

SYSMAC
C200HW-PCU01
C200HW-PCS01-V2

PC Card Unit

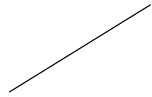
OPERATION MANUAL

OMRON

SYSMAC
C200HW-PCU01
C200HW-PCS01-V2
PC Card Unit

Operation Manual


Produced February 2001





Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to the product.

 **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

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Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes the installation and operation of the PC Card Unit and includes the sections described below. A PC Card Unit enables usage of a PC card with a C200HX/HG/HE PC to provide an interface to extra memory or an Ethernet connection.

In this manual Programmable Controller has been abbreviated as PC. Do not confuse this with personal computer, which has not been abbreviated except in the case of the PC Card Unit.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate a PC Card Units. **Be sure to read the following section before operating the PC Card Unit.**

Section 1 explains the features and system configuration of the PC Card Unit.

Section 2 outlines the individual system components and their functions. Devices that can be purchased separately are also described.

Section 3 outlines the installation of a PC Card Unit and peripheral devices.

Section 4 describes how to install a PC Card Unit and set up the C200HX/HG/HE.

Section 5 describes formatting Memory Cards, the file format, and file transfers between a PC Card Unit and the C200HX/HG/HE.

Section 6 outlines the installation of a PC Card Unit and connection to Ethernet.

Section 7 describes how to install Ethernet Cards and use the setup software.

Section 8 explains how to use SEND and RECV commands to transfer data.

Section 9 provides information on communicating in Ethernet Systems using FINS commands, and explains how to use the CMCR instruction to issue FINS commands.

Section 10 describes sockets (an interface for directly using TCP and UDP functions from the user program) and explains how to use socket services.

Section 11 describes the FINS commands that can be sent to the C200HX/HG/HE CPU and the FINS commands that can be sent to the PC Card Unit.

Section 12 provides explanations of each indicator and the actions to be taken for them, and explains how to use the error log.

The **Appendices** provide information on standard models, specifications, connector pin assignments, response codes from the C200HX/HG/HE CPU, FINS response codes from the PC Card Unit, differences with the CV-series Ethernet Unit, an example using a memory card with a personal computer, precautions for setting up the network, contents of version upgrade (PCS01-E to PCS01-EV1), and remote tool connection procedure.



WARNING

Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

TABLE OF CONTENTS

PRECAUTIONS	xi
1 Intended Audience	xii
2 General Precautions	xii
3 Safety Precautions	xii
4 Operating Environment Precautions	xii
5 Application Precautions	xiii
6 EC Directives	xiv
Part 1: – Features and Components	1
SECTION 1 – Features and System Configuration	3
1-1 Features	4
1-2 System Configuration	5
1-3 PC Card Unit Basics	6
1-3-1 Functions	6
1-3-2 Memory Card Functions	7
1-3-3 Ethernet Communication Functions	7
SECTION 2 – Components	9
2-1 C200HW-PCU01 PC Card Unit	10
2-1-1 PC Card Unit	10
2-1-2 Plates and Set Screws	11
2-1-3 Safety Precautions	11
2-2 C200HW-PCS01-V2 Ethernet Set	12
2-2-1 Ethernet Set	12
2-2-2 Plates and Set Screws	13
2-2-3 Safety Precautions	13
2-3 C200HW-CE011/CE012 Bus Connection Unit	13
2-3-1 C200HW-CE011 Bus Connection Unit	14
2-3-2 C200HW-CE012 Bus Connection Unit	14
2-4 Other Required Peripheral Devices	15
2-4-1 Devices Required for the PC Card Unit	15
2-4-2 Devices Required for Memory Cards	16
2-4-3 Devices Required for Ethernet	16
Part 2: – Installation and Operation	19
SECTION 3 – Preparations for Operation	21
3-1 Outline	22
3-2 Procedures	22
SECTION 4 – Installation and Switch Settings	25
4-1 Before Installing a PC Card Unit	26
4-1-1 Mounting a Communications Board	26
4-1-2 Setting the C200HX/HG/HE System Switch	27
4-1-3 Allocating a Function Code for CMCR	27
4-2 Component Names and Functions	29
4-2-1 Front View	29
4-2-2 Rear View	30
4-2-3 Indicator Section	30
4-3 Setting the System Switch	31
4-3-1 Opening the Front Cover	31
4-3-2 System Switch Functions	32
4-3-3 Setting the Startup Mode	33

Table of contents

4-3-4	Setting the Card Format and Slot	33
4-3-5	Formatting Memory Cards	34
4-3-6	Setting the Operating Level	35
4-4	Mounting the PC Card Unit	35
4-4-1	When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Not Used	36
4-4-2	When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Used ..	37
4-5	Installing the Bus Connection Unit	38
4-5-1	Installing the C200HW-CE011	38
4-5-2	Installing the C200HW-CE012	40
4-6	Installing and Removing Memory Cards	42
4-6-1	Memory Cards	42
4-6-2	PC Card Slots	42
4-6-3	Installing a Memory Card	42
4-7	Starting the PC Card Unit	44
SECTION 5 – Using Memory Cards		47
5-1	Outline	48
5-2	Formatting Memory Cards	49
5-2-1	Specifying the Card Format and Slot	49
5-2-2	Setting the Memory Card Formatting Mode	50
5-2-3	Starting Memory Card Formatting	50
5-2-4	Memory Card Compatibility	51
5-3	File Operations: CMCR Instruction	51
5-3-1	Summary of CMCR	51
5-3-2	CMCR Format	51
5-3-3	Files Created Using the CMCR Instruction	52
5-3-4	Related SR Words and Bits	52
5-3-5	Response Codes	53
5-3-6	Using CMCR Processes	53
5-3-7	File Write (Process No. 1)	53
5-3-8	File Read (Process No. 2)	55
5-3-9	File and Memory Compare (Process No. 3)	58
5-3-10	File Search (Process No. 4)	60
5-3-11	File Precautions	62
5-4	Memory Card Access Times for CMCR Instructions	62
5-5	Sample Program	63
5-6	Debugging Ladder Programs	64
Part 3: – Using Ethernet		67
SECTION 6 – Preparations for Operation		69
6-1	Outline	70
6-2	Procedures	70
6-3	Communications	72
6-3-1	Outline	72
6-3-2	Ethernet Communications Function	72
6-3-3	SEND and RECV	73
6-3-4	FINS Communications Service (FINS Commands and Responses) ..	73
6-3-5	Socket Services	73
SECTION 7 – Setting Up Ethernet		75
7-1	Preparations	76
7-2	Installing and Removing the Ethernet Card	76
7-2-1	Ethernet Cards	76
7-2-2	PC Card Slots	77
7-2-3	Installing and Removing an Ethernet Card	77
7-3	Connecting to the Ethernet Network	81
7-3-1	Connecting to the Hub	81

Table of contents

7-3-2	Constructing an Ethernet Network	82
7-4	Connecting to the Personal Computer	82
7-4-1	Restrictions on Personal Computers	82
7-4-2	Connecting the Computer to the PC Card Unit	82
7-5	Setting Up the Ethernet Environment	84
7-5-1	IP Address	84
7-5-2	Subnet Mask	85
7-5-3	ODI Driver	85
7-5-4	Hosts	85
7-5-5	Conversion Table for IP Addresses and FINS Node Addresses	85
7-5-6	FINS Routing Tables	86
7-5-7	Gateway Address	87
7-5-8	Other Ethernet Environment Settings	87
7-5-9	Setting the Port Number	87
7-6	Setup Software Operation	88
7-6-1	Setup Procedure	88
7-6-2	Preset Items	88
7-6-3	Connecting to the PC Card Unit	89
7-6-4	Starting and Exiting the Software	91
7-6-5	IP Address	92
7-6-6	Subnet Mask	92
7-6-7	ODI Driver	93
7-6-8	HOSTS File	94
7-6-9	Address Conversion Table	96
7-6-10	FINS Routing Tables	98
7-6-11	Gateway Address	99
7-6-12	Returning the PC Card Unit to Normal Mode	100
7-7	Backing Up and Restoring Settings	100
7-7-1	Backing Up Files	100
7-7-2	Restoring Files	102
SECTION 8 – Using SEND(90) and RECV(98)		105
8-1	Outline	106
8-1-1	Specifying Destination Nodes	106
8-1-2	Communications Specifications	106
8-1-3	Send/Receive Data Areas	107
8-1-4	Instruction Status	107
8-1-5	SEND(90)/RECV(98)/CMCR Data Processing Timings	109
8-2	SEND(90)	109
8-3	RECV(98)	111
8-4	Minimum Transmission Delay Time for SEND/RECV Instructions	113
SECTION 9 – FINS Commands		115
9-1	FINS Communications Service	116
9-2	Using FINS Communications	117
9-2-1	FINS Communications by Ladder Program	117
9-2-2	FINS Communications From Another Node	119
9-3	Using the CMCR Instruction	119
9-3-1	CMCR Format for FINS Commands	119
9-3-2	Control Data	119
9-3-3	Range of Control Data	120
9-3-4	Command Data	121
9-3-5	Response Data	121
9-3-6	Instruction Status	121
9-3-7	SEND(90)/RECV(98)/CMCR Data Processing Timing	123
9-3-8	FINS Command Example	123
9-4	Using FINS Commands and Responses	124
9-4-1	Command/Response Parameters	124
9-4-2	Communications Data Formats	124
9-4-3	Commands and Responses for C200HX/HG/HE CPUs	125

Table of contents

9-4-4	PC Card Unit FINS Commands List	125
9-4-5	Response Codes	126
9-4-6	Memory Area Designations	126
9-5	Sample Program	128
9-5-1	Program Example	128
9-6	FINS Communications From Computers	129
9-6-1	Frame Format	129
9-6-2	FINS Command and Response Formats	129
9-6-3	FINS Header Information	130
9-6-4	Designating Remote Addresses	131
SECTION 10 – Socket Services		133
10-1	About Socket Services	134
10-1-1	Sockets	134
10-1-2	Socket Operation	134
10-1-3	Differences between TCP and UDP	134
10-1-4	Opening TCP Sockets	135
10-1-5	Socket Services Port Numbers	136
10-1-6	Fragmentation of Transmitted Data	136
10-2	Using Socket Services	138
10-2-1	FINS Commands Used With Socket Services	138
10-2-2	Procedure for Using Socket Services	138
10-2-3	Socket Services and Socket Status	142
10-2-4	Communications Timing Chart	143
10-2-5	Socket Service Timing Chart	143
10-2-6	Precautions in Using Socket Services	145
10-3	Sample Programs for TCP and UDP Communications	146
10-3-1	Ladder Programming for TCP/IP Communications	146
10-3-2	Ladder Programming for UDP/IP Communications	154
SECTION 11 – Using FINS Commands and Responses		163
11-1	Commands and Responses for C200HX/HG/HE CPUs	164
11-1-1	Command/Response Parameters	164
11-1-2	Communications Data Formats	164
11-1-3	Commands and Responses	164
11-1-4	Memory Area Designations	165
11-1-5	MEMORY AREA READ	165
11-1-6	MEMORY AREA WRITE	166
11-1-7	MULTIPLE MEMORY AREA READ	167
11-1-8	PROGRAM AREA READ	168
11-1-9	PROGRAM AREA WRITE	169
11-1-10	RUN	169
11-1-11	STOP	170
11-1-12	CONTROLLER DATA READ	170
11-1-13	CONTROLLER STATUS READ	171
11-1-14	CLOCK READ	172
11-1-15	CLOCK WRITE	173
11-1-16	ERROR CLEAR	173
11-1-17	FORCED SET/RESET	174
11-1-18	FORCED SET/RESET CANCEL	175
11-1-19	MULTIPLE FORCED STATUS READ	175
11-2	PC Card Unit Commands and Responses	176
11-2-1	PC Card Unit FINS Commands List	176
11-2-2	CONTROLLER DATA READ	177
11-2-3	INTERNODE ECHO TEST	177
11-2-4	BROADCAST TEST RESULTS READ	178
11-2-5	BROADCAST TEST DATA SEND	178
11-2-6	ERROR LOG READ	179
11-2-7	ERROR LOG CLEAR	180
11-2-8	SINGLE FILE READ	180

Table of contents

11-2-9	SINGLE FILE WRITE	181
11-2-10	FILE DELETE	182
11-2-11	FILE COPY	182
11-2-12	FILE NAME CHANGE	183
11-2-13	SINGLE FILE READ WITH COMMAS	183
11-2-14	SINGLE FILE WRITE WITH COMMAS	184
11-3	FINS Commands Requesting Socket Services	185
11-3-1	Summary of Commands	185
11-3-2	Socket Status Area	186
11-3-3	UDP OPEN REQUEST	187
11-3-4	UDP RECEIVE REQUEST	188
11-3-5	UDP SEND REQUEST	189
11-3-6	UDP CLOSE REQUEST	190
11-3-7	TCP OPEN REQUEST (PASSIVE)	191
11-3-8	TCP OPEN REQUEST (ACTIVE)	192
11-3-9	TCP RECEIVE REQUEST	193
11-3-10	TCP SEND REQUEST	194
11-3-11	TCP CLOSE REQUEST	195
 Part 4: – Troubleshooting		197
 SECTION 12 – Error Processing		199
12-1	Indicators and the Error Log	200
12-1-1	Reading the Error Log	200
12-1-2	Error Log	200
12-1-3	Troubleshooting Using Indicators	200
12-2	Troubleshooting	201
12-3	Echo Test With PING Command	201
12-3-1	PING Command	201
12-3-2	Using the Host Computer	201
12-3-3	Using PING from a Unix Computer	202
 Appendix		203
A	Standard Models	203
B	Specifications	205
C	Connector Pin Assignments	207
D	Response Codes from the C200HX/HG/HE CPU	209
E	FINS Response Codes from the PC Card Unit	215
F	Differences with the CV-series or CS1-series Ethernet Units	217
G	Example Using a Memory Card with a Personal Computer	219
H	Precautions when Setting Up the Network	221
I	Contents of Version Upgrade	223
J	Remote Tool Connection Procedure	225
 Glossary		227
 Index		239
 END USER LICENSE AGREEMENT		244

PRECAUTIONS

This section provides general precautions for using the Programmable Controller (PC) and related devices.

The information contained in this section is important for the safe and reliable application of the PC. You must read this section and understand the information contained before attempting to set up or operate a PC system.

PRECAUTIONS	xi
1 Intended Audience	xii
2 General Precautions	xii
3 Safety Precautions	xii
4 Operating Environment Precautions	xii
5 Application Precautions	xiii
6 EC Directives	xiv

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.


2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.


Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.


Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating OMRON PCs. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

 **WARNING** It is extremely important that a PC and all PC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PC System to the abovementioned applications.

3 Safety Precautions

 **WARNING** Never attempt to disassemble any Units while power is being supplied. Doing so may result in serious electrical shock or electrocution.


 **WARNING** Never touch any of the terminals while power is being supplied. Doing so may result in serious electrical shock or electrocution.

4 Operating Environment Precautions

Do not operate the control system in the following places.


- Where the PC is exposed to direct sunlight.
- Where the ambient temperature is below 0°C or over 55°C.
- Where the PC may be affected by condensation due to radical temperature changes.
- Where the ambient humidity is below 10% or over 90%.
- Where there is any corrosive or inflammable gas.
- Where there is excessive dust, saline air, or metal powder.
- Where the PC is affected by vibration or shock.
- Where any water, oil, or chemical may splash on the PC.

- Provide proper shielding when installing in the following locations:
 - Locations subject to static electricity or other sources of noise.
 - Locations subject to strong electromagnetic fields.
 - Locations subject to possible exposure to radiation.
 - Locations near to power supply lines.


 **Caution** The operating environment of the PC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Application Precautions

Observe the following precautions when using the PC.


 **WARNING** Failure to abide by the following precautions could lead to serious or possibly fatal injury. Always heed these precautions.

- Always ground the system to 100 Ω or less when installing the system to protect against electrical shock.
- Always turn off the power supply to the PC before attempting any of the following. Performing any of the following with the power supply turned on may lead to electrical shock:
 - Mounting or removing any Units (e.g., I/O Units, CPU Unit, etc.) or memory cassettes.
 - Assembling any devices or racks.
 - Connecting or disconnecting any cables or wiring.


 **Caution** Failure to abide by the following precautions could lead to faulty operation or the PC or the system or could damage the PC or PC Units. Always heed these precautions.

- Use the Units only with the power supplies and voltages specified in the operation manuals. Other power supplies and voltages may damage the Units.
- Take measures to stabilize the power supply to conform to the rated supply if it is not stable.
- Provide circuit breakers and other safety measures to provide protection against shorts in external wiring.
- Do not apply voltages exceeding the rated input voltage to Input Units. The Input Units may be destroyed.
- Do not apply voltages exceeding the maximum switching capacity to Output Units. The Output Units may be destroyed.
- Always disconnect the LG terminal when performing withstand voltage tests.
- Install all Units according to instructions in the operation manuals. Improper installation may cause faulty operation.
- Be sure to tighten Backplane screws, terminal screws, and cable connector screws securely.
- Do not attempt to take any Units apart, to repair any Units, or to modify any Units in any way.
- Be sure to have this stickers in place on the Units when wiring. Wiring without the stickers in place may result in wiring cuttings entering the Unit and causing faulty operation.

- Remove the stickers after the completion of wiring to ensure proper heat dissipation. Operating the Unit with the sticker in place may cause heat build-up and possible faulty operation.
- Use crimp terminals for wiring. Wiring bare wires directly to terminals may result in a fire.
- Be sure that terminal blocks and connectors are correct before connecting them. Improper connection may damage the Units.
- Do not use the setup software for the C200HW-PCS01(-EV1) to perform settings for the C200HW-PCS01-V2.

 **Caution** The following precautions are necessary to ensure the general safety of the system. Always heed these precautions.

- Provide double safety mechanisms to handle incorrect signals that can be generated by broken signal lines or momentary power interruptions.
- Provide external interlock circuits, limit circuits, and other safety circuits in addition to any provided within the PC to ensure safety.

 **Caution** When using the PC Card, be sure to observe the following precautions.

- Insert or eject the PC Card for at least 10 seconds after it is inserted or ejected. (That is, don't eject the PC Card for at least 10 seconds after it is inserted and don't insert the the PC Card for at least 10 seconds after it is ejected.)
- Don't eject the PC Card while it is being accessed (while either the CARD1 indicator or CARD2 indicator is lit).

6 EC Directives

PC Card Units that meet EC directives must be installed as follows:

- 1, 2, 3...**
1. PC Card Units are defined for installation inside control panels, so they must all be installed within control panels. In addition, the control panels must be grounded, enclosed metal housings.
 2. Used reinforced insulation or double insulation for the DC power supplies used for the communications power supply, internal circuit power supply, and the I/O power supplies.
 3. PC Card Units that meet EC directives also meet the common emission standard (EN50081-2). When PC Card Units are built into equipment, however, the measure necessary to ensure that the standard is met will vary with the overall configuration of the control panel, the other devices connected to the control panel, and other conditions. You must therefore confirm that EC directives are met for the overall machine or device.

To reduce noise, wire the control panel with as thick and short electric lines as possible and ground to 100 Ω min.

Part 1

Features and Components

This part of the manual introduces the PC Card Unit's features, describes the components of the PC Card Unit, and explains the system configuration.

SECTION 1

Features and System Configuration

This section provides an introduction to the PC Card Unit's features and explains the system configuration.

1-1	Features	4
1-2	System Configuration	5
1-3	PC Card Unit Basics	6
1-3-1	Functions	6
1-3-2	Memory Card Functions	7
1-3-3	Ethernet Communication Functions	7

1-1 Features

The PC Card Unit provides various functions for using PC cards with SYSMAC C200HX/HG/HE Programmable Controllers. CIO, DM, and EM data (but not the user program) can be loaded and saved between C200HX/HG/HE Programmable Controllers and memory cards inserted in the PC Card Unit. These operations can be executed from ladder programs.

Inserting a commercially available Ethernet card into the PC Card Unit allows reading from and writing to C200HX/HG/HE memory from a personal computer or workstation, including reading programs. (The program data that is read, however, cannot be edited with the Ladder Support Software.)

The PC Card Unit provides the following features.

Standard Memory Cards

The PC Card Unit provides two PCMCIA 2.1-conforming PC card interface slots (but 3.3V cards are not supported). Either two type-I or -II or one type-III PC card can be installed. SRAM cards, FLASH cards, and ATA interface cards can all be used.

Personal Computer Compatibility

PC card data written by the PC Card Unit can be read and edited by commercially available personal computers, which can also be used to write data to the PC card.

File Operations

C200HX/HG/HE memory contents can be written to memory cards as files, using ladder-diagram instructions. File contents can be compared with C200HX/HG/HE memory and files can be searched. Word data can be separated by commas in the file format, so commercially available spreadsheets can be used.

Ethernet Expansion

With the C200HW-PCS01-V2 PC Card Unit Ethernet Set, commercially available Ethernet cards can be used to exchange data with CV Ethernet Units, personal computers, workstations, etc., by using the FINS protocol via UDP/IP.

FINS protocol is a communications protocol developed by OMRON for FA. For details, refer to *Section 11 Using FINS Commands and Responses*.

Note The PC Card Unit cannot be used with the C200HE-CPU11-E.

1-2 System Configuration

Systems using the PC Card Unit can be configured in either of two ways. The first is to use the C200HW-PCU01, which is the basic system for using PC cards. The second is to use the C200HW-PCS01-V2 PC Card Unit Ethernet Set, which allows you to add Ethernet functionality to the basic system.

Basic System Configuration (C200HW-PCU01)

C200HW-PCU01 PC Card Unit

C200HX/HG/HE

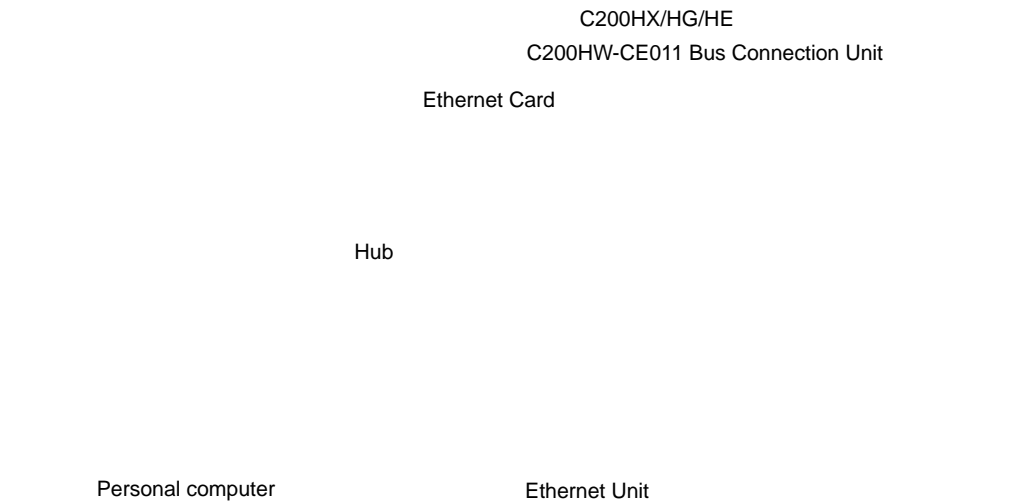
C200HW-CE011 Bus Connection Unit

Memory card (SRAM, FLASH, ATA)

Personal computer

Ethernet System Configuration (C200HW-PCS01-V2)

C200HW-PCS01-V2 PC Card Unit Ethernet Set



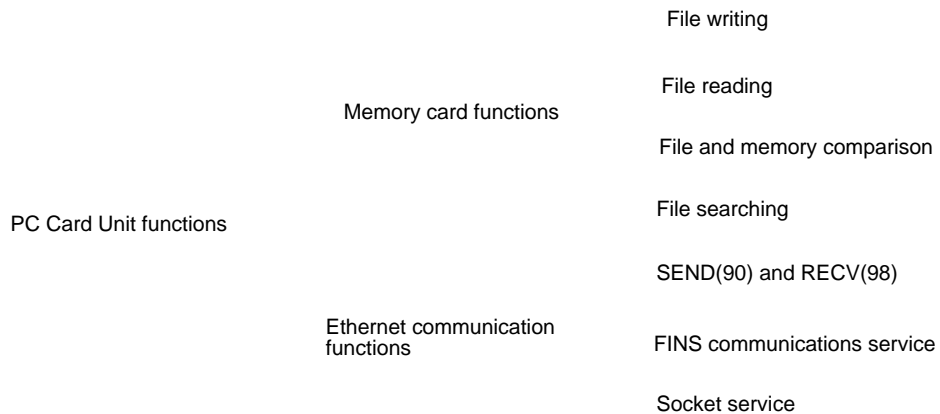
Note A MAU (Media Attachment Unit) is required to connect twisted-pair cable to a CV-series Ethernet Unit.

1-3 PC Card Unit Basics

This section provides a basic introduction to the PC Card Unit.

1-3-1 Functions

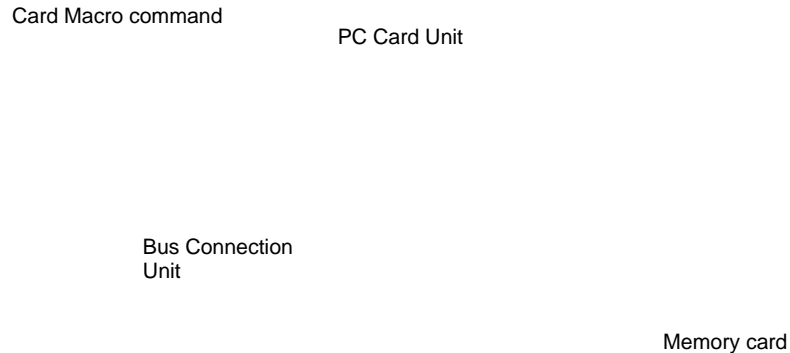
The PC Card Unit has both memory card functions and Ethernet communications functions, as shown in the following diagram.



The various services that can be performed using the memory card and Ethernet communications functions are described on the following pages.

1-3-2 Memory Card Functions

When the memory card functions are used, the following four operations can be executed with respect to memory cards.



1. File Write

Writes contents of CIO, DM, EM, etc., to the memory card as files.

2. File Read

Reads file data from memory card to CIO, DM, EM, etc.

3. File and Memory Compare

Compares contents of CIO, DM, EM, etc., to contents of files on memory card.

4. File Search

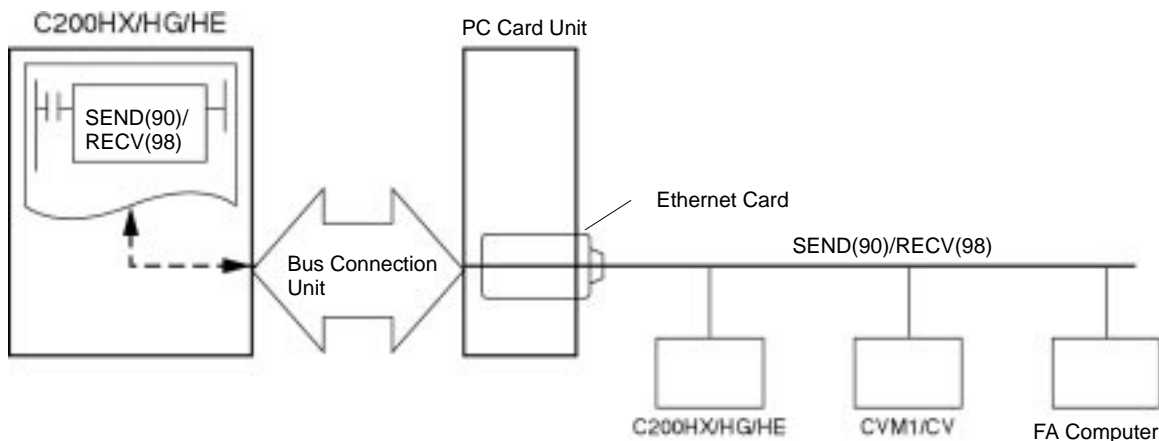
Searches data in files on memory card.

Note Read and write operations for the ladder program cannot be executed.

