.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the address of the coil to be changed.
	(L)	
ON/OFF=FFH/00H		Set the status for the coils.
00H		

Response

7 · · · · · · · · · · 0		
Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 05H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	The address of the changed coil to be returned.
	(L)	
ON/OFF=FFH/00H		The status of the changed coil is returned.
00H		

■ Single Holding Register Change

Command

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 06H		The SFC number is 06H when a single holding register is written.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the address of the single holding to be changed.
	(L)	
Register data	(H)	Set the contents to be changed in the single holding registers.
	(L)	

Response

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 06H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	The address of the changed single holding register is returned.
	(L)	
Register data	(H)	The changed single holding register contents is returned.
	(L)	

■ Loopback Test

Command

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 08H		The SFC number is 08H with the loopback test.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Test code 0000H		Set the test data.
Data AAAAH		

Response

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 08H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Test code 0000H		If the test is completed normally, the same data will be returned as for the command.
Data AAAAH		

■ Holding Register Read (Extended)

Command

7 · · · · · · · · · · 0

Length: 08H	(L) (H)	Set the command length.
MFC: 20H		Always 20H.
SFC: 09H		The SFC number is 09H when the holding register contents are read.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
Reference No.	(L) (H)	Set the leading address of the holding registers to be read.
No. of registers (n)	(L) (H)	Set the number of holding registers to be read.

Response

7 · · · · · · · · · · 0

Length: 06H+ No.of registers×2	(L) (H)	Set the command length.
MFC: 20H		Always 20H.
SFC: 09H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
No. of registers (n)	(L) (H)	The number of read holding registers is returned.
Data 1	(L) (H)	The holding register contents are returned.
~		
Data n	(L) (H)	

■ Input Register Read (Expanded)

Command

7 · · · · · · · · · · 0		
Length: 08H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0AH		The SFC number is 0AH when the input register contents are read.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
Reference No.	(L)	Set the leading address of the input registers to be read.
	(H)	
No. of registers (n)	(L)	Set the number of input registers to be read.
	(H)	

Response

7 · · · · · · · · · · 0		
Length: 06H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0AH		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
No. of registers (n)	(L)	The number of read input registers is returned.
	(H)	
Data 1	(L)	The read input register contents are returned.
	(H)	
~		
Data n	(L)	
	(H)	

■ Holding Register Write (Extended)

Command

7 · · · · · · · · · · 0		Description
Length: 06H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0BH		The SFC number is 0BH when holding registers are written.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
Reference No.	(L)	Set the leading address of the holding registers to be written.
	(H)	
No. of registers (n)	(L)	Set the number of holding registers to be written.
	(H)	
Data 1	(L)	Set the contents of the holding register to be written.
	(H)	
~		
Data n	(L)	
	(H)	

Response

7 · · · · · · · · · · 0		Description
Length: 08H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0BH		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE	(H)	
Reference No.	(L)	The leading addresses of the written holding registers are returned.
	(H)	
No. of registers (n)	(L)	The number of written holding registers is returned.
	(H)	

■ Discontinuous Multiple Holding Register Read

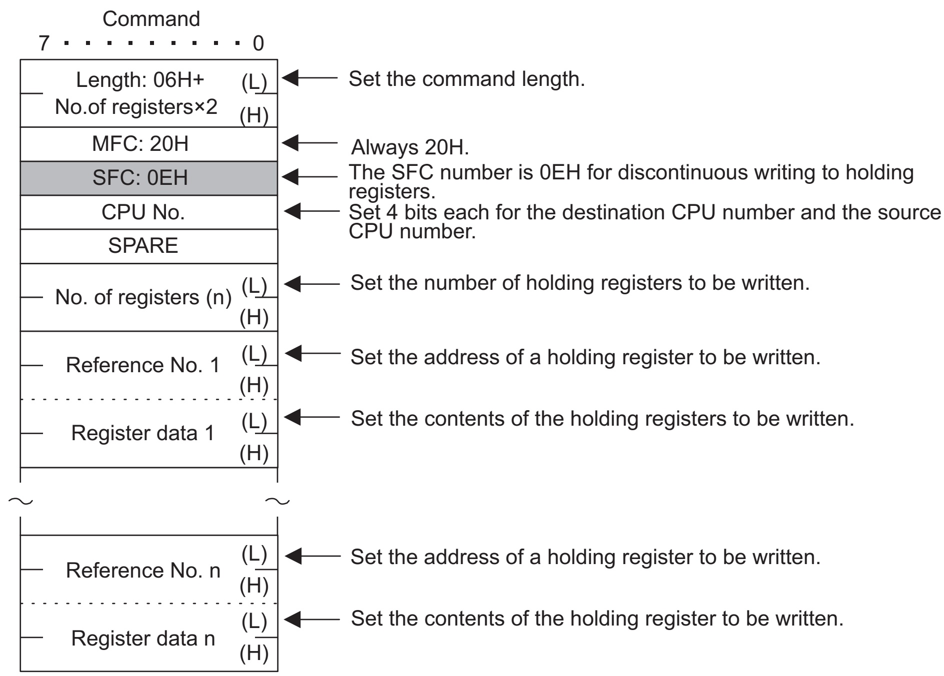
Command

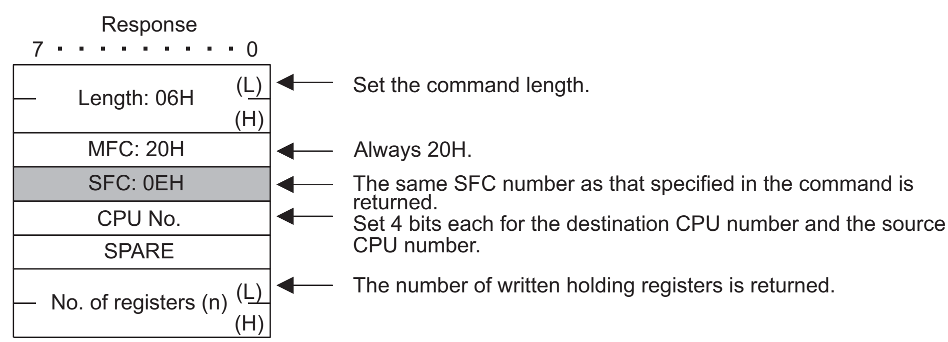
7 · · · · · · · · · · 0		
Length: 06H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0DH		The SFC number is 0BH for discontinuous reading of holding registers.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
No. of registers (n)	(L)	Set the number of holding registers to be read.
	(H)	
Reference No.1	(L)	Set the address of a holding register to be read.
	(H)	
~		
Reference No.n		Set the address of a holding register to be read.

Response

7 · · · · · · · · · · 0		
06H + No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 0DH		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
SPARE		
No. of registers (n)	(L)	The number of read holding registers is returned.
	(H)	
Data 1	(L)	The read holding register contents are returned.
	(H)	
~		
Data n	(L)	
	(H)	

■ Discontinuous Multiple Holding Register Write





■ Multiple Coil Status Change

Command

7 · · · · · · · · · · 0		
Length: 07H+ No.of coils/8	(L) (H)	Set the command length.
MFC: 20H		Always 20H.
SFC: 0FH		The SFC number is 0FH when multiple coil status is changed.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H) (L)	Set the leading address of the coils to be changed.
No. of coils (n)	(H) (L)	Set the number of coils to be changed.
Coil data (1 to 8) ~ Coil data (to n)		Set the status of the coils to be changed.

Response

7 · · · · · · · · · · 0		
Length: 07H	(L) (H)	Set the command length.
MFC: 20H		Always 20H.
SFC: 0FH		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H) (L)	The leading address of the changed coils is returned.
No. of coils (n)	(H) (L)	The number of changed coils is returned.

B

■ Holding Register Write

Command

7 · · · · · · · · · · 0

Length: 07H+ No.of registers×2	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 10H		The SFC number is 10H when holding registers are written.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	Set the leading address of the holding registers to be written.
	(L)	
No. of registers (n)	(H)	Set the number of holding registers to be written.
	(L)	
Data 1	(H)	Set the status of the holding registers to be written.
	(L)	
~		
Data n	(H)	
	(L)	

Response

7 · · · · · · · · · · 0

Length: 07H	(L)	Set the command length.
	(H)	
MFC: 20H		Always 20H.
SFC: 10H		The same SFC number as that specified in the command is returned.
CPU No.		Set 4 bits each for the destination CPU number and the source CPU number.
Reference No.	(H)	The leading address of written holding registers is returned.
	(L)	
No. of registers (n)	(H)	The number of written holding registers is returned.
	(L)	

■ Error Response

Command

7 · · · · · · · · · · 0

Length	(L)
	(H)
MFC: 20H	
SFC: 01H to 33H	
CPU No.	
Message Body	
~	

If there is an error in the command message SFC, in the reference number, or in the number of data items, the Slave station will return an error response message.

Response

7 · · · · · · · · · · 0

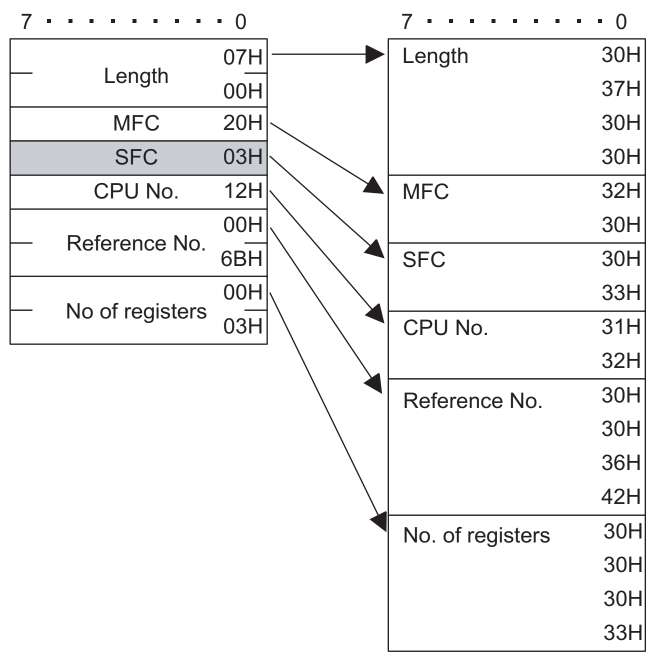
Length: 04H	(L)
	(H)
MFC: 20H	
SFC: SFC + 80H	
CPU No.	
Error code	

Error codes:
01: SFC error
02: Reference number error
03: Error in the number of data items

B.1.3 MEMOBUS ASCII Mode

With ASCII communications, binary communications data is converted to ASCII before being transmitted and received.

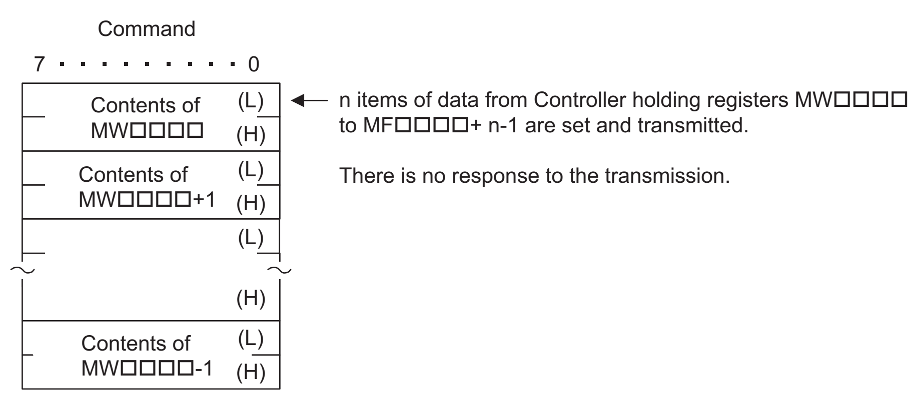
The following diagram shows an example of binary to ASCII conversion. As shown in the example, 8-bit data is converted to two ASCII characters (7 bits). The example shows only the conversion of the application data. However, in actual conversion, the EIF header is also converted to ASCII.



B.1.4 General-purpose Message Binary Mode

In general-purpose message mode, the values for the Controller holding registers (MW registers) are set as is in the application data following the EIF header part, and data is transmitted and received.

■ Binary Mode

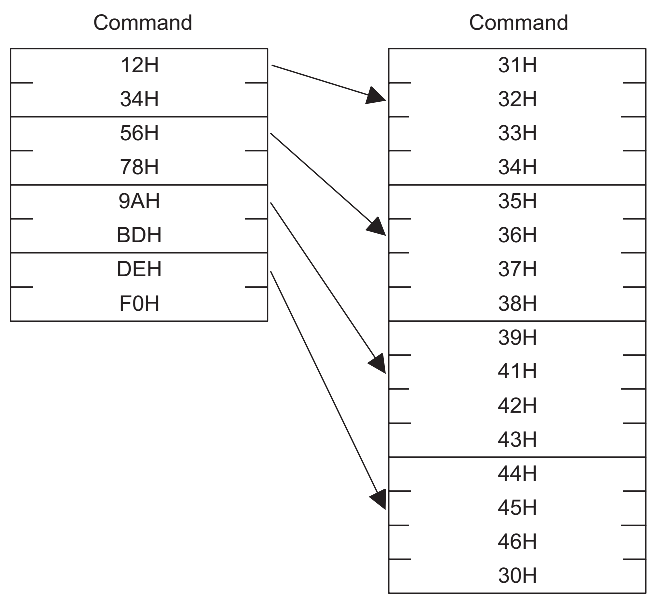


B.1.5 General-purpose Message ASCII Mode

With ASCII mode, binary communications data is converted to ASCII before being transmitted and received.

The following diagram shows an example of binary to ASCII conversion. As shown in the example, 8-bit data is converted to two ASCII characters (7 bits). The example shows only the conversion of the application data part. However, in actual conversion, the EIF header part is also converted to ASCII.

■ ASCII Mode

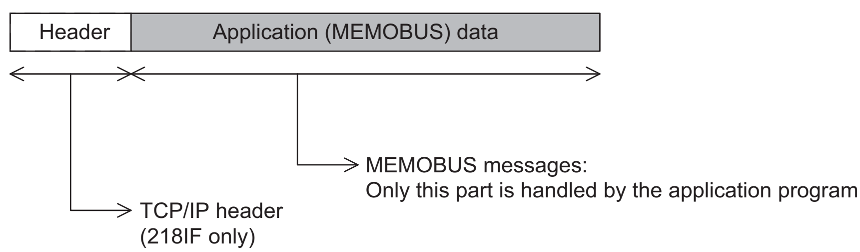


B.2 MEMOBUS Messages

B.2.1 Message Configuration

The message configuration shown below is for messages used by the 217IF and the 218IF. For details, refer to the MEMOBUS Document: MEMOBUS Descriptive Information (SIE-C815-13.60).

When data is transferred with the MEMOBUS protocol, each message consists of two elements: A header and application data. Unlike the Extended MEMOBUS protocol, there is no EIF header.



The TCP/IP header shown by the dotted lines can be handled only by the 218IF. Only application (MEMOBUS) data is transmitted and received by the 217IF.

The header is used for TCP/IP and UDP/IP. The user program need not be aware of this header because it is automatically added or deleted by the 218IF.

The actual data for the MEMOBUS protocol is stored in the application data.

The application data has the parameter structure shown below, according to the remote station handling code that is set in the connection parameter.

No.	Communications Protocol	Code	Reference
1	MEMOBUS messages	RTU	*B.2.2*
2	MEMOBUS messages	ASCII	*B.2.3*

■ List of MEMOBUS Commands

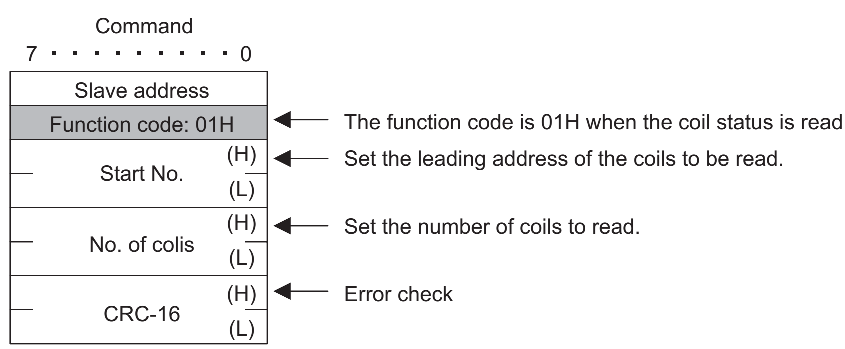
The commands that make up the MEMOBUS messages are identified by a function code, and have the functions shown in the following table.

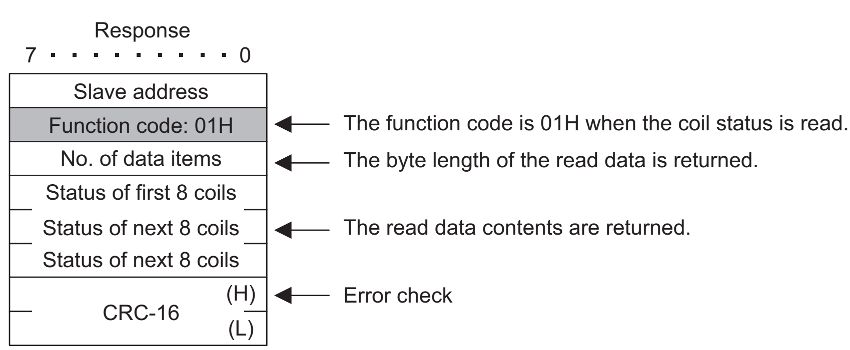
Function Code	Function	MEMOBUS (RTU)	MEMOBUS (ASCII)
01H	Coil status read	2,000 points	976 points
02H	Input relay status read	2,000 points	976 points
03H	Holding register write	125 words	61 words
04H	Input register read	125 words	61 words
05H	Single coil status change	1 point	1 point
06H	Single holding register write	1 word	1 word
08H	Loopback test	–	–
0FH	Multiple coil status change	800 points	800 points
10H	Multiple holding register write	100 words	59 words

B

B.2.2 MEMOBUS RTU Mode

■ Coil Status Read





■ Input Relay Status Read

Command

7 · · · · · · · · · · 0		
Slave address		
Function code: 02H		The function code is 02H when the relay status is read.
Start No.	(H)	Set the leading address of the relays to be read.
	(L)	
No. of relays	(H)	Set the number of relays to be read.
	(L)	
CRC-16	(H)	Error check
	(L)	

Response

7 · · · · · · · · · · 0		
Slave address		
Function code: 02H		The function code is 02H when the relay status is read.
No. of data items		The byte length of the read data is returned.
Status of first 8 relays		
Status of next 8 relays		The read data contents are returned.
Status of next 8 relays		
CRC-16	(H)	Error check
	(L)	

Holding Register Read

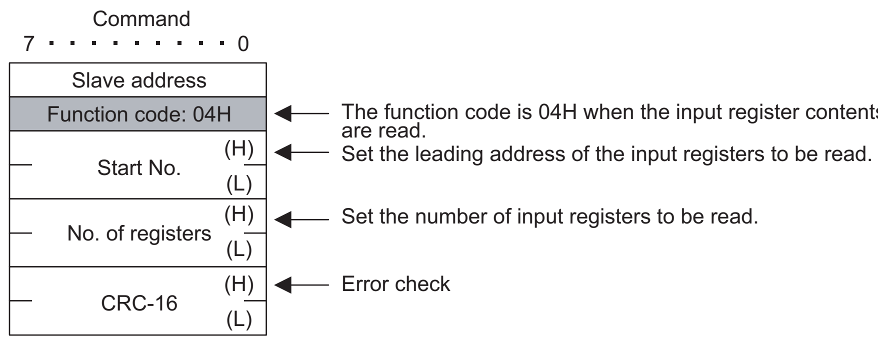
Command

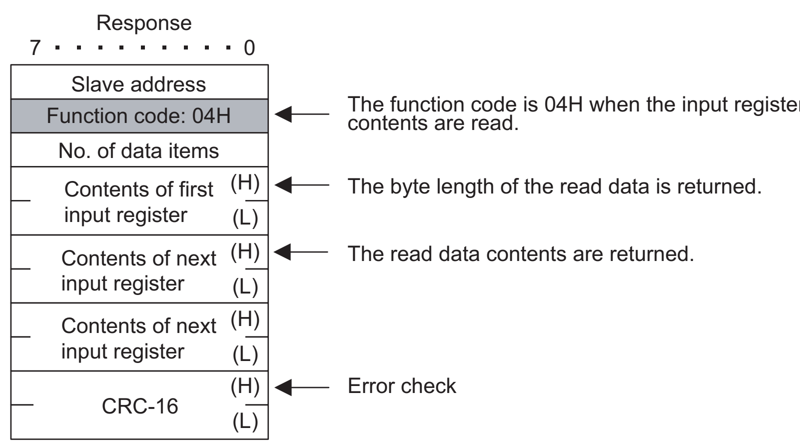
7 · · · · · · · · · · 0		
Slave address		
Function code: 03H		The function code is 03H when the holding register contents are read.
Start No.	(H)	Set the leading address of the holding registers to be read.
	(L)	
No. of registers	(H)	Set the number of holding registers to be read.
	(L)	
CRC-16	(H)	Error check
	(L)	

Response

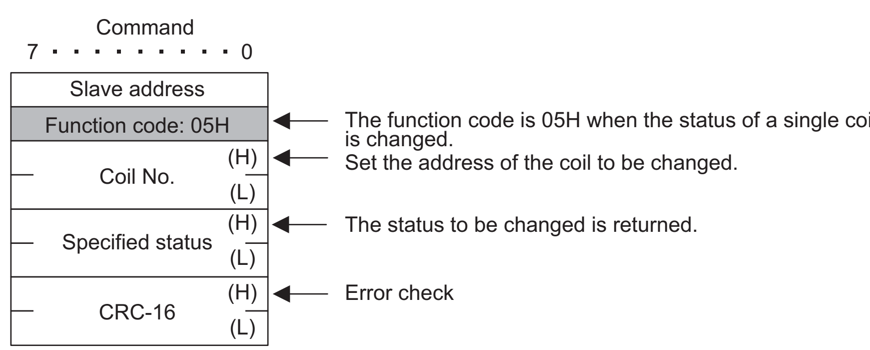
7 · · · · · · · · · · 0		
Slave address		
Function code: 03H		The function code is 03H when the holding register contents are read.
No. of data items		
Contents of first holding register	(H)	The byte length of the read data is returned.
	(L)	
Contents of next holding register	(H)	The read data contents are returned.
	(L)	
Contents of next holding register	(H)	
	(L)	
CRC-16	(H)	Error check
	(L)	

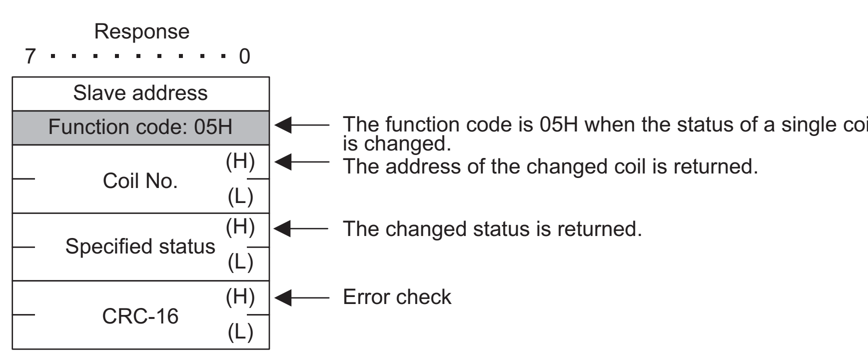
■ Input Register Read





■ Single Coil Status Change





■ Single Holding Register Change

Command

7 · · · · · · · · · · 0		
Slave address		
Function code: 06H		The function code is 06H when a single holding register is written.
Holding register No.	(H)	Set the address of the holding register to be changed.
	(L)	
Write data	(H)	Set the data contents to be changed.
	(L)	
CRC-16	(H)	Error check
	(L)	

Response

7 · · · · · · · · · · 0		
Slave address		
Function code: 06H		The function code is 06H when a single holding register is written.
Holding register No.	(H)	The address of the changed holding register is returned.
	(L)	
Write data	(H)	The changed data contents are returned.
	(L)	
CRC-16	(H)	Error check
	(L)	

■ Loopback Test

Command

7 · · · · · · · · · · 0		
Slave address		
Function code: 08H		The function code is 08H with the loopback test.
Test code	(H)	Set the test code.
	(L)	
Data	(H)	Set the test data.
	(L)	
CRC-16	(H)	Error check
	(L)	

Response

7 · · · · · · · · · · 0		
Slave address		
Function code: 08H		The function code is 08H with the loopback test.
Test code	(H)	If the test is completed normally, the same value is returned as for the command.
	(L)	
Data	(H)	If the test is completed normally, the same data is returned as for the command.
	(L)	
CRC-16	(H)	Error check
	(L)	

■ Multiple Coil Status Change

Command

7 · · · · · · · · · · 0

Slave address		
Function code: 0FH		The function code is 0FH when the coil status is changed.
Start No.	(H)	Set the leading address of the coils to be changed.
	(L)	
No. of colis	(H)	Set the number of coils to be changed.
	(L)	
No. of data items		Set the byte length of the data to be written.
Status of first 8 coils		
Status of next 8 coils		Set the status of the coils to be changed.
Status of next 8 coils		
CRC-16	(H)	Error check
	(L)	

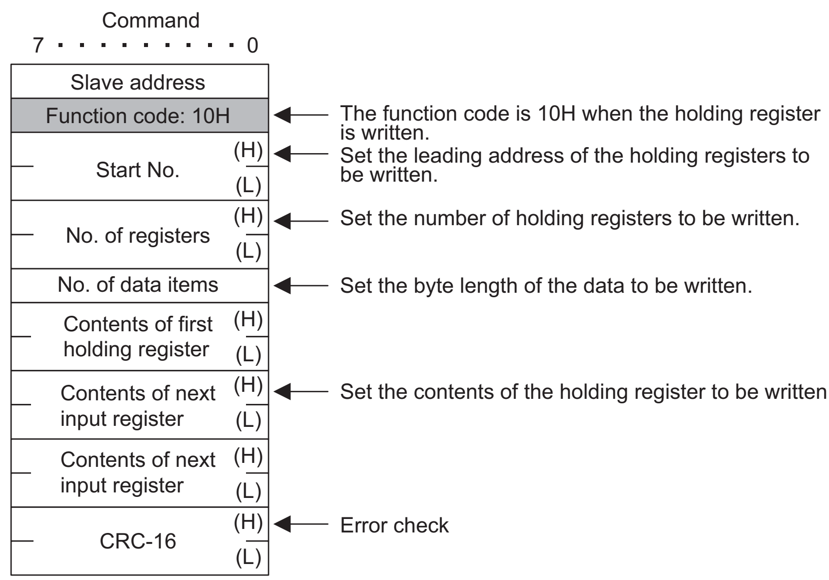
Response

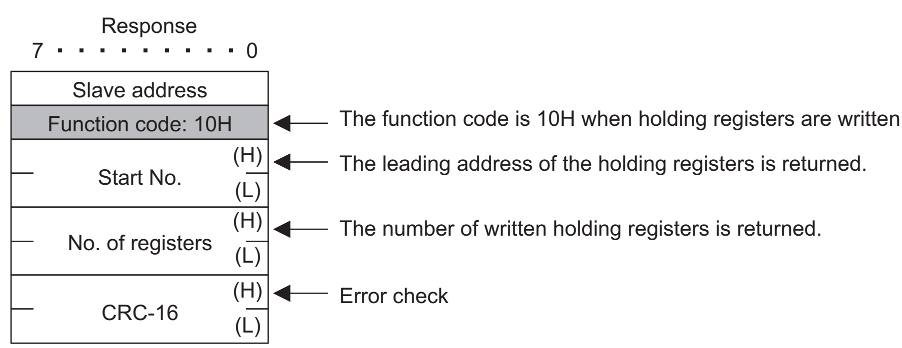
7 · · · · · · · · · · 0

Slave address		
Function code: 0FH		The function code is 0FH when the coil status is changed.
Start No.	(H)	The leading address of the changed coils is returned.
	(L)	
No. of coils	(H)	The number of changed coils is returned.
	(L)	
CRC-16	(H)	Error check
	(L)	

B

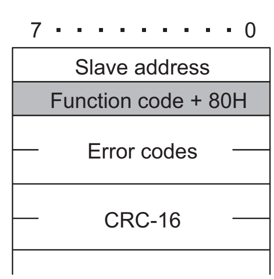
■ Holding Register Write





■ Error Response

If there is an error in the command message contents, the Slave will return an error response message without executing any instruction.



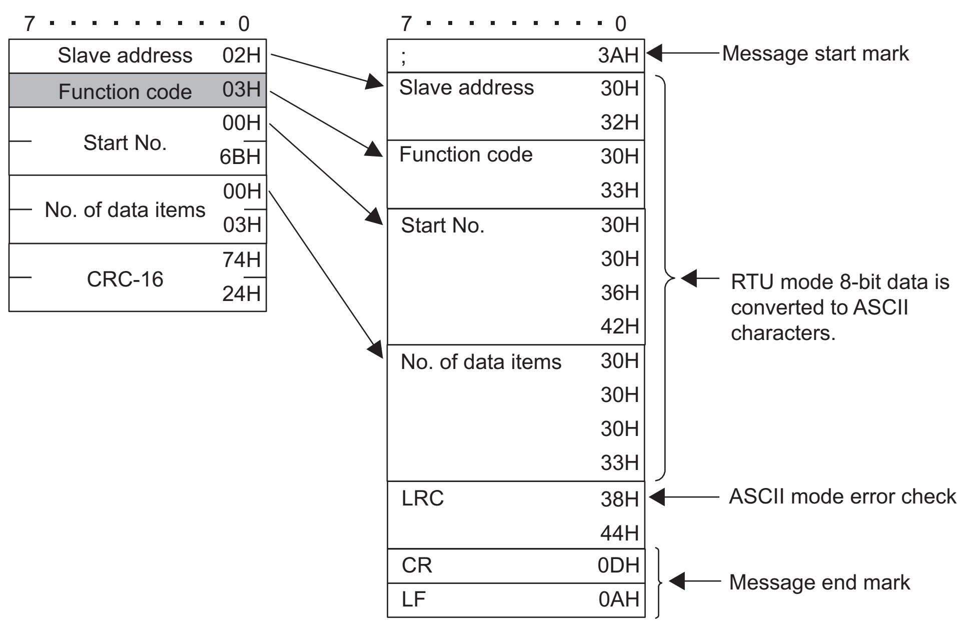
Error codes
1: Function code error
2: Coil, input relay, or register numbering error
3: Error in the number of coils, input relays, or registers

B.2.3 MEMOBUS ASCII Mode

With ASCII communications, RTU communications data is converted to ASCII before being sent and received.

The following diagram shows an example of RTU to ASCII conversion. As shown in the example, 8-bit application data is converted to two ASCII characters (7 bits).

With the MEMOBUS format, the code (":") showing the start of the data is added in front of the data, and the code ("CL" or "LF") showing the end of the data is added after the data. LRC will be the error check.

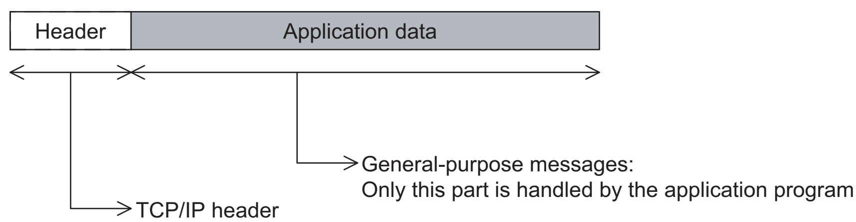


B.3 General-purpose Messages

B.3.1 Message Configuration

When the no-protocol mode is set as the communications protocol, application data can be handled as general-purpose messages.

When data is sent and received, each message consists of two elements: A header and application data.



The part shown by the dotted lines can be handled only by the 218IF.

The header is used for TCP/IP and UDP/IP. The user program need not be aware of this header because it is automatically added or deleted by the 218IF.

The format of the application data can be freely set. The operation codes have the message structure shown below, according to the code that is set in the connection parameter.

No.	Communications Protocol	Code	Reference
1	No protocol	Binary	*B.3.2*
2	No protocol	ASCII	*B.3.3*

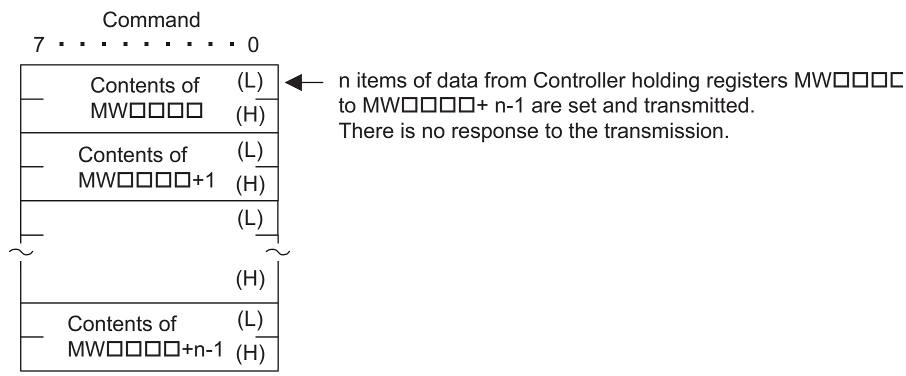
The difference from the general-purpose message mode of the Extended MEMOBUS protocol is that the EIF header may or may not be added in front of the application data.

■ List of General-purpose Message Commands

These commands are freely set by the application.

B.3.2 General-purpose Binary Mode

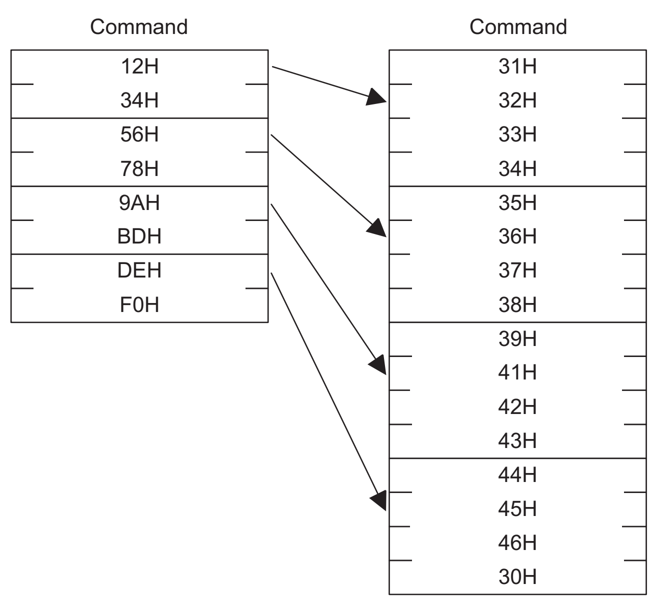
In through mode, the values for the Controller holding registers (MW registers) are set as the application data, and data is sent and received.



B.3.3 General-purpose ASCII Mode

With ASCII mode, binary communications data is converted to ASCII before being transmitted and received.

The following diagram shows an example of binary to ASCII conversion. As shown in the example, 8-bit data is converted to two ASCII characters (7 bits).



Appendix C

C Language Sample Programs

This appendix shows samples of the C language programs used for communication between a 218IF-01 Module and a personal computer or a workstation.

C.1 Sample Programs for Master Station

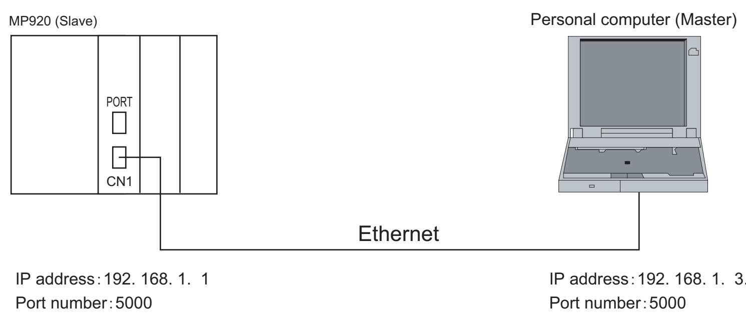
The programs listed in this appendix were prepared only for reference purpose and they may not operate correctly in actual applications. To execute the programs, a socket library and C compiler must be installed on the personal computer.

The brief explanations on the program contents are written in italics after double-slash (//) in the programs.

The line on the left end of the program indicates the positions of paragraph indentions.