1-3-3 Ethernet Communication Functions

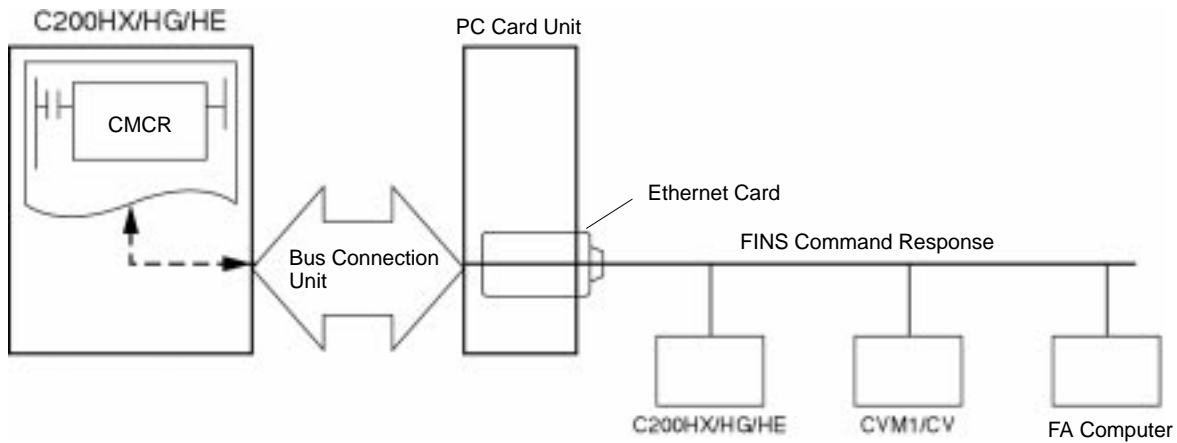
The C200HW-PCS01-V2 PC Card Unit Ethernet Set supports three communications methods. For details regarding Ethernet communications setup and methods, refer to *Section 6 Preparations for Operation* onwards.

Communications Using SEND(90) and RECV(98)



Data communications can be carried out by means of SEND(90) and RECV(98). The data to be sent or received must be set, but the communications processing is automatically performed internally. For details, refer to *Section 8 Using SEND(90) and RECV(98)*.

FINS Communications Service (FINS Command/Response)



When PC Card Unit Receives a FINS Command

When the PC Card Unit receives a command, it automatically interprets the command and sends a response. All of the processing is performed automatically, so there is no need to create a user program at the Programmable Controller. For details, refer to *Section 9 FINS Commands*.

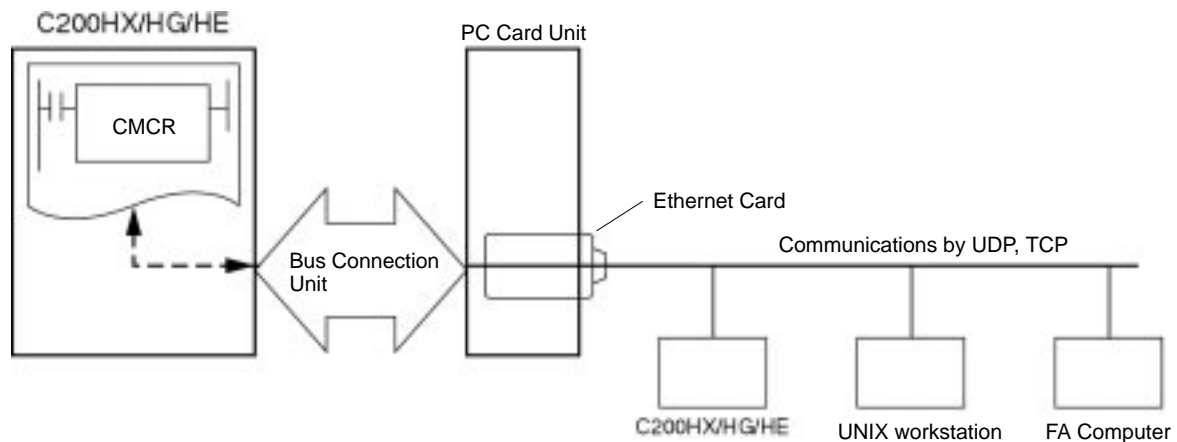
When a FINS Command is Sent From the PC Card Unit

A FINS command is issued using the CMCR instruction, and a response is returned from the recipient of the command. That response is returned automatically if the recipient of the FINS command is a C200HX/HG/HE or CVM1/CV Programmable Controller. For details, refer to *Section 9 FINS Commands*.

FINS Communications Between a Computer and a PC Card Unit

To use FINS commands from a computer, create the command data in the program at the computer according to the FINS command format. Have the FINS responses that are returned from the PC Card Unit analyzed and processed according to that format. For details, refer to *Section 9 FINS Commands*.

Socket Services



A socket is an interface which allows a user program to directly use TCP (Transmission Control Protocol) and UDP (User Datagram Program). Socket services are employed by using the CMCR instruction. Using socket services allows the PC Card Unit to communicate with UNIX workstations and FA Computers other than OMRON Programmable Controllers, with any protocol. For details, refer to *Section 10 Socket Services*.

SECTION 2

Components

This section describes individual product components and briefly explains the functions of each product. Unpack each product and make sure that it contains all the necessary components.

2-4 Other Required Peripheral Devices describes the devices that must be purchased separately by the customer.

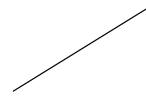
2-1	C200HW-PCU01 PC Card Unit	10
2-1-1	PC Card Unit	10
2-1-2	Plates and Set Screws	11
2-1-3	Safety Precautions	11
2-2	C200HW-PCS01-V2 Ethernet Set	12
2-2-1	Ethernet Set	12
2-2-2	Plates and Set Screws	13
2-2-3	Safety Precautions	13
2-3	C200HW-CE011/CE012 Bus Connection Unit	13
2-3-1	C200HW-CE011 Bus Connection Unit	14
2-3-2	C200HW-CE012 Bus Connection Unit	14
2-4	Other Required Peripheral Devices	15
2-4-1	Devices Required for the PC Card Unit	15
2-4-2	Devices Required for Memory Cards	16
2-4-3	Devices Required for Ethernet	16

2-1 C200HW-PCU01 PC Card Unit

This section describes the components of the C200HW-PCU01 PC Card Unit. Check the actual product against the drawings shown below.

2-1-1 PC Card Unit

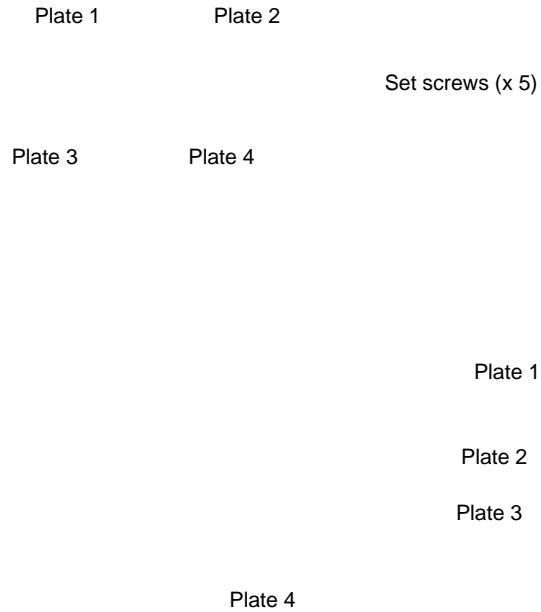
The PC Card Unit is the basic system that allows PC cards to be used in the C200HX/HG/HE.



PC Card Unit

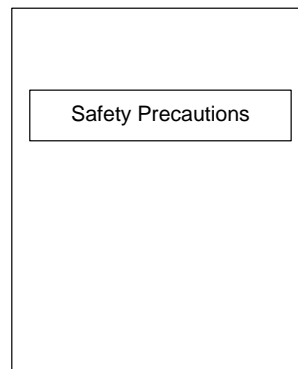
2-1-2 Plates and Set Screws

The following plates and set screws are used to secure the PC card, PC card cable, and Bus Connection Unit.



2-1-3 Safety Precautions

This sheet describes precautions to ensure safe use of the PC Card Unit. Be sure to read the sheet before using the PC Card Unit. This sheet is provided with the Unit.



2-2 C200HW-PCS01-V2 Ethernet Set

This section describes the components of the C200HW-PCS01-V2 Ethernet Set. Check the actual product against the drawings shown below.

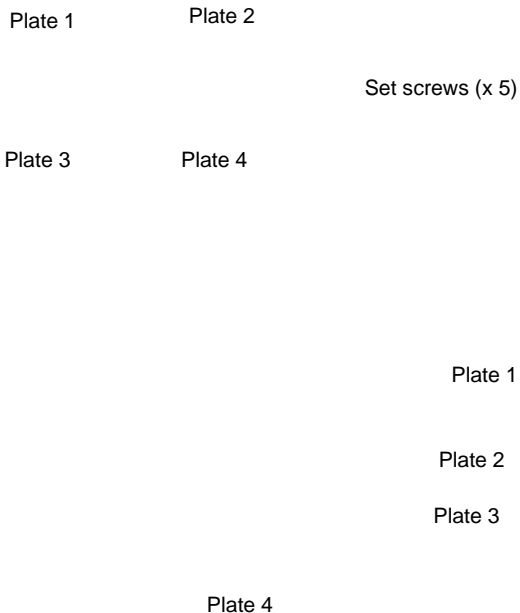
2-2-1 Ethernet Set

The Ethernet Set is a PC Card Unit (basic system) that has been equipped to support an Ethernet connection.

PC Card Unit

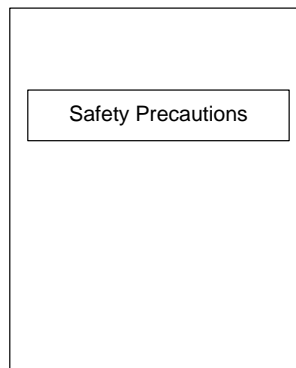
2-2-2 Plates and Set Screws

The following plates and set screws are used to secure the PC card, Ethernet cable, and Bus Connection Unit.



2-2-3 Safety Precautions

This sheet describes precautions to ensure safe use of the PC Card Unit. Be sure to read the sheet before using the PC Card Unit. This sheet is provided with the Unit.



2-3 C200HW-CE011/CE012 Bus Connection Unit

This section describes the components of the C200HW-CE011/CE012 Bus Connection Unit. Check the actual product against the drawings shown below.

- Note** 1. The previous Bus Connection Unit models, C200HW-CE001 and C200HW-CE002, cannot be used with a PC Card Unit.

2. The C200HW-CE011 and C200HW-CE012 are designed for a PC Card Unit and cannot be used with any other Units, except that the C200HW-CE012 also enables connection of a SYSMAC LINK or SYSMAC NET Link Unit.

2-3-1 C200HW-CE011 Bus Connection Unit

The C200HW-CE011 is used to connect a single PC Card Unit to the C200HX/HG/HE.

C200HW-CE011 Bus Connection Unit

2-3-2 C200HW-CE012 Bus Connection Unit

This Bus Connection Unit is used to connect one SYSMAC LINK Unit or SYSMAC NET Link Unit to the C200HX/HG/HE together with one PC Card Unit.

C200HW-CE012 Bus Connection Unit

2-4 Other Required Peripheral Devices

This section describes the peripheral devices that must be prepared by customers to use a PC Card Unit. Refer to this section when purchasing peripheral devices.

2-4-1 Devices Required for the PC Card Unit

To connect a PC Card Unit to the C200HX/HG/HE, a Communications Board must be mounted in the C200HX/HG/HE.

There are two Communications Boards that can be used. Use the C200HW-COM01 if only the PC Card Unit is to be used. Use the C200HW-COM04-E if a RS-232C port is required in the system in addition to the PC Card Unit.

C200HW-COM01 (with CPU bus
interface only)

C200HW-COM04-E (with CPU bus
interface and RS-232C port)

Note No Communications Board can be mounted in the C200HE-CPU11-E.

2-4-2 Devices Required for Memory Cards

Memory Cards

Applicable Memory Cards ATA-compatible cards can be used.

Note Before purchasing a memory card (SRAM, FLASH, or ATA), always make sure that it can be used with Phoenix PCM Plus 3.2.

2-4-3 Devices Required for Ethernet

The following devices are required to install Ethernet by using the setup software (installed on the Ethernet Set).

Host Link Cable

The user must provide the host link cable to connect the computer to the PC Card Unit.

RS-232C connectors are used. Applicable connectors are as follows:

- XM2A-0901 (connector) OMRON
- XM2S-0911 (connector cover) OMRON

Personal Computer

Prepare an AT or compatible computer. The computer must have at least one RS-232C port available.

Use an operating system supporting terminal software (e.g., HyperTerminal) that allows the exchange of binary files using the Zmodem protocol.

Example: Windows 98 or Windows NT 4.0.

Ethernet Card

Ethernet Card

Adaptor

Applicable Ethernet Cards

The PC Card Unit uses a DOS ODI driver. Although two DOS ODI drivers are currently in existence (SPEC3 and SPEC4), the PC Card Unit supports the SPEC3 ODI driver only. Therefore, Ethernet cards that have only the SPEC4 ODI driver cannot be used.

Hub

Hub

Cable

Twisted-pair Cable

Part 2

Installation and Operation

This part of the manual describes how to install a PC Card Unit and set up the C200HX/HG/HE. It includes information on memory card formatting, the file format, and file transfer operations between a PC Card Unit and the C200HX/HG/HE.

SECTION 3

Preparations for Operation

This section outlines the steps required to install the PC Card Unit and peripheral devices and prepare for operation. Be sure you have read this section and understood all of the procedures before attempting to actually make the settings or do any programming.

3-1	Outline	22
3-2	Procedures	22

3-1 Outline

The procedures to prepare for operation are outlined below. Be sure to familiarize yourself with this basic procedure.

Procedures are explained in more detail in *3-2 Procedures*.

- 1, 2, 3...**
- 1. Communications Board Installation**
Mount the Communications Board to the C200HX/HG/HE.
 - 2. C200HX/HG/HE Setup**
Assign a function code for the CARD MACRO (CMCR) expansion instruction.
 - 3. PC Card Unit Setup**
Mount the PC Card Unit and make the required settings.
 - 4. Programming**
Create the program.
 - 5. Program Debugging**
Debug the program.
 - 6. Operation.**

3-2 Procedures

This section outlines the steps required to install and set up the PC Card Unit and peripheral devices and prepare for application development and operation. Be sure that you thoroughly understand all of these sets. References for further reading are provided for each procedure.

- 1. Communications Board**
Mount either the C200HW-COM01 or C200HW-COM04-E Communications Board to the C200HX/HG/HE CPU. Refer to the *C200HW-COM01 to 06-E Communications Board Operation Manual* for details.
- 2. C200HX/HG/HE Setup**
Two steps are required to prepare the C200HX/HG/H for PC Card Unit application.
 - **Adding CMCR** 4-1

Use either the SYSMAC Support Software or the Programming Console to assign a function code to the CARD MACRO (CMCR) instruction.
 - **System Switch Setting** 4-1

Turn ON DIP switch pin no. 4 to enable setting expansion instructions for the C200HX/HG/HE.
- 3. PC Card Unit Setup**
Two steps are required to set up the PC Card Unit.
 - **System Switch Setting** 4-3

Set the startup mode, memory card initialization type, the operating level, and other settings. If only the memory card function is to be used, set only the operating level and leave the other pins set to OFF.
 - **Unit and Peripheral Connections** 4-4 to 4-6

Mount the PC Card Unit to the Backplane and install the Bus Connection Unit and memory card.

Unit Restrictions and Mounting Locations

When a PC Card Unit is used, only one SYSMAC LINK Unit (or SYSMAC NET Link Unit) can be used on the CPU Backplane.

When a PC Card Unit and SYSMAC LINK Unit (or SYSMAC NET Link Unit) are used together on the CPU Backplane, they must be mounted in the slots shown in the following illustration.

Mount the PC Card Unit to the
left of the SYSMAC LINK Unit

PC Card Unit C200HX/HG/HE CPU
SYSMAC LINK Unit

The previous Bus Connection Units (C200HW-CE001/002) cannot be used with the PC Card Unit. Likewise, the PC Card Unit's Bus Connection Units (C200HW-CE011/012) cannot be used with other Units, except that the C200HW-CE012 can be used to also connect a SYSMAC LINK or SYSMAC NET Link Unit.

4. Programming

5-1 to 5-5

Use SYSMAC Support Software to create the ladder program. For details regarding ladder programming, refer to the *SYSMAC Support Software Operation Manuals*.

5. Debugging

5-6

Use a memory card with the program that has been created and correct any bugs that may be found.

6. Operation

Proceed with actual operation.

SECTION 4

Installation and Switch Settings

This section describes how to install a PC Card Unit and set up the C200HX/HG/HE.

4-1	Before Installing a PC Card Unit	26
4-1-1	Mounting a Communications Board	26
4-1-2	Setting the C200HX/HG/HE System Switch	27
4-1-3	Allocating a Function Code for CMCR	27
4-2	Component Names and Functions	29
4-2-1	Front View	29
4-2-2	Rear View	30
4-2-3	Indicator Section	30
4-3	Setting the System Switch	31
4-3-1	Opening the Front Cover	31
4-3-2	System Switch Functions	32
4-3-3	Setting the Startup Mode	33
4-3-4	Setting the Card Format and Slot	33
4-3-5	Formatting Memory Cards	34
4-3-6	Setting the Operating Level	35
4-4	Mounting the PC Card Unit	35
4-4-1	When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Not Used	36
4-4-2	When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Used	37
4-5	Installing the Bus Connection Unit	38
4-5-1	Installing the C200HW-CE011	38
4-5-2	Installing the C200HW-CE012	40
4-6	Installing and Removing Memory Cards	42
4-6-1	Memory Cards	42
4-6-2	PC Card Slots	42
4-6-3	Installing a Memory Card	42
4-7	Starting the PC Card Unit	44

4-1 Before Installing a PC Card Unit

Before installing a PC Card Unit, set up the C200HX/HG/HE.

Note Always set up the C200HX/HG/HE. Otherwise, a PC Card Unit cannot be used.

4-1-1 Mounting a Communications Board

A Communications Board must be mounted in the C200HX/HG/HE to connect a PC Card Unit. There are two Communications Boards that can be used, as shown below. Use the Communications Board that matches your system requirements (i.e., the C200HW-COM04-E can be used to provide an RS-232C port in addition to the CPU bus interface for the PC Card Unit.

C200HW-COM01 (with CPU bus
interface only)

C200HW-COM04-E (with CPU bus
interface and RS-232C port)

Refer to the *C200HW-COM01 to 06-E Communications Board Operation Manual* for details on installing a Communications Board.

4-1-2 Setting the C200HX/HG/HE System Switch

The CMCR expansion instruction is used to operate the memory card in the PC Card Unit. Turn ON pin no. 4 on the DIP switch to enable allocating expansion instructions for the C200HX/HG/HE.



DIP switch

4-1-3 Allocating a Function Code for CMCR

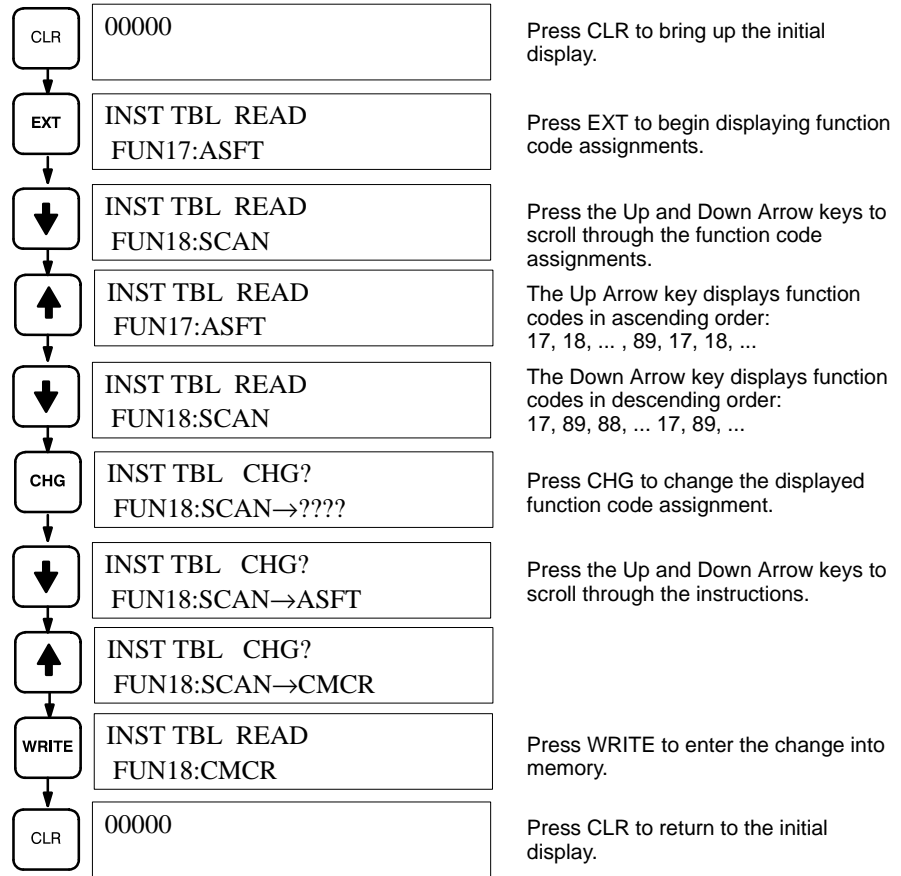
Use the SYSMAC Support Software or Programming Console to allocate a function code to the CMCR instruction (CARD MACRO instruction).

- The following 18 function codes can be allocated to expansion instructions: 17 to 19, 47, 48, 60 to 69, and 87 to 89.
- A default instruction is already allocated to each expansion function code.
- One instruction cannot be allocated to more than one function code.
- Information about the correspondence between expansion instructions and function codes is stored in the system area in the user program.
- This operation can be performed only when DIP switch pin no. 1 is OFF (user program write-enabled) and pin no. 4 is ON (settings other than default setting).
- Switch the PC operating mode to PROGRAM mode.

Programming Console

Execute the function for allocating/reading a function code to an expansion instruction.

Example



SYSMAC Support Software

Refer to the allocation procedure for function codes in the *SYSMAC Support Software Operation Manual: C-series PCs*.

4-2 Component Names and Functions

This section describes the name and function of each component of a PC Card Unit.

4-2-1 Front View

-
- ① Front cover
 - ② Indicator section
 - ③ PC card slot
 - ④ CPU bus interface connector
 - ⑤ Plate 1 mounting hole
 - ⑥ Plate 2 mounting hole
 - ⑦ Plate 3 mounting hole
 - ⑧ System switch
 - ⑨ Serial communications connector

(When front cover is opened)

Name and Function of Each Component

The page numbers in parentheses indicate where relevant procedures are explained.

① Front cover (p.31)

Open the front cover when setting the system switch or connecting the Ethernet setup cable.

② Indicator section (p.30)

The indicators show the current operation status.

③ PC card slot (p.42)

A PC card is mounted in this slot.

④ CPU bus interface connector (p.38)

This connector allows data exchange with the Programmable Controller. Use the C200HW-CE011 or C200HW-CE012 Bus Connection Unit to connect the PC Card Unit to the Programmable Controller.

⑤ Plate 1 mounting hole (p.41)

This screw hole is used to fix Plate 1 to secure a Bus Connection Unit in place.

⑥ Plate 2 mounting hole (p.43)

This screw hole is used to fix Plate 2 to secure a PC Card in place.

⑦ Plate 3 mounting hole

This screw hole is used to fix Plate 3 to secure the adapter cable attached to the Ethernet Card.

⑧ System switch (p.31)

This DIP switch is used to set the startup mode, memory card format, format slot, and operating level. It is also used to start formatting a memory card.

⑨ Serial communications connector (p.83)

This connector is used to set up Ethernet. Connect the personal computer used for setup to the serial communications connector. The signal pin layout is the same as that of the Host Link connector.

4-2-2 Rear View

① I/O bus connector

Name and Function of Component

The page number in parentheses indicates where the relevant procedure is explained.

① **I/O bus connector (p.35)**

This connector is used to supply electrical power from the C200HX/HG/HE to the PC Card Unit.

4-2-3 Indicator Section

The indicators show the operating status of the PC Card Unit, the PC card slot, etc. Refer to *12-1 Indicators and the Error Log* for troubleshooting procedures.

(When front cover is opened)

Meaning of Indicators

Name	Color	Description	Meaning (when lit)
RUN	Green	Unit running	Lights when the Unit is operating (see note 1) or when files are being transferred. (See note 2)
	Flashing	Data is being read or written	
ERR	Red	Error	Lights when an error has occurred in the Unit (see note 3).
CARD1	Orange	Card 1	Lights when PC card socket 1 is being accessed.
CARD2	Orange	Card 2	Lights when PC card socket 2 is being accessed.
FMT	Orange: Flashing Lit	Format mode: Format standby Formatting	Lights when the Unit is in PC Card formatting mode.

- Note**
1. The meaning of the status “the Unit is operating” differs depending on the system.
When only the PC Card Unit is used: Status in which the CMCR instruction can be executed in the ladder program.
When Ethernet is used: Status in which IP protocol can be used (The RUN indicator may light even when the C200HX/HG/HE is stopped.)
 2. The RUN indicator flashes when data is being read or written between the PC Card Unit and the C200HX/HG/HE. When the card is removed or inserted the indicator may go off temporarily.
 3. The ERR indicator lights if the Ethernet setup file is incorrect or no Ethernet card is mounted when the Ethernet is being used.

4-3 Setting the System Switch

The system switch is used to set the PC Card Unit. Use this switch to set the startup mode, memory card format, format slot, and operating level. The system switch can also be used to start formatting a memory card.

4-3-1 Opening the Front Cover

Before setting the system switch, open the front cover as shown below.

4-3-2 System Switch Functions

The system switch functions are described below.

Note Restart the PC Card Unit to use the new system switch settings.

System
switch

System Switch Functions

Pin No.	Function	OFF	ON
6, 5	Sets the startup mode	See the table below.	
4	Specifies the card format	SRAM/ATA card (FAT format)	FLASH card (MS-FLASH format)
3	Specifies the slot to be formatted	Slot 1	Slot 2
2	Starts formatting (see note)	Formatting is started by turning the pin OFF and then ON, or ON and then OFF.	
1	Sets the operating level	Level #1	Level #0

Note Pin 2 is valid only in memory card formatting mode (when the FMT indicator is flashing).

Startup Mode

Pin 6	Pin 5	Startup mode
OFF	OFF	Normal mode
OFF	ON	File transfer mode
ON	OFF	Memory card formatting mode

Note

1. In normal mode, always turn OFF pins 2, 3, and 4.
2. By default, all pins are set to OFF. Change the switch settings as necessary.

4-3-3 Setting the Startup Mode

Pins 6 and 5 are used to set the startup mode. The setting procedure and pin settings are described below.

Note Restart the PC Card Unit to use the new system switch settings. By default, all pins are set to OFF. Change the switch settings as necessary.

Pin 6
Pin 5

Startup Mode Settings (Pins 6 and 5)

Pin 6 and pin 5 settings	Description
OFF <input type="checkbox"/> <input checked="" type="checkbox"/>	Normal mode (pins 2, 3, and 4 must be turned OFF.)
OFF <input checked="" type="checkbox"/> <input type="checkbox"/>	
OFF <input checked="" type="checkbox"/> <input type="checkbox"/> ON <input type="checkbox"/> <input checked="" type="checkbox"/>	File transfer mode This mode is used to transfer the settings with the Ethernet setup software.
ON <input type="checkbox"/> <input checked="" type="checkbox"/> OFF <input checked="" type="checkbox"/> <input type="checkbox"/>	Memory card formatting mode The FMT indicator flashes. This mode is used to format the card inserted in the PC card slot. SRAM, ATA, and FLASH cards can be inserted in the slot.





4-3-4 Setting the Card Format and Slot

Pins 4 and 3 are used to set the card format and the slot to be formatted. The setting procedure and pin settings are described below.

Note Restart the PC Card Unit to use the new system switch settings. By default, all pins are set to OFF. Change the switch settings as necessary.

Pin 4
Pin 3

Card Format and Slot Settings (Pins 4 and 3)

Pin 4 and pin 3 settings		Description	
OFF		SRAM and ATA cards	Format card in slot 1
OFF		SRAM and ATA cards	Format card in slot 2
ON		FLASH card	Format card in slot 1
ON		FLASH card	Format card in slot 2

Note Memory cards can also be formatted using PCMCIA2.1-compliant equipment such as personal computers. In this case, SRAM and ATA Cards must be formatted in FAT format, and FLASH Cards must be formatted in MS-FLASH format.

4-3-5 Formatting Memory Cards

Note Formatting a memory card erases all data from the card. Before formatting a memory card, always back up all the necessary data from the card.

Turning pin 2 OFF then ON, or ON then OFF starts formatting the memory card. Pin no. 2 is valid, however, only when the startup mode is set to the memory card formatting mode (FMT indicator will be lit).