C.1.1 TCP (When Using Extended MEMOBUS Protocol (SFC = 09))

< Configuration and Setting Example >




```
#include <stdio.h>
#include <winsock.h>
#include <winioctl.h>

int sd;                 /* Socket Discripter */
struct sockaddr_in my;
struct sockaddr_in dst;

#define MY_IP      0xC0A80103  // Local IP address: 192.168.1.3
#define MY_PORT    5000        // Local port number

#define DST_IP     0xC0A80101  //  Remote IP address: 192.168.1.1
#define DST_PORT   5000        //  Remote port number

char sbuf[2048];
char rbuf[2048];

void main_tcp(void);
void mk_cmd_data(void);
int chk_rsp_data(int);

void main_tcp(void)
{
        WSADATAwsadata;

        int rc, slen, rlen;

        // Declaration to use Winsock.dll (Always required at first.)
        rc = WSAStartup( 0x0101, &wsadata );
        if ( rc != 0 )
        {
                exit(0);
        }
```

```
// Clears the sockaddr structure (IP address, port number, etc.) to zero.
memset( (char *)&my, 0, sizeof(struct sockaddr));
memset( (char *)&dst, 0, sizeof(struct sockaddr));

// Declaration of local IP address and port number
my.sin_family = AF_INET;
my.sin_addr.s_addr = htonl( MY_IP );
my.sin_port = htons( MY_PORT );

//  Declaration of remote IP address and port number
dst.sin_family = AF_INET;
dst.sin_addr.s_addr = htonl( DST_IP );
dst.sin_port = htons( DST_PORT );

// Creates TCP socket.
sd = socket( AF_INET, SOCK_STREAM, 0 );
if ( sd <= 0 )
{
        printf( "Error: Socket !!\n" );
        exit(0);
}

// Execute a bind to allocate local port number.
rc = bind( sd, ( struct sockaddr *)&my, sizeof(struct sockaddr_in));
if ( rc == -1 )
{
        closesocket( sd );
        printf( "Error: bind !!\n" );
        exit(0);
}

// Establishes the connection.
rc = connect( sd, ( struct sockaddr *)&dst, sizeof(struct sockaddr_in));
if ( rc == -1 )
{
        closesocket( sd );
        printf( "Error: Connect !!\n" );
        exit(0);
}

// Prepares command data after the connection is established.
mk_cmd_data();

// Repeats sending command and receiving response.
while(1)
{
        // Sends the command data.
        // This processing will not end if the Master cannot send the data.
        slen = send( sd, &sbuf[0], 22, 0  );// Sends the command (22 bytes).
        if ( slen != 22 )// The number of bytes (22) that was sent will be returned if sending process is successful.
        {
                closesocket(sd);
                printf( "Error: Send !! -> %d\n", slen );
                exit(0);
        }
        // Receives the response data.
        // This processing will not end if the Slave does not send the response data.
        rlen = recv( sd, &rbuf[0], sizeof(rbuf), 0 ); // Receives the response data from the remote station.
        if ( rlen <= 0 )//Value 0 or less will be returned if an error occurs in receiving data.
        {
```

C

```
                        closesocket(sd);
                        printf( "Error: Recv !! -> %d\n", rlen );
                        exit(0);
                }
                // Checks the response data.
                rc = chk_rsp_data( rlen );
                if ( rc != 0 )//Errors in received data
                        closesocket(sd);
                        exit(0);

                }
                sbuf[1] ++;// Increments the serial number of 218 header.
                printf( "Hit Any Key !!\n" );
        }
}

// Prepares the extended MEMOBUS protocol command, Read Holding Register Contents (SFC = 09).


void mk_cmd_data(void)
{
        // Prepares the 218 header.
        // Sets the data type.
        sbuf[0] = 0x11;// Extended MEMOBUS (reference command)

        // Sets the serial number (The serial number will be incremented every send data.)
        sbuf[1] = 0x00;

        // Sets the destination channel number.
        sbuf[2] = 0x00; // The channel number can be fixed to 0 as the channel of PLC is not specified.

        // Sets the destination channel number.
        sbuf[3] = 0x00; // Always set to 0 because a personal computer has no channel number.

        sbuf[4] = 0x00; // Reserved
        sbuf[5] = 0x00; // Reserved

        // Sets all the number of data items (from the starting of 218 header to the end of MEMOBUS data).
        sbuf[6] = 0x16; // L (22 bytes = 218 header (12 bytes) + MEMOBUS data (10 bytes)
        sbuf[7] = 0x00; // H

        sbuf[8] = 0x00;// Reserved
        sbuf[9] = 0x00;// Reserved
        sbuf[10] = 0x00;// Reserved
        sbuf[11] = 0x00;// Reserved

        // Prepares the MEMOBUS data.
        // Length: From MFC to the end of data
        sbuf[12] = 0x08;    // MEMOBUS data length (L)
        sbuf[13] = 0x00;    // MEMOBUS data length (H)

        // MFC is fixed to 0x20
        sbuf[14] = 0x20;

        // SFC is 0x09 (Read Holding Register Contents (extended))
        sbuf[15] = 0x09;

        // Sets the CPU number.
        sbuf[16] = 0x10;    // Remote CPU No.: CPU1. Multi CPUs: 1 - 4. Local CPU No.: always 0.

        sbuf[17] = 0x00;    // Always 0 for Spare.
```

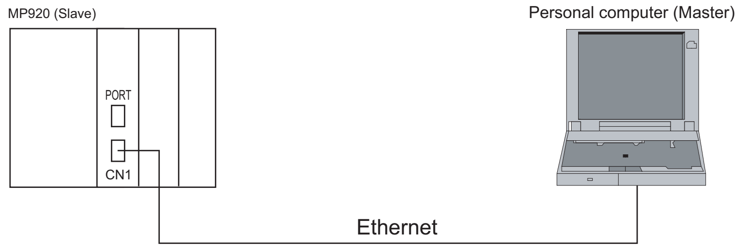
```
        // Sets the reference number.
        sbuf[18] = 0x00;    // Adr(L) leading address: MW0
        sbuf[19] = 0x00;    // Adr(H)

        // Sets the number of registers.
        sbuf[20] = 0x0A;    // Reads 10 words from the DataNum(L) leading address.
        sbuf[21] = 0x00;    // DataNum(H)

}

// Checks the response data.
int chk_rsp_data( int rlen )
{
        int rc;

        rc = 0;
        // Checks the total length of data.
        if ( rlen != 40 )// 40-byte response for 10-word read out
                  // ((218 header (12 bytes) + MEMOBUS data (28 bytes))
        {
                rc = -1;
                return( rc );


        }
        // Checks the packet type.
        if ( rbuf[0] != 0x19 )// Not the MEMOBUS response
        {
                rc = -2;
                return( rc );
        }

        // Checks the serial number.
        if ( sbuf[1] != rbuf[1] )// Does not agree with the command serial number.
        {
                rc = -3;
                return( rc );
        }

        // Checks the length of the total data in the message.
        if (( rbuf[6] != 0x28 ) && (rbuf[7] !=0x00))// 40 bytes = 218 header (12 bytes) + MEMOBUS data (28 bytes)
        {
                rc = -4;
                return( rc );
        }

        // Checks the MEMOBUS data length.
        if (( rbuf[12] != 0x1A ) || (rbuf[13] != 0x00))//  26 bytes
        {
                rc = -5;
                return( rc );
        }

        // Checks the MFC.
        if ( rbuf[14] != 0x20 )// MFC is fixed to 0x20.
        {
                rc = -6;
                return( rc );
        }

        // Checks the SFC.
        if ( rbuf[15] != 0x09 )// SFC is 0x09 (Read Holding Register Contents).
        {
                rc = -7;
                return( rc );
        }
```

C

```
        // Checks the number of registers.
        if (( rbuf[18] != 0x0A ) || (rbuf[19] != 0x00))// Not 10 words.
        {
                rc = -8;
                return( rc );
        }

        // Reads the register data rbuf[20] and the data that follows.

        return( rc );
}
```

C.1.2 UDP (When Using Extended MEMOBUS Protocol (SFC = 09))

< Configuration and Setting Example >



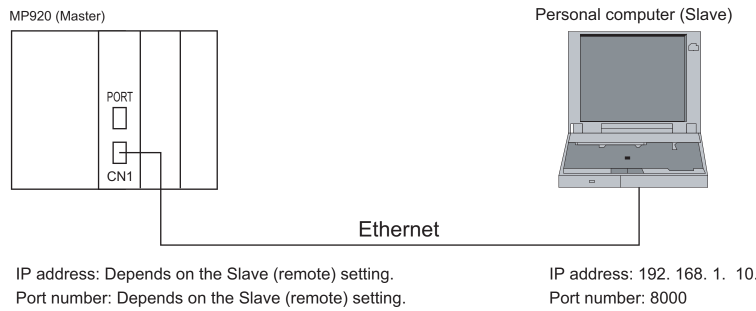

```
#include <stdio.h>
#include <winsock.h>
#include <winioctl.h>

int sd;                /* Socket Discripter */
struct sockaddr_in my;
struct sockaddr_in dst;
struct sockaddr_in from;

#define MY_IP      0xC0A8010A  // Local IP address: 192.168.001.010
#define MY_PORT    10010       // Local port number

#define DST_IP     0xC0A80106  // Remote IP address: 192.168.001.006
#define DST_PORT   10020       // Remote port number

unsigned char sbuf[2048];
unsigned char rbuf[2048];

// 218TCP.C
extern     void mk_cmd_data(void);
extern     int chk_rsp_data(int);

void main_udp(void)
{
           WSADATAwsadata;

           int rc, slen, rlen, fromlen;

           // Declaration to use Winsock.dll (Always required at first.)
           rc = WSAStartup( 0x0101, &wsadata );
           if ( rc != 0 )
           {
                  exit(0);
           }

           // Clears the sockaddr structure (IP address, port number, etc.) to zero.
           memset( (char *)&my, 0, sizeof(struct sockaddr));
           memset( (char *)&dst, 0, sizeof(struct sockaddr));

           // Declaration of local IP address and port number
           my.sin_family = AF_INET;
           my.sin_addr.s_addr = htonl( MY_IP );
           my.sin_port = htons( MY_PORT );

           // Declaration of remote IP address and port number
           dst.sin_family = AF_INET;
           dst.sin_addr.s_addr = htonl( DST_IP );
```

```
        dst.sin_port = htons( DST_PORT );

        // Creates UDP socket.
        sd = socket( AF_INET, SOCK_DGRAM, 0 );
        if ( sd <= 0 )
        {
                printf( "Error: Socket !!\n" );
                exit(0);
        }

        // Execute a bind to allocate local port number.
        rc = bind( sd, ( struct sockaddr *)&my, sizeof(struct sockaddr_in));
        if ( rc == -1 )
        {
                closesocket( sd );
                printf( "Error: bind !!\n" );
                exit(0);
        }

        // Prepares the command data after allocating the local port number.
        mk_cmd_data();

        // Repeats sending the command and receiving the response.
        while(1)
        {
                // Sends the command data.
                // This processing will not end if the Master cannot send data.
                 slen = sendto( sd, &sbuf[0], 22, 0, (struct sockaddr *)&dst, sizeof(struct sockaddr));
                // Sends the command (22 bytes).
                if ( slen != 22 )// The number of bytes (22) that was sent will be returned if sending process is successful.
                {
                        closesocket(sd);
                        printf( "Error: Send !! -> %d\n", slen );
                        exit(0);
                }
                // Receives the response data.
                // This processing will not end if the Slave does not send the response data.
                fromlen = sizeof(struct sockaddr);
                 rlen = recvfrom( sd, &rbuf[0], sizeof(rbuf), 0, (struct sockaddr *)&from, &fromlen );
                // Receives data from the remote station.
                if ( rlen <= 0 )//Value 0 or less will be returned if an error occurs in receiving data.
                {
                        closesocket(sd);
                        printf( "Error: Recv !! -> %d\n", rlen );
                        exit(0);
                }
                // Checks the response data.
                rc = chk_rsp_data( rlen );
                if ( rc != 0 )// Errors in received data
                {
                        closesocket(sd);
                        exit(0);
                }
                sbuf[1] ++;// Increments the serial number of 218 header.
                printf( "Hit Any Key !!\n" );
        }
}
```

C.2 Sample Programs for Slave Station

C.2.1 TCP (When Using Extended MEMOBUS Protocol)

< Configuration and Setting Example >




```
#include <stdio.h>
#include <winsock.h>
#include <winioctl.h>

int       sd;                  // Socket to wait for connection
int              new_sd;       // Socket for communication after connected
struct    sockaddr_in my;      // Work to store local IP address and port number
struct    sockaddr_in dst;     // Work to store the remote IP address and port number

char      sbuf[2048];              // Send buffer
char      rbuf[2048];              // Receive buffer

#define MY_IP      0xC0A8010A      // Local IP address: 192.168.1.10
#define MY_PORT    8000            // Local port number: 8000

void main_tcp_Srv(void);
void mk_rsp_data(int*);
int chk_cmd_data(int);

void main_tcp_Srv(void)
{
          WSADATAwsadata;

          int rc, slen, rlen, send_len, client_addrlen;

          // Declaration to use Winsock.dll (Always required at first.)
          rc = WSAStartup( 0x0101, &wsadata );
          if ( rc != 0 )
          {
                 exit(0);
          }

          // Clears the sockaddr structure (IP address, port number, etc.) to zero.
          memset( (char *)&my, 0, sizeof(struct sockaddr));
          memset( (char *)&dst, 0, sizeof(struct sockaddr));

          //  Declaration of local IP address and port number
          my.sin_family = AF_INET;
          my.sin_addr.s_addr = htonl( MY_IP );
          my.sin_port = htons( MY_PORT );

          // Creates TCP socket.
          sd = socket( AF_INET, SOCK_STREAM, 0 );
          if ( sd <= 0 )  // A value 0 or less will be returned if an error occurs in processing.
```

```
{
        printf( "Error: Socket !!\n" );
        exit(0);
}

// Execute a bind to allocate local port number.
rc = bind( sd, ( struct sockaddr *)&my, sizeof(struct sockaddr_in));
if ( rc == -1 )  // -1 will be returned if an error occurs in processing.
{
        closesocket( sd );
        printf( "Error: bind !!\n" );
        exit(0);
}

// Preparation to wait for connection: Up to 5 connection requests can be held.
// (The number of connection requests is limited depending on the OS.)
rc = listen( sd, 5 );
if( rc == -1 )  // -1 will be returned if an error occurs in processing.
{
        closesocket( sd );
        printf( "Error: listen !!\n" );
        exit(0);
}

client_addrlen = (int)(sizeof(struct sockaddr_in));

// Wait for connection
// This processing will not end if no connection request is sent from the Master.
new_sd = accept( sd, ( struct sockaddr * )&dst, &client_addrlen );
if( new_sd == -1 )  // -1 will be returned if an error occurs in processing.
{
        closesocket( sd );
        printf( "Error: accept !!\n" );
        exit(0);
}

// sd is the socket to wait for connection. When connecting processing is executed, another socket (new_sd)
// will be created. The new_sd will be the socket number to be used for communication.

// The socket to wait for connection is closed here so that any more connection request will not be accepted.
closesocket( sd );

// Extended MEMOBUS data sending and receiving processing
// A response must be sent for the received command when using the extended MEMOBUS protocol.
// Repeats sending the command data and receiving the response data.
while(1)
{
        // Receives the command data.
        // This processing will not end if the Master does not send the command data.
        rlen = recv( new_sd, &rbuf[0], sizeof(rbuf), 0 ); // Receives data from the remote station.
        if ( rlen <= 0 )// Value 0 or less will be returned if an error occurs in receiving data.
        {
                closesocket(new_sd);
                printf( "Error: Recv !! -> %d\n", rlen );
                exit(0);
        }

        // Checks the receive data.
        rc = chk_cmd_data( rlen );
        if ( rc != 0 )// Errors in the receive data
        {
                closesocket(new_sd);
```

```
                    exit(0);
                }

                // Prepares the response data.
                mk_rsp_data( &send_len );

                // Sends the response data.
                // This processing will not end if the Slave cannot send the response data.
                slen = send( new_sd, &sbuf[0], send_len, 0 );

                if ( slen != send_len )// The number of bytes that was sent will be returned if the sending process is successful.
                {
                    closesocket(new_sd);
                    printf( "Error: Send !! -> %d\n", slen );
                    exit(0);
                }

                printf( "Hit Any Key !!\n" );
            }
}


/************************************************************************************/
/* Preparation of extended MEMOBUS response data                                    */
/*                                                                                  */
/* An appropriate response for the function code (SFC=03, 06, 08, 09, 0B, or 10) of extended */
/* MEMOBUS protocol will be returned. In this sample program, an error response will be */
/* returned for other function codes as they are not supported.                     */
/* A dummy data will be prepared and returned for Read command.                     */
/************************************************************************************/
void mk_rsp_data( int *slen )
{
int                 i;
unsigned shortdata_size, memex_len;

            /****************************************/
            /* Preparation of Extended MEMOBUS Data  */
            /****************************************/
            // MFC
            sbuf[14] = 0x20;        // Fixed to 20H
            // SFC
            sbuf[15] = rbuf[15];    //Send a received data.
            // Set the CPU numbers.
            sbuf[16] = (rbuf[16] << 4) & 0xF0;          // The destination is the source CPU. Local CPU No.: 0

            // Processing for each function code
            switch( rbuf[15] )
            {
                case    0x03:   // Read Holding Register Contents
                    data_size = (unsigned short)((unsigned char)rbuf[19]) << 8;
                    data_size += (unsigned short)((unsigned char)rbuf[20]);
                    data_size *= 2;// Read data size in bytes
                    memex_len = data_size + 3;              // Extended MEMOBUS length for response
                     // data size + 3byte(MFC,SFC,CPU NO)
                    // Prepares a dummy data.
                    // Converts then sends the requested word unit data into byte units.
                    for( i = 0; i < data_size; i++ )
                    {
                        sbuf[17 + i] = i;// Sets data read from sbuf[17].
                    }
                    break;
```

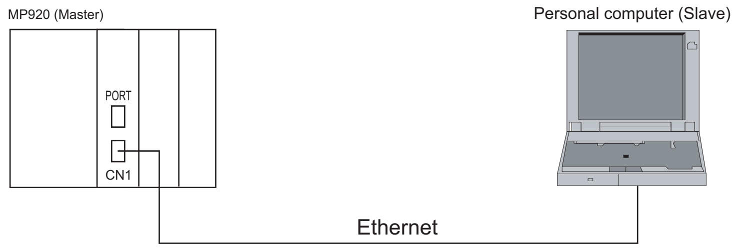
```
        case    0x06:   //Modify a Single Holding Register Contents
        case    0x08:   // Loopback Test
                memex_len = 7;// Extended MEMOBUS Length for Response
                sbuf[17] = rbuf[17];// Send a received data.
                sbuf[18] = rbuf[18];// Send a received data.
                sbuf[19] = rbuf[19];// Send a received data.
                sbuf[20] = rbuf[20];// Send a received data.
                break;

        case    0x09:   // Read Holding Register Contents (extended)
                data_size = (unsigned short)((unsigned char)rbuf[21]) << 8;
                data_size += (unsigned short)((unsigned char)rbuf[20]);
                data_size *= 2;// Read data size in bytes
                memex_len = data_size + 6;// Extended MEMOBUS Length for Response
                // data size + 6 bytes (MFC, SFC, CPU No, SPEAR, REG No)
                sbuf[17] = 0x00;    // Spare is fixed to 0.
                // Sets the number of registers.
                sbuf[18] = rbuf[20];    // DataNum(L)
                sbuf[19] = rbuf[21];    // DataNum(H)
                // Prepares a dummy data.
                // Converts then sends the requested word unit data into byte units.
                for( i = 0; i < (data_size / 2); i++ )
                {
                        sbuf[20 + 2 * i] = i;           // Set data read from sbuf[20].
                }
                break;

        case    0x0B:   // Write to Holding Register (extended)
                memex_len = 8;// Extended MEMOBUS Length for Response
                sbuf[17] = 0x00;    // Spare is fixed to 0.
                sbuf[18] = rbuf[18];// Send a received data.
                sbuf[19] = rbuf[19];// Send a received data.
                sbuf[20] = rbuf[20];// Send a received data.
                sbuf[21] = rbuf[21];// Send a received data.
                break;

        case    0x10:   // Write to Holding Register (extended)
                memex_len = 7;// Extended MEMOBUS Length for Response
                sbuf[17] = rbuf[17];// Send a received data.
                sbuf[18] = rbuf[18];// Send a received data.
                sbuf[19] = rbuf[19];// Send a received data.
                sbuf[20] = rbuf[20];// Send a received data.
                break;

        default:// In this sample program, function code other than the above listed are judged
                // as not supported codes and an error response will be returned.
                memex_len = 4;// Extended MEMOBUS Length for Response
                sbuf[15] |= 0x80;// Error response (SFC + 80H)
                sbuf[17] = 0x01;// Error response (SFC error)
}

// Length: From MFC to the end of data
sbuf[12] = (char)(memex_len & 0x00FF); // Extended MEMOBUS length L
sbuf[13] = (char)((memex_len >> 8) & 0x00FF); // Extended MEMOBUS length H

/**************************/
/* Preparation of 218 Header      */
/*************************/
// Sets the data type.
sbuf[0] = 0x19;         // Extended MEMOBUS (Response)
```

```
        //Sets the serial number.
        sbuf[1] = rbuf[1];      // Send a received data.

        // Sets the destination channel number.
        sbuf[2] = rbuf[3];      // Sets the PLC source channel number.

        // Sets the source channel number.
        sbuf[3] = 0x00;         // Fixed to 0 since a personal computer has no channel number.

        sbuf[4] = 0x00;         // Reserved
        sbuf[5] = 0x00;         // Reserved

        // Sets all the number of data items (from the start of 218 header to the end of MEMOBUS data).
        sbuf[6] = (char)((12 + 2 + memex_len) & 0x00FF);
        //L (218 header (12 bytes) + MEMOBUS header length (2 bytes) + Extended MEMOBUS length
    //(memex_len bytes)
        sbuf[7] = (char)(((12 + 2 + memex_len) >> 8) & 0x00FF); // H




        sbuf[8] = 0x00;         // Reserved
        sbuf[9] = 0x00;         // Reserved
        sbuf[10] = 0x00;// Reserved
        sbuf[11] = 0x00;// Reserved

        // Sets the send data length (218 header + Extended MEMOBUS data).
        *slen = (int)(memex_len + 12 + 2);
}



/****************************************************/
/* Extended MEMOBUS Command Check                               */
/* Checks the header of the received data.                      */
/****************************************************/
int chk_cmd_data( int rlen )
{
        int rc;
        unsigned shortdata_len, memex_len;

        rc = 0;

        // Total data length
        data_len = (unsigned short)((unsigned char)rbuf[7]) << 8;
        data_len += (unsigned short)((unsigned char)rbuf[6]);


        // Checks the total data length.
        if ( rlen != (int)data_len )
        {
                rc = -1;
                return( rc );
        }

        // Checks the packet type.
        if ( rbuf[0] != 0x11 )// Commands other than MEMOBUS commands are not accepted.
        {
                rc = -2;
                return( rc );
        }
```

```
        // Extended MEMOBUS Data Length
        memex_len = (unsigned short)((unsigned char)rbuf[13]) << 8;
        memex_len += (unsigned short)((unsigned char)rbuf[12]);

        // Checks the extended MEMOBUS data length.
        if (( data_len - 14) != memex_len )
        // Extended MEMOBUS data length ¼Total data length - 218 header (12 bytes) -
    // Extended MEMOBUS length (2 bytes)
        {
                rc = -3;
                return( rc );
        }

        // Checks the MFC.
        if ( rbuf[14] != 0x20 )// MFC is fixed to 0x20.
        {
                rc = -4;
                return( rc );
        }

        // Checks the SFC.
        // Checks within mk_rsp_data().

        return( rc );
}
```

C.2.2 UDP (When Using Extended MEMOBUS Protocol)

< Configuration and Setting Example >




```
#include <stdio.h>
#include <winsock.h>
#include <winioctl.h>

int     sd;                  // Socket
struct  sockaddr_in my;      // Work to store local IP address and port number
struct  sockaddr_in from;// Work to store the remote IP address and port number

char    sbuf[2048];          // Send buffer
char    rbuf[2048];          // Receive buffer

#define MY_IP      0xC0A8010A // Local IP address: 192.168.1.10
#define MY_PORT    8000       // Local port number:  8000

// 218TCPSrv.C
extern  void mk_rsp_data(int*);
extern  int chk_cmd_data(int);

void main_udp_Srv(void);

void main_udp_Srv(void)

{
        WSADATAwsadata;

        int rc, slen, rlen, send_len, fromlen;

        // Declaration to use Winsock.dll  (always required at first.)
        rc = WSAStartup( 0x0101, &wsadata );
        if ( rc != 0 )
        {
                exit(0);
        }

        // Clears the sockaddr structure (IP address, port number, etc.) to zero.
        memset( (char *)&my, 0, sizeof(struct sockaddr));
        memset( (char *)&from, 0, sizeof(struct sockaddr));

        // Declaration of local IP address and port number
        my.sin_family = AF_INET;
        my.sin_addr.s_addr = htonl( MY_IP );
        my.sin_port = htons( MY_PORT );
```

```
        // Creates UDP socket.
        sd = socket( AF_INET, SOCK_DGRAM, 0 );
        if ( sd <= 0 )  // Value 0 or less will be returned if an error occurs in processing.
        {
                printf( "Error: Socket !!\n" );
                exit(0);
        }

        // Execute a bind to allocate local port number.
        rc = bind( sd, ( struct sockaddr *)&my, sizeof(struct sockaddr_in));
        if ( rc == -1 )  // -1 will be returned if an error occurs in processing.
        {
                closesocket( sd );
                printf( "Error: bind !!\n" );
                exit(0);
        }

        // Immediately waits for receive data since there is no other connection.

        // Extended MEMOBUS data sending and receiving processing
        // A response must be sent for the received command when using the extended MEMOBUS protocol.
        // Repeats receiving the command data and sending the response data.
        while(1)
        {
                // Receives the command data.
                // This processing will not end if the Master does not send the command.
                fromlen = sizeof(struct sockaddr);
                rlen = recvfrom( sd, &rbuf[0], sizeof(rbuf), 0, (struct sockaddr *)&from, &fromlen );
                if ( rlen <= 0 )//Value 0 or less will be returned if an error occurs in receiving data.
                {
                        closesocket(sd);
                        printf( "Error: Recv !! -> %d\n", rlen );
                        exit(0);
                }

                // Checks the receive data.
                rc = chk_cmd_data( rlen );
                if ( rc != 0 )  //Errors in the receive data
                {
                        closesocket(sd);
                        exit(0);
                }

                // Prepares the response data.
                mk_rsp_data( &send_len );

                // Sends the response data.
                // This processing will not end if the Slave cannot send the response data.
                 slen = sendto( sd, &sbuf[0], send_len, 0, (struct sockaddr *)&from, sizeof(struct sockaddr));
                if ( slen != send_len )  // The number of bytes that was sent will be returned if the sending processing is
suc-
                cessful.
                {
                        closesocket(sd);
                        printf( "Error: Send !! -> %d\n", slen );
                        exit(0);
                }

                printf( "Hit Any Key !!\n" );
        }
}
```

Appendix D

Wiring Communications

This appendix describes in-panel wiring, panel-to-panel wiring, and transmission line components required for the Communications Modules.

D

D.1 In-panel Wiring

D.1.1 Connection Methods

■ 215IF Cable Connections

215IF Module

This section describes how to connect cables inside the control panel of the 215IF Module mounted in an MP900-Series Machine Controller.

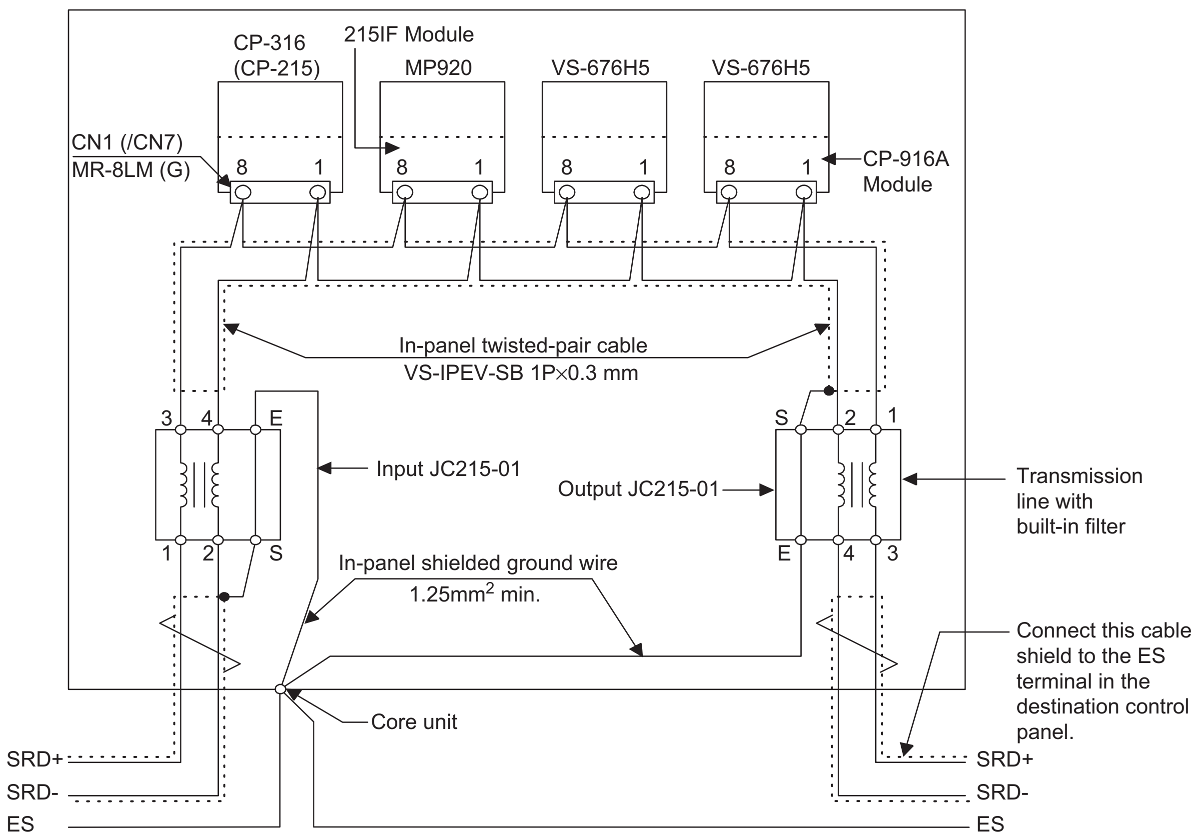


Fig. D.1 215IF Transmission Line Connection Example (JC215-01)

- For connections between Communications Interface Modules, connect the MR-8LM(G) terminals with the same number using in-panel cables.
  Connect pins 8 and 1 of the MR-8LM(G) connector to SRD+ and SRD-, respectively.
- Install the JC215-01 on the input and output sides of the control panel, and connect the in-panel and panel-to-panel cables to the JC215-01.
- JC215-01 signal terminals: Both input and output are possible between terminals 1 and 2 or between terminals 3 and 4.
- Where the JC215-01 is installed at the end of the transmission line, always install a terminating resistance (75Ω) between JC215-01 terminals 1 and 2 or between terminals 3 and 4.
- Connect only one end of each in-panel cable or panel-to-panel cable shield to terminal S of input JC215-01 or output JC215-01, and connect terminal E to terminal Es in the control panel using a 1.25 mm^2 ground wire.

215IF Card for PC/AT or Compatible Computers

This section describes how to connect cables inside the control panel of the CP-215PC/AT mounted in a PC/AT or compatible computer.

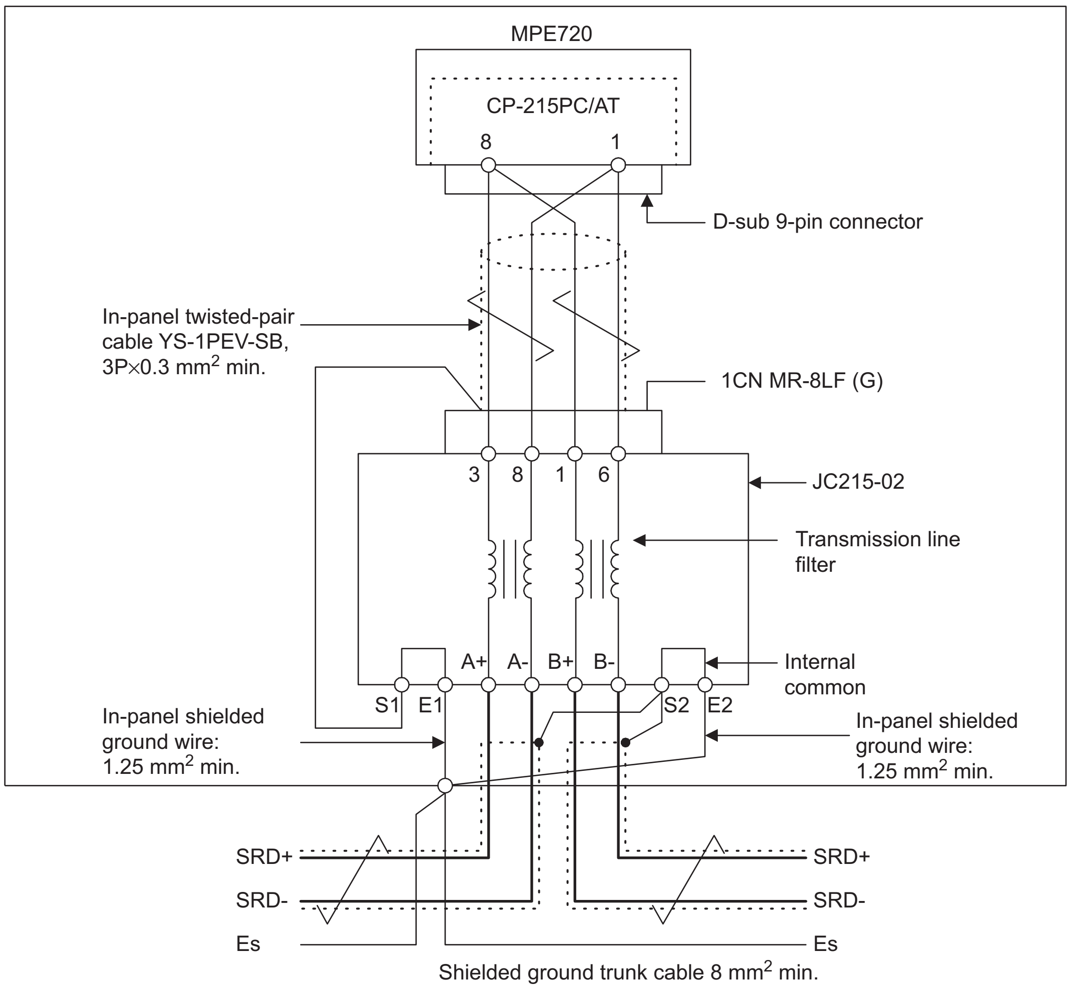


Fig. D.2 215IF Transmission Line Connection Example (JC215-02)

- Connection Method

  Connect the CP-215PC/AT Card to the JC215-02 with an in-panel cable. Connect the SRD+ and SRD- signal wires of the in-panel cable to the A+ and A- terminals (or B+ and B- terminals), respectively.

- Terminating Resistance

  If the CP-215PC/AT Card is located at the end of the transmission line, connect terminating resistances to the A+ and A- terminals (or B+ and B- terminals) of the JC215-02.

- Shield Ground Wire Treatment

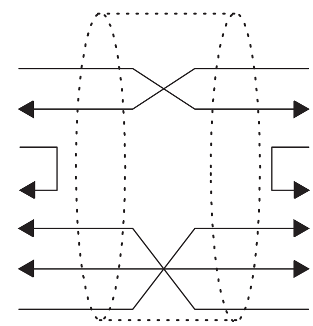
  Connect only one end of each in-panel cable and panel-to-panel cable shield to the S1 and S2 terminals of the JC215-02, and connect the E1 and E2 terminals to the Es terminals of the control panel using a ground wire of 1.25 mm^2 or greater.

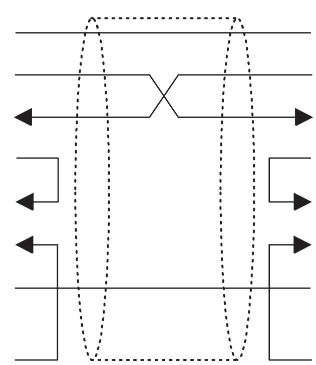
■ 217IF Cable Connections

CN1, CN2, and RS-232C Cables

This section describes RS-232C transmission line connections for 217IF Module of the MP920.

Table D.1 217IF RS-232C Transmission Line Connections

MP920 217IF (CN1, CN2)		Cable Connections and Signal Directions	Remote Station (D-sub 25-pin)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD(TXD)	2		2	SD(TXD)
RD(RXD)	3		3	RD(RXD)
RS	4		4	RS
CS(CTS)	5		5	CS(CTS)
DSR(DR)	6		6	DSR(DR)
SG	7		7	SG
DTR(ER)	9		20	DTR(ER)

MP920 217IF (CN1, CN2)		Cable Connections and Signal Directions	Remote Station (D-sub 9-pin)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD(TXD)	2		2	SD(TXD)
RD(RXD)	3		3	RD(RXD)
RS	4		4	RS
CS(CTS)	5		5	CS(CTS)
DSR(DR)	6		6	DSR(RD)
SG	7		7	SG
N.C.	8		8	N.C.
DTR(ER)	9		9	DTR(ER)

MP920 217IF (CN1)		Cable Connections and Signal Directions	PC/AT or Compatible Computer	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD(TXD)	2		2	SD(TXD)
RD(RXD)	3		3	RD(RXD)
RS	4		4	RS
CS(CTS)	5		5	CS
DR(DSR)	6		6	DSR(DR)
SG	7		7	SG
CD	8		8	CD
ER(DTR)	9		9	RTR(ER)

CN3 RS-485 Cable

The following figure shows RS-485 transmission line connection examples for 217IF Module of the MP920.

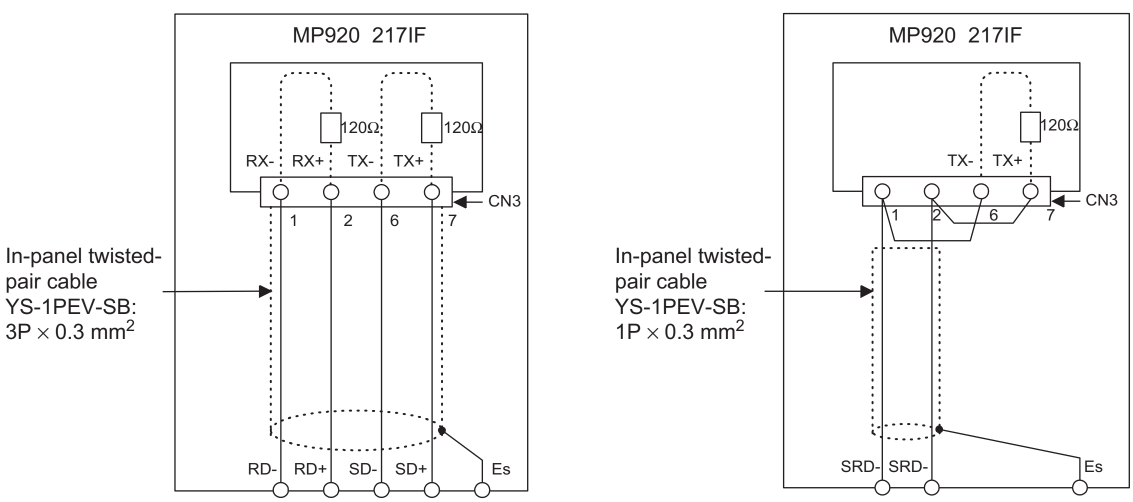


Fig. D.3 217IF RS-485 Transmission Line Connection Examples

- The terminating resistance at the end station of the transmission line must be connected. Shield treatment is required at each intermediate station of the transmission line. Follow the CN3 wiring shown in *6.4.2 RS-422/485 Interface Cables*.