Pin 2

If formatting starts normally, the FMT indicator will light and the indicator for the PC card slot will flash.

The FMT indicator will go OFF when formatting is complete.

Turn the power OFF, then remove the card.

Note Refer to 5-2 *Formatting Memory Cards* for details on formatting memory cards.

4-3-6 Setting the Operating Level

Pin 1 is used to set the PC Card Unit operating level. The procedure and pin settings are described below.

Pin 1

Operating Level (Pin 1)

Pin 1 setting	Description
OFF <input type="checkbox"/>	Level #1
ON <input checked="" type="checkbox"/>	Level #0

If the SYSMAC LINK Unit or SYSMAC NET Link Unit is to be used together with a PC Card Unit, select a different level.

Note Do not switch the operating level while the PC Card Unit is operating. Otherwise, the Unit will fail to operate normally.

4-4 Mounting the PC Card Unit

This section describes how to mount the PC Card Unit on the CPU Backplane.

Note Before mounting the PC Card Unit on a CPU Backplane, always mount the C200HW-COM01 or C200HW-COM04-E Communications Board in the C200HX/HG/HE. Refer to the *C200HW-COM01 to 06-E Communications Board Operation Manual* for the mounting procedure.

4-4-1 When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Not Used

Note Always install the PC Card Unit in the slot on the left of the C200HX/HG/HE CPU. If the PC Card Unit is installed in another slot, the Bus Connection Unit cannot be installed.

- 1, 2, 3...**
1. Hitch the claw on the upper edge of the bottom of the PC Card Unit to the CPU Backplane as shown in the figure below.

2. Insert the connector on the PC Card Unit all the way into the connector on the CPU Backplane.

When the PC Card Unit is correctly installed a click will be audible. Insert the connector until the click is heard.

Note To remove the PC Card Unit, lift the Unit while pressing the lock lever with a screwdriver as shown in the figure below.

4-4-2 When a SYSMAC LINK Unit or SYSMAC NET Link Unit is Used

Note Always mount the SYSMAC LINK Unit or SYSMAC NET Link Unit in the slot on the left of the C200HX/HG/HE CPU. Then, mount the PC Card Unit in the slot on the left of the SYSMAC LINK Unit or SYSMAC NET Link Unit. If these Units are mounted in other slots, the Bus Connection Unit cannot be mounted.

- 1, 2, 3...**
1. Hitch the claw on the upper edge of the bottom of the PC Card Unit to the CPU Backplane as shown in the figure below.

2. Insert the connector on the PC Card Unit all the way into the connector on the CPU Backplane.

When the PC Card Unit is correctly installed a click will be audible. Insert the connector until the click is heard.

4-5 Installing the Bus Connection Unit

There are two Bus Connection Units that can be used: C200HW-CE011 and C200HW-CE012.

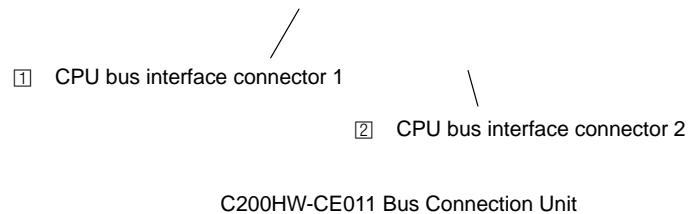
The C200HW-CE011 is used to connect a PC Card Unit to the C200HX/HG/HE. The C200HW-CE012 is used to connect a SYSMAC LINK Unit or SYSMAC NET Link Unit to the C200HX/HG/HE together with a PC Card Unit.

This section describes how to install the C200HW-CE011 and C200HW-CE012.

4-5-1 Installing the C200HW-CE011

Before installing the C200HW-CE011 Bus Connection Unit, mount the C200HX/HG/HE CPU and PC Card Unit in the correct slots in the CPU Backplane.

Name and Function of Each Component The name and function of each component are described below.



① CPU bus interface connector 1

This connector connects to the CPU Bus Interface Connector on the PC Card Unit.

② CPU bus interface connector 2

This connector connects to the CPU Bus Interface Connector on the C200HX/HG/HE CPU.

Installation Procedure

- 1, 2, 3...** 1. Connect the CPU bus interface connectors 1 and 2 to the two connectors in the Bus Connection Unit as shown in the figure below and press them firmly into place.

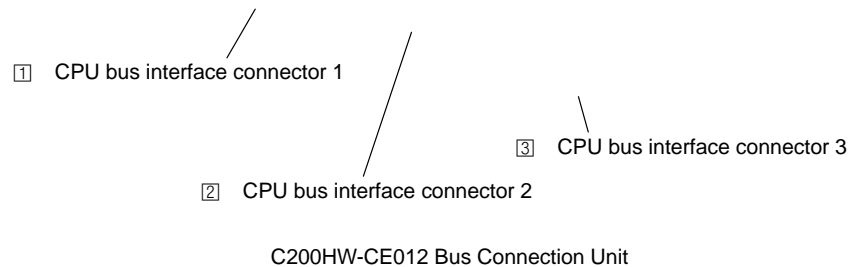
2. Secure the Bus Connection Unit with plate 1. To do so, secure plate 1 by tightening a screw into the plate-1 mounting hole as shown in the figure below.

3. Secure the Bus Connection Unit to the C200HX/HG/HE CPU with a screw as shown in the figure below.

4-5-2 Installing the C200HW-CE012

Before installing the C200HW-CE012 Bus Connection Unit, mount the C200HX/HG/HE CPU, SYSMAC LINK Unit or SYSMAC NET Link Unit, and PC Card Unit in the correct slots in the CPU Backplane.

Name and Function of Each Component The name and function of each component are described below.



1 CPU bus interface connector 1

This connector connects to the CPU bus interface connector on the PC Card Unit.

2 CPU bus interface connector 2

This connector connects to the CPU bus interface connector on the SYSMAC LINK Unit or SYSMAC NET Link Unit.

3 CPU bus interface connector 3

This connector connects to the CPU bus interface connector on the C200HX/HG/HE CPU.

Installation Procedure

- 1, 2, 3...**
1. Connect the CPU bus interface connectors 1, 2, and 3 all the way into the three corresponding connectors on the Bus Connection Unit as shown in the figure below.

2. Secure the Bus Connection Unit with plate 1. To do so, secure plate 1 by tightening a screw into the plate-1 mounting hole in the front surface of the PC Card Unit as shown in the figure below.

3. Secure the Bus Connection Unit to the C200HX/HG/HE CPU with a screw as shown in the figure below.

4-6 Installing and Removing Memory Cards

This section includes information on the memory cards to be used and explains how to install memory cards in the PC card slots in the front surface of the PC Card Unit.

4-6-1 Memory Cards

Use memory cards that fall within the following range of current consumption:

$$I_{5V} (1 \text{ slot}) \leq 0.5 \text{ A}, I_{12V} (1 \text{ slot}) \leq 0.1 \text{ A}$$

$$I_{5V} (2 \text{ slots}) + 3.4 \times I_{12V} (2 \text{ slots}) \leq 1.0 \text{ A}$$

Before purchasing memory cards (SRAM, FLASH, or ATA), always make sure that they can be used with Phoenix PCM Plus 3.2.

4-6-2 PC Card Slots

Slot 1

Slot 2

Slot 1: A type-I, -II, or -III PC card can be mounted in this slot.

Slot 2: A type-I or -II PC Card can be mounted in this slot. If, however, a type-III PC Card is mounted in slot 1, slot 2 cannot be used.

Note Always use the same type of card in each slot. If a different type of card is mounted in the same slot, an error will occasionally occur depending on the types of the cards.

4-6-3 Installing a Memory Card

- 1, 2, 3... 1. Mount a memory card in a PC card slot as shown below. Press the memory card until it is aligned with the eject buttons.

← Back

Before inserting the card, make sure that it is oriented correctly.

Eject buttons

2. If another memory card is to be installed, repeat Step 1.

3. Secure the memory card with plate 2. To do so, secure plate 2 by tightening a set screw into the plate 2 mounting hole in the front surface of the PC Card Unit as shown below.

Memory card _____ Plate 2

Note Do not press the eject button with Plate 2 mounted.

The Ethernet card cannot be installed or removed when the power is ON. Always turn off the power before installing or removing the Ethernet Card.

Removing the Memory Card

- 1, 2, 3...** 1. Remove the set screw, then remove plate 2.
2. Press the eject button as shown below.

The card inserted into slot 2 can be removed or installed by loosening the set screws on plate 2. When removing or installing a card into slot 1, always remove plate 2.

4-7 Starting the PC Card Unit

Turning on the C200HX/HG/HE automatically starts the PC Card Unit.

Before turning on the C200HX/HG/HE to start the PC Card Unit, check the items described in this section. Also, after the PC Card Unit is started, check the indicators and SR bits to confirm that operation is normal.

Checking the System Switch Check the startup mode and system settings.

- Make sure that pins 2 to 6 are all set to OFF.
- Make sure that pin 1 is set to the correct operating level for your system.

Starting in normal mode

System settings

Checking the Memory Card Make sure that the memory card is correctly mounted in the PC Card Unit.

Turning ON the C200HX/HG/HE

Turn on the C200HX/HG/HE.

Checking Operation with Indicators

If the PC Card Unit is started normally, the RUN indicator will light. If the ERR indicator lights, eliminate the cause of the error as described in *12-1 Indicators and the Error Log*.

Checking System Operation with SR Bits

Check whether the PC Card Unit has been recognized by the C200HX/HG/HE. Use the ladder program to read word SR 252. If bit 01 is ON, the PC Card Unit has been correctly recognized by the C200HX/HG/HE.

Word address	Bit number	Operating level
SR 252	01	#0
	04	#1

Note Operations from the time the power is switched on until the RUN indicator is lit.

- The SEND/RECV Enable Flag (SR 252) turns ON immediately after the power is turned on.
- The instruction will be executed after the RUN indicator lights.

- The Data Link Operating Flag turns ON when the power is turned on and turns OFF when the RUN indicator is lit.
- It takes 25 seconds until the RUN indicator is lit (35 seconds when Ethernet is built-in). During this time the PC Card driver (socket service and card service), the Ethernet ODI driver, and the UDP/IP protocol are loaded into the Unit.

AR Restart

When the relevant bit on word AR01 is turned from ON to OFF, the PC Card Unit is restarted. For operating level 0, turn bit 11 from ON to OFF, for operating level 1 turn bit 10 from ON to OFF.

Clock Specifications

When the PC Card Unit is restarted, either by resetting the power supply or using AR restart, read the C200HX/HG/HE clock to set the clock on the PC Card Unit.

SECTION 5

Using Memory Cards

This section describes formatting Memory Cards, file formats, and file transfers between the PC Card Unit and the C200HX/HG/HE CPU.

5-1	Outline	48
5-2	Formatting Memory Cards	49
5-2-1	Specifying the Card Format and Slot	49
5-2-2	Setting the Memory Card Formatting Mode	50
5-2-3	Starting Memory Card Formatting	50
5-2-4	Memory Card Compatibility	51
5-3	File Operations: CMCR Instruction	51
5-3-1	Summary of CMCR	51
5-3-2	CMCR Format	51
5-3-3	Files Created Using the CMCR Instruction	52
5-3-4	Related SR Words and Bits	52
5-3-5	Response Codes	53
5-3-6	Using CMCR Processes	53
5-3-7	File Write (Process No. 1)	53
5-3-8	File Read (Process No. 2)	55
5-3-9	File and Memory Compare (Process No. 3)	58
5-3-10	File Search (Process No. 4)	60
5-3-11	File Precautions	62
5-4	Memory Card Access Times for CMCR Instructions	62
5-5	Sample Program	63
5-6	Debugging Ladder Programs	64

5-1 Outline

The PC Card Unit allows data, such as CIO, DM, and EM data, to be transferred between a memory card mounted in the PC Card Unit and the C200HX/HG/HE CPU. File read/write operations are performed using the CMCR instruction executed in the ladder program in the C200HX/HG/HE. Refer to *4-1 Before Installing a PC Card Unit* for details on allocating a function code to CMCR.



Caution When using the PC Card, be sure to observe the following precautions.

- Insert or eject the PC Card for at least 10 seconds after it is inserted or ejected. (That is, don't eject the PC Card for at least 10 seconds after it is inserted and don't insert the the PC Card for at least 10 seconds after it is ejected.)
- Don't eject the PC Card while it is being accessed (while either the CARD1 indicator or CARD2 indicator is lit).

Applicable PC Cards

The PC Card Unit has two PCMCIA 2.1-compliant PC card interface slots, in which two type-I or type-II PC cards or one type-III PC card can be mounted. Memory cards on the market, such as SRAM, ATA, and FLASH memory cards, can be used.

Before purchasing memory cards (SRAM, FLASH, or ATA), always make sure that they can be used with PHOENIX PCM Plus 3.2.

File Operations

The CMCR instruction (CARD MACRO) is used to transfer data between the PC Card Unit and the C200HX/HG/HE CPU.

If the user specifies the memory address from which data is to be read, the number of words, and a file name, data in C200HX/HG/HE memory can be written to the specified file in the memory card. Similarly, files can be written from the memory card to C200HX/HG/HE memory. C200HX/HG/HE files can also be compared and searched.

The PC Card Unit also supports saving data with words separated by commas (CSV) as the file format, allowing data to be processed with commercially available spreadsheet software.

File Save Format

Data can be saved in any of the following three file format. Select the appropriate format for your purpose.

- Single word comma separated value (CSV) format

The contents of the specified words are saved in ASCII format. The data for each word is separated by a comma (4-byte ASCII characters).

- Double word CSV format

The contents of the specified words are saved in ASCII format. The data for each pair of words is separated by a comma (8-byte ASCII characters).

- Binary format

The contents of the specified words are saved directly in a file.

Specify the save format in the control data when programming the CMCR instruction. Refer to *5-3 File Operations: CMCR Instruction* for details.

Accessing Data from Personal Computers

Data stored in a memory card in a PC Card Unit can be accessed from a personal computer. Conversely, data stored in a personal computer can be written to the PC Card Unit and then accessed by the PC.

5-2 Formatting Memory Cards

This section describes how to format memory cards.

5-2-1 Specifying the Card Format and Slot

The format differs according to the memory card being used.









- SRAM and ATA Cards: DOS FAT format
- FLASH Cards: MS-FLASH format

Use the system switch on the front panel of a PC Card Unit to specify the format and the slot containing the card to be formatted.

Specifying the Card Format and Slot (Pins 4 and 3)

Note Restart the PC Card Unit to use new system switch settings. By default, all pins are set to OFF. Change the switch settings as necessary.

Pin 4
Pin 3

Pin 4 and pin 3 settings		Description	
OFF		SRAM/ATA Card	Format card in slot 1
OFF			
OFF		SRAM/ATA Card	Format card in slot 2
ON			
ON		FLASH Card	Format card in slot 1
OFF			
ON		FLASH Card	Format card in slot 2
ON			

Note Memory cards can also be formatted using PCMCIA2.1-compliant equipment such as personal computers. In this case, SRAM and ATA Cards must be formatted in FAT format, and FLASH Cards must be formatted in MS-FLASH format.

Newly purchased memory cards may not be formatted on the PC Card Unit. In such a case, format them using a personal computer.

If a personal computer is not PCMCIA2.1-compliant, format the SRAM Card with the following procedure using the PC Card Unit.

- 1, 2, 3...**
1. Connect an ANSI terminal, such as the Hyperterminal for Windows 95, to the PC Card Unit using a host link cable. Set the communications conditions as follows:
 - 9,600 bps, 8 bits, no parity, 1 stop bit
 2. Set only pins 5 and 6 to ON, and then turn on the PC Card Unit.
 3. Insert the SRAM Card into slot 2.

4. Input the following underlined characters.

```
F: \>FORMAT H: /U.
```

5. If an MS-DOS error message appears, select "FAIL." The format will be forcibly executed.

5-2-2 Setting the Memory Card Formatting Mode

Use pins 6 and 5 to set the memory card formatting mode. The setting procedure and pin settings are described below.

Note Restart the PC Card Unit to use new system switch settings. By default, all pins are set to OFF. Change the switch settings as necessary.

Pin 6
Pin 5

Start Mode Settings (Pins 6 and 5)

Pin 6 and pin 5 settings	Description
ON <input type="checkbox"/>	Memory card formatting mode.
OFF <input checked="" type="checkbox"/>	The FMT indicator flashes. This mode is used to format the card inserted in the PC card slot. SRAM, ATA, and FLASH cards can be inserted in the slot.

5-2-3 Starting Memory Card Formatting

Note Formatting a memory card erases all data from the card. Before formatting a memory card, always back up all the necessary data from the card.

Turning pin 2 OFF then ON, or ON then OFF starts formatting the memory card. Pin no. 2, however, is valid only when the startup mode is the memory card formatting mode (FMT indicator will be lit).

Pin 2

Any card is formatted into a single partition and is given volume label "C200HW." SRAM and ATA cards are formatted in FAT format, and FLASH cards are formatted in MS-FLASH format.

5-2-4 Memory Card Compatibility

Memory Cards used for the PC Card Unit are not compatible with the Memory Cards used for the CV-series CPUs. Memory Cards used for the CV-series Personal Computer Unit (CV500-VP2□□), or the CV-series ISA Control Unit (CV500-ISP0□) however, are compatible.

5-3 File Operations: CMCR Instruction

This section explains how to use the CARD MACRO expansion instruction (CMCR).

The CMCR instruction can be used when the C200HX/HG/HE SEND/RECV Enable Flag is ON.

5-3-1 Summary of CMCR

Process	Name	Function
Process No. 1	File Write	Writes the contents of C200HX/HG/HE memory to a file on a memory card in the PC Card Unit.
Process No. 2	File Read	Reads to C200HX/HG/HE memory the contents of a file in a memory card in the PC Card Unit.
Process No. 3	File and Memory Compare	Compares to C200HX/HG/HE memory the contents of a file in on a memory card in the PC Card Unit.
Process No. 4	File Search	Searches data in the files on a memory card in the PC Card Unit.

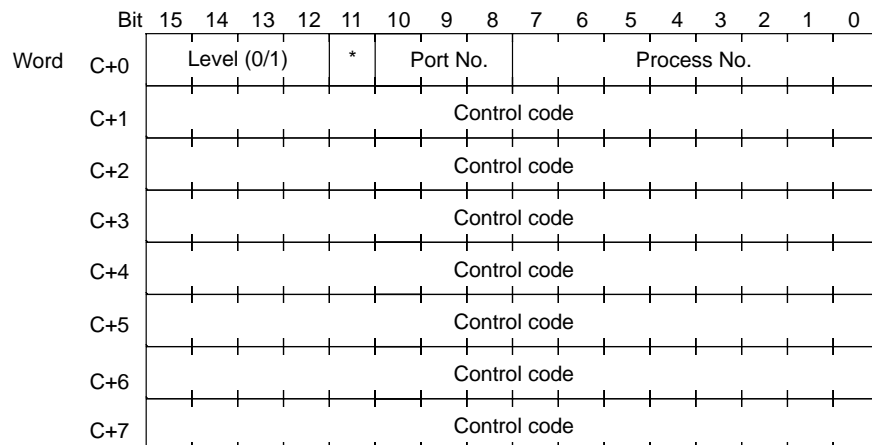
5-3-2 CMCR Format

The CMCR format is as follows:

CMCR	
Control	C: Beginning control data word (rightmost)
Source	S: Beginning command data word (rightmost)
Destination	D: Beginning response word

Control Data

Control data is written in the following format, from the beginning control data word (C).



*Control code enable

• **(Operating) Level**

Setting to “0” specifies level #0; setting to “1” specifies level #1.

• **Control Code Enable**

When bit 11 of word C+0 is ON (i.e., set to “1”), the control codes in words C+1 through C+7 are transmitted to the PC Card Unit.

• **Port Number**

The port number varies depending on the process number. For explanations of the various processes, refer to 5-3-6 *Using CMCR Processes*.

• **Process Number**

The process number specifies a CMCR process (from 1 to 4).

• **Control Code**

The control code specifies the filename for writing, reading, comparison, or searching.

Command Data

In word S+0, specify the command data length +1. The maximum command data length is 1,000 words.

S+0	Command data length (Number of words: BCD) \$1 to \$1001
S+1	Command data
S+2	Command data
	• • •
S+1000	Command data

Response Data

The response data varies depending on the CMCR process. For explanations of the various processes, refer to Section 5-3-6 *Using CMCR Processes*.

5-3-3 Files Created Using the CMCR Instruction

• **Maximum Number of Files per Card**

The entire card may be used, but this depends on the FAT size of the card.

• **Maximum Size for One File**

The entire card may be used, but the offset setting is up to 65,535. A file size of up to 4,294,967,295 bytes ($2^{16} - 1$) can be read.

5-3-4 Related SR Words and Bits

The following table shows the SR words and bits that are related to CMCR execution.

Word	Bit no.	Function
SR 237	00 to 07	Response code for operating level #0 after CMCR execution.
	08 to 15	Response code for operating level #1 after CMCR execution.
SR 252	00	Turns ON when there is an error after CMCR execution for operating level #0.
	01	ON when CMCR can be executed for operating level #0.
	03	Turns ON when there is an error after CMCR execution for operating level #1.
	04	ON when CMCR can be executed for operating level #1.

5-3-5 Response Codes

Code	Meaning
00	Normal completion
01	Parameter error (offset, file size, number of words read, etc.)
02	Disk full, file I/O error, file type error
03	File does not exist.
04	Comparison, search failure
05 to FE	Undefined
FF	Process number error

Note CMCR Errors

When the C200HX/HG/HE ER Flag is ON.

Either the set parameter range has been exceeded or the instruction was executed when the SEND/RECV Enable Flag was OFF.

When the PC Card Unit displays an error response.

The relevant bit on word 252 is ON. Refer to 5-3-4 Related SR Words and Bits.

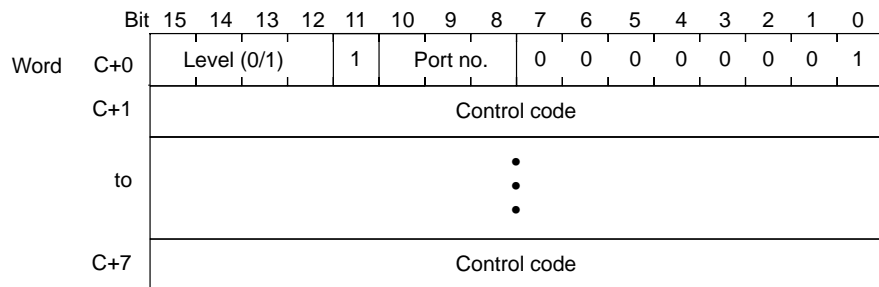
5-3-6 Using CMCR Processes

The following four subsections explain how to use the four CMCR processes. The processes are explained one by one, in order of process number.

5-3-7 File Write (Process No. 1)

The File Write process writes the contents of C200HX/HG/HE memory to a file on a memory card in the PC Card Unit.

Control Data



- **(Operating) Level**

Setting to “0” specifies level #0; setting to “1” specifies level #1.

- **Port Number**

Bit 8 0: Overwrites existing file.

1: Creates new file.

When “offset” (explained below) is set to “1,” the new data is added to the end of the existing file.

When “offset” is set to “0,” a new file with the same name as an existing file overwrites the existing file. At this time, if “data length” (explained below) is set to “1” (no transmission data), the existing file is deleted.

Bit 9 0: Makes the created file a comma separated value file. Carriage returns are not inserted. The separation method is determined by bit 10. The file is created as one line with no carriage returns (CR + LF).

1: Makes the created file a binary file, and saves the memory contents just as it is.

- Bit 10** 0: Puts a comma between the data for each word.
 1: Puts a comma between the data for every two words (double-length words).

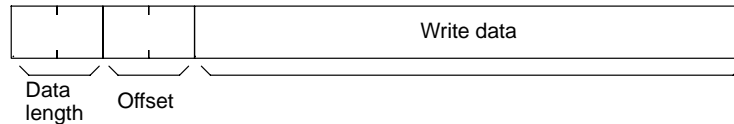
- **Control Code**

Write the hexadecimal values for the drive and filename for the file to be written. The extension must be written in three characters. Shift JIS 1-byte alphanumeric code is used.

If there are already directories on the card, a directory can be specified.

Slot 1 is drive G, and slot 2 is drive H.

Command Data



- **Data Length**

The data length (including the data length and offset designations) is specified by the number of words. Specify a number from 1 to 1001 in BCD.

- **Offset**

The transmission data offset is specified by the number of elements (i.e., the number of words for binary and single-word comma separation, or the number of double-length words double-word comma separation). Specify a number from 0 to FFFF in hexadecimal.

When adding data to a file, all numbers other than 0 have the same meaning (i.e., add to the end of the file).

Single-word comma separation, binary: Specified number of words.

Double-word comma separation: Specified number of elements.

- **Write Data**

The data to be written to the file. The maximum amount of data depends on the type of file created, as follows:

Single-word comma separation, binary: 999 words

Double-word comma separation: 998 words (449 elements)

Response Data

There is no response data.

Response Codes

- 00: Normal completion.
 01: Offset or file size error (e.g., offset + size exceeds file size).
 02: Disk full, file output error, or file type error.
 03: File does not exist.

File Writing Example

In the following example, two words of data, from DM 0102 and DM 0103, are written as a new file to the operating level #1 PC Card Unit's memory card. The drive and filename are G:\DMDATA.DAT.

Word

Bit

Specify the drive and filename in hexadecimal.

Settings and Results

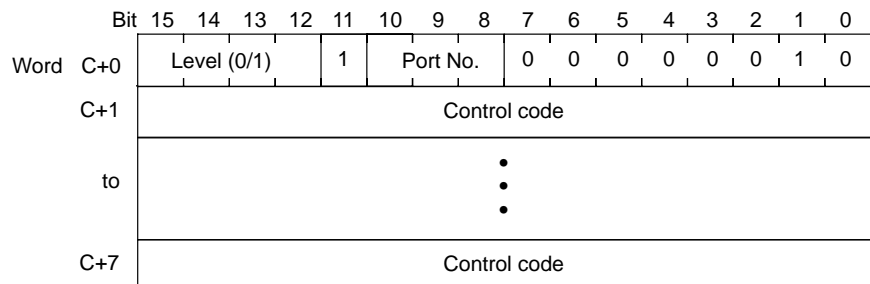
The following table shows examples of settings for bits 8 to 10 and the command data and file writing results.

Function	Bit			Command data	Contents of file
	10	9	8		
New (Binary)	*	1	1	00 04 00 00 12 34 56 78	12 34 56 78 (4 bytes, binary file)
New (CSV word)	0	0	1	00 06 00 00 12 34 56 78 9a bc de f0	1234,5678,9abc,def0 (19 bytes, ASCII text file)
New (CSV double-length word)	1	0	1	00 06 00 00 12 34 56 78 9a bc de f0	12345678,9abcdef0 (17 bytes, ASCII text file)
Delete	*	*	1	00 01	—
Add (CSV word)	0	0	1	00 04 00 01 12 34 56 78	1234,5678 → 1234,5678,1234,5678 (19 bytes, ASCII text file)
Overwrite (CSV word)	0	0	0	00 03 00 01 12 34	1234,5678 → 1234,1234 (9 bytes, ASCII text file)
Overwrite (CSV double-length word)	1	0	0	00 04 00 01 12 34 56 78	12345678,9abcdef0 → 12345678,12345678 (17 bytes, ASCII text file)

5-3-8 File Read (Process No. 2)

The File Read process reads files on a memory card in the PC Card Unit to C200HX/HG/HE memory.

Control Data



- **(Operating) Level**
Setting to “0” specifies level #0; setting to “1” specifies level #1.
- **Control Code Enable**
Fixed at “1” (control codes enabled).
- **Port Number**
 - Bit 8** 0: Reads the specified file.
 - 1: Reads the specified number of elements in the file.
 - Bit 9** 0: Reads data as comma separated values. The separation method is determined by bit 10.
 - 1: Reads as binary file.
 - Bit 10** 0: Uses comma separation in single word units (one word).
 - 1: Uses comma separation in double word units (two words).
- **Control Code**
Write in hexadecimal value the drive and filename for the file to be read. The extension must be written in three characters. Shift JIS 1-byte alphanumeric code is used.
Slot 1 is drive G, and slot 2 is drive H.