■ CP-215 Repeater-TT Cable Connections

The following figure shows a 215IF transmission line connection example.

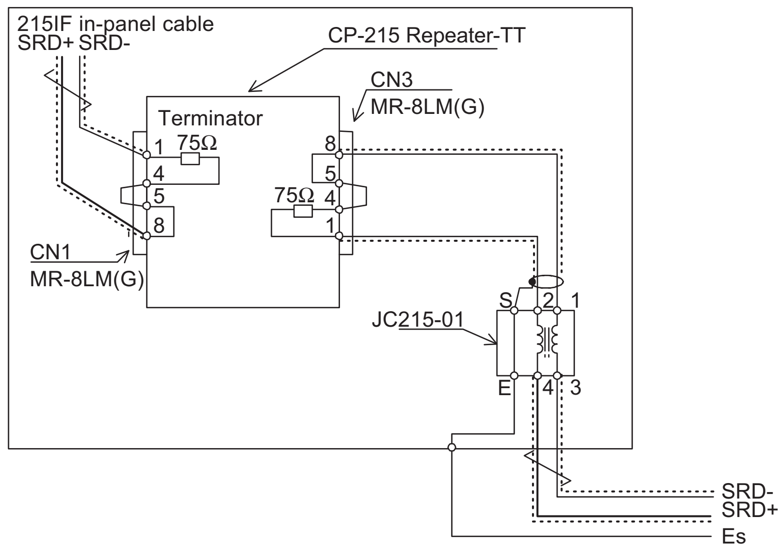


Fig. D.4 CP-215 Repeater-TT Transmission Line Connection Example

- Connect pins 8 and 1 of the CN1 and CN3 transmission connectors (MR-8LM(G)) on the Repeater to SRD+ and SRD-, respectively.
- If the Repeater is located at the end of the transmission line, short-circuit pins 4 and 5 of the CN1 or CN3 to connect the internal 75Ω terminating resistance.

■ CP-215 Repeater-TC Cable Connections

The following figure shows a CP-215 Repeater-TC transmission line connection example.

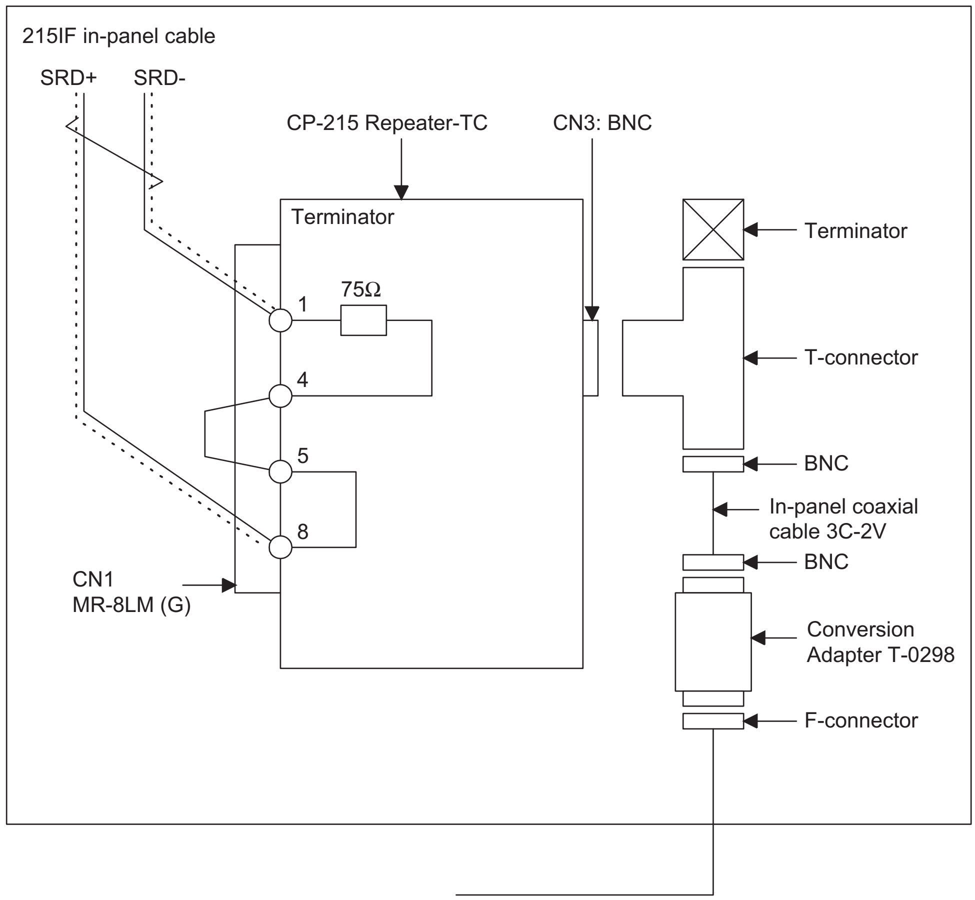


Fig. D.5 CP-215 Repeater-TC Transmission Line Connection Example

- Connect the in-panel twisted-pair cable (YS-IPEV-SB, 1P $\times$ 0.3 mm^2, manufactured by Fujikura Corporation) equipped with an MR-8LM(G) connector to the CN1 transmission connector on the Repeater.
- Connect pins 8 and 1 of the CN1 transmission connector on the Repeater to SRD+ and SRD-, respectively.
- Fit a T-connector onto the CN3 transmission connector (BNC connector) on the Repeater, and connect it to a 3C-2V in-panel coaxial cable equipped with a BNC connector.
- If the Repeater is located at the end of the transmission line, short-circuit pins 4 and 5 of the CN1 to connect the internal 75Ω terminating resistance.

CP-215 Repeater-TP Cable Connections

The following figure shows a CP-215 Repeater-TP transmission line connection example.

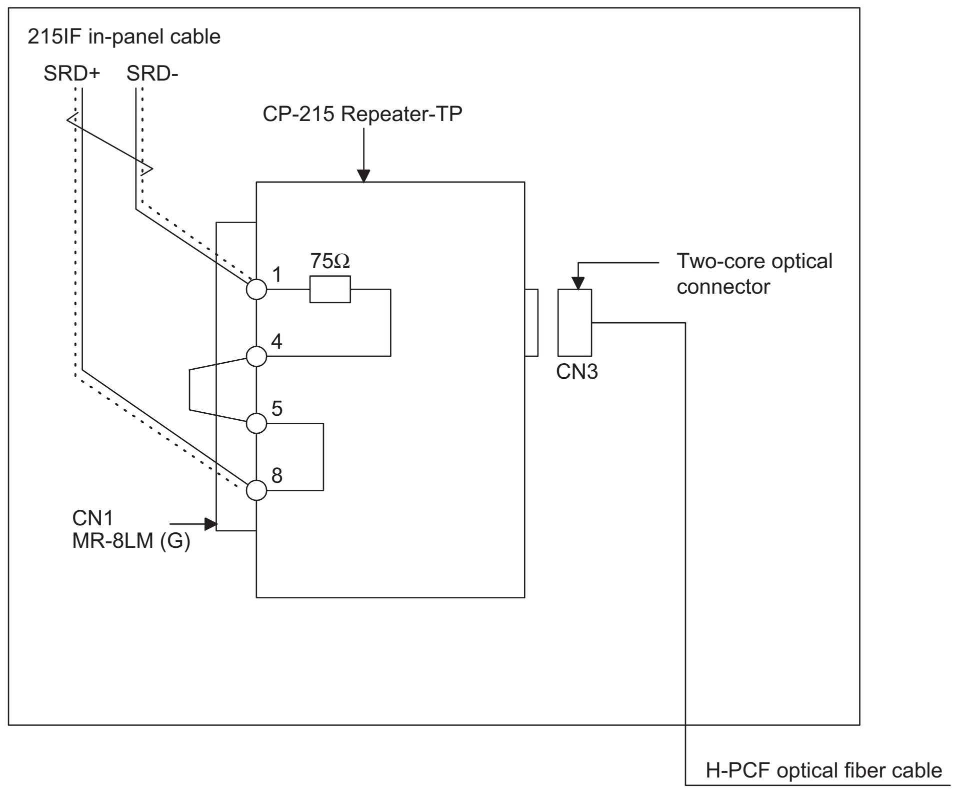


Fig. D.6 CP-215 Repeater-TP Transmission Line Connection Example

- Connect the in-panel twisted-pair cable (YS-IPEV-SB, 1P × 0.3 mm^2, manufactured by Fujikura Corporation) with an MR-8LM(G) connector to the CN1 transmission connector on the Repeater.
- Connect pins 8 and 1 of the CN1 transmission connector on the Repeater to SRD+ and SRD-, respectively.
- Connect an H-PCF optical fiber cable equipped with a two-core optical connector to the CN3 optical transmission connector on the Repeater.
- If the Repeater is located at the end of the transmission line, short-circuit pins 4 and 5 of the CN1 to connect the internal 75Ω terminating resistance.

D

■ CP-215 Repeater-TS2 Cable Connections

The following figure shows a CP-215 Repeater-TS2 transmission line connection example.

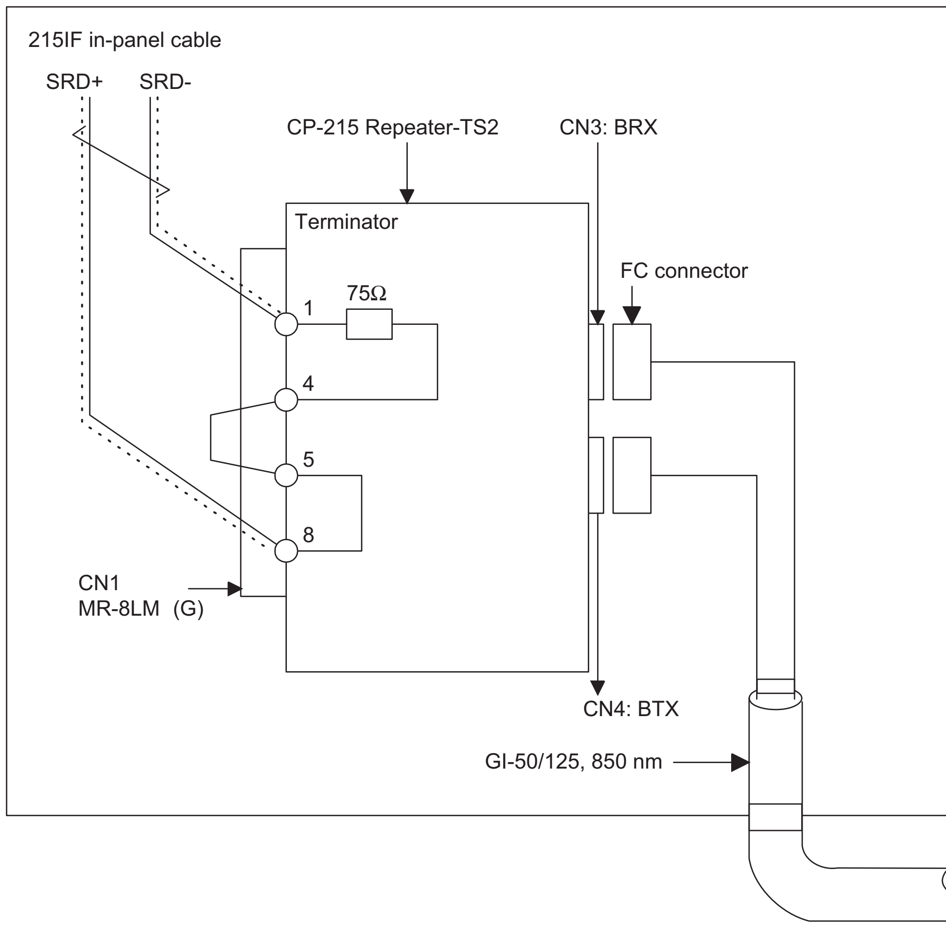


Fig. D.7 CP-215 Repeater-TS2 Transmission Line Connection Example

- Connect the in-panel twisted-pair cable (YS-IPEV-SB, 1P × 0.3 mm^2, manufactured by Fujikura Corporation) equipped with an MR-8LM(G) connector to the CN1 transmission connector on the Repeater.
- Connect pins 8 and 1 of the CN1 transmission connector on the Repeater to SRD+ and SRD-, respectively.
- Connect the CN3 and CN4 optical transmission connectors on the Repeater to a crystal glass fiber cord or cable (GI-50/125, 850 nm, 2.5 to 3 dB) equipped with a single-core optical connector (FC type).
- If the Repeater is located at the end of the transmission line, short-circuit pins 4 and 5 of the CN1 to connect the internal 75Ω terminating resistance.

■ CP-215 Repeater-TS5 Cable Connections

The following figure shows a CP-215 Repeater-TS5 transmission line connection example.

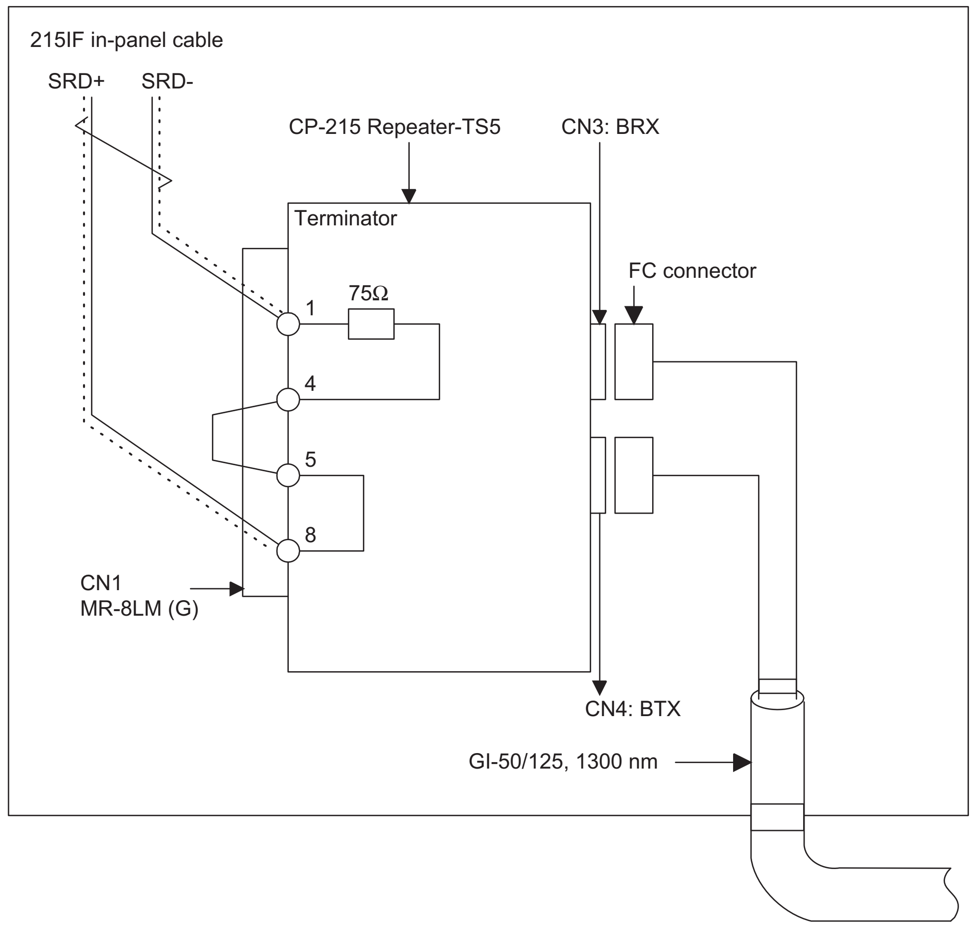


Fig. D.8 CP-215 Repeater-TS5 Transmission Line Connection Example

- Connect the in-panel twisted-pair cable (YS-IPEV-SB, 1P × 0.3 mm^2, manufactured by Fujikura Corporation) equipped with an MR-8LM(G) connector to the CN1 transmission connector on the Repeater.
- Connect pins 8 and 1 of the CN1 transmission connector on the Repeater to SRD+ and SRD-, respectively.
- Connect the CN3 and CN4 optical transmission connectors on the Repeater to a crystal glass fiber cord or cable (GI-50/125, 1,300 nm, 0.7 to 1 dB) equipped with a single-core optical connector (FC type).
- If the Repeater is located at the end of the transmission line, short-circuit pins 4 and 5 of the CN1 to connect the internal 75Ω terminating resistance.

D

D.1.2 In-panel Cables

The following table shows the in-panel cables used for communications.

Always use the specified cables. Otherwise, the communications system will fail to provide its full performance.

When bending a communications cable, be sure that the bending radius is at least 10 times the finished outer diameter of the cable.

Table D.2 Cable Bending Radius

Communications System	Cable Type	Finished Outer Diameter dl (mm)	Permissible Bending Radius 10 dl (mm)	Applicable Duct
215IF, 217IF RS-485	Twisted-pair cable: YS-IPEV-SB, 1P × 0.3 mm, manufactured by Fujikura Corporation	5.6	56 min.	Low-voltage duct
	Twisted-pair cable: YS-IPEV-SB, 3P × 0.3 mm, manufactured by Fujikura Corporation	7.2	72 min.	Low-voltage duct
217IF RS-232C				Low-voltage duct
CP-215 Repeater	Coaxial cable: 3C-2V, manufactured by Fujikura Corporation	5.6	56 min.	Special-purpose duct
	Coaxial cable: 3C-2V (Cu, Fe) ZV, manufactured by Fujikura Corporation	8.6	86 min.	Low-voltage duct
218IF	Transceiver cable: DAISET-1581B, manufactured by Mitsubishi Cable Industries, LTD.	9.2	100 min.	Low-voltage duct

D.1.3 In-panel Wiring Separation

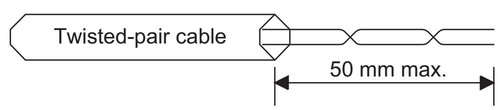
- Nonshielded in-panel cables must be thoroughly separated from low-voltage cables. If this is difficult, shield the low-voltage cables.
- Shielded in-panel cables must be thoroughly separated from high-voltage cables. If this is difficult, shield the high-voltage cables.

D.1.4 Shield Treatment

- Connect the shield of each shielded in-panel twisted-pair cable to the Es ground terminal so that it does not loop.

D.1.5 Exposed Conductor Length

- The exposed conductor length of each in-panel twisted-pair cable should be as short as possible (50 mm or less).
- The characteristic impedance of the exposed conductor section is greater than the prescribed value (75Ω).
- Increasing the exposed conductor length increases transmission waveform distortion, resulting in a transmission error.



D.2 Indoor Panel-to-Panel Wiring

D.2.1 Panel-to-Panel Cable Connections

■ 215IF Panel-to-Panel Cable Connections

The following figure shows a 215IF panel-to-panel cable connection example.

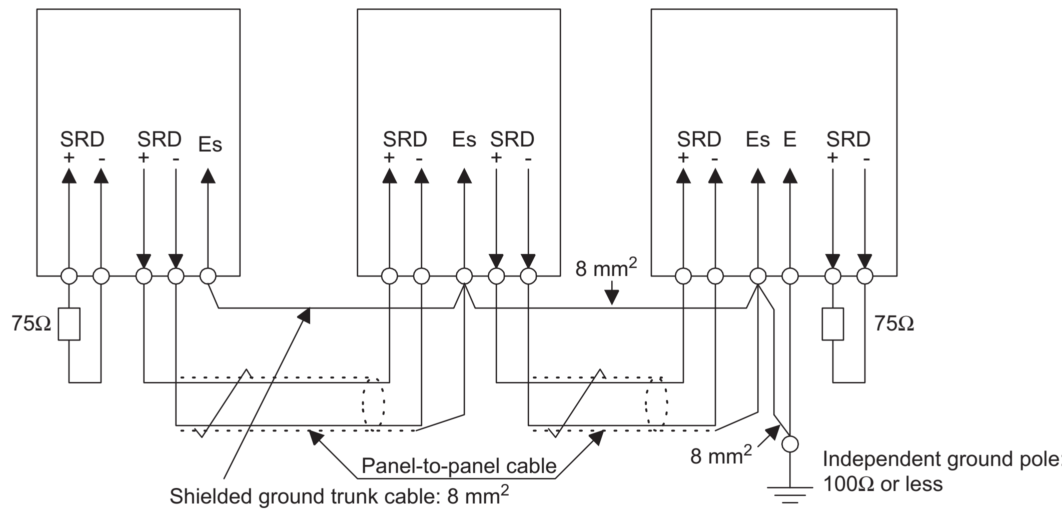


Fig. D.9 215IF Panel-to-Panel Cable Connection Example

- Connecting Signal Lines

  Use panel-to-panel cables to connect the incoming and outgoing SRD+ and SRD- signal terminals on each control panel as shown in the above figure.

- Connecting Terminating Resistances

  Mount 75Ω terminating resistances at both ends of the transmission line.

- Connecting Shielded Ground Trunk Cables

  Connect the Es terminals of each control panel using daisy chain connections.

  Use a shielded ground trunk cable of 8 mm^2 or greater.

  Using a ground wire of 8 mm^2 or greater, ground the shielded ground trunk cable to an independent ground pole with a ground resistance of 100Ω or less.

■ 217IF RS-485 Panel-to-Panel Cable Connections

The following figure shows a 217IF RS-485 panel-to-panel cable connection example.

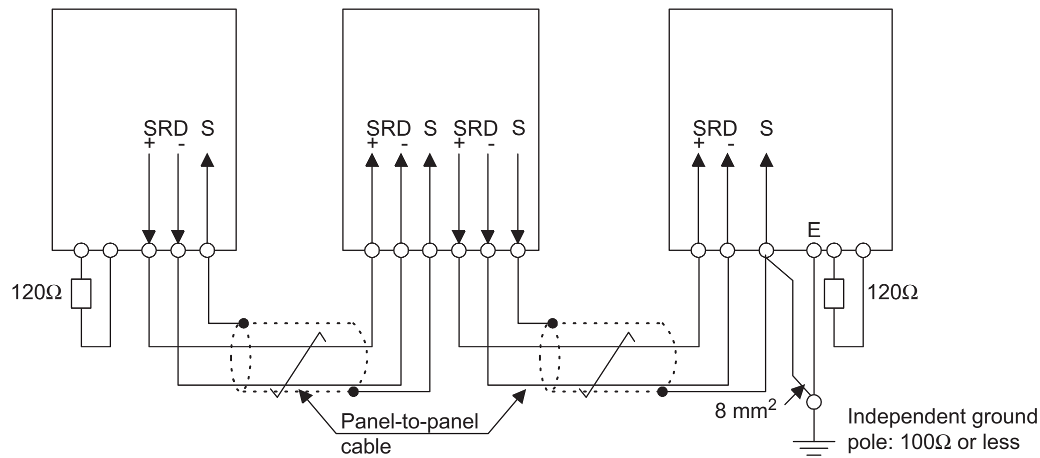


Fig. D.10 217IF RS-485 Panel-to-Panel Cable Connection Example

- Connecting Signal Lines

  Use panel-to-panel cables to connect the incoming and outgoing SRD+ and SRD- signal terminals on each control panel as shown in the above figure.

- Connecting Terminating Resistances

  Mount terminating resistances at both ends of the transmission line.

- Connecting Shielded Ground Trunk Cables

  Connect the shield of each panel-to-panel cable to shielded wire junction terminal S on each control panel and ground it at one point only.

  Using a ground wire of 8 mm^2 or greater, ground the shield to an independent ground pole with a ground resistance of 100Ω or less.

D

D.2.2 Panel-to-Panel Cables

The following table shows the panel-to-panel cables used for communications.

Always use the specified cables. Otherwise, the communications system will fail to provide its full performance.

When bending a communications cable, be sure that the bending radius is at least 10 times the finished outer diameter of the cable.

Table D.3 Cable Bending Radius

Communications System	Cable Type	Finished Outer Diameter dl (mm)	Permissible Bending Radius 10 dl (mm)	Applicable Duct
215IF, 217IF RS-485	Twisted-pair cable: YS-IPEV-S (Cu), 1P × 1.25 mm, manufactured by Fujikura Corporation	8.6	86 min.	Low-voltage duct
CP-215 Repeater	Coaxial cable: 5C-2V (Cu, Fe)-ZV, manufactured by Fujikura Corporation	12.0	120 min.	Low-voltage duct

D.2.3 Wiring Separation

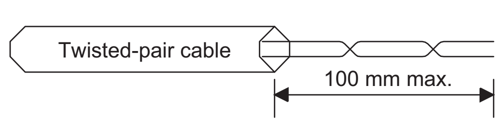
- House the shielded communications cables in a low-voltage circuit duct that is different from general operation circuit ducts. If this is not possible, keep the low-voltage circuits at least 100 mm away from the general control circuits.
- Likewise, keep the shielded communications cables at least 300 to 1,200 mm from the main circuits.

D.2.4 Shield Treatment

- Ground the shield at one point only for panel-to-panel cables.
- Using a ground wire of 8 mm^2 or greater, ground the shielded ground trunk cable to an independent ground pole with a ground resistance of 100Ω or less.

D.2.5 Exposed Conductor Length

- The exposed conductor length of each panel-to-panel twisted-pair cable should be as short as possible (100 mm or less).
- The characteristic impedance of the exposed conductor section is greater than the prescribed value (75Ω).
- Increasing the exposed conductor length increases transmission waveform distortion, resulting in a transmission error.



D.3 Outdoor Panel-to-Panel Wiring

D.3.1 Wiring Precautions

The procedure for laying communications cables is based on the procedure described in *D.2 Indoor Panel-to-Panel Wiring*, but heed the following precautions.

- For outdoor wiring, always lay the communications cables along an above-ground structure such as steel frames (see *Fig. D.11 (a)* below).
- Where there is no above-ground structure, house the communications cables in an underground pit or tunnel, or bury them in the ground (see *Fig. D.11 (b)* and *(c)* below).
- Do not lay bare communications cables overhead. Otherwise, the cables will collect inductive noise from electric waves in the air and cause transmission errors.
- The transmission system is not protected against lightning surge. If the communications cables are laid overhead, the equipment may be damaged due to lightening.
- Communications cables expand according to the surrounding temperature. Generally, the temperature coefficient of communications cables is approximately 0.05% per 10°C.

  For example, a 500-meter communications cable expands 25 cm when the temperature increases 10°C. Normally, this amount of expansion can be absorbed within the cabling route. However, where communications cables are laid along above-ground structure, the temperature difference will be considerably large and cable expansion or contraction may not be absorbed within the cabling route. To prevent this, the communications cables must be given some play so that their expansion and contraction can be absorbed within the route.
- If the communications cables are housed in a metal wiring conduit or duct, water will be trapped inside the conduit or duct and apply mechanical stress to the communications cables when frozen in winter. To prevent this, provide the conduit or duct with drain holes.

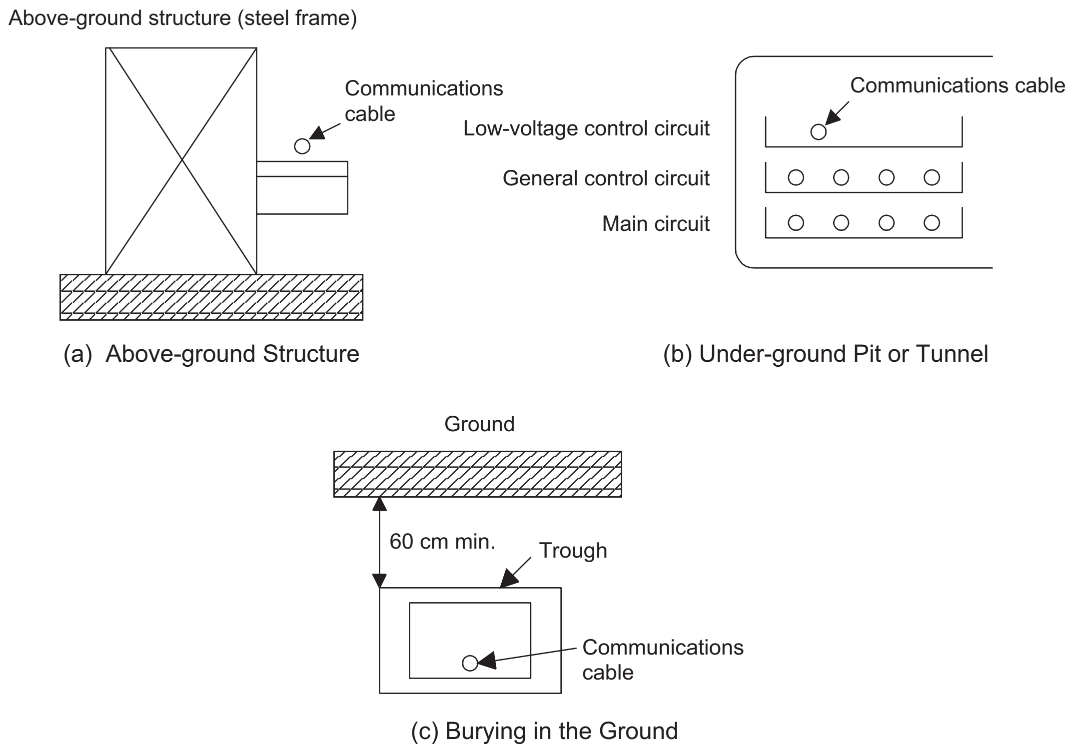


Fig. D.11 Laying Cables between Buildings

D.4 Wiring Optical Fiber Cables

D.4.1 In-panel Wiring

Heed the following precautions during in-panel wiring of optical fiber cables

- Install in-panel ducts or clamp bars so that the tension and bending radius of the optical fiber cord or cable do not exceed the limits.
- When securing the optical fiber cord with clamps, use a cushioning material and secure clamps at intervals of approximately 500 mm, taking care not to tighten the cord excessively.
- When laying a long optical fiber cord vertically, secure it with clamps at intervals of approximately 500 mm so that tensile force will not be applied to the optical connector or bent portions.
- Install a tension member after fixing a crimp terminal at the tip of the member. The steel wire tension member must be insulated from the ground of the control panel during installation.
- If the optical fiber cord is mixed with power supply or control cables inside an in-panel duct, take care that lateral pressure, load, and other mechanical stresses will not be applied to the cord.
- Do not pull or twist the optical fiber cord or cable while gripping the optical connector.

D.4.2 Indoor and Outdoor Panel-to-Panel Optical Wiring

■ Connecting Optical Connectors

Optical connectors must be connected on-site in the following situations.

- The exact cable length cannot be decided because the cabling route is unknown.
- There is no work site where excess cable lengths can be treated.
- There is no work site (approximately 1 m × 1 m) where optical connectors can be connected.
- It is difficult to lay optical fiber cords or cables equipped with a connector because there are conduits or ducts in the cabling route. Conduit/duct diameter, conduit/duct bending radius, and through-hole diameter restrictions apply when a cover is used to protect the tip of a connector during cable installation.

  Unless there are special circumstances as above, it is recommend to purchase optical fiber cords or cables equipped with optical connectors at both ends.

IMPORTANT

On-site optical connector connection must always be done by those who have completed a connector processing training course.

For details on connecting optical connectors and laying optical fiber cords or cables, contact your nearest Yaskawa dealer.

■ Connecting Optical Fiber Cords or Cables

The following methods can be used to connect crystal glass optical fiber cables outside a control panel to Optical Repeaters inside the control panel or connect optical fiber cables between control panels. Use an appropriate method.

IMPORTANT

H-PCF optical fiber cables cannot be connected with each other.

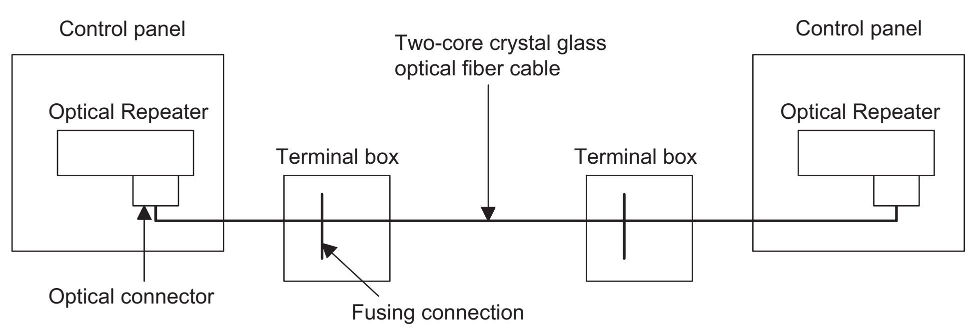
The maximum transmission distance varies according to the optical fiber cable connection method (fusing connection or connector relay connection) and the connection position.

Refer to the next section ■*Calculating the Maximum Transmission Distance* for details on how to determine the maximum transmission distance (L).

Fusing Connection Method

This method connects optical fiber cables inside a control panel to optical fiber cables outside the control panel or connect optical fiber cables between control panels by fusing these cables. Terminal boxes are used to connect the cables.

The connection loss will be 0.1 to 0.2 dB per connection (at intervals of 500 to 1,000 m max.).



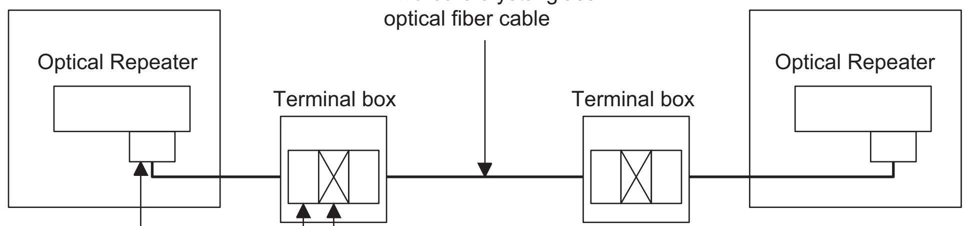
Connector Connection Method

This method connects the connectors of optical fiber cables inside and outside a control panel or the connectors of optical fiber cables between control panels by using Conversion Adapters. Terminal Boxes are used to connect these connectors.

Note that Conversion Adapter connection loss varies according to the method for grinding the tip of the optical connector ferrule.

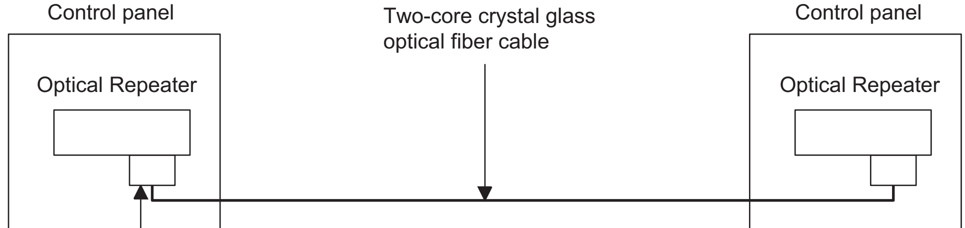
The optical connector grinding methods and the connection loss values are as follows:

- Connection loss when using PC grinding for FC connectors: 0.8 dB per connection
- Connection loss when using flat grinding for FC connectors: 1.2 dB per connection



Direct Connection Method

This method directly connects optical fiber cables outside a control panel to optical connectors inside the control panel.



■ Calculating the Maximum Transmission Distance

The maximum transmission distance differs according to the method for connecting optical fiber cables inside a control panel to optical fiber cables outside the control panel or connecting optical fiber cables between control panels (fusing connection or connector relay connection) as well as the connection position.