Command Data

Data length Offset Number of words read

- **Data Length**
Fixed at 0003.
- **Offset**
The beginning read offset is specified by word or number of elements (double-length words). Specify a number from 0 to FFFF in hexadecimal.
 - Single-word comma separation, binary: Specified by word.
 - Double-word comma separation: Specified by no. of elements.
- **Number of Words Read**
The number of words read is specified by word or number of elements.
 - Single-word comma separation, binary: Specified by word.
 - Double-word comma separation: Specified by no. of elements.
 Make the setting from 1 to 3E7 in hexadecimal. The number of words read depends on the type of file, as follows:
 - Single-word comma separation, binary: 999 words (\$3E7)
 - Double-word comma separation: 449 (998 words) (\$1F3)

Note Comma-separated files are read as text files with one-byte separations, such as commas, every 4 or 8 bytes. If 2-byte separations, such as carriage returns (CR + LF), are included, an error will be generated with a response code of 2. Convert to 1-byte characters beforehand.

Response Data

The data read from the specified file is stored. When reading the number of elements, the number of elements in the file is stored in 2-word hexadecimal.

Response Codes

- 00: Normal completion.
- 01: Error in offset value or number of words read.
- 02: File I/O error or file type error.
- 03: File does not exist.

File Reading Example

In the following example, a file called “G:\DMDATA.DAT” in the operating level #0 PC Card Unit is read in comma separated word units. The offset value is 0000 and the number of words read is “2.” The data is read to DM 0200 onwards.

Word Bit

Specify the drive and filename in hexadecimal.

Settings and Results

The following table shows examples of settings for bits 8 to 10 and the command data and file reading results.

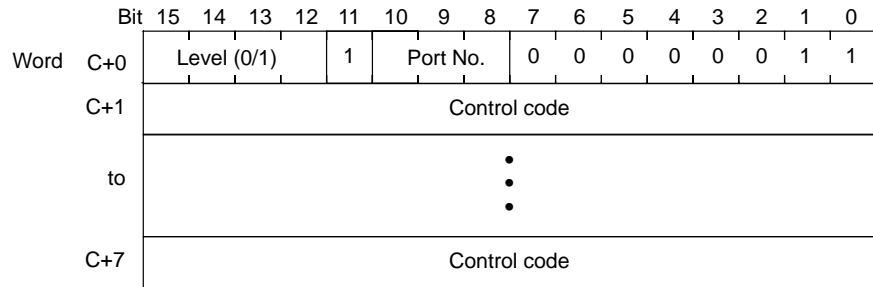
Function	Bit			Command data	Contents of PC card file	D: Response data storage words
	10	9	8			
Size (Binary)	*	1	1	*	12 34 56 78 9a bc de f0	0000 0004
Size (CSV word)	0	0	1	*	1234,5678,9abc,def0	0000 0004
Size (CSV double-length word)	1	0	1	*	12345678,9abcdef0	0000 0002
Read (Binary)	*	1	0	00 03 00 00 00 02	12 34 56 78 9a bc de f0	12 34 56 78
Read (CSV word)	0	0	0	00 03 00 00 00 02	1234,5678,9abc,def0	12 34 56 78
Read (CSV double-length word)	1	0	0	00 03 00 00 00 02	12345678,9abcdef0	12 34 56 78 9a bc de f0

5-3-9 File and Memory Compare (Process No. 3)

The File and Memory Compare process compares a file on a memory card in the PC Card Unit to C200HX/HG/HE memory. The results of the comparison are indicated by the response code.

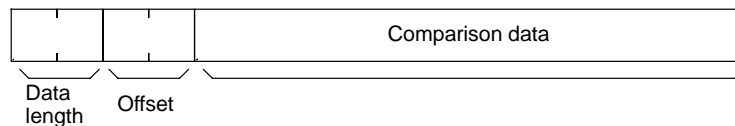
If the specified length of data does not perfectly match, or if the file size is smaller than the specified length of data, the response code (04) shows that there is no match.

Control Data



- **(Operating) Level**
Setting to “0” specifies level #0; setting to “1” specifies level #1.
- **Control Code Enable**
Fixed at “1” (control codes enabled).
- **Port Number**
 - Bit 9** 0: Compares data as comma separated values. The separation method is determined by bit 10.
 - 1: Compares as binary file.
 - Bit 10** 0: Puts comma separation in single word units (one word).
 - 1: Puts comma separation in double word units (two words).
- **Control Code**
Input in hexadecimal values the drive and filename for the file to be compared. The extension must be written in three characters. Shift JIS 1-byte alphanumeric code is used.
Slot 1 is drive G, and slot 2 is drive H.

Command Data



- **Data Length**
The data length (including the data length and offset designations) is specified by the number of words. Specify a number from 1 to 1001 in BCD.
- **Offset**
The offset specifies the comparison data offset. For binary files it is specified by the number of words, and for comma separated files it is specified by the number of elements. Specify a number from 0 to FFFF in hexadecimal.
- **Comparison Data**
The maximum value for comparison data depends on the type of file created, as follows:
 - Single-word comma separation, binary: 999 words (data length: 1001)
 - Double-word comma separation: 998 words (data length: 1000)

Note Comma-separated files are read as text files with one-byte separations, such as commas, every 4 or 8 bytes. If 2-byte separations, such as carriage returns (CR + LF), are included, an error will be generated with a response code of 2. Convert to 1-byte characters beforehand.

Response Data No response data. Comparison results are indicated by response codes.

- Response Codes**
- 00: Normal completion.
 - 01: Error in offset value or size.
 - 02: File input error or file type error.
 - 03: File does not exist.
 - 04: Data does not match.

File Reading Example In the following example, a file called "G:\DMDATA.DAT" at the operating level #0 PC Card Unit is compared to C200HX/HG/HE memory as binary data. The comparison data length is three words, and the offset value is 0000 (beginning of file).

Word

Bit

Specify the drive and filename in hexadecimal.

Settings and Results The following table shows examples of settings for bits 9 and 10 and the command data and comparison results.

Function	Bit		Command data	Contents of PC card file	Response code
	10	9			
Binary comparison	*	1	00 04 00 00 12 34 56 78	12 34 56 78	00 (Match)
	*	1	00 03 00 01 56 78	12 34 56 78	00 (Match)
	*	1	00 03 00 00 56 78	12 34 56 78	04 (No match)
CSV word comparison	0	0	00 06 00 00 12 34 56 78 9a bc de f0	1234,5678,9abc,def0	00 (Match)
	0	0	00 04 00 02 9a bc de f0	1234,5678,9abc,def0	00 (Match)
	0	0	00 04 00 00 9a bc de f0	1234,5678,9abc,def0	04 (No match)
CSV double-length word comparison	1	0	00 06 00 00 12 34 56 78 9a bc de f0	12345678,9abcdef0	00 (Match)
	1	0	00 04 00 01 9a bc de f0	12345678,9abcdef0	00 (Match)
	1	0	00 04 00 00 9a bc de f0	12345678,9abcdef0	04 (No match)

5-3-10 File Search (Process No. 4)

The File Search process searches files, by specified data, on a memory card in the PC Card Unit.

Control Data

	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Word	C+0	Level (0/1)				1	Port No.		0	0	0	0	0	1	0	0		
	C+1	Control code																
	to	• • •																
	C+7	Control code																

- **(Operating) Level**
Setting to “0” specifies level #0; setting to “1” specifies level #1.
- **Control Code Enable**
Fixed at “1” (control codes enabled).
- **Port Number**
 - Bit 9** 0: Searches as comma separated values. The separation method is determined by bit 10.
 - 1: Searches as binary file.
 - Bit 10** 0: Puts comma separation in single word units (one word).
 - 1: Puts comma separation in double word units (two words).
- **Control Code**
Input in hexadecimal values the drive and filename for the file to be searched. The extension must be written in three characters. Shift JIS 1-byte alphanumeric code is used.
Slot 1 is drive G, and slot 2 is drive H.

Command Data

Search data

Data length Offset 2 or 4 bytes

- **Data Length**
For word comparison, specify “3” and for double-length word comparison specify “4.” For binary, specify “3.”
- **Offset**
The offset specifies the search data offset. For binary files it is specified by the number of words, and for comma separated files it is specified by the number of elements. Specify a number from 0 to FFFF in hexadecimal.
- **Search Data**
The length of the search data depends on the type of file created, as follows:
 - Single-word comma separation, binary: One word
 - Double-word comma separation: Two words

Note Comma-separated files are read as text files with one-byte separations, such as commas, every 4 or 8 bytes. If 2-byte separations, such as carriage returns (CR + LF), are included, an error will be generated with a response code of 2. Convert to 1-byte characters beforehand.

Response Data When the search data is found, the location of the matching data is stored. It is returned as data within a range of 0 to FFFF.

The word location of matching data is as indicated as being a certain number of words from the specified offset, i.e., the first word after the offset becomes 0000; the second word, 0001; the third word, 0002, etc.

Response Codes

- 00: Normal completion.
- 01: Parameter error (for example, if the data length is 3 for double word comparison).
- 02: File input error or file type error.
- 03: File does not exist.

File Reading Example In the following example, the contents (single-word comma separation) of a file called "G:\DMDATA.DAT" at the operating level #0 PC Card Unit is searched for the specified data in C200HX/HG/HE memory. The offset is 0000 and the search data is \$5678. The contents of DMDATA.DAT is 0000, 1234, 5678, 9123, 4560, 0000, 1111.

Word Bit

Specify the drive and filename in hexadecimal.

Indicates a match with the third element.

Settings and Results The following table shows examples of settings for bits 9 and 10 and the command data and search results.

Function	Bit		Command data	Contents of file	Response data (location of match)
	10	9			
Binary search	*	1	00 03 00 01 9a bc	12 34 56 78 9a bc de f0	00 01
CSV word search	0	0	00 03 00 01 9a bc	1234,5678,9abc,def0	00 01
CSV double-length word search	1	0	00 04 00 01 9a bc de f0	12345678,9abcdef0	00 00

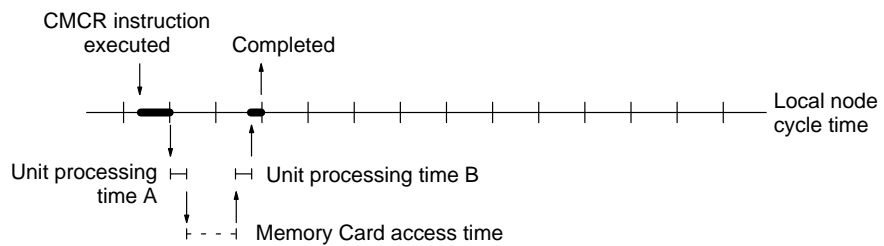
5-3-11 File Precautions

- When comma-separated files are written by CMCR, they are written as one line.
- Comma-separated files created at a personal computer are read with the assumption that they were created in one of the following formats.
 - 4 bytes, comma, 4 bytes, comma, 4 bytes, comma....
 - 8 bytes, comma, 8 bytes, comma, 8 bytes, comma....
- Additional data can only be written to a file if there is space available on the card, and file data can only be overwritten in the range where an offset can be specified.
- Individual fields in comma separated files are not enclosed by quotation marks.

5-4 Memory Card Access Times for CMCR Instructions

The minimum times for executing CMCR instructions are as follows:

Minimum CMCR Instruction Execution Times



The access time will differ depending on the type of Memory Card used, so in this instance it is calculated as 0.

Minimum CMCR Instruction Execution Time
 = local node cycle time + Unit processing time A + Memory Card access time + Unit processing time B + local node cycle time.

• **Unit Processing Time A**

Time to write data on the card: no. of write words × 0.013 + 5 ms
 Time to read data from a card: 5 ms

• **Unit Processing Time B**

Time to write data on the card: 5 ms
 Time to read data from a card: no. of read words × 0.013 + 5 ms

Example: The minimum instruction execution time for writing 999 words

$$\begin{aligned} & \text{Local node cycle time} \times 2 + 999 \times 0.013 + 5 \text{ ms} + 5 \text{ ms} \\ & = \text{local node cycle time} \times 2 + 22.987 \text{ ms} \end{aligned}$$

Actual Measurement Values

The write time for a 999-word SRAM card: 24 ms
 The write time for a 1-word SRAM card: 9.7 ms

C200HX/HG/HE Cycle Delay Time

When a PC Card Unit is connected to the C200HX/HG/HE CPU, the cycle time will be delayed by a maximum of 6 ms.

5-5 Sample Program

This section provides a sample program for writing and reading files. In this program, when execution condition IR 00000 is turned from OFF to ON and then OFF again, the data in 100 DM words beginning with DM 0100 is written to G:\DMSAVE.DAT. When execution condition IR 00001 is turned from OFF to ON and then OFF again, the 100 words of data is read from DMSAVE.DAT to the DM words from DM 0200 onwards.

Program

Execution
condition
00000

25201: Operating level #0 CMCR execution enabled.

Operating level #0
File write (newly created)
(Single-word comma separated file)

Process No. 1, File Write
Command execution

00300: Output for CMCR instruction error.

00101: CMCR execution completion

Execution
condition
00001

25201: Operating level #0 CMCR execution enabled.

Operating level #0
File read (newly created)
(Single-word comma separated file)

Process No. 2, File Read
Command execution

00301: Output for CMCR instruction error

00201: CMCR execution completion

DM Area Settings

DM0000	Control data		
DM0001	47	3A	'G', ':'
DM0002	5C	44	'\', 'D'
DM0003	4D	53	'M', 'S'
DM0004	41	56	'A', 'V'
DM0005	45	2E	'E', '.'
DM0006	44	41	'D', 'A'
DM0007	54		'T'

DM0010	0003	Fixed at 0003.
DM0011	0000	Offset: 0
DM0012	0064	Read data length: 100 words

DM0098	0102	Write data length: 102 words
DM0099	0000	Offset: 0
DM0100	Data	
	:	
DM0199	Data	

5-6 Debugging Ladder Programs

This section shows how to debug the ladder program, using the sample program provided in 5-5 *Sample Program* as an example.

Procedure

The procedure for debugging a ladder program is outlined below. Each of these steps is then explained in more detail.

- 1, 2, 3...**
1. Start up the Support Software.
 2. Allocate a function code to CMCR.
 3. Create the ladder program.
 4. Go online.
 5. Transfer the program to the PC.
 6. Prepare the system for debugging.
 7. Execute the program.
 8. Debug the program.
 9. Check the write data.

Support Software Startup

From the drive in which the SYSMAC Support Software is installed, enter "SSS" and then press the Enter key to start up the SYSMAC Support Software. Then, from the System Setup menu, set the PC model, PC communications parameters, and so on.

Expansion Instruction Setup

Select "X:Set instructions" from the Utility Menu. Then use "E:Edit instructions" to set a function code for the CMCR instruction in the instructions table. For details, refer to the *SYSMAC Support Software Operation Manual: C-series PCs*.

The settings can also be made using the Programming Console. For details, refer to 4-1-3 *Allocating a Function Code for CMCR*.

Ladder Program Creation

Create the sample program.

Online Connection

Go online by pressing Ctrl+O followed by the F1 key (PC connection).

Program Transfer

Use "Monitoring/P:Transfer program/W:Computer → PC" to transfer the program to the C200HX/HG/HE Programmable Controller.

Debug Preparation	Insert the memory card into slot 1 in the PC Card Unit. Set the control data, data length, offset, and write data to the DM area using the DM Menu.
Program Execution	Press Ctrl+O followed by the F3 key (MONITOR) to switch to MONITOR mode.
Debugging	<p>Use the "Monitor data" operation under the Monitoring Menu to execute the write command by turning execution condition IR 00000 from OFF to ON and back OFF.</p> <p>Check to see that error output IR 00300 does not turn ON. If it does turn ON, use CMCR response codes 23700 to 23707 to check the error.</p> <p>Execute the read command by turning execution condition IR 00001 from OFF to ON and back OFF.</p> <p>Just as for the write command, check to see that error output IR 00301 does not turn ON, and check the response codes if it does.</p> <p>Use the DM Menu to check to see that the contents of DM 0100 to DM 0199 have been copied to DM 0200 to DM 0299.</p>
Checking the Write Data	<p>Eject the memory card from the PC Card Unit.</p> <p>Insert the memory card in a personal computer with a 3G8F5-PCM01 PC Card Interface Board installed, or in a computer with a PC card slot.</p> <p>Check to see that a file called "DMSAVE.DAT" has been created on the memory card. This is a text data file, in single-word comma separated value format.</p> <p>This completes the ladder program debugging operation.</p>

Part 3

Using Ethernet

This part of the manual describes how to install Ethernet Cards and use the setup software. It includes directions on how to use the SEND and RECV instructions to transfer data and provides details on the FINS commands and responses used for communications between the C200HX/HG/HE CPU and the PC Card Unit.

SECTION 6

Preparations for Operation

This section outlines the steps required to install the PC Card Unit and Ethernet function and prepare for operation. Be sure you have read this section and understood all of the procedures before attempting to actually make the settings or do any programming.

6-1	Outline	70
6-2	Procedures	70
6-3	Communications	72
6-3-1	Outline	72
6-3-2	Ethernet Communications Function	72
6-3-3	SEND and RECV	73
6-3-4	FINS Communications Service (FINS Commands and Responses) ...	73
6-3-5	Socket Services	73

6-1 Outline

The procedures required to prepare for operation are outlined below. Be sure to familiarize yourself with these basic procedures.

These procedures are explained in more detail in *6-2 Procedures*.

- 1, 2, 3...**
- 1. Communications Board Installation**
Mount the Communications Board in the C200HX/HG/HE CPU.
 - 2. C200HX/HG/HE Setup**
Assign a function code to the CARD MACRO (CMCR) expansion instruction.
 - 3. PC Card Unit Setup**
Mount the PC Card Unit and make the required settings.
 - 4. Ethernet Setup**
Install the Ethernet Card and set up Ethernet using the setup software so that the communications software can be used.
 - 5. Programming**
Write the program.
 - 6. Debugging**
Debug the program.
 - 7. Operation**

6-2 Procedures

This section outlines the procedures required to install and set up the PC Card Unit and peripheral devices for application development and operation. Be sure that you thoroughly understand all of these procedures. References for further reading are provided for each procedure.

- 1. Communication Board**
Mount either the C200HW-COM01 or C200HW-COM04-E Communications Board in the C200HX/HG/HE CPU. Refer to the *C200HW-COM01 to 06-E Communications Board Operation Manual* for details.
- 2. C200HX/HG/HE Setup**
Two steps are required to prepare the C200HX/HG/H for PC Card Unit application.
 - **Addition of CMCR** 4-1
Use either the SYSMAC Support Software or the Programming Console to assign a function code to the CARD MACRO (CMCR) instruction.
 - **System Switch Setting** 4-1
Turn ON DIP switch pin number 4 to enable setting expansion instructions for the C200HX/HG/HE.
- 3. PC Card Unit Setup**
Two steps are required to set up the PC Card Unit.
 - **System Switch Setting** 4-3
Set the startup mode, memory card initialization type, the operating level, etc. If only the memory card function is to be used, set only the operating level and leave the other pins set to OFF.
 - **Unit and Peripheral Connections** 4-4 to 4-6
Mount the PC Card Unit on the Backplane and install the Bus Connection Unit and memory card.

Unit Restrictions and Mounting Locations

When a PC Card Unit is used, only one SYSMAC LINK Unit or SYSMAC NET Link Unit can be used on the CPU Backplane.

When a PC Card Unit and SYSMAC LINK Unit or SYSMAC NET Link Unit are used together on the CPU Backplane, they must be mounted in the slots shown in the following illustration.

Mount the PC Card Unit to the left of the SYSMAC LINK Unit

PC Card Unit C200HX/HG/HE CPU
SYSMAC LINK Unit

4. Ethernet Setup

• Ethernet Card Installation

7-2

Install the Ethernet Card into the PC Card Unit.

• Ethernet Connection

7-3

Connect the PC Card Unit to the Ethernet network.

• Personal Computer Setup

7-4

Connect the PC Card Unit to a personal computer and copy the setup software.

• Setup Software Settings

7-5 and 7-6

Activate the setup software on the personal computer and carry out all settings for Ethernet.

5. Programming

8 to 11

Use SYSMAC Support Software with a personal computer to create the ladder program. For details regarding ladder programming, refer to the SYSMAC Support Software Operation Manuals.

6. Program Debugging

Use a memory card with the program that has been created and correct any bugs that may be found.

7. Operation

Proceed with actual operation.

- Note**
1. Do not use the setup software for the C200HW-PCS01(-EV1) to perform settings for the C200HW-PCS01-V2.
 2. The C200HW-PCS01-V2 is factory-set to ODI driver (cntpclat.com). For this reason, if the Unit is started up without installing the C-NET(PC)C-10L Ethernet Card made by CONTEC, the ERR indicator will light. Perform the required settings for the ODI driver and Ethernet communications according to the Ethernet Card used.

6-3 Communications

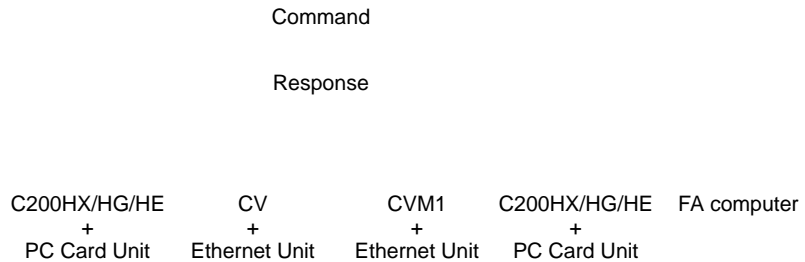
6-3-1 Outline

The PC Card Unit has a built in message service that enables the use of data communications and commands to control PCs and FA computers on nodes on a network.

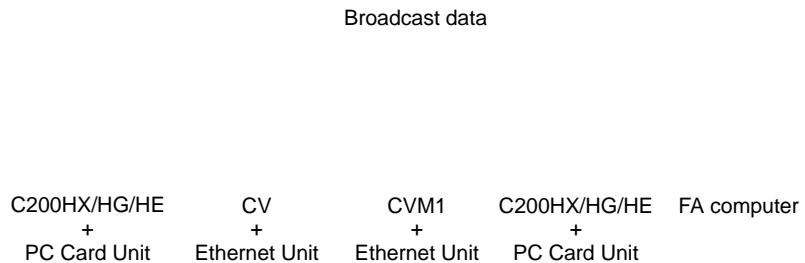
The message service operates by setting the communications destination each time it sends a command or data and then receives the response from the destination node. The message service can be set so as not to send any response if a response is not necessary. A message can be sent to all nodes on the network simultaneously. This is called broadcasting.

The PC Card Unit can participate in communications with C200HX/HG/HE CPUs, CV-series PCs, and computers on the Ethernet network.

Node-to-node Data Transfer



Broadcasting

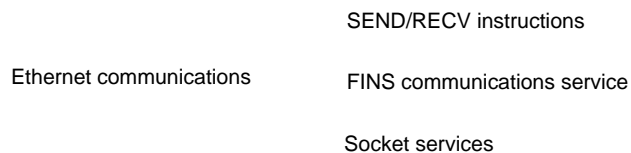


There are three communications systems used by the message service for the PC Card Unit: ladder diagram instructions (SEND and RECV), FINS commands, and socket services. These are detailed next.

6-3-2 Ethernet Communications Function

The C200HW-PCS01-V2 PC Card Unit Ethernet Set supports the three communications methods shown in the following diagram.

Overview



Software Configuration

SEND		
RECV	CMCR	CMCR
CMCR		

PC Card Unit
Ethernet Card

Note FINS commands are issued by using CMCR.

The three communication methods are outlined below.

6-3-3 SEND and RECV

Data is transmitted from the PC Card Unit using the SEND and RECV instructions. Although it is necessary to specify the data for transmission, detailed data processing is automatically performed by the Unit.

Refer to *Section 8 Using SEND(90) and RECV(98)* for details on SEND and RECV.

6-3-4 FINS Communications Service (FINS Commands and Responses)

The FINS communication service is explained below in three categories: when the PC Card Unit receives a FINS command; when a FINS command is sent from the PC Card Unit; and when FINS communication is carried out between the computer and the PC Card Unit.

For details on FINS commands and responses, refer to *Section 9 FINS Commands* and *Section 11 Using FINS Commands and Responses*.

When the PC Card Unit Receives a FINS Command

When the PC Card Unit receives a FINS command, it automatically interprets the command and sends a response. All processing is conducted automatically, so there is no need to program the PC to respond to FINS commands.

When a FINS Command is Sent From the PC Card Unit

A FINS command is issued using the CMCR instruction, and a response is returned from the recipient of the command. That response is returned automatically if the recipient of the FINS command is a C200HX/HG/HE or CVM1/CV Programmable Controller.

FINS Communication Between the Computer and the PC Card Unit

To use FINS commands from a computer, create the command data in the program at the computer according to the FINS command format. Have the FINS responses that are returned from the PC Card Unit analyzed and processed according to that format. For details, refer to *Section 9 FINS Commands*.

6-3-5 Socket Services

A socket is an interface which allows a user program to directly use TCP (Transmission Control Protocol) and UDP (User Datagram Program). Socket services are employed by using the CMCR instruction. Using socket services allows the PC Card Unit to communicate with UNIX workstations and FA Computers other than OMRON Programmable Controllers, with any protocol. For details, refer to *Section 10 Socket Services*.

SECTION 7

Setting Up Ethernet

This section describes how to install Ethernet cards and use the setup software. Before setting up Ethernet, always set up the PC Card Unit as described in *Section 4 Installation and Switch Settings*.

7-1	Preparations	76
7-2	Installing and Removing the Ethernet Card	76
7-2-1	Ethernet Cards	76
7-2-2	PC Card Slots	77
7-2-3	Installing and Removing an Ethernet Card	77
7-3	Connecting to the Ethernet Network	81
7-3-1	Connecting to the Hub	81
7-3-2	Constructing an Ethernet Network	82
7-4	Connecting to the Personal Computer	82
7-4-1	Restrictions on Personal Computers	82
7-4-2	Connecting the Computer to the PC Card Unit	82
7-5	Setting Up the Ethernet Environment	84
7-5-1	IP Address	84
7-5-2	Subnet Mask	85
7-5-3	ODI Driver	85
7-5-4	Hosts	85
7-5-5	Conversion Table for IP Addresses and FINS Node Addresses	85
7-5-6	FINS Routing Tables	86
7-5-7	Gateway Address	87
7-5-8	Other Ethernet Environment Settings	87
7-5-9	Setting the Port Number	87
7-6	Setup Software Operation	88
7-6-1	Setup Procedure	88
7-6-2	Preset Items	88
7-6-3	Connecting to the PC Card Unit	89
7-6-4	Starting and Exiting the Software	91
7-6-5	IP Address	92
7-6-6	Subnet Mask	92
7-6-7	ODI Driver	93
7-6-8	HOSTS File	94
7-6-9	Address Conversion Table	96
7-6-10	FINS Routing Tables	98
7-6-11	Gateway Address	99
7-6-12	Returning the PC Card Unit to Normal Mode	100
7-7	Backing Up and Restoring Settings	100
7-7-1	Backing Up Files	100
7-7-2	Restoring Files	102

7-1 Preparations

Before setting up the Ethernet, always perform the setup procedure described below.

- Note**
1. Do not use the setup software for the C200HW-PCS01(-EV1) to perform settings for the C200HW-PCS01-V2.
 2. The C200HW-PCS01-V2 is factory-set to ODI driver (cntpclat.com). For this reason, if the Unit is started up without installing the C-NET(PC)C-10L Ethernet Card made by CONTEC, the ERR indicator will light. Perform the required settings for the ODI driver and Ethernet communications according to the Ethernet Card used.
 3. The service conditions, slots used, and restrictions on PC cards are the same for the PC Card Unit Ethernet Set as for the PC Card Unit. Be sure to observe the restrictions described in *Section 4 Installation and Switch Settings*.

1, 2, 3...

1. Mounting the Communications Board

Mount the C200HW-COM01 or C200HW-COM04-E Communications Board in the C200HX/HG/HE CPU. Refer to the *C200HW-COM01 to 06-E Communications Board Operation Manual* for details.

2. Setting Up the C200HX/HG/HE

• Adding CMCR 4-1

Use the SYSMAC Support Software or Programming Console to allocate a function code to the CMCR instruction (CARD MACRO instruction).

• Setting the System Switch 4-1

Turn ON pin no. 4 on the DIP switch to enable allocating function codes to expansion instructions for the C200HX/HG/HE.

3. Setting Up the PC Card Unit

• Setting the System Switch 4-3

Set the startup mode, memory card format, operating level, etc. If only a memory card is to be used, set the operating level only. Other pins can be left OFF.

• Connecting the PC Card Unit to Peripherals 4-4 to 4-6

Install the PC Card Unit on the CPU Backplane, and mount a Bus Connection Unit and memory card.

7-2 Installing and Removing the Ethernet Card

This section describes restrictions on Ethernet cards and explains how to install/remove an Ethernet card in/from the PC Card Unit.