Calculating the Maximum Transmission Distance for the 215IF Repeater-TS2

$$L = \frac{PL - Ps - Pa\ (dB)}{Pc\ (dB / km)}\ (km)$$

Where,

$$\begin{aligned} PL &= Po - Pi - Pm\ (dB) \\ &= -18 + 28 - 1.5 \\ &= 8.5\ (dB) \end{aligned}$$

PL: Allowable loss for optical sending and receiving (8.5 dB)

Po: Optical sending level (-18 dBmp)

Pi: Optical receiving level (-28 dBmp)

Pm: System margin (1.5 dBmp)

Ps: Fusing connection loss (0.2 dB per position)

Pa: Connector relay loss (1.2 dB per position)

Pc: Optical fiber cable (GI-50/125, λ = 850 nm) loss (2.5 or 3.0 dB/km)

Calculating the Maximum Transmission Distance for the CP-215 Repeater-TS5

$$L = \frac{PL - Ps - Pa\ (dB)}{Pc\ (dB / km)}\ (km)$$

Where,

$$\begin{aligned} PL &= Po - Pi - Pm\ (dB) \\ &= -22 + 29 - 1.5 \\ &= 5.5\ (dB) \end{aligned}$$

PL: Allowable loss for optical sending and receiving (5.5 dB)

Po: Optical sending level (-22 dBmp)

Pi: Optical receiving level (-29 dBmp)

Pm: System margin (1.5 dBmp)

Ps: Fusing connection loss (0.2 dB per position)

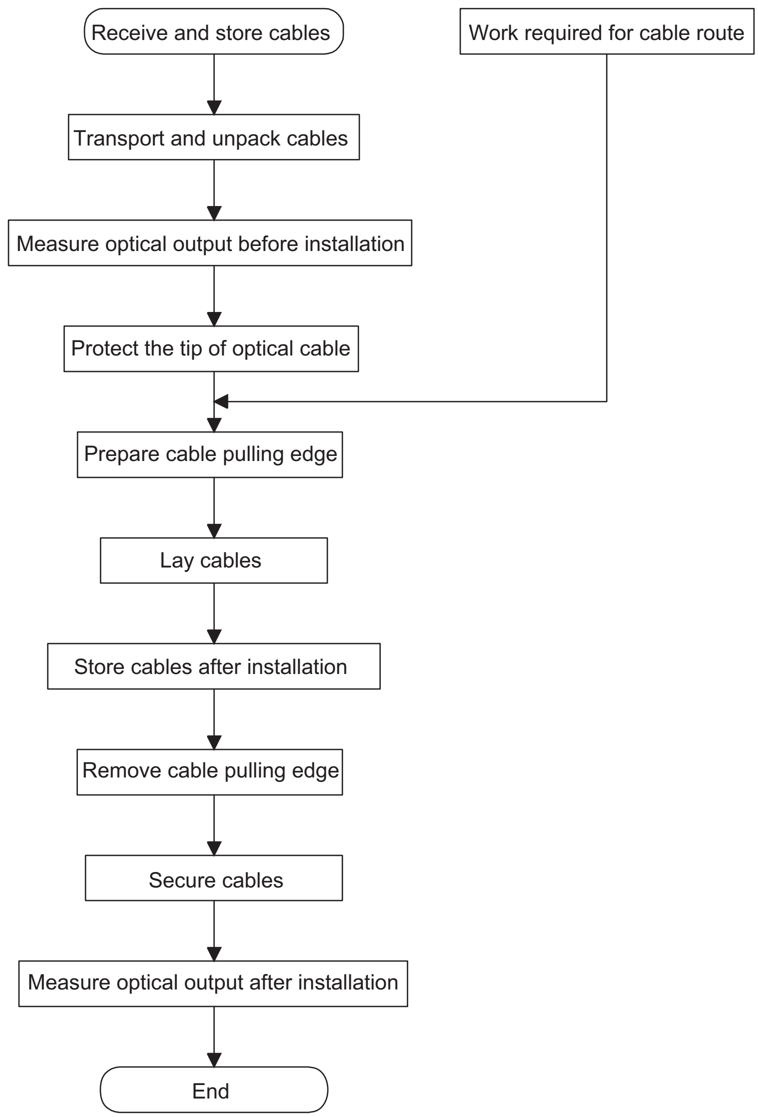
Pa: Connector relay loss (1.2 dB per position)

Pc: Optical fiber cable (GI-50/125, λ = 1,300 nm) loss (0.7 or 1.0 dB/km)

■ Procedure for Laying Optical Fiber Cables

Lay indoor and outdoor optical fiber cables after discussing with the cable installation subcontractor or cable manufacturer.

The procedure for laying optical fiber cables is shown below.



D

■ Cable Installation Precautions

The handling of optical fiber cables during installation is basically the same as that of metal cables, but pay special attention to the following precautions.

General Precautions

- Do not apply shock to cable drums during transport or relocation.
- Always roll a cable drum in the direction indicated on the drum.
- In principle, store cable drums indoor.
- Never pile up cable drums face-to-face.
- Do not twist cables while laying them.
- Do not step on cables.

Precautions Specific to Optical Fiber Cables

- Be sure that optical fiber cables will not receive tension greater than the maximum allowable limit. (The allowable tension differs according to the cable structure, so refer to the relevant cable specifications.)
- Do not bend optical fiber cables at an angle exceeding the maximum allowable limit. (The allowable bending radius differs according to the cable structure, so refer to the relevant cable specifications.)
- Because crystal glass optical fiber cables are connected using a fusing connection device, provide an extra cable length of at least 3 meters at both ends.
- Unlike metal cables, crystal glass optical fiber cables are connected using a fusing connection device, so provide a working area of approximately 1 m × 1 m.

D.5 Transmission Line Components

D.5.1 215IF Transmission Line Components

Cables

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Twisted-pair Cable	YS-IPEV-SB*1, $1P \times 0.3\ mm^2$	–	Pas4: 60 dB/km Z4: 75Ω	For in-panel low-voltage ducts	Fujikura Corporation
	YS-IPEV-SB*1, $3P \times 0.3\ mm^2$	–	Pas4: 58 dB/km Z4: 75Ω	For in-panel low-voltage ducts. JC215-02 dedicated cable.	Fujikura Corporation
	YS-IPEV-S (Cu)*2, $1P \times 1.25\ mm^2$	–	Pas4: 23 dB/km Z4: 77Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation

* 1. Refer to the Manufacturing Specifications No. II-95J6015.

* 2. Refer to the Manufacturing Specifications No. II-95J6015.

* 3. Pas4 refers to cable signal dB loss at 4 MHz. Z4 refers to cable characteristic impedance at 4 MHz.

Note: Specify the desired model and cable length (in 500-m units) when ordering.

Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
MR-8 Connector	MR-8LM(G)	–	8-pin, male, case included	For connection and branching of 215IF Module. One connector required for each Module.	Honda Communication Industries Co., Ltd.

Junction Boxes

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
JC215-01	–	87215-8100□	For cable size conversion	For conversion of in-panel or panel-to-panel cable size. Two junction boxes required for each control panel.	YASKAWA ELECTRIC CORPORATION
JC215-02	–	87215-8200□	For connection of CP-215IF/AT Card Cable length: 3 m	For connection of ACGC4000 and MPE720 Programming Device	YASKAWA ELECTRIC CORPORATION

Terminating Resistors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Terminating Resistor	ERO-SICKF75R0	R002849	75 Ω ±1%, 1/2 W, 100 PPm/°C	Mounted at both ends of transmission line. Two resistors required for each transmission line.	YASKAWA ELECTRIC CORPORATION

Note: Use junction terminal blocks to install terminating resistors.

In-panel Cables with Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
JC215-02 Dedicated Cable	−	87215-9900□	Twisted-pair cable with MR-8LF(G) and D-sub 9-pin connectors at both ends. Cable length: 3 m	For connection between ACGC4000, MPE720 Programming Device, and JC215-02	YASKAWA ELECTRIC CORPORATION

D.5.2 217IF Transmission Line Components

■ 217IF RS-485 Transmission Line Components

Cables

Name	Model	Electrical Product Code	Specifications[*3]	Usage	Manufacturer
Twisted-pair Cable	YS-IPEV-SB[*1], 1P × 0.3 mm^2	−	Pas1: 25 dB/km Z1: 78Ω	For in-panel low-voltage ducts	Fujikura Corporation
	YS-IPEV-SB[*1], 3P × 0.3 mm^2	−	Pas1: 28 dB/km Z1: 78Ω	For in-panel low-voltage ducts	Fujikura Corporation
	YS-IPEV-S (Cu)[*2], 1P × 1.25 mm^2	−	Pas1: 12 dB/km Z1: 78Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation

* 1. Refer to the Manufacturing Specifications No. II-95J6015.
* 2. Refer to the Manufacturing Specifications No. II-95J6015.
* 3. Pas1 refers to cable signal dB loss at 1 MHz. Z1 refers to cable characteristic impedance at 1 MHz.

Note: Specify the desired model and cable length (in 500-m units) when ordering.

Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
MR-8 Connector	MR-8LM(G)	–	8-pin, male, case included	For connection and branching of 217IF Module. One connector required for each Module.	Honda Communication Industries Co., Ltd.

Terminating Resistors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Terminating Resistor	ERO-SIPKF1200	R002854	120Ω ±1%, 1/2 W, 100 PPm/°C	Mounted at both ends of transmission line. Two resistors required for each transmission line.	YASKAWA ELECTRIC CORPORATION

Note: If no 120Ω terminating resistors are mounted in the 217IF Module, use junction terminal blocks to install terminating resistors.

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■ 217IF RS-232C Transmission Line Components

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
RS-232C Connection Cable	–	–	Cable with D-sub 25-pin and D-sub 9-pin connectors	For use in control panel. Compatible with OMRON products.	YASKAWA ELECTRIC CORPORATION
	–	–	Cable with D-sub 25-pin connector	For use in control panel. Compatible with MELSEC products.	YASKAWA ELECTRIC CORPORATION
D-sub 9A Connector	17JE-23090-02 (D8A)	–	D-sub 9-pin, male, M2.6 mounting screw	–	Daiichi Electronic Industries Co., Ltd.
D-sub 9B Connector	17JE-23090-02 (D8B)	–	D-sub 9-pin, male, M3 mounting screw	–	Daiichi Electronic Industries Co., Ltd.

D.5.3 CP-215 Repeater Transmission Line Components

■ CP-215 Repeater-TT Transmission Line Components

Cables

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Twisted-pair Cable	YS-IPEV-SB*1, 1P × 0.3 mm^2	–	Pas4: 60 dB/km Z4: 75Ω	For in-panel low-voltage ducts	Fujikura Corporation
	YS-IPEV-S (Cu)*2, 1P × 1.25 mm^2	–	Pas4: 22 dB/km Z4: 77Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation

* 1. Refer to the Manufacturing Specifications No. II-95J6015.
* 2. Refer to the Manufacturing Specifications No. II-95J6015.
* 3. Pas4 refers to cable signal dB loss at 4 MHz. Z4 refers to cable characteristic impedance at 4 MHz.
Note: Specify the desired model and cable length (in 500-m units) when ordering.

Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
MR-8 Connector	MR-8LM(G)	–	8-pin, male, case included	For connection and branching of CP-215 Repeater. One connector required for each Repeater.	Honda Communication Industries Co., Ltd.

Junction Boxes

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
JC215-01	–	87215-8100x	For cable size conversion	For conversion of in-panel or panel-to-panel cable size. Two junction boxes required for each control panel.	YASKAWA ELECTRIC CORPORATION

Terminating Resistors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Terminating Resistors	ERO-SICKF75R0	R002849	75Ω ±1%, 1/2 W, 100 PPm/°C	Mounted at both ends of transmission line. Two resistors required for each transmission line.	YASKAWA ELECTRIC CORPORATION

Note: Use junction terminal blocks to install terminating resistors.

■ CP-215 Repeater-TC Transmission Line Components

Cables

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Coaxial Cable	3C-2V	–	Pas4: 25 dB/km Z4: 75Ω	For in-panel low-voltage ducts	Fujikura Corporation
	3C-2V(Cu, Fe)-ZV	–	Pas4: 25 dB/km Z4: 75Ω	For in-panel low-voltage ducts	Fujikura Corporation
	5C-2V(Cu, Fe)-ZV	–	Pas4: 16 dB/km Z4: 75Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation
	7C-FB(Cu, Fe)-ZV	–	Pas4: 10 dB/km Z4: 75Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation
	7C-FL(Cu, Fe)-ZV	–	Pas4: 8.1 dB/km Z4: 75Ω	For panel-to-panel low-voltage ducts	Fujikura Corporation

* Pas4 refers to cable signal dB loss at 4 MHz. Z4 refers to cable characteristic impedance at 4 MHz.

Note: Specify the desired model and cable length (in 500-m units) when ordering.

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Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
BNC Connector	BNC-P-3-Ni-CAu	YCN006648	For 3C-2V	For use in a control panel	Daiichi Electronic Industries Co., Ltd.
F-Connector	FSPW-5-Ni-CAu	YCN000144	For 5C-2V	For use between control panels	Fujikura Corporation
	F-7FB	YCN000146	For 7C-FB	For use between control panels	Fujikura Corporation
	FSPW-7-Ni-CAu	YCN000145	For 7C-FL	For use between control panels	Fujikura Corporation

Branch Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
T-Connector	BNC-TA-JPJ-Ni-CAu	YCN006650	For BNC	For connection and branching of 215IF Module. One connector required for each Module.	Daiichi Electronic Industries Co., Ltd.

Conversion Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Conversion Adapter	T-0298	YCN005244	Conversion between BNC and F-connectors	For conversion of in-panel or panel-to-panel cable size. Two adapters required for each control panel.	DX ANTENNA CO., LTD.

Junction Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Junction Connector	F-A	YCN005279	For connection between F-connectors	For connection between panel-to-panel cables	Fujikura Corporation

Note: When using a junction connector, wrap self-adhesive tape around the junction part of the coaxial cable for waterproofing and insulate the connector to prevent the cable from becoming grounded.

Terminating Connectors

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
Terminator	BNC-RC-75-Ni-CAu	YCN006647	BNC type, 75Ω, 1 W	Mounted at both ends of transmission line. Two terminators required for each transmission line.	Daiichi Electronic Industries Co., Ltd.

Coaxial Cables with BNC Connector

Name	Model	Electrical Product Code	Specifications	Usage	Manufacturer
In-panel Coaxial Cable	JZMSZ-W60-1	–	3C-2V cable with BNC connectors at both ends, 2 m	For use in control panel	YASKAWA ELECTRIC CORPORATION

■ CP-215 Repeater-TP Transmission Line Components

H-PCF Optical Fiber Cords and Cables with Optical Connector

No.	Model (Manufactured by Sumitomo Electric Industries)	Usage	External Specifications, etc.
1	HCB1-CD202-43-V-2HA-L*1 (L = 0 to 650 m)	In-panel cord with crimp cut connectors at both ends	No sheath
2	HCB2-CL202-43V8V-2HA-L*2 (L = 0 to 650 m)	Indoor reinforced cable with crimp cut connectors at both ends	Vinyl sheath
3	HCB6-CL202-43V13V-2HA-L*2 (L = 0 to 650 m)	Indoor cord assembly cable with crimp cut connectors at both ends	Vinyl sheath, cable tension member included
4	HCB6-CL202-43V13V-2HB-L*2 Nonstandard cable (L = 650 to 850 m)	Indoor cord assembly cable with adhesive grind-type connectors at both ends	Vinyl sheath, cable tension member included
5	HCB6-LL202-43V15V-2HA-L*2 (L = 0 to 650 m)	Outdoor cord assembly cable with crimp cut connectors at both ends	LAP sheath, tension member included
6	HCB6-LL202-43V15V-2HB-L*2 Nonstandard cable (L = 650 to 850 m)	Outdoor cord assembly cable with adhesive grind-type connectors at both ends	LAP sheath, tension member included

* 1. L is 0.3 m, 1 m, 3m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.

* 2. L is 1 m, 3m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.

Note: 1. Refer to *D.6.1 H-PCF Cable Specifications* for detailed specifications.

2. A pulling eyelet can be mounted to protect optical connectors. If this is required, specify optical fiber cords equipped with pulling eyelet when ordering.

■ CP-215 Repeater-TS2 Transmission Line Components

Multi-mode Crystal Optical Fiber Cords and Cables for Short Wavelength (850 nm)

No.	Model (Manufactured by Sumitomo Electric Industries, Ltd.)	Usage	Specification No. in *D.6.2* of this Appendix	External Specifications, etc.
1	CVS-EG-5/3002, L*1	In-panel single-core cord	(1)	No sheath, cord only
2	CVS-EG-5/3002 with FC connector at one end, L*2	In-panel single-core cord with FC connector at one end	(1)	No sheath
3	CVS-EG-5/3002 with FC connectors at both ends, L*2	In-panel single-core cord with FC connectors at both ends	(1)	No sheath
4	2GI-C-V-NM, (EG-5/3002), L*1	Indoor two-core cable (for racks and troughs)	(2)	Vinyl sheath, cable only
5	2GI-GS-V-NM, (EG-5/3002), L*1	Indoor two-core cable (for racks, troughs, and electrical conduits)	(3)	Polyethylene sheath, cable only
6	2GI-L-4C-LAP, (EG-5/3002)*1	Outdoor two-core cable (for racks, troughs, and electrical conduits)	(4)	LAP sheath, cable only
7	2GI-C-LAP, (EG-5/3002), L*1	Outdoor two-core cable (for racks, troughs, and electrical conduits)	(5)	LAP sheath, cable only
8	2GI-C-V-NM with FC connectors at both ends, (EG-5/3002), L*3 *4	Indoor two-core cable with FC connectors at both ends (for racks and troughs)	(5)	LAP sheath
9	2GI-C-LAP, (EG-5/3002) with FC connectors at both ends, L*3 *4	Outdoor two-core cable with FC connectors at both ends (for racks, troughs, and electrical conduits)	(5)	LAP sheath
10	2GI-L-4C-LAP-MAZE, (EG-5/3002), L*1	Two-core cable for vertical use	-	Equipped with steel pipe
11	2GI-L-4C-LAP-(with steel pipe), (EG-5/3002), L	Two-core cable for underwater use	-	Equipped with steel pipe

* 1. L is 100 m, 200 m, 500 m, or 1,000 m.
* 2. L is 0.3 m, 1 m, 3 m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.
* 3. L is 1 m, 3 m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.
* 4. A pulling eyelet can be mounted to protect optical connectors. To specify this option, append "-P" at the end of the model number.

Note: 1. If optical connectors or optical fiber cables are to be connected on-site, specify a cable length that allows some play at both ends.
2. When ordering cords or cables with non-standard specifications, refer to *D.6.4 Specifying Detailed Order Patterns*.
3. For ordering, contact your Yaskawa representative.
4. Be sure that excessive tensile force or lateral pressure will not be applied to the cord.
5. For outdoor installation, specify LAP sheaths.
6. Cable sheath is made of PVC. If there is a risk of the cable being exposed to oil or chemicals that may damage PVC, it is recommended using cable sheaths made of polyethylene (PE).

■ 215IF Repeater-TS5 Transmission Line Components

* 1. Multi-mode Crystal Optical Fiber Cords and Cables for Long Wavelength (1,300 nm)

No.	Model (Manufactured by Sumitomo Electric Industries, Ltd.)	Usage	Specification No. in *D.6.2* of this Appendix	External Specifications, etc.
1	CVS-EG-5/0702, L*1	In-panel single-core cord	(1)	No sheath, cord only
2	CVS-EG-5/0702 with FC connectors at one end, L*2	In-panel single-core cord with FC connector at one end	(1)	No sheath
3	CVS-EG-5/0702 with FC connectors at both ends, L*2	In-panel single-core cord with FC connectors at both ends	(1)	No sheath
4	2GI-C-V-NM, (EG-5/0702), L*1	Indoor two-core cable (for racks and troughs)	(2)	Vinyl sheath, cable only
5	2GI-GS-E-NM, (EG-5/0702), L*1	Outdoor two-core cable (for racks, troughs, and electrical conduits)	(3)	Polyethylene sheath, cable only
6	2GI-L-4C-LAP, (EG-5/0702)*1	Outdoor two-core cable (for racks, troughs, and electrical conduits)	(4)	LAP sheath, cable only
7	2GI-C-LAP, (EG-5/0702), L*1	Outdoor two-core cable (for racks, troughs, and electrical conduits)	(5)	LAP sheath, cable only
8	2GI-C-V-NM with FC connectors at both ends, (EG-5/0702), L*3 *4	Indoor two-core cable with FC connectors at both ends (for racks and troughs)	(5)	LAP sheath
9	2GI-C-LAP, (EG-5/0702) with FC connectors at both ends, L*3*4	Outdoor two-core cable with FC connectors at both ends (for racks, troughs, and electrical conduits)	(5)	LAP sheath
10	2GI-L-4C-LAP-MAZE, (EG-5/0702), L*1	Two-core cable for vertical use	-	Equipped with steel pipe
11	2GI-L-4C-LAP-(with steel pipe), (EGñ5/0702), L	Two-core cable for underwater use	-	Equipped with steel pipe

* 1. L is 100 m, 200 m, 500 m, or 1,000 m.
* 2. L is 0.3 m, 1 m, 3 m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.
* 3. L is 1 m, 3 m, or 5 m. For 10 m or longer, specify the cable length in 5-m units.
* 4. A pulling eyelet can be mounted to protect optical connectors. To specify this option, append “-P” at the end of the model number.