7-2-1 Ethernet Cards

Applicable Ethernet Cards

The PC Card Unit uses a DOS ODI driver. Although two DOS ODI drivers are currently in existence (SPEC3 and SPEC4), the PC Card Unit supports the SPEC3 ODI driver only. Therefore, Ethernet cards that have only the SPEC4 ODI driver cannot be used.

- Note**
1. Before installing or removing an Ethernet card, always turn the PC Card Unit OFF. An Ethernet card cannot be installed or removed while the PC Card Unit is ON.
 2. Only one Ethernet card can be used.

7-2-2 PC Card Slots

Slot 1

Slot 2

Slot 1: A type-I, -II, or -III PC card can be mounted in this slot.

Slot 2: A type-I or -II PC Card can be mounted in this slot. If, however, a type-III PC Card is mounted in slot 1, slot 2 cannot be used.

Note The card inserted into slot 2 can be removed or installed by loosening the set screws on plate 2. When removing or installing a card into slot 1, always remove plate 2.

To avoid accidental removal of the Ethernet Card, it is recommended that the Ethernet Card be installed in slot 1.

7-2-3 Installing and Removing an Ethernet Card

Note Use an Ethernet card that has a connector more than 3 mm away from the edge of the card, as shown in the figure below. If the distance between the edge of the card and the connector is 3 mm or less, the plate for securing the PC card cannot be installed.

Ethernet card

3 mm

Note There is a restriction on the current consumption of the Ethernet card. Use an Ethernet card that meets the following conditions:

$I_{5V} (1 \text{ slot}) \leq 0.5 \text{ A}$, $I_{12V} (1 \text{ slot}) \leq 0.1 \text{ A}$
 $I_{5V} (2 \text{ slots}) + 3.4 \times I_{12V} (2 \text{ slots}) \leq 1.0 \text{ A}$

Installing an Ethernet Card

- 1, 2, 3...**
1. Connect the attached adapter to the Ethernet card as shown in the figure below. Carefully check the shape of each connector to ensure correct connection. Be sure to press the connector all the way in.

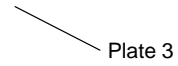
2. Insert the Ethernet card into the PC card slot as shown in the figure below. Press the Ethernet card until its edge is aligned with the eject buttons. To avoid accidental removal of the Ethernet Card, it is recommended that the Ethernet Card be installed in slot 1.

Eject buttons

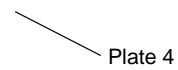
3. If a memory card is to be installed, install it in the same way as step 2.
4. Secure the Ethernet card with plate 2. To do so, secure plate 2 by tightening a set screw into the plate 2 mounting hole in the front panel of the PC Card Unit as shown below.

————— Plate 2

5. Secure plate 3 by tightening a set screw into the plate 3 mounting hole.



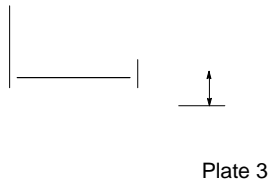
6. Secure the adapter cable with plates 3 and 4 by tightening set screws as shown below.



Installation Precautions

For the PC Card Unit Ethernet Set, consider the lengths of the cable and plate 3 indicated in the figure below to ensure that there is sufficient room to install the Ethernet Set properly.

Backplane



Consider the length of this cable to ensure that there is sufficient room to install the Ethernet Set.

Removing an Ethernet Card

- 1, 2, 3...**
1. Remove the set screw, then remove plate 2.
 2. Remove the set screw, then remove plate 3.
 3. Press the eject button as shown in the figure below.

The card inserted into slot 2 can be removed or installed by loosening the set screws on plate 2. When removing or installing a card into slot 1, always remove plate 2.

Note Do not press the eject button with the plates mounted.

7-3 Connecting to the Ethernet Network

This section explains connection to a 10BASE-T network as an example of Ethernet connection.

7-3-1 Connecting to the Hub

- 1, 2, 3...** 1. Connect the adapter from the Ethernet card to a twisted-pair cable.

Adapter

2. Connect the twisted-pair cable to the hub as shown below.

7-3-2 Constructing an Ethernet Network

The following diagram illustrates an example of Ethernet network configuration. For the types of networks and the types and number of devices that can be connected, refer to documentation for the hub.



7-4 Connecting to the Personal Computer

This section describes how to connect to a personal computer to enable using the setup software to set your Ethernet connection.

7-4-1 Restrictions on Personal Computers

Use a computer that meets the conditions shown below.

Applicable Computers and Operating Systems

An AT or compatible computer can be used. The computer must have at least one RS-232C port available.

Use an operating system supporting terminal software (e.g., HyperTerminal) that allows the exchange of binary files using the Zmodem protocol.

Example: Windows 98 or Windows NT 4.0.

7-4-2 Connecting the Computer to the PC Card Unit

Connect the computer to the PC Card Unit with a Host Link Cable.

- Note**
1. Before connecting or disconnecting the cable, always turn both the PC Card Unit and the computer OFF.
 2. If the computer does not have a 25-pin D-SUB connector RS-232C connector, wire your own cable. Refer to *Appendix C Connector Pin Assignments* for wiring.

1, 2, 3... 1. Open the front cover as shown below.

2. Connect the 9-pin D-SUB connector of the Host Link Cable to the serial communication connector on the PC Card Unit. Insert the connector all the way in, then tighten the screws.

Front cover

3. Connect the 25-pin D-SUB connector of the Host Link Cable to the serial communication connector on the personal computer. Insert the connector all the way in, then tighten the screws.

7-5 Setting Up the Ethernet Environment

The Ethernet communications environment must be set up to perform Ethernet communications from a PC Card Unit. This section describes how to set up the Ethernet environment with the setup software.

Refer to 7-6 Setup Software Operation for details on how to use the setup software.

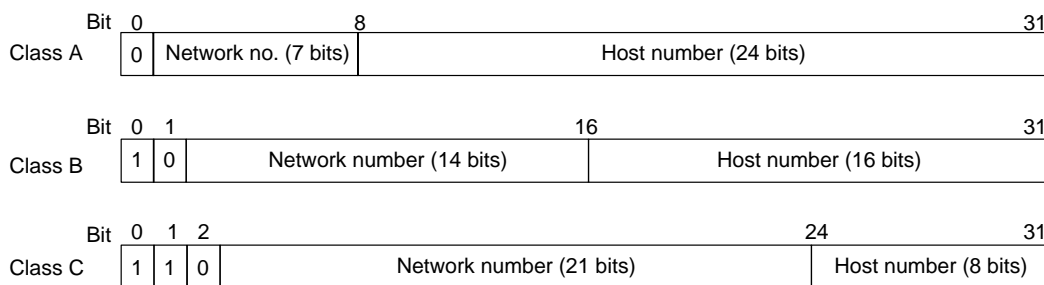
7-5-1 IP Address

Because a PC Card Unit uses an Ethernet expansion function (UDP/IP and TCP/IP), it must have its own IP address. An IP address is used to identify each node (such as computers, CV-series Ethernet Units, and PC Card Units) on an Ethernet network. IP addresses must be set and managed to ensure that each address is unique.

IP Address Structure

An IP address is a 32-bit binary data, consisting of a network number and a host number. The network number is an address used to identify each network. The host number is used to identify each host (i.e., node).

IP addresses are divided into three classes: Class A, Class B, and Class C. Select an applicable class according to the scale of the network being used.



The numbers of networks and hosts that can be identified differ according to the class.

Class	Number of networks	Number of hosts
Class A	Small	More than 65536 (2^{16})
Class B	Medium	256 (2^8) to 65536 (2^{16})
Class C	Large	Less than 256 (2^8)

An IP address consists of 32 bits divided into four segments of 8 bits each. These segments are separated with a dot and represented as four decimal numbers.

Example: 10000010 00111010 00010001 00100000 → 130.58.17.32

- Note**
1. All nodes within a network must have the same network number.
 2. The network number of an IP address is used to identify each Ethernet network (IP network segment). The network number is not the same as the network address used for FINS communication.
 3. An IP network segment is a logical network consisting of nodes that have the same network number.

Assigning IP Addresses

Assign a unique IP address to each node within a network (or among multiple networks).

The internet protocol (IP) is a standard international communications protocol. Therefore, obtaining an IP address from a public organization prevents address-related problems when the network is expanded in the future. Obtaining an official IP address is not required for a local Ethernet network that is not connected to outside networks. We do, however, recommend that you obtain an official IP address if there is any chance of connection to outside networks at any time in the future.

Assigning an IP Address to a PC Card Unit

To assign an IP address to the PC Card Unit, select "1. Enter IP Address for Unit" from the main menu of the setup software. Refer to *7-6 Setup Software Operation* for details on how to specify the IP address.

7-5-2 Subnet Mask

Connecting a lot of nodes to a network makes network operation and management difficult. In this case, it is better to construct the system by subdividing a network into multiple subnetworks. These subnetworks operate independently within the network, but they are viewed as a single network from outside the network.

To allow such network operations, the host number of the IP address must be subdivided into a host number and a subnet number.

A subnet mask is the information used to identify which part of the host number is going to be used as the subnet number. All bits in the subnet mask that correspond to the bits in the IP address used either as the network number or the subnet number are set to "1" and the remaining bits, which correspond to the bits in the IP address actually used for the host number, are set to "0." In the following example, only the last 8 bits are used as the host number.

Example: 11111111 11111111 11111111 00000000 → FFFFFFF0

All nodes on a subnetwork must have the same subnet mask value.

If no subnetwork is to be used, a subnet mask need not be specified. In this case, the subnet mask is recognized as the one that has no subnet number (or that consists of only the network number and host number).

Specifying a Subnet Mask for a PC Card Unit

To assign a subnet mask to a PC Card Unit, select "2. Enter Subnet Address for Unit" from the main menu of the setup software. Refer to *7-6 Setup Software Operation* for details on how to specify a subnet address.

7-5-3 ODI Driver

Specify the file name (including extension ".COM") of the ODI driver provided with the Ethernet card.

To specify an ODI driver path, select "3. Enter ODI Driver Path" from the main menu of the setup software. Refer to *7-6 Setup Software Operation* for details on how to specify an ODI driver path.

7-5-4 Hosts

Specify the IP addresses and host names of all the nodes to be registered in the IP network to be used. For a PC Card Unit, up to 127 nodes can be specified.

Example:

```

128.0.1.1 master
128.0.1.2 submaster
  
```

Set the hosts for the IP network to be used. To do so, an existing HOSTS file can be copied, or a new HOSTS file can be created. Insert an space between the IP address and the host name. The maximum number of lines in a HOSTS file is 127.

To set the hosts, select "4. Edit HOSTS File" from the main menu of the setup software. Refer to *7-6 Setup Software Operation* for details on how to edit a HOSTS file.

7-5-5 Conversion Table for IP Addresses and FINS Node Addresses

When a UDP/IP address has been used on the Ethernet an IP address must be used for the specified node address. Communications using FINS commands

use a FINS node address. The conversion between the IP address and the FINS node address is made in the PC Card Unit. The conversion table for IP addresses and FINS node addresses shows the correspondence between FINS node addresses and IP addresses.

Specify IP addresses in decimal notation. If 0 is added to the beginning of each field, the address will be interpreted as an octal number. Enter an space between the IP address and node address.

When using only the socket communications, also register the IP-FINS node address conversion table of the local node.

7-5-6 FINS Routing Tables

The FINS routing tables are required to return responses to FINS commands sent from a computer or CV-series PC on another network to the PC Card Unit. They show the route to each network to which response is to be returned.

The FINS routing tables consist of a local network table and a relay network table.

Note Even if there is only one network, always specify the local network table. If the PC Card Unit is to communicate with a node on another network, the relay station must be a CV-series PC.

If routing tables are already set for C200HX/HG/HE Programmable Controllers, the PC Card Unit will use those routing tables. Routing tables established by the setup software will be invalid.

Local Network Table

Specify the unit no. of the PC Card Unit and the network address of the network to which the PC Card Unit is connected.

- Local network address: Address of the network to which the PC Card Unit is connected (1 to 127)
- Unit no.: 0 (fixed)

Relay Network Table

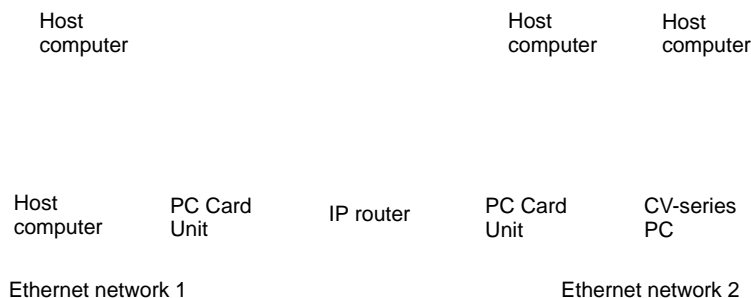
The relay network table shows the route to each network with which the PC Card Unit is to communicate. This table need not be specified if the PC Card Unit is to communicate only with nodes within the local network.

- End network: Address of the network on which the destination node resides (1 to 127)
- Relay network: Address of the network linking the local node to the next relay node (1 to 127)
- Relay node: Address of the relay node between the relay network and the end network (Ethernet Unit: 1 to 127)

To edit the routing tables, select "6. Edit Routing Table for FINS" from the main menu of the setup software. Refer to *7-6 Setup Software Operation* for details on how to edit the routing tables.

7-5-7 Gateway Address

An IP router can be used to connect multiple IP network segments. Networks connected by an IP router can communicate with each other. FINS communications allow nodes on different networks to communicate with one another as if these nodes are on the same network. To establish such communications, gateway addresses must be specified.



Assign an identical value to the FINS network addresses of the Ethernet networks connected by the IP router. (The network number or subnet number of the IP address, however, must be different for each network.) For example, the PC Card Units shown in the figure above have the same FINS network address (same layer).

Broadcasting is not allowed between Ethernet networks connected by an IP router. For example, data broadcast within Ethernet network 1 is not transmitted to nodes on Ethernet network 2.

To specify a gateway address, select "7. Edit Gateway Address for Unit" from the main menu of the setup software. Refer to 7-6 *Setup Software Operation* for details on how to specify a gateway address.

7-5-8 Other Ethernet Environment Settings

The following Ethernet environment settings cannot be changed for the PC Card Unit:

- Broadcast address: All bits are fixed at 1.
- Packet size: The size is fixed at 1,500 bytes. UDP data is split into 1,472-byte data before transmission. TCP is 1,024 bytes.
- KEEP ALIVE: Fixed at 60 seconds.
- Send/Receive packet: Fixed at 2,048 bytes.

7-5-9 Setting the Port Number

In the Ethernet Set, FINS communications are processed through the UDP port. The default port number is 9600.

To change the port number, use the following procedure.

- 1, 2, 3... 1. With reference to the information on making backup copies in 7-7 *Backing Up and Restoring Settings*, make backup copies of the setting files.
2. Using the text editor of the personal computer, change the last line of the BASE.BAT file in the same folder as the setting files in the way shown below. Input the port number in decimal.
base_e → base_e <port_number>
3. After saving the BASE.BAT file, with reference to the information on restoring files in 7-7 *Backing Up and Restoring Settings*, restore the BASE.BAT file.

When the port number is changed, only the BASE.BAT file has to be restored. It is not necessary to restore other files.

7-6 Setup Software Operation

7-6-1 Setup Procedure

The procedure required for making Ethernet communications environment settings using the setup software is given below. The setup software is an application that operates on the PC Card Unit and is used from the terminal software installed on the personal computer.

- 1, 2, 3...
 1. Turn OFF the power supply to the C200HX/HG/HE and the personal computer.
 2. Connect the personal computer and the PC Card Unit using an RS-232C cable. Refer to *7-4 Connecting to the Personal Computer* for details.
 3. Start up the terminal software and set the communications conditions.
 4. Change the PC Card Unit's startup mode (set pins 5 and 6 of the system switch to ON).
 5. Turn ON the power supply to the C200HX/HG/HE and the personal computer.
 6. Start up the setup software (SETUP.EXE) using the terminal software on the personal computer.
 7. Make the Ethernet communications environment settings using the setup software.
 8. Restart the PC Card Unit in normal mode (i.e., with pins 5 and 6 of the system switch set to OFF). At this point the settings changes are enabled. Refer to *7-6-12 Returning the PC Card Unit to Normal Mode* for details.

- Note**
1. Do not use the setup software for the C200HW-PCS01(-EV1) to perform settings for the C200HW-PCS01-V2.
 2. Backing Up and Restoring Settings
Before changing settings using the setup software, it is recommended that a backup copy is made of the settings. Backing up and restoring settings is performed not from the setup software, but from HyperTerminal. For details of the procedures, refer to *7-7 Backing Up and Restoring Settings*.

7-6-2 Preset Items

Before starting Ethernet communications through the Ethernet card, use the setup software to set up the Ethernet communications environment.

The items set using the setup software are described on the following pages.

Preset Items

Menu	Description
1. Enter IP address for UNIT	Specify the IP address of the PC Card Unit.
2. Enter Subnet address for UNIT	Specify the subnet mask of the PC Card Unit.
3. Enter ODI Driver Path.	Specify the file name (including the extension ".COM") of the ODI driver provided with the Ethernet card. An ODI driver (cntpclat.com) for the C-NET(PC)C-10L Ethernet card made by CONTEC is installed in the Unit.
4. Edit HOSTS File.	Set the HOSTS file for the IP network. To do so, you can copy the existing HOSTS file or create a new HOSTS file. Insert a space between the IP address and host name. The maximum number of lines in the HOSTS file is 127.
5. Edit Conversion Table for IP address and FINS Node address.	Specify the conversion correspondence between each pair of a FINS node address and IP address. Specify IP addresses in decimal notation. Note that if 0 is added to the beginning of each field, the address will be interpreted as an octal number. Enter a space between the IP address and node address.
6. Edit Routing Table for FINS.	Specify the data required for internetwork communication. The data consists of a local network table and a relay network table. Even if there is only one network, specify just the local network table. If the PC Card Unit is to communicate with a node on another network, the relay station must be a CV-series PC.
7. Edit Gateway address for UNIT	Enter the IP address to be used as a gateway with other Ethernet networks.
8. Display File Details.	Not used.
9. Exit	Exit the setup software to return to the DOS prompt.

7-6-3 Connecting to the PC Card Unit

The procedure for connecting to the PC Card Unit is given below. The connection method is explained here using HyperTerminal, which is provided with Windows operating systems, as an example.

Before making the settings described below, connect the personal computer and the PC Card Unit using a Host Link Cable with reference to *7-4 Connecting to the Personal Computer*.

Changing the Startup Mode (System Switch)

Change the PC Card Unit's startup mode (system switch) by setting pins 5 and 6 to ON.

Pin 6
Pin 5

HyperTerminal Startup and Initial Settings

- 1, 2, 3... 1. Start up HyperTerminal at the personal computer. The *Connection Description* dialog box will be displayed.
- 2. Enter a name. In this example, the name "PCS" is used. Next, the dialog box shown below will be displayed.

Select the COM port of the personal computer used.



3. Click the “OK” Button, and make the following communications settings in the dialog box displayed next.

4. Click the “OK” Button.
5. Turn ON the power supply to the PC Card Unit. (If the PC Card Unit has already been started up, press ENTER.) The PC Card Unit will start up. If connections have been made successfully, the following prompt will be displayed.



7-6-4 Starting and Exiting the Software

This section describes how to start and exit the setup software.

Note Backing Up and Restoring Settings

Before changing settings using the setup software, it is recommended that a backup copy is made of the settings. Backing up and restoring settings is performed not from the setup software, but from HyperTerminal. For details of the procedures, refer to *7-7 Backing Up and Restoring Settings*.

Starting the Setup Software

- 1, 2, 3... 1. Enter “SETUP” from the terminal software.

Note For Japanese display, be sure to specify the “J” option. If this option is not specified, messages will be displayed in English.



The setup software is started, and the following main menu appears on the display:

- ```

1. Enter IP address for UNIT.
2. Enter Subnet address for UNIT.
3. Enter ODI Driver Path.
4. Edit HOSTS File.
5. Edit Conversion Table for IP address and FINS Node address.
6. Edit Routing Table for FINS.
7. Edit Gateway address for UNIT.
8. Display File Details.
9. Exit.

```

Select Number for Item (1–9): █

2. Select an item by inputting a number between 1 and 9 and pressing ENTER. If a number between 1 and 7 is selected, the settings for that item can be read or changed.

### Exiting the Setup Software

Select “9. Exit” from the main menu.

The setup software terminates and a prompt is displayed in the terminal software.

## 7-6-5 IP Address

Specify the IP address of the PC Card Unit as described below.

1, 2, 3...

1. Select “1. Enter IP address for UNIT” from the main menu.

```

.
.
Select Number for ITEM (1–9): 1
Current IP address: 192.168.0.1
New IP address: █

```

2. Specify the IP address of the PC Card Unit. Input a decimal number.

```

New IP address: 123.45.67.89
: 123.45.67.89 May I setup current data? (Y/N) █

```

3. Make sure that the IP address is correct. Then, enter Y and press ENTER. The screen will return to the main menu. To cancel the setting, enter N and press ENTER to return to the main menu.

**Note** When the IP address of the PC Card Unit has been changed, always select “4. Edit HOSTS File.” and set the HOSTS file.

## 7-6-6 Subnet Mask

Specify the subnet mask of the PC Card Unit as described below.

1, 2, 3...

1. Select “2. Enter Subnet address for UNIT” from the main menu.

```

.
.
Select Number for ITEM (1–9): 2
Current Subnet Mask: 255.255.255.0
New Subnet Mask: █

```

- Specify the subnet mask of the PC Card Unit. Input a decimal number.

```
New Subnet Mask: 255.255.0.0
: 255.255.255.0 May I setup current data? (Y/N) █
```

- Make sure that the subnet mask is correct. Then, enter Y and press ENTER. The screen will return to the main menu. To cancel the setting, enter N and press ENTER to return to the main menu.

## 7-6-7 ODI Driver

Set the ODI driver to be used with the Ethernet card.

The default setting is "cntplat.com."

- 1, 2, 3... 1. Select "3. Enter ODI Driver Path." from the main menu.

```
.
.
Select Number for ITEM (1-9): 3
Current ODI Driver : cntplat.com
Enter New ODI Driver Name : on-net-n.com █
```

- Enter an ODI driver name (including the extension ".COM"). The drive and the directory cannot be specified. Only the filename must be specified.

```
oc-net-n.com : May I setup this new driver?
If you press Y, current ODI driver is deleted
and Unit gets waiting for file receiving.
So please send a new ODI driver.
If you press N, current ODI driver is selected. (Y/N) █
```

**Note** After confirming that the current ODI driver is no longer required, enter Y and press ENTER. (The current ODI driver will be erased.)

- Make sure that the ODI driver name is correct. To cancel the setting, enter N and press ENTER to return to the main menu. If Y is entered and ENTER is pressed, the PC Card Unit will go on standby to receive 1 file via the Zmodem protocol, and the following message will be displayed.

```
Please send a New ODI driver.
*:B00000000aa51
```

- After confirming that the PC Card Unit is on standby by checking that the message above is displayed, start up the terminal software, and send the new ODI driver to the PC Card Unit.

**Example: Procedure for HyperTerminal**

- Select “Transfer” and then “Send File.” The “Send File” dialog box shown below will be displayed.
- Specify the path and file name of the ODI driver specified in step 2 and click the “Send” Button.

**Note** Be sure to select “Zmodem” as the protocol.

- The transfer will start and the following dialog box will be displayed.

- When transfer is completed, the screen will return to the setup software’s main screen.

## 7-6-8 HOSTS File

Edit the HOSTS file as described below.

If a HOSTS file already exists in your personal computer, copy the file beforehand. In each record of the HOSTS file, enter the IP address, a space, and the host name in this order. Up to 127 nodes can be specified. An existing HOSTS file can be used, but the maximum number of lines is still 127.

Example:

128.0.1.2 submaster

IP address      Space      Host name

- 1, 2, 3... 1. Select "4. Edit HOSTS File." from the main menu.

```
(0)
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █
```

2. Select 0.

```
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): 0
Enter New Address and Name: █
```

3. Specify the IP address and host name of the remote node. To do so, enter the IP address, a space, and the host name in this order.

```
Enter New Address and Name: 123.45.67.89 myaddress
(0) 123.45.67.89 myaddress
(1)
(2)
.
.
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █
```

4. Select 1, and specify the IP address and host name in the same way as for step 3. Then, continue with this setting procedure for the rest of the HOSTS file ((2) and onwards).

```
(0) 123.45.67.89 myaddress
(1) 123.45.67.77 FA1
(2) 123.45.67.78 FA2
(3) 123.45.67.79 FA3
(4) 123.45.67.80 FA4
(5) 123.45.67.21 LAB1
(6) 123.45.67.25 LAB2
(7) 123.45.67.28 LAB3
(8) 123.45.67.11 HO1
(9) 123.45.67.12 HO2
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █
```

- The screen only displays (0) to (9), as shown in the figure above.
- To specify the line next to (9) (eleventh line), select "Add Line (10)."

```
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): 10
Enter New Address and Name: █
```

- If an IP address and host name are entered, the display will change as shown below.

```

Enter New Address and Name: 123.45.67.13 HO3
(0) 123.45.67.13 HO3
(1)
(2)
.
.
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █

```

- Then, select the line on which an IP address and host name are to be entered (or select “Add Line (10)”), and enter the IP address and host name. Continue with this setting procedure as required.
  - To delete data from a line, select “Delete Line (0-9)”, enter the line number (0 to 9), and press ENTER. When “Enter New Address and Name:” is displayed, press ENTER. The data is deleted from the line.
  - Selecting “Display Previous Item (11)” scrolls up the screen to display the previous 10 lines.
  - Selecting “Display Next Item (12)” scrolls down the screen to display the next 10 lines.
5. After editing the HOSTS file, select “End (13).”

```

Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): 13

```

The screen will return to the main menu.

## 7-6-9 Address Conversion Table

Edit the conversion table file for IP addresses and FINS node addresses as described below. Up to 127 nodes can be specified.

- 1, 2, 3...** 1. Select “5. Edit Conversion Table for IP address and FINS Node address” from the main menu.

```

(0)
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █

```

As shown above, no addresses are registered as default settings.

2. Select 0.

```

Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): 0
Enter New Address and Name: █

```

- Specify the IP address of the remote node and the corresponding FINS node address. To do so, enter the IP address, a space, and the FINS node address (0 to 127) in this order.

```

Enter New Address and Name: 123.45.67.89 14
(0) 123.45.67.89 14
(1)
(2)
.
.
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █

```

- Select 1, and specify the IP address and the corresponding FINS node address in the same way as Step 3.

Then, continue with this setting procedure for the rest of the conversion table ((2) and onwards).

Example:

```

(0) 123.45.67.89 14
(1) 123.45.67.77 15
(2) 123.45.67.78 16
(3) 123.45.67.79 21
(4) 123.45.67.80 22
(5) 123.45.67.21 31
(6) 123.45.67.25 32
(7) 123.45.67.28 33
(8) 123.45.67.11 40
(9) 123.45.67.12 41
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █

```

- The screen only displays (0) to (9) as shown in the figure above.
- To specify the line next to (9) (eleventh line), select “Add Line (10).”

```

Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): 10
Enter New Address and Name: █

```

- If an IP address and FINS node address are entered, the display is changed as shown below.

```

Enter New Address and Name: 123.45.67.13 42
(0) 123.45.67.13 42
(1)
(2)
.
.
(9)
Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9),
Display Previous Item (11), Display Next Item (12), End (13): █

```

- Then, select the line on which an IP address and host name are to be entered (or select “Add Line (10)”), and enter the IP address and host name. Continue with this setting procedure as required.
- To delete data from a line, select “Delete Line (0-9)”, enter the line number (0 to 9), and press ENTER. When “Enter New Address and Name:” is displayed, press ENTER. The data is deleted from the line.

- Selecting “Display Previous Item (11)” scrolls up the screen to display the previous 10 lines.
  - Selecting “Display Next Item (12)” scrolls down the screen to display the next 10 lines.
5. After editing the Conversion Table for IP Address and FINS Node Address, select “End (13).”

Enter Number of Line To Change (0–9), Add Line (10), Delete Line (0–9), Display Previous Item (11), Display Next Item (12), End (13): 13

The screen will return to the main menu.

## 7-6-10 FINS Routing Tables

Editing the routing tables for FINS is described next. Set the local network and relay network.

**Note** Always specify both the local network and relay network during the editing procedure. Even if only one of the networks needs to be modified, always perform the setting procedures for both of them.

- 1, 2, 3...** 1. Select “6. Edit a Routing Table for FINS.” from the main menu.