Note: 1. If optical connectors or optical fiber cables are to be connected on-site, specify a cable length that allows some play at both ends.
2. When ordering cords or cables with non-standard specifications, refer to *D.6.4 Specifying Detailed Order Patterns*.
3. For ordering, contact your Yaskawa representative.
4. Be sure that excessive tensile force or lateral pressure will not be applied to the cord.
5. For outdoor installation, specify LAP sheaths.
6. Cable sheath is made of PVC. If there is a risk of the cable being exposed to oil or chemicals that may damage PVC, it is recommended using cable sheaths made of polyethylene (PE).

D.6 Optical Cable Specifications

D.6.1 H-PCF Cable Specifications

Item		Specifications			
Cable Type		Two-core cord	Indoor reinforced cable	Indoor cord assembly cable	Outdoor LAP sheathed cable
Representative Model		HCB1-CD202-43-V	HCB2-CL202-43V8V	HCB6-CL202-43V13V	HCB6-LL202-43V15V
Optical Fiber Type		Plastic clad multi-mode optical fiber (manufactured by Toray Industries Inc., H-PCF, SI type, HCU-FB200-L)			
Transmission Loss		7 dB/km max. at wavelength λ = 850 nm (ambient temperature: 25°C)			
Core and Clad		Material: Crystal glass, Diameter: 200 ±5 µm Material: Acrylate resin fluoride, Diameter: 230 + 0, -10 µm			
Numerical Aperture (NA)		0.37			
Transmission Bandwidth		14.5 MHz at λ = 850 nm			
Number of Cores		2			
Tension Member		None		Material: Steel cable with plastic sheath Outer diameter: 2.4 mm	
Sheath		Orange heat-resisting PVC	Orange heat-resisting PVC sheath	Black heat-resisting PVC sheath	Black LAP sheath
Finished Outer Diameter		4.3 mm	8.4 mm	13.7 mm	15.1 mm
Approximate Mass		15 kg/km	50 kg/km	150 kg/km	170 kg/km
Storage Temperature	Maximum	70°C	70°C	70°C	70°C
	Minimum	-40°C	-40°C	-40°C	-40°C
Operating Temperature	Maximum	60°C	60°C	60°C	60°C
	Minimum	-10°C	-10°C	-10°C	-10°C
Maximum Allowable Tension*		20 kg	30 kg	75 kg	75 kg
Allowable Bending Radius	Temporary Bending (No Load)	15 mm	25 mm	50 mm	50 mm
	Long-term Bending (No Load)	45 mm	50 mm	100 mm	100 mm
Maximum Allowable Temporary Lateral Pressure		None	50 kg/50 mm	100 kg/50 mm	100 kg/50 mm

* Temporary tension applied when the cable is laid. The maxim allowable tension that can be applied to the neck of the optical connector is 2 kg. The applicable optical connector is JIS C 5977 F08 type.

D.6.2 Crystal Fiber Cords for Short Wavelength

Table D.4 Cable Specifications (GI-50/125, λ = 850 nm)

Item		Specifications				
Cable Type		Single-core cord	Indoor cable	Indoor cable	Outdoor cable	Outdoor cable
Representative Model (Manufactured by Sumitomo Electric Industries, Ltd.)		CSV-EG-5/3002	2GI-C-V-NM	2GI-GS-E-NM	2GI-L-4C-LAP	2GI-C-LAP
Optical Fiber Core Specifications	Optical Fiber Type	Graded-index (GI) fiber				
	Transmission Loss	3.0 dB/km max. (λ = 850 nm)				
	Transmission Bandwidth	200 MHz^2·km min.				
	Core and Clad	Material: Crystal glass, Diameter: 50 ±3 µm Material: Crystal glass, Diameter: 125 ±3 µm				
	Numerical Aperture (NA)	0.21 ±0.02				
Number of Cores		1	2			
Sheath		Black PVC	Black PVC	Black PE	Black PE	Black PE
Tension Member		None	1.2-mm-dia. FRP	4.5-mm-dia. FRP	2.3-mm-dia. copper wire with PE insulation	1.0-mm-dia. copper wire with PE insulation
Finished Outer Diameter (mm)		3	11	14	12	12
Approximate Mass (kg/km)		9	110	140	130	115
Storage Temperature	Maximum	0°C	0°C	-20°C	-20°C	0°C
	Minimum	60°C	60°C	-60°C	60°C	60°C
Operating Temperature	Maximum	0°C	0°C	-20°C	-20°C	0°C
	Minimum	60°C	60°C	60°C	60°C	60°C
Maximum Allowable Tension (kg) *		15	50	150	150	50
Allowable Bending Radius (mm)	Temporary Bending (No Load)	30	120	450	120	120
	Long-term Bending (No Load)	60	240	450	240	240
Maximum Allowable Temporary Lateral Pressure (kg/50 mm)		None	None	150	100	100

* Temporary tension applied when the cable is laid. The maxim allowable tension that can be applied to the neck of the optical connector is 2 kg. The applicable optical connector is FC type (complying with JIS C 5970 F01).

Note: 1. For cable specifications other than those shown above, contact your Yaskawa representative.

2. If cables manufactured by another company are to be used, present the above optical fiber core specifications to that company.

D.6.3 Crystal Fiber Cords for Long Wavelength

Table D.5 Cable Specifications (GIñ50/125, l = 1,300 nm)

Item		Specifications				
Cable Type		Single-core cord	Indoor cable	Indoor cable	Outdoor cable	Outdoor cable
Representative Model (Manufactured by Sumitomo Electric Industries, Ltd.)		CSV-EG-5/0702	2GI-C-V-NM	2GI-GS-E-NM	2GI-L-4C-LAP	2GI-C-LAP
Optical Fiber Core Specifications	Optical Fiber Type	Graded-index (GI) fiber				
	Transmission Loss	0.7 dB/km max. (λ = 1300 nm)				
	Transmission Bandwidth	200 MHz·km min.				
	Core and Clad	Material: Crystal glass, Diameter: 50 ±3 μm Material: Crystal glass, Diameter: 125 ±3 μm				
	Numerical Aperture (NA)	0.21 ±0.02				
Number of Cores		1	2			
Sheath		Black PVC	Black PVC	Black PE	Black PE	Black PE
Tension Member		None	1.2-mm-dia. FRP	4.5-mm-dia. FRP	2.3-mm-dia. copper wire with PE insulation	1.0-mm-dia. copper wire with PE insulation
Finished Outer Diameter (mm)		3	11	14	12	12
Approximate Mass (kg/km)		9	110	140	130	115
Storage Temperature	Maximum	0°C	0°C	-20°C	-20°C	0°C
	Minimum	60°C	60°C	60°C	60°C	60°C
Operating Temperature	Maximum	0°C	0°C	-20°C	-20°C	0°C
	Minimum	60°C	60°C	60°C	60°C	60°C
Maximum Allowable Tension (kg) *		15	50	150	150	50
Allowable Bending Radius (mm)	Temporary Bending (No Load)	30	120	450	120	120
	Long-term Bending (No Load)	60	240	450	240	240
Maximum Allowable Temporary Lateral Pressure (kg/50 mm)		None	None	150	100	100

* Temporary tension applied when the cable is laid. The maxim allowable tension that can be applied to the neck of the optical connector is 2 kg. The applicable optical connector is FC type (complying with JIS C 5970 F01).

Note: 1. For cable specifications other than those shown above, contact your Yaskawa representative.
2. If cables manufactured by another company are to be used, present the above optical fiber core specifications to that company.

D.6.4 Specifying Detailed Order Patterns

■ Optical Fiber Core

Optical fiber core: EG - 5 / 10 02

- 02 → Transmission bandwidth (Unit: 100 MHz)
  02: 200 MHz
- 10 → Transmission loss (Unit: 0.1 dB/km)
  07: 0.7 dB/km (λ= 1,300 nm)
  10: 1.0 dB/km (λ= 1,300 nm)
  25: 2.5 dB/km (λ= 850 nm)
  30: 3.0 dB/km (λ= 850 nm)
- 5 → Core diameter (Unit: 10μm)
  5: 50μm
- EG → Optical fiber type
  EG crystal graded fiber

■ In-panel Cord

Optical fiber cord: CS V - EG - 5 / 1002, L

- EG - 5 / 1002, L → Optical fiber core type
- V → Cord sheath material
  V: PVC
- CS → Signal-core cord

Indoor or Outdoor Cable

Optical fiber cable:

n GI - C - 4C - V - NM - SSD (EG - 5 / 1002), L

- (EG - 5 / 1002) → Optical fiber core type
- SSD → Special sheath
  SSD: Self-supported Cable
- NM → MM: Non-metallic type (structure containing no metal)
  Blank: Metallic type (structure containing metal)
- V → Sheath material
  V: PVC (indoor)
  E: PE (outdoor)
  LAP: LAP (outdoor)
- 4C → Indicates the number of cores. Specify this for only strand structure.
- C → Configuration
  C: Cord type (consisting of optical fibers)
  L: Stand type (consisting of optical fiber cores. Only metallic type can be specified.)
  GS: Special type (optical fibers protected by GS structure)
- GI → Optical fiber type
  GI: Multi-mode fiber core
- n → n: Number of optical fiber cores (1 to 6)

Appendix E

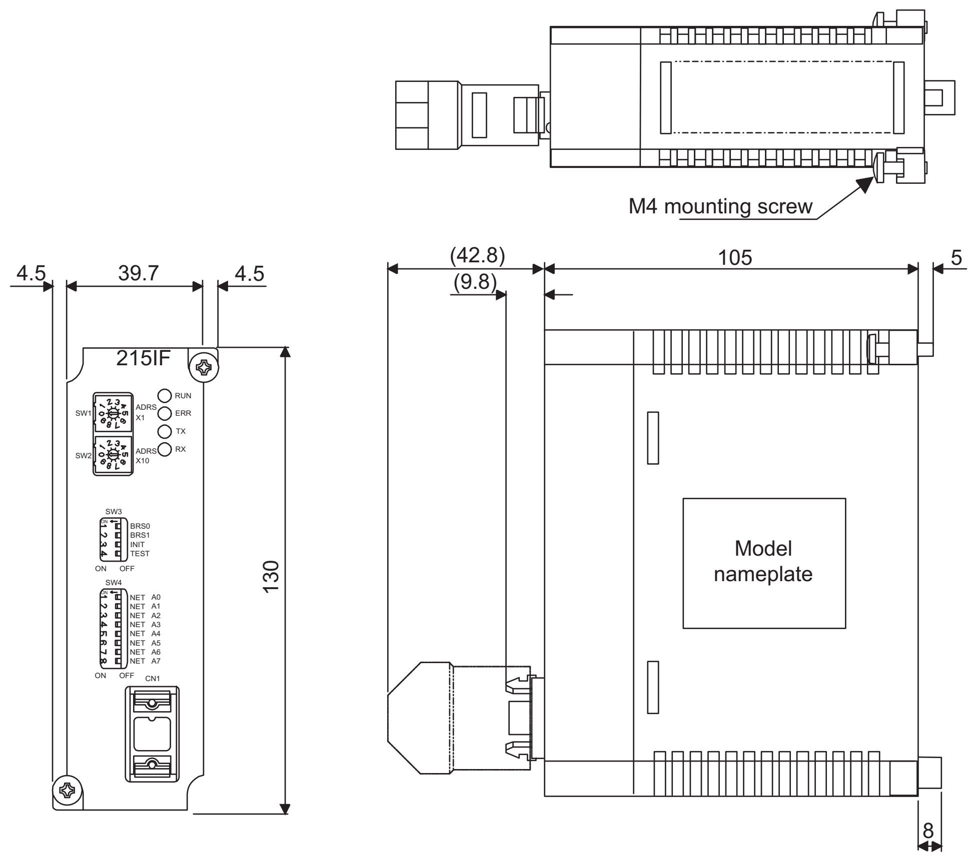
Module Appearance

This appendix shows the appearance of Communications Modules used in the MP900-Series Machine Controller.

E.1 215IF Module

Description: 215IF

Model: JEPMC-CM220

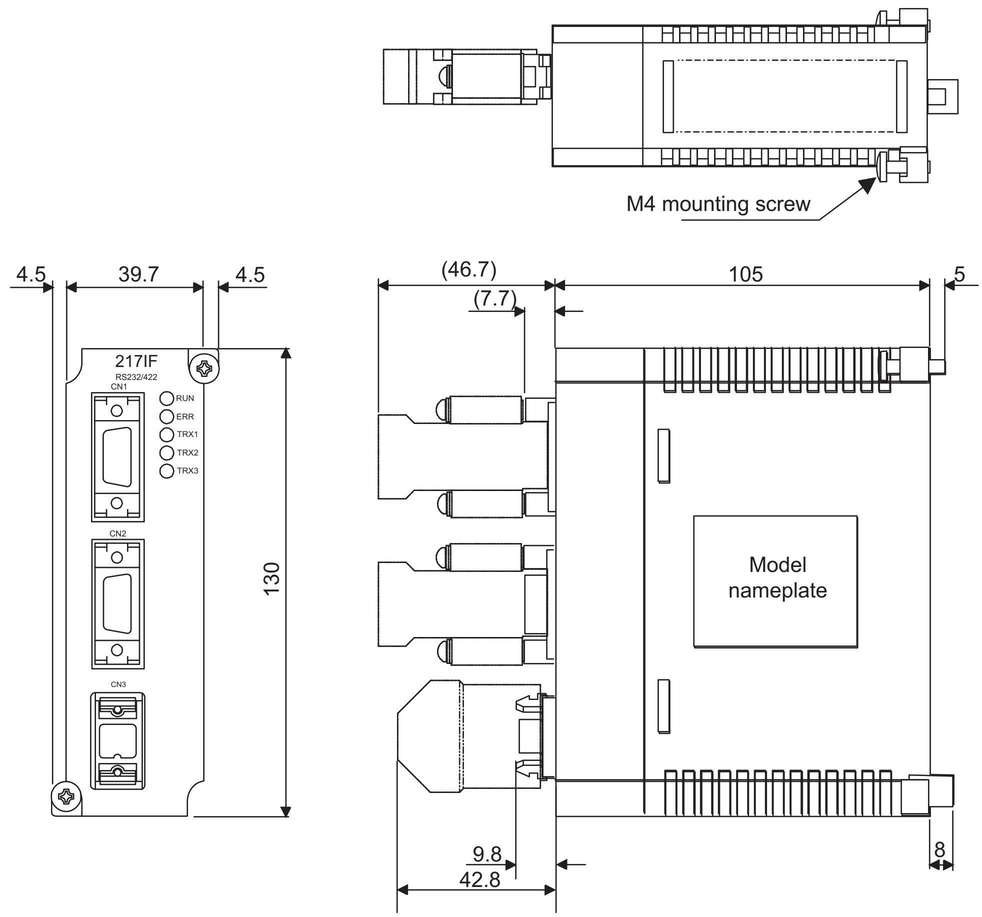


Units: mm

E.2 217IF Module

Description: 217IF

Model: JEPMC-CM200

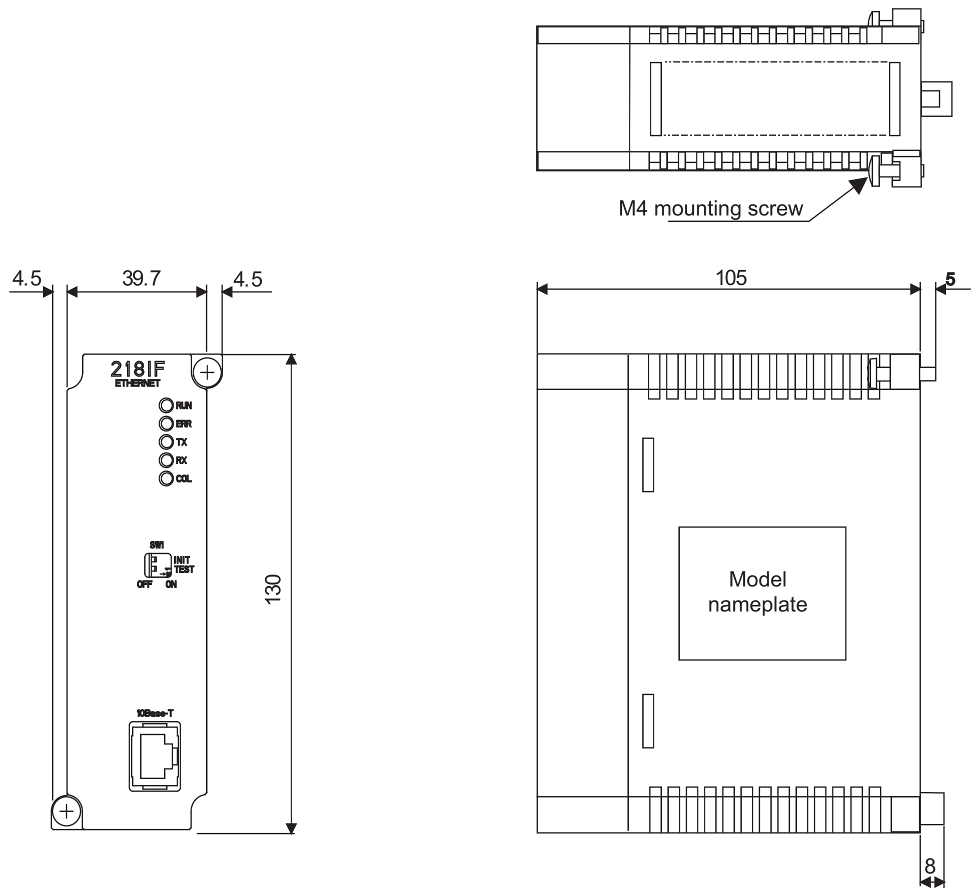


Units: mm

E.3 218IFA Module

Description: 218IFA

Model: JEPMC-CM210A



Units: mm

INDEX

Numerics

G

I

L

M

N

O

P

R

S

T

U

Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

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			7.1.2	Deletion: INFO
			7.2.1	Addition: INFO
			7.2.2	Revision: Model of module (218IF → 218IFA)
			7.3.2	Addition: Note
			Back cover	Revision: Address
March 2006		0	All chapters	Completely revised
May 2003	3	0	Preface	Partly revised
October 2002	2	0	Back cover	Revision: Address
September 2000	1	0	–	Partly revised
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Machine Controller MP920
Communications Module
USER'S MANUAL

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