1. Set My Network address  
2. Set Relay Network address  
3. Exit  
Select Number of Item (1–3): █

### Local Network

2. Enter 1 and press ENTER to select “1. Set My Network address.”

Select Number for ITEM (1–3): 1  
Current My Network address:  
New My Network address: █

3. Specify the local network number. To do so, enter a local network no., a space, and 0 (fixed) in this order. “0” is the unit no. of a PC Card Unit. If a node number is to be specified from another node via FINS communication, specify 16 (\$10). The node no. of the C200HX/HG/HE CPU is 0.

New My Network address: 10  
: 10 May I setup current data? (Y/N) █

4. Make sure that the local network number is correct. Then, enter Y and press ENTER. The screen will return to the screen displayed in Step 1. To cancel the setting, enter N and press ENTER to return to the screen displayed in Step 1.

## Relay Networks

5. Enter 2 and press ENTER to select "2. Set Relay Network address."

```
Select Number for ITEM (1-3): 2
(0)
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
Enter Number of Line To Change (0-9), Add Line (10), Delete Line (0-9),
Display Previous Item (11), Display Next Item (12), End (13): █
```

By default, nothing is yet registered, as shown above.

6. Specify the relay network. To do so, enter the number of the network containing the end target node (decimal number), a space, the local network no. (decimal number), a space, and the relay node no. in this order. (The relay node no. is the number of the exit node within the local network that is used to transfer data to the end target network.)

Up to 127 networks can be specified.

An example of specifying relay networks is shown below. The input procedure is the same as that described in 7-6-8 *HOSTS File*.

```
(0) 2 1 32 (Data is sent to the network via node 32.)
(1) 3 1 33 (Data is sent to the network via node 33.)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
```

7. After editing the relay network table, select "End (13)."

```
Enter Number of Line To Change (0-9), Add Line (10), Delete Line (0-9),
Display Previous Item (11), Display Next Item (12), End (13):
1. Set My Network address
2. Set Relay Network address
3. Exit
Select Number for ITEM (1-3): █
```

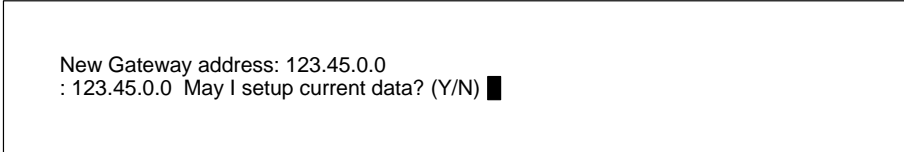
8. Enter 3 and press ENTER to select "3. Exit."  
The screen will return to the main menu.

## 7-6-11 Gateway Address

- 1, 2, 3... 1. Select "7. Edit Gateway address for UNIT" from the main menu.

```
.
.
Select Number for ITEM (1-9): 7
Current Gateway address:
New Gateway address: █
```

2. Enter the IP address of the node to be used as a gateway.

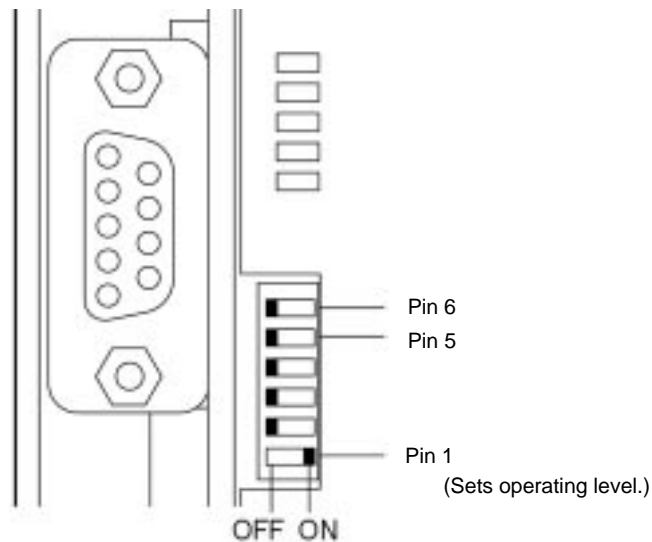


3. Make sure that the IP address is correct. Then, enter Y and press ENTER. The screen will return to the main menu. To cancel the setting, enter N and press ENTER to return to the main menu.

### 7-6-12 Returning the PC Card Unit to Normal Mode

Use the following procedure to return the PC Card Unit to normal mode.

- 1, 2, 3... 1. Turn OFF the power to the C200HX/HG/HE and the personal computer.
2. Disconnect the RS-232C cable.
3. Change the PC Card Unit's startup mode (system switch) by setting pins 5 and 6 to OFF.



4. Turn ON the power to the C200HX/HG/HE and the personal computer. The PC Card Unit will start up in normal mode.

## 7-7 Backing Up and Restoring Settings

Before changing the PC Card Unit's Ethernet communications environment settings, it is recommended that a backup copy is made of the settings.

The methods for making a backup copy of the Ethernet communications environment settings stored in the PC Card Unit, and for restoring these settings to the PC Card Unit are explained below.

### 7-7-1 Backing Up Files

Use the following procedure to make a backup copy of the Ethernet communications environment settings saved in the PC Card Unit.

- 1, 2, 3... 1. Turn OFF the power supplies to the personal computer and the PC Card Unit.
2. Connect the personal computer and the PC Card Unit using a Host Link Cable. (Refer to 7-4 *Connecting to the Personal Computer.*)

3. Set pins 5 and 6 of the PC Card Unit's system switch to ON, and start up the PC Card Unit.
4. Start up HyperTerminal at the personal computer and connect to the PC Card Unit. (Refer to *7-6 Setup Software Operation*.)
5. At the HyperTerminal, select "Transfer" and "Receive File." The "Receive File" dialog box shown below will be displayed.
6. Specify the directory in which the backup file is to be saved, and click the "Close" Button.

- Note**
1. When making a backup copy, be sure to specify "Zmodem" under "Use receiving protocol:."
  2. If "Zmodem with Crash Recovery" is selected, and backup is made several times to the same directory, files with the same name will have a number added to the filename. When making backup copies more than once, use a different directory.
  7. After the prompt, enter "backup" and press ENTER. Backup processing (i.e., transfer of the file from the PC Card Unit to the personal computer) is started, and the following dialog box is displayed.

When backup processing is completed, the screen will return to the prompt screen.

- Note** For details on the method for returning the PC Card Unit to normal mode, refer to *7-6-12 Returning the PC Card Unit to Normal Mode*.

### **Backed Up Files**

If backup is completed successfully, the following 8 files are copied to the specified directory in the personal computer.

alias  
base.bat  
net.cfg  
nowodi  
ip\_fins.fil  
route.fil  
setup.fil  
hosts

**Note** When restoring files, be sure to transfer all of the above files to the PC Card Unit.

## 7-7-2 Restoring Files

Use the following procedure to restore the Ethernet communications environment settings (which were backed up to the personal computer) to the PC Card Unit.

- Note**
1. Be sure to transfer all 8 backed up files to the PC Card Unit. For details on backing up files, refer to *7-7-1 Backing Up Files*.
  2. With HyperTerminal, only one file can be sent for each transfer operation. Therefore, when restoring backed up files, the "Send File" operation must be performed 8 times.
- 1, 2, 3...**
1. Turn OFF the power supplies to the personal computer and the PC Card Unit.
  2. Connect the personal computer and the PC Card Unit using a Host Link Cable. (Refer to *7-4 Connecting to the Personal Computer*.)
  3. Start up HyperTerminal at the personal computer. (Refer to *7-6 Setup Software Operation*.)
  4. Set pin 5 of the system switch to ON, set pin 6 to OFF, and then start up the PC Card Unit.

```
E:\ftrans.exe f:\ /r /z /f
FTRANS : File translate utility. Version 2.13
Copyright (c) 1995, 1996 by NJK. All right reserved.
Receive the file by Z modem.
The directory name is f:\
**B00000000aa51
```

5. At the HyperTerminal, select "Transfer" and "Send File." The "Send File" dialog box shown below will be displayed.
6. Specify the backup file to be restored.

7. Click the "Send" Button.

```
Normal End.
E:\>goto offon
E:\>urunon.exe

E:\>ftrans.exe f:\ /r /z /f
FTRANS : File translate utility. Version 2.13
Copyright (c) 1995, 1996 by NJK. All right reserved.
Receive the file by Z modem.
The directory name is f:\
**B00000000aa51
```

8. Repeat steps 5 to 7 until all the backed up files have been transferred to the PC Card Unit. Refer to *Backed Up Files* on page 101 for the names of the files.
9. After the last file has been sent, confirm that the PC Card Unit is on standby to receive files.
10. Set pins 5 and 6 of the PC Card Unit's system switch to OFF, and then restart the PC Card Unit. This will enable the restored Ethernet communications environment settings.

# SECTION 8

## Using SEND(90) and RECV(98)

This section describes how to use the SEND(90) and RECV(98) instructions to transfer data.

|       |                                                                  |     |
|-------|------------------------------------------------------------------|-----|
| 8-1   | Outline .....                                                    | 106 |
| 8-1-1 | Specifying Destination Nodes .....                               | 106 |
| 8-1-2 | Communications Specifications .....                              | 106 |
| 8-1-3 | Send/Receive Data Areas .....                                    | 107 |
| 8-1-4 | Instruction Status .....                                         | 107 |
| 8-1-5 | SEND(90)/RECV(98)/CMCR Data Processing Timings .....             | 109 |
| 8-2   | SEND(90) .....                                                   | 109 |
| 8-3   | RECV(98) .....                                                   | 111 |
| 8-4   | Minimum Transmission Delay Time for SEND/RECV Instructions ..... | 113 |

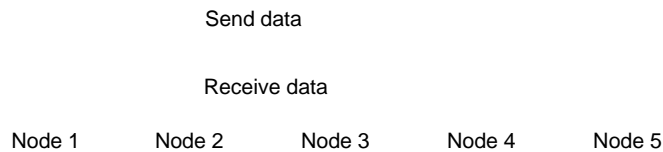
## 8-1 Outline

The SEND(90) and RECV(98) instructions are used in the PC user program to send data from a PC to other nodes, such as PCs or computers.

### 8-1-1 Specifying Destination Nodes

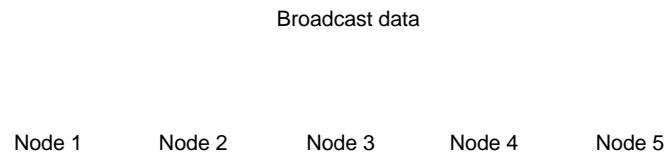
Either of the following two communications modes is used depending on how destination nodes are specified:

**Node-to-node Data Transfer** Data can be transferred between the local node and the destination node by specifying the node address in the control data of the SEND(90) and RECV(98) instructions.



### Broadcasting

The same data can be sent to all nodes on the network by specifying 00 as the node address of the destination node. In this case, no response is received from the nodes. (Broadcasting is not applicable to RECV(98).)



### 8-1-2 Communications Specifications

PC communications are based on the following specifications:

| Item                      | Specifications                                                                                                                                                                           |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Direction of transmission | 1:1 SEND(90) and RECV(98) instructions<br>1:N SEND(90) instruction (broadcast mode, no response, N = 127 or less)                                                                        |
| Data length               | SEND(90): 1,000 words max. (2,000 bytes) (727 words when data is broadcast or sent to local node)<br>RECV(98) : 1,000 words max. (2,000 bytes)                                           |
| Data contents             | The following data is sent or received when each instruction is executed:<br>SEND(90): Data transmission request and response data<br>RECV(98): Data reception request and response data |
| Response monitoring time  | 00: Default (2.2 seconds)<br>01 to FF: User setting (approx. 0.1 to 25.5 seconds in 0.1 s increments)                                                                                    |
| No. of retries            | 0 to F: 0 to 15 times                                                                                                                                                                    |

UDP Port No. 9600 is used for SEND/RECV.

### 8-1-3 Send/Receive Data Areas

The data areas that can be transferred using the SEND(90) and RECV(98) instructions differs according to the PC model being used. Check the operation manual for your PC for details.

#### Send/Receive Data Areas

| When remote node is C-series PC                |                |                | When remote node is CV-series PC               |                |                |
|------------------------------------------------|----------------|----------------|------------------------------------------------|----------------|----------------|
| Area                                           | Area type      | Word addresses | Area                                           | Area type      | Word addresses |
| IR and SR areas                                | 00             | 0 to 511       | CIO Area                                       | 00             | 0 to 2555      |
| LR area (LR)                                   | 06             | 0 to 63        | CPU Bus Link Area (G)                          | 01             | 0 to 255       |
| HR area (HR)                                   | 07             | 0 to 99        | Auxiliary Area (A)                             | 02             | 0 to 511       |
| AR area (AR)                                   | 08             | 0 to 27        | Timer Area (TIM)                               | 03             | 0 to 1023      |
| Timer/Counter Area (TIM/CNT)                   | 03             | 0 to 511       | Counter Area (CNT)                             | 04             | 0 to 1023      |
| DM Area (DM)                                   | 05             | 0 to 9999      | DM Area (DM)                                   | 05             | 0 to 24575     |
| Expansion DM<br>Banks 0 to 7:<br>Current bank: | 10 to 17<br>18 | 0 to 6143      | Expansion DM<br>Banks 0 to 7:<br>Current bank: | 10 to 17<br>18 | 0 to 32765     |

#### Indirect Addressing: Operand 2 (D) Data When Bit 12 of Word (C+1) = 1

| Word  | Bits 15 to 08 | Bits 07 to 04 | Bits 03 to 00 |
|-------|---------------|---------------|---------------|
| D     | Area code     | 0             | Word address  |
| (D+1) | Word address  | Word address  | Word address  |

Specified in binary coded decimal (BCD)

Set the send/receive area within the above ranges.

A data length of 1,000 words is valid only when the remote node supports it. If the remote node can only return 256 words, any data greater than 257 words is not guaranteed.

The PC Card Unit supports a data length of 1 to 997 words for the SEND(90) instruction, and a data length of 1 to 1,000 words for the RECV(98) instruction.

### 8-1-4 Instruction Status

Status information for executed SEND(90), RECV(98), and CMCR instructions is reflected in the SR Area of the PC as instruction execution flags and instruction response codes.

#### Structure of Instruction Execution Flags

The following two instruction execution flags are used:

Instruction Enabled Flag:

ON ("1") when the SEND(90), RECV(98), or CMCR instruction can be executed.

Instruction Error Flag:

ON ("1") when the SEND(90), RECV(98), or CMCR instruction has terminated abnormally.

If multiple instructions are to be used, always make sure that the Instruction Enabled Flag is ON before executing the next instruction (i.e., perform exclusive control).

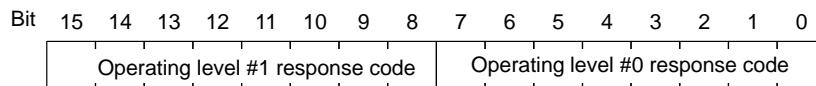
C200HX/HG/HE Word SR 252

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| Bit                |                                                                            |
|                    | Instruction Enabled Flag<br>0: Do not execute<br>1: Can be executed        |
| Operating level #1 | Instruction Error Flag<br>0: Normal termination<br>1: Abnormal termination |
|                    | Instruction Enabled Flag<br>0: Do not execute<br>1: Can be executed        |
| Operating level #0 | Instruction Error Flag<br>0: Normal termination<br>1: Abnormal termination |

**Note** Only one instruction can be executed for each operating level at a time. (Two instructions can be simultaneously executed on two operating levels.) If more than one instruction is to be used on the same operating level, perform exclusive control by using the Instruction Enabled Flag, i.e., do not execute SEND(90) or RECV(98) while the Instruction Enabled Flag for that level is ON.

**Instruction Response Codes** When an instruction terminates, the status is recorded as a response code. The code is retained until the next instruction is executed. It is set to 00 during execution. The instruction response code is one byte and differs from the command/response end code (2 bytes).

C200HX/HG/HE Word SR 237



**Response Codes**

| Response code | Item                          | Explanation                                                                                                   |
|---------------|-------------------------------|---------------------------------------------------------------------------------------------------------------|
| 00            | Normal completion             | Processing terminated normally.                                                                               |
| 01            | Parameter error (cannot send) | SEND(90)/RECV(98) instruction parameter specification error<br>Local node address specification error         |
| 02            | Cannot send                   | The system was reset during instruction processing.<br>The local node has not been registered in the network. |
| 05            | Response time-out             | No response was received within response monitoring time.                                                     |
| 06            | Response error                | Refer to <i>Response Error</i> below.                                                                         |

**Response Error**

The SEND(90) and RECV(98) instructions are converted to FINS commands and are sent to the destination node from the PC Card Unit. The SEND(90) instruction is converted to MEMORY AREA WRITE and the RECV(98) instruction is converted to MEMORY AREA READ. When these SEND(90) and RECV(98) instructions are executed, if the instructions are not completed normally (i.e., the MRES is not 0), a response error is generated. (Refer to 124.) Possible causes for a response error include the following.

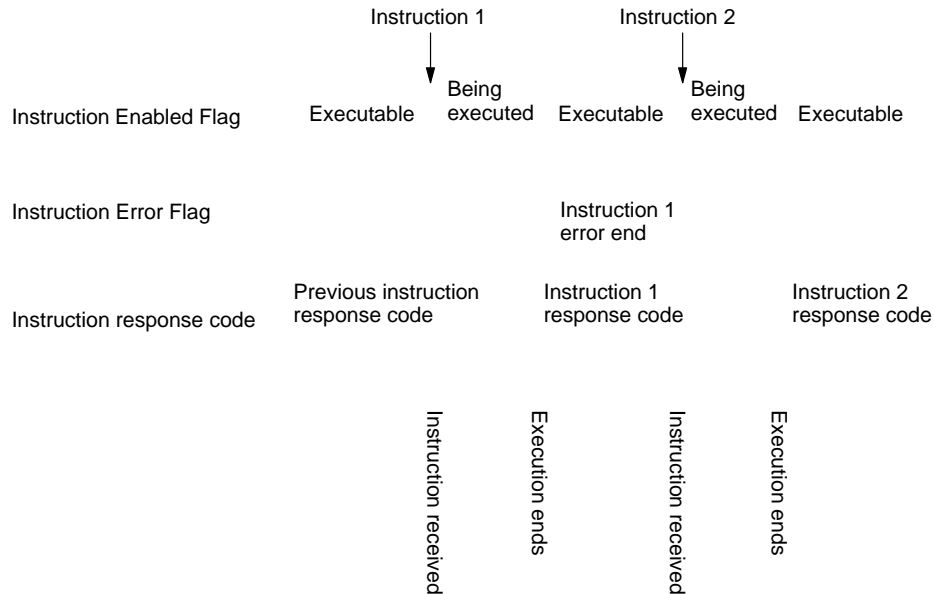
- The destination node is not participating in the network.
- The destination node is busy.
- Processing is being performed at the destination node and so commands cannot be received.

- Communications controller error
- Node address setting error
- PC error

**Flag ON/OFF Timing**

The Instruction Enabled Flag, Instruction Error Flag, and instruction response code are refreshed as shown below.

Example: When two instructions are executed consecutively and the first instruction causes an error



**8-1-5 SEND(90)/RECV(98)/CMCR Data Processing Timings**

The table below shows when data for the SEND(90)/RECV(98)/CMCR instruction is sent.

| Send data                                                                             | Send/Receive end processing                                   |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------|
| All data that has been processed by the time the END instruction is executed is sent. | Processing is performed when the END instruction is executed. |

**8-2 SEND(90)**

The SEND(90) instruction sends data from a memory area of the local node to a memory area of the destination node.

**Format**

The SEND(90) instruction format is shown below.

| Executed each Cycle | Differentiated |
|---------------------|----------------|
| SEND(90)            | @SEND(90)      |
| S                   | S              |
| D                   | D              |
| C                   | C              |

- S: Beginning source word (rightmost) (local node)
- D: Beginning destination word (rightmost) (destination node)  
(Beginning indirect reception word)
- C: First control data word (rightmost) (local node)

**Control Data**

Control data is written beginning with the first control data word in the following format:

|          |                             |    |    |                                  |                |    |   |                          |                          |   |   |   |   |   |   |   |
|----------|-----------------------------|----|----|----------------------------------|----------------|----|---|--------------------------|--------------------------|---|---|---|---|---|---|---|
| Bit      | 15                          | 14 | 13 | 12                               | 11             | 10 | 9 | 8                        | 7                        | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Word C+0 | Number of words transferred |    |    |                                  |                |    |   |                          |                          |   |   |   |   |   |   |   |
| C+1      | *1                          | *2 | *3 | *4                               | No. of retries |    |   |                          | Response monitoring time |   |   |   |   |   |   |   |
| C+2      | 0                           | 0  | 0  | Unit address of destination node |                |    |   | Destination node address |                          |   |   |   |   |   |   |   |

- \*1: Fixed at 1
- \*2: Operating level (0: level #1, 1: level #0)
- \*3: Response request bit (0: Response required, 1: Response not required)
- \*4: Indirect addressing bit for beginning destination word (0: Direct addressing, 1: Indirect addressing)

**Number of words transferred:**

Specify the total number of words of data to be stored in the destination node in hexadecimal (0 to 3E8).

**Operating Level:**

Specify the operating level of the PC Card Unit.

**Response request bit:**

If a response is not required, set this bit to 1 (ON: response not required). For broadcasting, the bit is automatically set to 1.

**Indirect addressing bit for beginning destination word:**

Because CV-series PCs support larger areas than C-series PCs, the user may not be able to specify the beginning destination word of the destination node for the SEND(90) instruction operand. The beginning destination word of the destination node may also need to be changed in some situations. In this case, set this bit to 1 (ON: indirect addressing). Then, the second operand (D) will be an indirect beginning reception word, allowing the destination beginning word (rightmost) of the destination node to be specified with the word specified for D in BCD format as shown below.

|          |                       |    |    |    |                       |    |   |   |                       |   |   |   |                       |   |   |   |
|----------|-----------------------|----|----|----|-----------------------|----|---|---|-----------------------|---|---|---|-----------------------|---|---|---|
| Bit      | 15                    | 14 | 13 | 12 | 11                    | 10 | 9 | 8 | 7                     | 6 | 5 | 4 | 3                     | 2 | 1 | 0 |
| Word D+0 | Area type             |    |    |    |                       |    |   |   | 0                     | 0 | 0 | 0 | Word addr (5th digit) |   |   |   |
| D+1      | Word addr (4th digit) |    |    |    | Word addr (3rd digit) |    |   |   | Word addr (2nd digit) |   |   |   | Word addr (1st digit) |   |   |   |

Specify the area as follows:

| When remote node is a C-series PC              |                | When remote node is a CV-series PC             |                |
|------------------------------------------------|----------------|------------------------------------------------|----------------|
| Area                                           | Area type      | Area                                           | Area type      |
| IR/SR area                                     | 00             | CIO Area                                       | 00             |
| LR area                                        | 06             | CPU Bus Link Area (G)                          | 01             |
| HR area                                        | 07             | Auxiliary Area                                 | 02             |
| AR area                                        | 08             | Timer Area                                     | 03             |
| Timer/Counter Area                             | 03             | Counter Area                                   | 04             |
| DM area                                        | 05             | DM Area                                        | 05             |
| Expansion DM<br>Banks 0 to 7:<br>Current bank: | 10 to 17<br>18 | Expansion DM<br>Banks 0 to 7:<br>Current bank: | 10 to 17<br>18 |

**No. of retries:**

Specify the maximum number of retries to be executed when no response is returned after the SEND(90) instruction is executed. Specify the number in hexadecimal (0 to F).

**Response monitoring time:**

Specify the response wait time when the response request bit is set to 0 (response required). Specify the time in hexadecimal (0 to FF). This setting is not valid for broadcasting because no response is returned.

**Unit address of destination node:**

The address is fixed at \$00.

**Destination node address:**

Specify the node address of the destination node in hexadecimal. If \$00 is specified, data is broadcasted to all nodes on the network.

**Control Data Settings**

The table below shows the range of values that can be set for each item.

| Item                                                   | Setting                                                                                                        |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Number of words transferred                            | \$0000 to \$03E8 (0 to 1,000 words)                                                                            |
| Operating level                                        | 0 (OFF): level #1<br>1 (ON): level #0                                                                          |
| Response request bit                                   | 0 (OFF): Response required<br>1 (ON): Response not required                                                    |
| Indirect addressing bit for beginning destination word | 0 (OFF): Direct addressing<br>1 (ON): Indirect addressing                                                      |
| No. of retries                                         | \$0 to \$F (0 to 15)                                                                                           |
| Response monitoring time                               | \$00: Default (2.2 seconds)<br>\$01 to \$FF (approx. 0.1 to 25.5 seconds in 0.1 s increments)                  |
| Unit address of destination node                       | \$00: PC's CPU                                                                                                 |
| Destination node address                               | \$01 to \$7E: Destination node address (1 to 127)<br>\$00: Broadcast (Local node address cannot be specified.) |

**Note** No response is returned for broadcasting even if the response request bit is set to 0 (OFF: response required).

## 8-3 RECV(98)

The RECV(98) instruction writes data from the memory area of the source (remote) node to the memory area of the local node.

**Format**

The RECV(98) instruction format is shown below.

|                                                                                                                    |                |   |   |   |                                                                                                                     |           |   |   |   |
|--------------------------------------------------------------------------------------------------------------------|----------------|---|---|---|---------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|
| Executed each Cycle                                                                                                | Differentiated |   |   |   |                                                                                                                     |           |   |   |   |
| <table border="1"> <tr><td>RECV(98)</td></tr> <tr><td>S</td></tr> <tr><td>D</td></tr> <tr><td>C</td></tr> </table> | RECV(98)       | S | D | C | <table border="1"> <tr><td>@RECV(98)</td></tr> <tr><td>S</td></tr> <tr><td>D</td></tr> <tr><td>C</td></tr> </table> | @RECV(98) | S | D | C |
| RECV(98)                                                                                                           |                |   |   |   |                                                                                                                     |           |   |   |   |
| S                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |
| D                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |
| C                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |
| @RECV(98)                                                                                                          |                |   |   |   |                                                                                                                     |           |   |   |   |
| S                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |
| D                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |
| C                                                                                                                  |                |   |   |   |                                                                                                                     |           |   |   |   |

- S: Beginning source word (rightmost) (remote node)  
(Beginning indirect reception word)
- D: Beginning destination word (rightmost) (local node)
- C: First control data word (rightmost) (local node)

**Control Data**

Control data is written beginning with the first control data word in the following format:

|      |                             |    |    |                             |                |    |   |                     |                          |   |   |   |   |   |   |   |
|------|-----------------------------|----|----|-----------------------------|----------------|----|---|---------------------|--------------------------|---|---|---|---|---|---|---|
| Bit  | 15                          | 14 | 13 | 12                          | 11             | 10 | 9 | 8                   | 7                        | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Word | C+0                         |    |    |                             |                |    |   |                     |                          |   |   |   |   |   |   |   |
|      | Number of words transferred |    |    |                             |                |    |   |                     |                          |   |   |   |   |   |   |   |
|      | *1                          | *2 | *3 | *4                          | No. of retries |    |   |                     | Response monitoring time |   |   |   |   |   |   |   |
|      | 0                           | 0  | 0  | Unit address of source node |                |    |   | Source node address |                          |   |   |   |   |   |   |   |

- \*1: Fixed at 1
- \*2: Operating level (0: level #1, 1: level #0)
- \*3: Response request bit (0: Response required, 1: Response not required)
- \*4: Indirect addressing bit for beginning source word (0: Direct addressing, 1: Indirect addressing)

**Number of words transferred:**

Specify the total number of words to be written from the source node to the local node in hexadecimal (0 to 3E8).

**Operating Level:**

Specify the operating level of the PC Card Unit

**Response request bit:**

Set this bit to 0 (OFF: response required) because the RECV(98) instruction must return response data.

**Indirect addressing bit for beginning source word:**

Because CV-series PCs support larger areas than C-series PCs, the user may not be able to specify the beginning source word of the source node in the RECV(98) instruction operand. The beginning source word of the source node may also need to be changed in some situations. In this case, set this bit to 1 (ON: indirect addressing). Then, the first operand (S) becomes an beginning indirect source word, allowing the beginning source word (rightmost) at the source node to be specified with the word specified for S in BCD format as shown below.

|      |                       |    |    |    |                       |    |   |   |                       |   |   |   |                       |   |   |   |
|------|-----------------------|----|----|----|-----------------------|----|---|---|-----------------------|---|---|---|-----------------------|---|---|---|
| Bit  | 15                    | 14 | 13 | 12 | 11                    | 10 | 9 | 8 | 7                     | 6 | 5 | 4 | 3                     | 2 | 1 | 0 |
| Word | S+0                   |    |    |    |                       |    |   |   |                       |   |   |   |                       |   |   |   |
|      | Area type             |    |    |    |                       |    |   |   | 0                     | 0 | 0 | 0 | Word addr (5th digit) |   |   |   |
|      | Word addr (4th digit) |    |    |    | Word addr (3rd digit) |    |   |   | Word addr (2nd digit) |   |   |   | Word addr (1st digit) |   |   |   |
| Word | S+1                   |    |    |    |                       |    |   |   |                       |   |   |   |                       |   |   |   |

| When remote node is C-series PC |           | When remote node is CV-series PC |           |
|---------------------------------|-----------|----------------------------------|-----------|
| Area                            | Area type | Area                             | Area type |
| IR/SR area                      | 00        | CIO Area                         | 00        |
| LR area (LR)                    | 06        | CPU Bus Link Area (G)            | 01        |
| HR area (HR)                    | 07        | Auxiliary Area (A)               | 02        |
| AR area (AR)                    | 08        | Timer Area (TIM)                 | 03        |
| Timer/Counter Area (TIM/CNT)    | 03        | Counter Area (CNT)               | 04        |
| DM area (DM)                    | 05        | DM Area (DM)                     | 05        |
| Expansion DM                    |           | Expansion DM                     |           |
| Banks 0 to 7:                   | 10 to 17  | Banks 0 to 7:                    | 10 to 17  |
| Current bank:                   | 18        | Current bank:                    | 18        |

**No. of retries:**

Specify the maximum number of retries to be executed when no response is returned after the RECV(98) instruction is issued. Specify the number in hexadecimal (0 to F).

**Response monitoring time:**

Specify the response wait time when the response request bit is set to 0 (response required). Specify the time in hexadecimal (0 to FF).

**Unit address of source node:**

The address is fixed at \$00

**Source node address:**

Specify the node address of the source node in hexadecimal (1 to 7E).

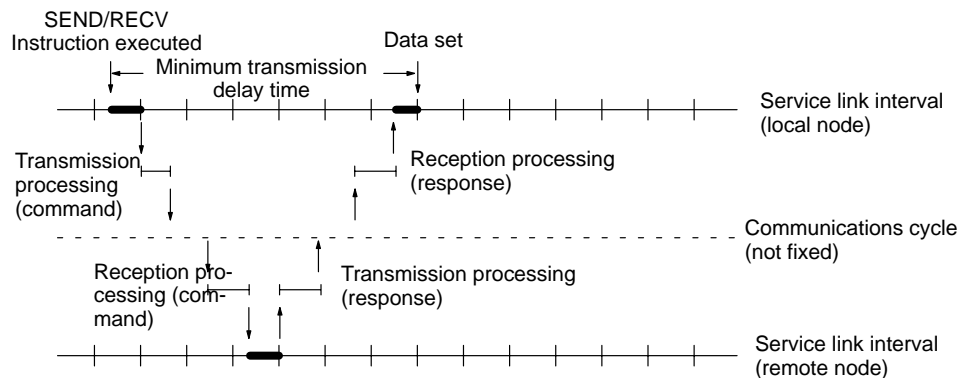
**Control Data Settings**

The table below shows the range of values that can be set for each item.

| Item                                              | Setting                                                                                        |
|---------------------------------------------------|------------------------------------------------------------------------------------------------|
| Number of words transferred                       | \$0000 to \$03E8 (0 to 1000word)                                                               |
| Operating level                                   | 0 (OFF): level #1<br>1 (ON): level #0                                                          |
| Response request bit                              | 0 (OFF): Response required                                                                     |
| Indirect addressing bit for beginning source word | 0 (OFF): Direct addressing<br>1 (ON): Indirect addressing                                      |
| No. of retries                                    | \$0 to \$F (0 to 15)                                                                           |
| Response monitoring time                          | \$00: Default (2.2 seconds)<br>\$01 to \$FF (approx. 0.1 to 25.5 seconds in 100 ms increments) |
| Unit address of source node                       | \$00: PC                                                                                       |
| Source node address                               | \$01 to \$7E: Source node address (1 to 127)                                                   |

## 8-4 Minimum Transmission Delay Time for SEND/RECV Instructions

The minimum transmission delay time for SEND/RECV instructions is as illustrated below.



The Ethernet communications cycle time differs according to system configuration and load, so in this instance the communications cycle time is calculated as 0.

**Minimum transmission delay time**

= service link interval (local node) + transmission processing (command)  
 + communications cycle + reception processing (command)  
 + service link interval (remote node) + transmission processing (response)  
 + communications cycle + reception processing (response)  
 + service link interval (local node).

• **Service Link Interval**

One cycle time for the C200HX/HG/HE CPU

- **Transmission/Reception Processing (Command)**

For SEND instructions:  $\text{No. of transmission words} \times 0.013 + 5 \text{ ms}$

For RECV instructions: 5 ms

- **Transmission/Reception Processing (Response)**

For SEND instructions: 5 ms

For RECV instructions:  $\text{No. of transmission words} \times 0.013 + 5 \text{ ms}$

Example: When the RECV instruction is executed for word 256.

$$\begin{aligned} & \text{Local node cycle time} \times 2 + \text{remote node cycle time} + 5 \text{ ms} + 5 \text{ ms} \\ & + (256 \times 0.013 + 5) \text{ ms} + (256 \times 0.013 + 5) \text{ ms} \\ & = \text{local node cycle time} \times 2 + \text{remote node cycle time} + 26.656 \text{ ms.} \end{aligned}$$

**Actual Measurement Values**

For communication with a C200HX, cycle time of 1.5 ms and during the SYS-MAC LINK data link

Word 256 SEND/RECV instruction execution times for a C200HX/HG/HE.

SEND Instruction      34.6 ms

RECV Instruction      37.0 ms

Word 1 SEND/RECV instruction execution times for a C200HX/HG/HE.

SEND Instruction      28.4 ms

RECV Instruction      27.4 ms

# SECTION 9

## FINS Commands

This section provides information on communicating in Ethernet Systems using FINS commands, and explains how to use the CMCR instruction to issue FINS commands.

|       |                                                     |     |
|-------|-----------------------------------------------------|-----|
| 9-1   | FINS Communications Service .....                   | 116 |
| 9-2   | Using FINS Communications .....                     | 117 |
| 9-2-1 | FINS Communications by Ladder Program .....         | 117 |
| 9-2-2 | FINS Communications From Another Node .....         | 119 |
| 9-3   | Using the CMCR Instruction .....                    | 119 |
| 9-3-1 | CMCR Format for FINS Commands .....                 | 119 |
| 9-3-2 | Control Data .....                                  | 119 |
| 9-3-3 | Range of Control Data .....                         | 120 |
| 9-3-4 | Command Data .....                                  | 121 |
| 9-3-5 | Response Data .....                                 | 121 |
| 9-3-6 | Instruction Status .....                            | 121 |
| 9-3-7 | SEND(90)/RECV(98)/CMCR Data Processing Timing ..... | 123 |
| 9-3-8 | FINS Command Example .....                          | 123 |
| 9-4   | Using FINS Commands and Responses .....             | 124 |
| 9-4-1 | Command/Response Parameters .....                   | 124 |
| 9-4-2 | Communications Data Formats .....                   | 124 |
| 9-4-3 | Commands and Responses for C200HX/HG/HE CPUs .....  | 125 |
| 9-4-4 | PC Card Unit FINS Commands List .....               | 125 |
| 9-4-5 | Response Codes .....                                | 126 |
| 9-4-6 | Memory Area Designations .....                      | 126 |
| 9-5   | Sample Program .....                                | 128 |
| 9-5-1 | Program Example .....                               | 128 |
| 9-6   | FINS Communications From Computers .....            | 129 |
| 9-6-1 | Frame Format .....                                  | 129 |
| 9-6-2 | FINS Command and Response Formats .....             | 129 |
| 9-6-3 | FINS Header Information .....                       | 130 |
| 9-6-4 | Designating Remote Addresses .....                  | 131 |

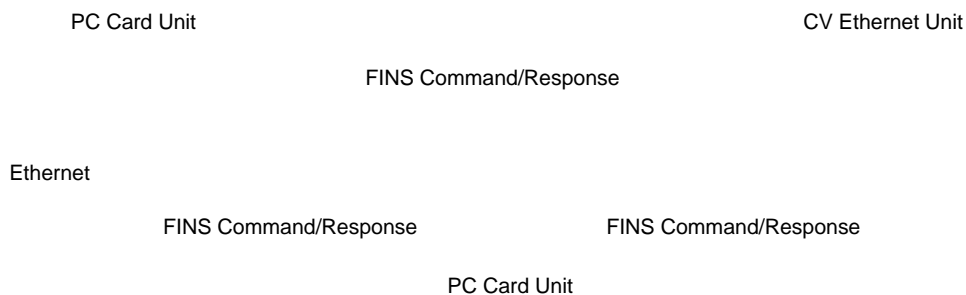
## 9-1 FINS Communications Service

The FINS communications service is a communications protocol that was developed by OMRON for its factory automation (FA) networks. FINS communications allow C200HX/HG/HE Programmable Controllers on these networks to be controlled by reading or writing memory area data without the need to program these operations into the PC user program.

FINS communications use a unique set of addresses which differ from the address system of the Ethernet network. This different addressing system was implemented to provide a consistent communications method that can be used regardless of whether the PC at the target node is on an Ethernet network or is on another FA network, such as a SYSMAC NET or SYSMAC LINK network.

For details regarding FINS commands, refer to *Section 11 Using FINS Commands and Responses* in this manual and also to the *FINS Commands Reference Manual (W227)*.

Communication Units that provide the FINS communications service utilize the particular functions of the network type that is being used. The PC Card Unit executes the FINS communications service using UDP/IP. When FINS commands are used for communications between Programmable Controllers as shown in the following illustration, however, communications are executed without the user having to pay attention to the UDP/IP protocol.

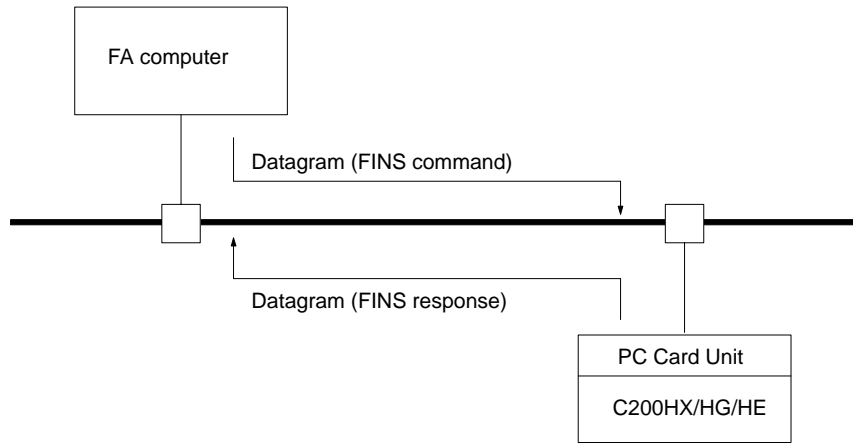


**Note** The PC Card Unit uses the CMCR instruction for sending and receiving FINS commands.

When communications are transmitted from an FA computer to a C200HX/HG/HE as shown in the following illustration, the C200HX/HG/HE's memory can be read, written, and controlled by simply sending datagrams expressing FINS commands to the PC Card Unit's UDP port for FINS communications. There is thus no need to prepare a user program at the C200HX/HG/HE.

- Note**
1. The PC Card Unit uses the CMCR instruction for sending and receiving FINS commands.
  2. Port 9600 is normally used for sending and receiving FINS commands. To change this, refer to *7-5-9 Setting the Port Number*.

- FINS commands to a PC Card Unit at the same Programmable Controller are not transmitted to the Ethernet.



A datagram is the unit of data handled by UDP/IP communications through the port specified for UDP communications. A communications service using UDP/IP normally allocates unique communications ports to run the service.

**Note** The UDP/IP protocol does not provide communications control to ensure communications reliability. Consequently, the FINS communications services using the UDP/IP protocols cannot guarantee that any message arrived safely and unaltered at the destination. Methods such as arrival confirmation processing to ensure reliability must be programmed into the user application.

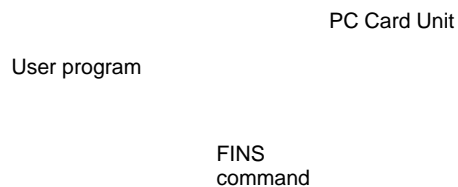
## 9-2 Using FINS Communications

This subsection outlines the methods for using FINS communications.

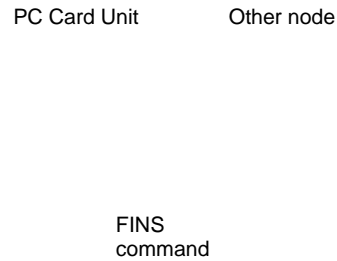
### 9-2-1 FINS Communications by Ladder Program

The processing flow for executing FINS communications from a ladder program is explained below.

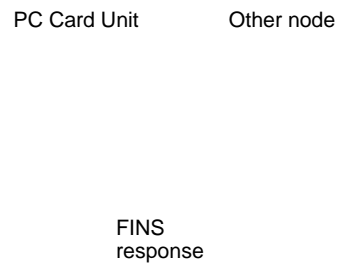
- 1, 2, 3...** 1. The CMCR instruction is used to issue a FINS command.



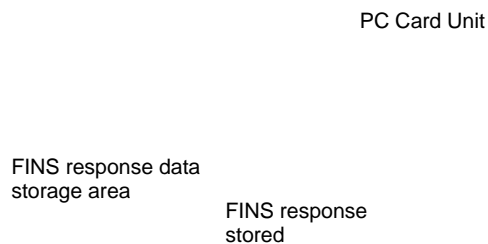
- The PC Card Unit receives the FINS command and sends it to the specified node.



- The PC Card Unit receives a FINS response from the other node.



- The FINS response data that was received by the PC Card Unit is stored in the FINS response data storage area that was specified by the CMCR instruction.



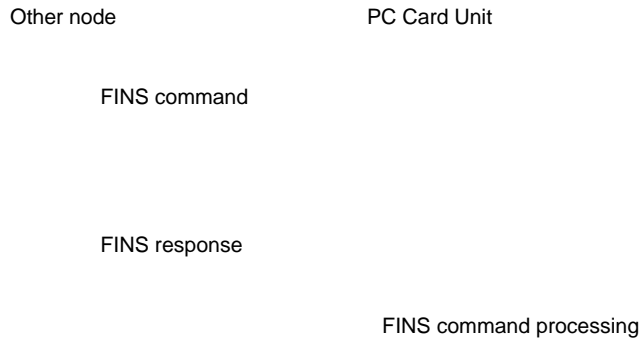
For details on how to use FINS commands and responses, refer to *9-4 Using FINS Commands and Responses*. For an explanation of using socket services with FINS commands, refer to *Section 10 Socket Services*.

**Service Time for FINS Communications From a Ladder Program**

The service time for FINS communications from a ladder program is the same as for SEND(90) and RECV(98). For details, refer to *8-4 Minimum Transmission Delay Time for SEND/RECV Instructions*. The instruction execution time is the same as for SEND(90).

### 9-2-2 FINS Communications From Another Node

When the PC Card Unit receives a FINS command from another node, it automatically returns a response as shown in the following illustration.



A ladder program related to FINS command/response processing is not required for the C200HX/HG/HE.

For details regarding the handling of FINS command/response data at other nodes, refer to 9-6 *FINS Communications From Computers*.

## 9-3 Using the CMCR Instruction

With the PC Card Unit, the CMCR instruction is used to issue FINS commands. This subsection explains how to use the CMCR instruction for that purpose. For an explanation of how to use the CMCR for memory card file operations, or for details regarding the basic CMCR format, refer to 5-3 *File Operations: CMCR Instruction*.

### 9-3-1 CMCR Format for FINS Commands

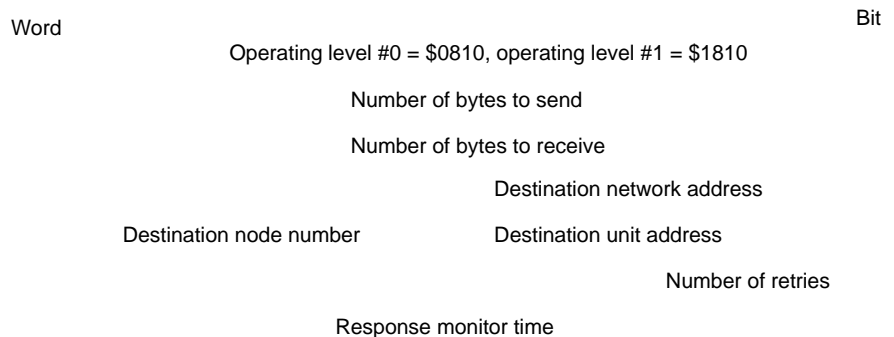
The CMCR instruction's format for issuing FINS commands is as follows:

|             |                                                            |
|-------------|------------------------------------------------------------|
| CMCR        |                                                            |
| Control     | <b>C:</b> Beginning control data storage word              |
| Source      | <b>S:</b> Beginning command data storage word (see note 1) |
| Destination | <b>D:</b> Beginning response word (see note 2)             |

- Note**
1. The data length and FINS command are stored here.
  2. The FINS response is stored here.

### 9-3-2 Control Data

Control data is written in the following format, from the beginning control data word (C).



\*Response flag (0: Response required; 1: Response not required)

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Level</b>             | Setting to "\$0810" specifies operating level #0; setting to "\$1810" specifies operating level #1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Number of Bytes to Send</b>     | Specifies the number of bytes of data to be transmitted from the FINS command code onwards, within a range of 2 to 2,000 (\$2 to 7D0).                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Number of Bytes to Receive</b>  | Specifies the number of bytes of response data (from the FINS command code onwards), within a range of 4 to 2,000 (\$4 to 7D0), to be stored beginning with the the response data storage word.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Destination Network Address</b> | Specifies the <i>destination network address</i> within a range of 0 to 127 (\$0 to 7F). Set to 00 when transmitting to a Unit in the local network.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Destination Node Number</b>     | Specifies, within a range of 0 to 127 (\$0 to 7F), the destination node number in the network set by the <i>destination network address</i> . To broadcast within that network, set the <i>destination node number</i> to FF. Set to 00 when transmitting to a local node in the local network.                                                                                                                                                                                                                                                                                                                    |
| <b>Destination Unit Address</b>    | Sets the device or Unit where the command is to be sent. To send the command to the Programmable Controller, set the <i>destination unit address</i> to 00. To send to a Special I/O Unit, set a value (\$10 to 1F) with \$10 added to the unit number (\$0 to F). The unit number of the PC Card Unit is 0 (with a unit address of \$10). If the <i>destination unit address</i> is set to FE, the command will be sent to the Communications Unit corresponding to the <i>destination node number</i> .<br>Set the network to 0, node to 0, and Unit to \$10 when sending to the PC Card Unit in the local node. |
| <b>Response Request Bit</b>        | This bit is normally set to OFF (0: Request response). If no response is required, set the bit to ON (1: Don't request response).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Number of Retries</b>           | Specifies the number of retries to be performed if a response is not returned following execution of the CMCR instruction. Any number from 0 to 15 (\$0 to F) can be set.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Response Monitor Time</b>       | The response monitor time (i.e., the timeout time) can be set from 0 to 65,535 (\$0 to FFFF), in units of 110 ms. If the default setting of "0" is specified, the response monitoring time will be 2.2 s.<br>The <i>response monitor time</i> setting is only valid when the <i>response request bit</i> is set to OFF (0: Request response).                                                                                                                                                                                                                                                                      |

**Note** If more than the *number of bytes to receive* is received, the bytes over the set number will be discarded. If fewer bytes are received, the data will be stored in the specified area and the data in the remainder of that area will be unchanged.

### 9-3-3 Range of Control Data

The permissible ranges of control data are as follows:

| Item                                  | Value                                                                        |
|---------------------------------------|------------------------------------------------------------------------------|
| Number of bytes to send (see note 1.) | \$0002 to 07D0 (2 to 2,000 bytes) (after FINS command code)                  |
| Number of bytes to receive            | \$0004 to 07D0 (4 to 2,000 bytes)                                            |
| Destination network address           | \$00: To the local network<br>\$01 to 7F (1 to 127): To a designated network |
| Destination node number               | \$00: To the local node<br>\$01 to 7F (1 to 127): To a designated node       |
| Destination unit address              | \$00: PC<br>\$10 to 1F: CPU Bus Unit (unit number: 0 to F, respectively)     |
| Response request bit (see note 2.)    | \$0 (OFF): Request response<br>\$1 (ON): Don't request response              |
| Number of retries                     | \$0 to F (0 to 15)                                                           |
| Response monitor time                 | 2.2 s (default)<br>\$0001 to FFFF: Units of 110 ms                           |

- Note**
1. A maximum of 1,462 bytes can be sent for broadcasts.
  2. In the case of broadcasting, set the Response Request Bit to ON (1: Don't request response).

### 9-3-4 Command Data

In word S+0, specify the FINS command data length +1. The FINS command is stored in words S+1 onwards. The maximum command data length is 1,000 words.

|        |                                                          |
|--------|----------------------------------------------------------|
| S+0    | Command data length (Number of words: BCD) \$1 to \$1001 |
| S+1    | FINS Command data                                        |
| S+2    | FINS Command data                                        |
|        | •<br>•<br>•                                              |
| S+1000 | FINS Command data                                        |

**Note** If there is an odd number of bytes of data, set the remaining data to 0.

### 9-3-5 Response Data

The response returned from the transmission destination node is stored. The contents of the FINS response depend on the FINS command. For details regarding the contents of response data, refer to *Section 11 Using FINS Commands and Responses*.

### 9-3-6 Instruction Status

Status information for executed SEND(90), RECV(98), and CMCR instructions is reflected in the SR Area of the PC as instruction execution flags and instruction response codes.

#### Structure of Instruction Execution Flags

The following two instruction execution flags are used:

Instruction Enabled Flag:

ON ("1") when the SEND(90), RECV(98), or CMCR instruction can be executed.

Instruction Error Flag:

ON ("1") when the SEND(90), RECV(98), or CMCR instruction has terminated abnormally. This status is retained until the next instruction is executed.

If multiple instructions are to be used, always make sure that the Instruction Enabled Flag is ON before executing the next instruction (i.e., perform exclusive control).

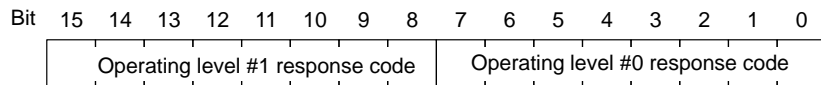
## C200HX/HG/HE Word SR 252

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| Bit                |                                                                            |
|                    | Instruction Enabled Flag<br>0: Do not execute<br>1: Can be executed        |
| Operating level #1 | Instruction Error Flag<br>0: Normal termination<br>1: Abnormal termination |
|                    | Instruction Enabled Flag<br>0: Do not execute<br>1: Can be executed        |
| Operating level #0 | Instruction Error Flag<br>0: Normal termination<br>1: Abnormal termination |

**Note** Only one instruction can be executed for each operating level at a time. (When a PC Card Unit and a SYSMAC Link Unit are connected, instructions can be executed in two operating levels simultaneously.) If more than one instruction is to be used in the same operating level, perform exclusive control by using the Instruction Enabled Flag, i.e., do not execute SEND(90) or RECV(98) while the Instruction Enabled Flag for that operating level is ON.

**Instruction Response Codes** When an instruction terminates, the status is recorded as a response code. The code is retained until the next instruction is executed. It is set to 00 during execution. The instruction response code is one byte and differs from the command/response end code (2 bytes).

## C200HX/HG/HE Word SR 237



## Response Codes

| Response code | Item                          | Explanation                                                                                                   |
|---------------|-------------------------------|---------------------------------------------------------------------------------------------------------------|
| 00            | Normal completion             | Processing terminated normally.                                                                               |
| 01            | Parameter error (cannot send) | Outside specified parameter range.<br>Local node address specification error                                  |
| 02            | Cannot send                   | The system was reset during instruction processing.<br>The local node has not been registered in the network. |
| 05            | Response time-out             | No response was received within response monitoring time.                                                     |
| 06            | Response error                | Refer to <i>Response Error</i> below.                                                                         |

## Response Error

The SEND(90) and RECV(98) instructions are converted to FINS commands and are sent to the destination node from the PC Card Unit. The SEND(90) instruction is converted to MEMORY AREA WRITE and the RECV(98) instruction is converted to MEMORY AREA READ. When these SEND(90) and RECV(98) instructions are executed, if the instructions are not completed normally (i.e., the MRES is not 0), a response error is generated. (Refer to 124.) Possible causes for a response error include the following.

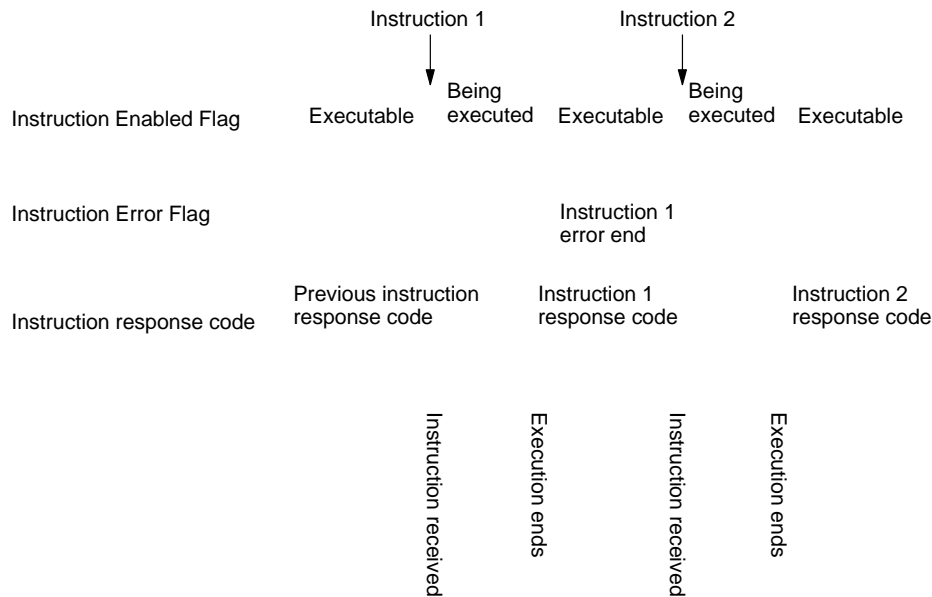
- The destination node is not participating in the network.
- The destination node is busy.

- Processing is being performed at the destination node and so commands cannot be received.
- Communications controller error
- Node address setting error
- PC error

**Flag ON/OFF Timing**

The Instruction Enabled Flag, Instruction Error Flag, and instruction response code are refreshed as shown below.

Example: When two instructions are executed consecutively and the first instruction causes an error



**9-3-7 SEND(90)/RECV(98)/CMCR Data Processing Timing**

The table below shows when data for the SEND(90), RECV(98), or CMCR instruction is sent.

| Send data                                                                             | Send/Receive end processing                                   |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------|
| All data that has been processed by the time the END instruction is executed is sent. | Processing is performed when the END instruction is executed. |

**9-3-8 FINS Command Example**

The example below shows how to use the CMCR instruction to issue a FINS command. In this example, a RUN (0401) command is issued to a Programmable Controller on an Ethernet network, at the following destination.

- Operating level: 1
- Number of bytes to send: 5
- Number of bytes to receive: 100 (Allow sufficient space.)
- Network address: 2
- Node number: 1
- Unit address: 00 (Programmable Controller)
- Response: Required
- Number of retries: 0
- Response monitor time: 2.2 s (default: 00)

When the RUN (0401) command is issued to this destination with these conditions, the following data is set in the DM area.

| Word                                                                      | Bit                          |
|---------------------------------------------------------------------------|------------------------------|
|                                                                           | \$1810 (Operating level #1)  |
| \$0005 (number of bytes to send: after FINS command code)                 |                              |
| \$0064 (number of bytes to receive: 100 bytes)                            |                              |
| \$0002 (network address)                                                  |                              |
| \$01 (node number)                                                        | \$00 (unit address: 00 = PC) |
| \$00 (request response)                                                   | \$00 (no retry)              |
| \$0000 (response monitor time: 2.2 s)                                     |                              |
| \$0004 (data length [number of words: BCD]. Including this leading word.) |                              |
| \$0401 (FINS command)                                                     |                              |
| \$0000 (program number)                                                   |                              |
| \$0200 (\$02: changes to monitor mode, \$00: see note)                    |                              |

**Note** The number of bytes to send (after the FINS command code) is 5. The remaining byte is set as 00. If the number of bytes to send is an odd number, set the remaining data to 0.

FINS response storage destination (50 words in this example)

## 9-4 Using FINS Commands and Responses

With the C200HX/HG/HE, the CMCR instruction is used for issuing FINS commands. This subsection explains communications data formats, FINS commands to the C200HX/HG/HE and to the PC Card Unit, and how to specify memory areas.

### 9-4-1 Command/Response Parameters

All parameters are specified in hexadecimal unless otherwise specified.

### 9-4-2 Communications Data Formats

#### Headers

When FINS commands are issued from a device such as an FA computer, a header must be affixed before the command code. For details regarding headers, refer to *9-6 FINS Communications From Computers*.

#### Commands

Commands have the following format.

2 bytes                      1,998 bytes max.

|                 |      |
|-----------------|------|
| Command<br>code | Text |
|-----------------|------|

**Responses**

Responses have the following format.

2 bytes    2 bytes    1,996 bytes max.

Command    Response    Text  
code        code

**Note** The maximum size of a command or response depends upon the type of network through which the transmission is relayed. The above limits are for FINS commands and responses on Ethernet networks.

**9-4-3 Commands and Responses for C200HX/HG/HE CPUs**

| Command code |    | Name                        | PC mode   |           |         | Page |
|--------------|----|-----------------------------|-----------|-----------|---------|------|
|              |    |                             | RUN       | MONITOR   | PROGRAM |      |
| 01           | 01 | MEMORY AREA READ            | Valid     | Valid     | Valid   | 165  |
|              | 02 | MEMORY AREA WRITE           | Valid     | Valid     | Valid   | 166  |
|              | 04 | MULTIPLE MEMORY AREA READ   | Valid     | Valid     | Valid   | 167  |
| 03           | 06 | PROGRAM AREA READ           | Valid     | Valid     | Valid   | 168  |
|              | 07 | PROGRAM AREA WRITE          | Not valid | Not valid | Valid   | 169  |
| 04           | 01 | RUN                         | Valid     | Valid     | Valid   | 169  |
|              | 02 | STOP                        | Valid     | Valid     | Valid   | 170  |
| 05           | 01 | CONTROLLER DATA READ        | Valid     | Valid     | Valid   | 170  |
| 06           | 01 | CONTROLLER STATUS READ      | Valid     | Valid     | Valid   | 171  |
| 07           | 01 | CLOCK READ                  | Valid     | Valid     | Valid   | 172  |
|              | 02 | CLOCK WRITE                 | Not Valid | Valid     | Valid   | 173  |
| 21           | 01 | ERROR CLEAR                 | Valid     | Valid     | Valid   | 173  |
| 23           | 01 | FORCED SET/RESET            | Not valid | Valid     | Valid   | 174  |
|              | 02 | FORCED SET/RESET CANCEL     | Not valid | Valid     | Valid   | 175  |
|              | 0A | MULTIPLE FORCED STATUS READ | Valid     | Valid     | Valid   | 175  |

**9-4-4 PC Card Unit FINS Commands List**

The following is a list of the FINS commands supported by the PC Card Unit.

| Command Code |    | Name                          | Page |
|--------------|----|-------------------------------|------|
| 05           | 01 | CONTROLLER DATA READ          | 177  |
| 08           | 01 | INTERNODE ECHO TEST           | 177  |
|              | 02 | BROADCAST TEST RESULTS READ   | 178  |
|              | 03 | BROADCAST TEST DATA SEND      | 178  |
| 21           | 02 | ERROR LOG READ                | 179  |
|              | 03 | ERROR LOG CLEAR               | 180  |
| 22           | 02 | SINGLE FILE READ              | 180  |
|              | 03 | SINGLE FILE WRITE             | 181  |
|              | 05 | FILE DELETE                   | 182  |
|              | 07 | FILE COPY                     | 182  |
|              | 08 | FILE NAME CHANGE              | 183  |
|              | 12 | SINGLE FILE READ WITH COMMAS  | 183  |
|              | 13 | SINGLE FILE WRITE WITH COMMAS | 184  |

## 9-4-5 Response Codes

Response codes are 2-byte codes that indicate the results of command execution. The first byte of the response code indicates the general results of execution and is called the main response code, or MRES. The second byte provides further details on the results of execution and is called the sub-response code, or SRES.

The following tables shows the relationship between the MRES and the execution results. Refer to *Appendix D: Response Codes from the C200HX/HG/HE CPU* for details on all response codes including the SRES and actions for each.

### Main Response Codes

| MRES | Execution completed    | MRES | Execution completed            |
|------|------------------------|------|--------------------------------|
| 00   | Normal completion      | 20   | Read not possible              |
| 01   | Local node error       | 21   | Write not possible             |
| 02   | Destination node error | 22   | Not executable in current mode |
| 03   | Controller error       | 23   | No unit                        |
| 04   | Not executable         | 24   | Start/Stop not possible        |
| 05   | Routing error          | 25   | Unit error                     |
| 10   | Command format error   | 26   | Command error                  |
| 11   | Parameter error        | 30   | Access right error             |

## 9-4-6 Memory Area Designations

The following table gives the addresses to use when reading or writing PC data.

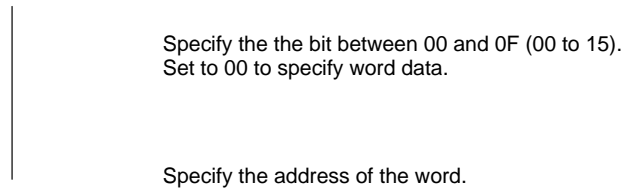
| Memory area        | Data                   | Data area address                        | Address used in communications |          | Memory area code | No. of bytes |
|--------------------|------------------------|------------------------------------------|--------------------------------|----------|------------------|--------------|
|                    |                        |                                          | 1st and 2nd bytes              | 3rd byte |                  |              |
| CIO area           | Bit status             | 00000 to 51115                           | 0000 to 01FF                   | 00 to 0F | 00               | 1            |
|                    | Word contents          | 000 to 511                               |                                | 00 to 00 | 80               | 2            |
| LR area            | Bit status             | LR 0000 to LR 6315                       | 03E8 to 0427                   | 00 to 0F | 00               | 1            |
|                    | Word contents          | LR 00 to LR 63                           |                                | 00 to 00 | 80               | 2            |
| HR area            | Bit status             | HR 0000 to HR 9915                       | 0428 to 048B                   | 00 to 0F | 00               | 1            |
|                    | Word contents          | HR 00 to HR 99                           |                                | 00 to 00 | 80               | 2            |
| AR area            | Bit status             | AR 0000 to AR 2715                       | 048C to 04A7                   | 00 to 0F | 00               | 1            |
|                    | Word contents          | AR 00 to AR 27                           |                                | 00 to 00 | 80               | 2            |
| Timer/Counter Area | Completion Flag status | TIM 000 to TIM 511<br>CNT 000 to CNT 511 | 0000 to 01FF                   | 00 to 00 | 01               | 1            |
|                    | PV                     | TIM 000 to TIM 511<br>CNT 000 to CNT 511 |                                | 00 to 00 | 81               | 2            |
| DM Area            | Word contents          | DM 0000 to DM 9999                       | 0000 to 270F                   | 00 to 00 | 82               | 2            |
| Expansion DM Area  | Word contents          | EM 0000 to EM 6143                       | 0000 to 17FF                   | 00 to 00 | 90 to 98         | 2            |

- Note**
1. The size of the memory area varies depending on the PC. Refer to the PC's operation manual for details on the size limits of the memory areas.
  2. The meanings of the memory area codes for the Expansion DM area are shown below.

| Memory area code | Meaning       |
|------------------|---------------|
| 98               | Current bank  |
| 90 to 97         | Banks 0 to 7  |
| A8 to AF         | Banks 8 to 15 |

**Word/Bit Addresses**

Each word/bit address specifies a specific bit or word. The rightmost two digits of the address specify bit 00 to 15 (or 00 if not required), and leftmost four digits specify the word address.



To obtain the corresponding address of the desired word or bit, add the data area word address (hexadecimal) to the first address of the range of addresses used in communications (see table on previous page). For example, the address for word AR 13 is computed as follows:

|                            |      |
|----------------------------|------|
| First address for AR area: | 048C |
| 048C + 0D (13 in decimal): | 0499 |

The word address for AR 13 would thus be 049900 (the memory area code would specify this as a word) and the address of bit 12 in AR 13 would be 04990C.

The unit of access (bit or word) and the data code are specified as shown in the following illustration.

**Memory Area Codes**

Memory area codes are the following configuration of access sizes and area codes.

Bit

Data code

00: CIO, LR, HR, or AR area  
01: Timer or Counter area  
02: Data Memory area

Access unit

00: Bit  
10: Word

**Number of Bytes**

A specific number of bytes is required for each element specified for either MEMORY AREA READ or MEMORY AREA WRITE. This will vary depending on the access unit of the memory area code, as indicated below.

|              |                     |
|--------------|---------------------|
| Bit Access;  | 1 byte per element  |
| Word Access; | 2 bytes per element |

**Data Configuration**

The configuration of the various types of data that can be read or written is shown below. The number of bytes required for each type of data is also given.

- **Flag or Bit Status (One Byte)** 00: Bit is OFF (0)  
01: Bit is ON (1)

- **Word Contents or PV (Two Bytes)**

Byte 1 Byte 2

Bits 0 to 7 (second byte)

Bits 8 to 15 (first byte)

## 9-5 Sample Program

This subsection provides a sample program for executing FINS commands and responses.

### 9-5-1 Program Example

- 1, 2, 3...
1. The CMCR instruction is executed when the execution condition 00000 turns ON while the Instruction Enabled Flag (bit 25204) is ON. Bit 12800 stays ON from the time CMCR execution is started until it is completed.
  2. The CMCR instruction's control data and command data are set in advance in the C200HX/HG/HE's memory area.

#### Control Data

| Word  | Contents | Meaning                                                              |
|-------|----------|----------------------------------------------------------------------|
| D0000 | \$1810   | Operating level #1                                                   |
| D0001 | \$0002   | Number of bytes to send: 2 bytes                                     |
| D0002 | \$0064   | Number of bytes to receive: 100                                      |
| D0003 | \$0001   | Destination network address: \$01                                    |
| D0004 | \$0100   | Destination node number: \$01<br>Destination unit address: \$00 (PC) |
| D0005 | \$0000   | Request response<br>Number of retries: 0 (No retries)                |
| D0006 | \$0000   | Response monitor time: 2.2 s (\$0000 is default)                     |

#### Command Data

| Word  | Contents | Meaning                    |
|-------|----------|----------------------------|
| D0010 | \$0002   | Data length: 2 words (BCD) |
| D0011 | \$0701   | FINS command: CLOCK READ   |

3. Specifies the FINS response storage destination. In this example, the FINS response data is stored from DM 0020 onwards.

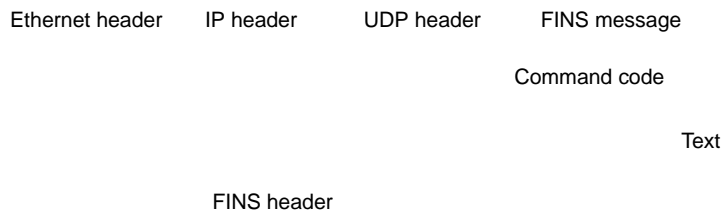
4. Executes the CMCR instruction.
5. CMCR instruction execution is completed when bit 12801 is turned ON while the Instruction Enabled Flag (bit 25204) is ON.
6. Turns ON if an error occurs during communications execution.

## 9-6 FINS Communications From Computers

Commands and responses sent from host computers must be in the formats described in this subsection and must provide the proper FINS header information. These formats can also be used to decode commands and responses received from other network nodes.

### 9-6-1 Frame Format

With the FINS communications service, datagrams in the Ethernet frame format shown below are sent and received.



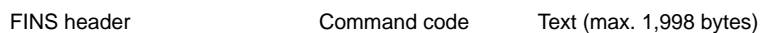
When a FINS command from a computer is used, the destination's IP address and UDP port number must be set.

### 9-6-2 FINS Command and Response Formats

This subsection explains the data formats for FINS commands and responses.

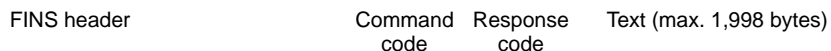
#### FINS Commands

Commands consist of a FINS header, command code, and text. The length and content of the text depend on the particular command.



#### FINS Responses

A response block includes a response code (a 2-byte code in binary) added to the command format. In the FINS header information, DNA DA1, and DA2 are interchanged with SNA, SA1, and SA2 (in comparison to the command header) and SID is the same as that in the command header.



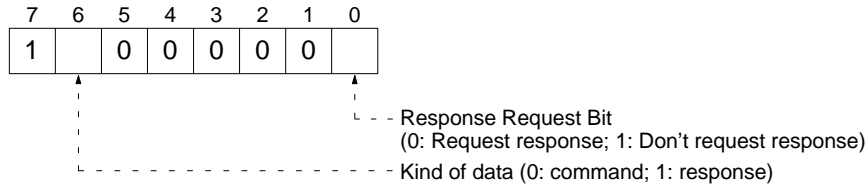
An error response will be returned if the IP-FINS node address conversion table is not correctly set.

### 9-6-3 FINS Header Information

This subsection explains the FINS header contents and settings used for FINS commands and responses.

**ICF (Information Control Field)**

Information such as the data classification, response request, communications between networks, and so on, is set in the ICF. The configuration is as follows:



**RSV Reserved (system reserved area)**

Set to \$00.

**GCNT (Permissible Number of Gateways)**

Set to \$02.

**DNA (Destination Network Address)**

Specifies the network address of the destination node.

\$01 to 7F: (1 to 127)

**DA1 (Destination Node Number)**

Specifies the destination node number for sending the command. It is used for FINS, and is different from the IP address used for Ethernet.

\$00: Local PC  
 \$01 to 7F (1 to 127): Node in Ethernet

**DA2 (Destination Unit Address)**

Specifies as an absolute address a unit number at the destination node. (Example: CPU Special I/O Unit #0 is \$10.)

\$00: PC (CPU)  
 \$10 to \$1F: CPU Special I/O Unit (PC Card Unit is \$10.)  
 \$FE: Communications Unit

**SNA (Source Network Address)**

\$01 to 7F: Local network address (1 to 127)

**SA1 (Source Node Number)**

\$00: Local PC  
 \$01 to 7F (1 to 127): Node in Ethernet

**SA2 (Source Node Address)**

\$00: PC (CPU)  
 \$10 to \$1F: CPU Special I/O Unit (PC Card Unit is \$10.)  
 \$FE: Communications Unit

**SID (Service ID)**

The SID is used to identify the process that data is sent from. Set any desired number from \$00 to \$FF for the SID. The same number will be returned in the response, allowing you to match commands and responses in your application.

### 9-6-4 Designating Remote Addresses

UDP sockets are used when sending FINS commands from a host computer to the C200/HX/HG/HE. This subsection provides an example of addressing remote PCs from the host computer for communications.

Host computer  
 IP address: 196.36.32.50  
 FINS network/node/unit: 1/32/0 hex)

Ethernet

PC Card Unit

Remote node  
 IP address: 196.36.32.100  
 FINS network/node/unit: 1/64/0 hex)

The communications parameters specified from the host computer would be as follows:

| Item                   | Setting                             | Remarks                        |
|------------------------|-------------------------------------|--------------------------------|
| Destination IP Address | 196.36.32.100                       | PC Card Unit address           |
| UDP port number        | 9600 (FINS UDP default port number) | PC Card Unit's UDP port number |
| FINS addresses         | DNA, DA1, DA2 = 1, 64, 0 (hex)      | C200HX/HG/HE                   |
|                        | SNA, SA1, SA2 = 1, 32, 0 (hex)      | Host computer                  |

# SECTION 10

## Socket Services

This section describes sockets (an interface for directly using TCP and UDP functions from the user program) and explains how to use socket services.

|        |                                                      |     |
|--------|------------------------------------------------------|-----|
| 10-1   | About Socket Services .....                          | 134 |
| 10-1-1 | Sockets .....                                        | 134 |
| 10-1-2 | Socket Operation .....                               | 134 |
| 10-1-3 | Differences between TCP and UDP .....                | 134 |
| 10-1-4 | Opening TCP Sockets .....                            | 135 |
| 10-1-5 | Socket Services Port Numbers .....                   | 136 |
| 10-1-6 | Fragmentation of Transmitted Data .....              | 136 |
| 10-2   | Using Socket Services .....                          | 138 |
| 10-2-1 | FINS Commands Used With Socket Services .....        | 138 |
| 10-2-2 | Procedure for Using Socket Services .....            | 138 |
| 10-2-3 | Socket Services and Socket Status .....              | 142 |
| 10-2-4 | Communications Timing Chart .....                    | 143 |
| 10-2-5 | Socket Service Timing Chart .....                    | 143 |
| 10-2-6 | Precautions in Using Socket Services .....           | 145 |
| 10-3   | Sample Programs for TCP and UDP Communications ..... | 146 |
| 10-3-1 | Ladder Programming for TCP/IP Communications .....   | 146 |
| 10-3-2 | Ladder Programming for UDP/IP Communications .....   | 154 |

## 10-1 About Socket Services

This subsection provides an outline of PC Card Unit socket services.

### 10-1-1 Sockets

A socket is an interface which allows a user program to directly use TCP (Transmission Control Protocol) and UDP (User Datagram Program).

Socket services allow arbitrary data to be sent to and from other nodes, thereby enabling communications in any protocol with FA computer other than OMRON PCs, with UNIX workstations, and so on.

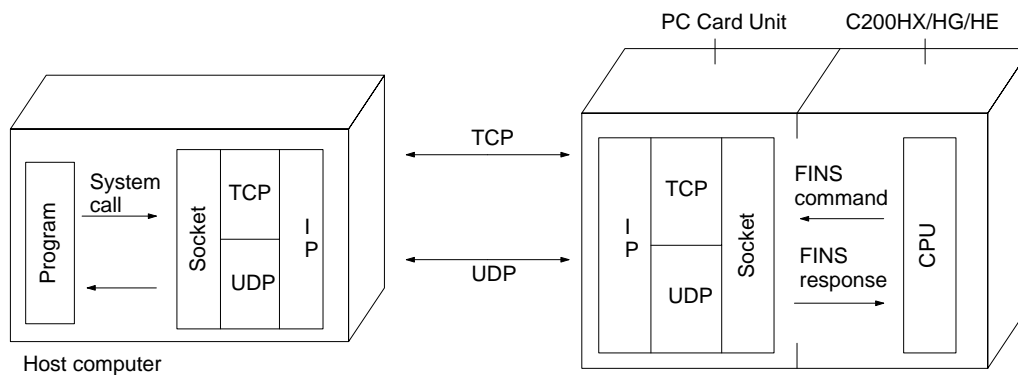
Socket services are supplied for most host computers (or some personal computers) as a C-language interface library. This interface library allows user programs to communicate using TCP and UDP.

The socket interface is supported for UNIX workstations in the form of system calls.

Socket services are achieved for C200HX/HG/HE PCs by sending FINS commands from the user program to a PC Card Unit. Refer to *Section 9 FINS Commands*, *10-2 Using Socket Services*, *10-3 Sample Programs for TCP and UDP Communications*, and *Section 11 FINS Commands and Responses*.

### 10-1-2 Socket Operation

A socket operates as shown in the following diagram when communicating between an FA computer and a PC Card Unit. Data from the computer or C200HX/HG/HE PC passes through the socket and is communicated using the TCP or UDP protocol.



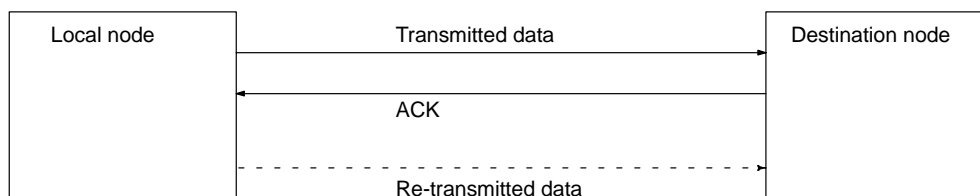
### 10-1-3 Differences between TCP and UDP

There are differences in the socket services between TCP and UDP.

#### TCP Communications

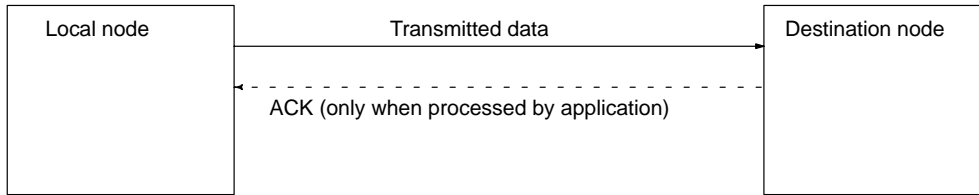
The following procedure is followed each time data is transmitted to ensure that the data arrives properly at the destination node:

- 1, 2, 3... 1. The destination node returns ACK when data is received normally.
2. The local node sends the next data after it receives ACK, or it resends the same data if ACK is not returned within the specified time.



**UDP Communications**

Data is simply sent to the destination. Unlike TCP, the receipt of data is not checked and data is not re-transmitted. To increase communication reliability, data resends must be programmed by the user in user applications.

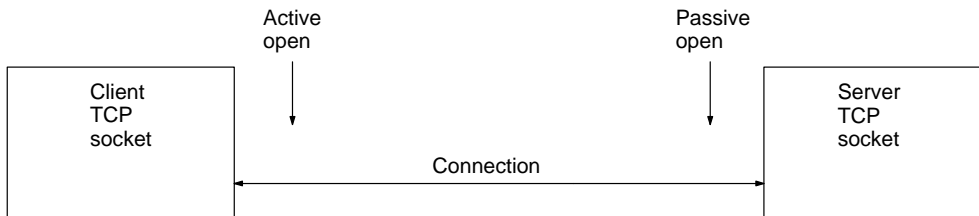


**10-1-4 Opening TCP Sockets**

To achieve highly reliable data communication, TCP establishes a virtual communications circuit between the two nodes before starting data transmissions. The virtual communications circuit is known as a "connection."

**Passive OPEN and Active OPEN**

An open command is executed for a node to establish a connection. The open method differs depending on whether the node is a client or server. A passive open method is used to open the node as a server and the active open method is used to open the node as a client.



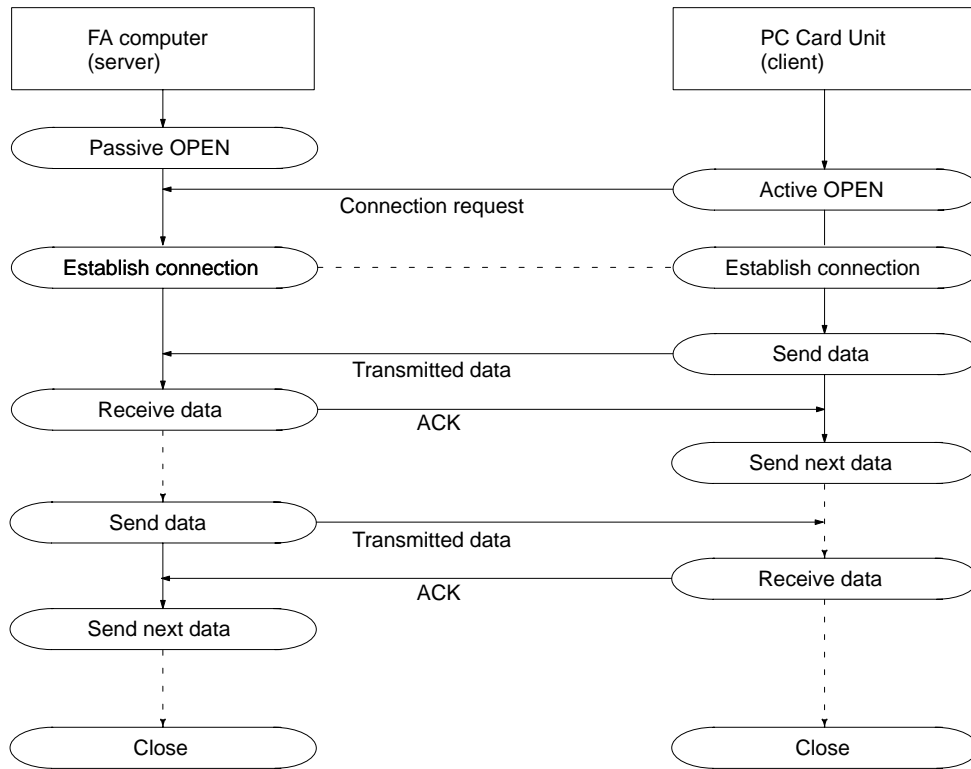
**Client and Server**

When an application which includes data communications processing between two nodes is executed, the node which provides the service is known as the "server" and the node which requests the service is known as the "client." The server is booted first and waits for a service request from a client. Data is transmitted only after the client requests the server to establish a connection. If the TCP protocol is used, this process is carried out automatically at the protocol level; it is not necessary to run an application program.

**Note** TCP communications with other TCP sockets will not be possible until the connection for the first socket opened has been closed. For the PC Card Unit, four sockets are provided for UDP and TCP together. Communications with multiple UDP sockets is possible, because connections are not set for UDP sockets.

**TCP Communications Procedure**

The communications procedure is shown below for communications between an FA computer and PC Card Unit using a TCP socket.



**10-1-5 Socket Services Port Numbers**

Port numbers up to 1023 on a UNIX workstation can be used by the superuser only. Port numbers 0 to 255 are reserved for well-known ports. Consequently, port numbers from 1024 to 65535 should be used for socket services. The PC Card Unit does not support port #0.

For FINS communications, the 9600 port is used as the default. Also, some port numbers over 1024 may be reserved on some workstations (for example, the X-window server is port #6000). Do not use port numbers that are already reserved for other processes.

The setting status of the UNIX workstation port numbers can be checked in `/etc/services`.

**10-1-6 Fragmentation of Transmitted Data**

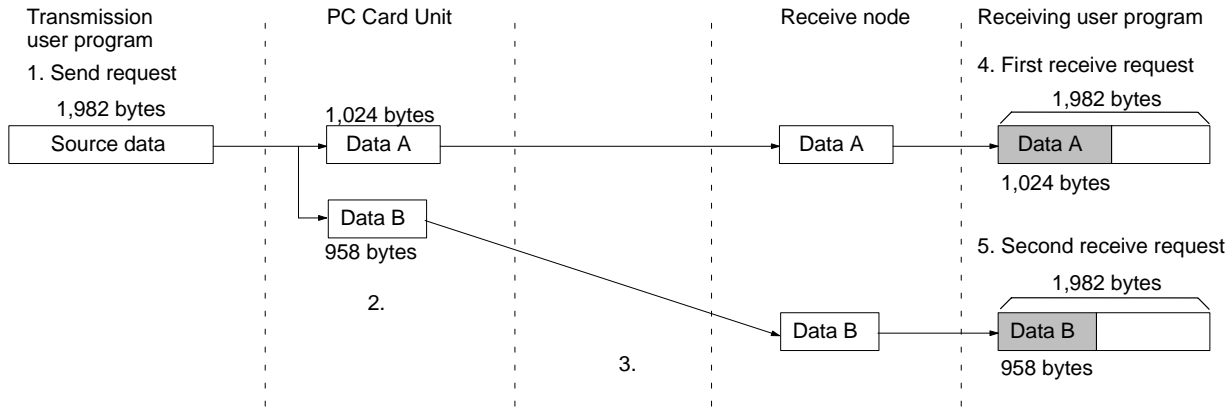
The PC Card Unit fragments data for TCP transmission into units of 1,024 bytes and data for UDP transmission into units of 1,472 bytes. TCP requires one reception request to receive each unit of data. UDP, however, restores the original data before passing it to the user process, allowing all the data in a single transmission to be received with one reception request. Examples of these are given next.

**Cautions when Using TCP**

An example of the fragmentation and transmission of data using the TCP is shown in the following illustration.

- 1, 2, 3... 1. The transmission user program sends a request to send 1,982 bytes of data.
2. The PC Card Unit fragments the transmission data into Data A with 1,024 bytes and Data B with 958 bytes.
3. Data A and Data B are sent consecutively.
4. The receiving user program sends a request to receive 1,982 bytes of data. However, only data A is sent in the first packet; data B is not received.

5. Another receive request to receive data must be made before the remaining data, Data B, is sent.



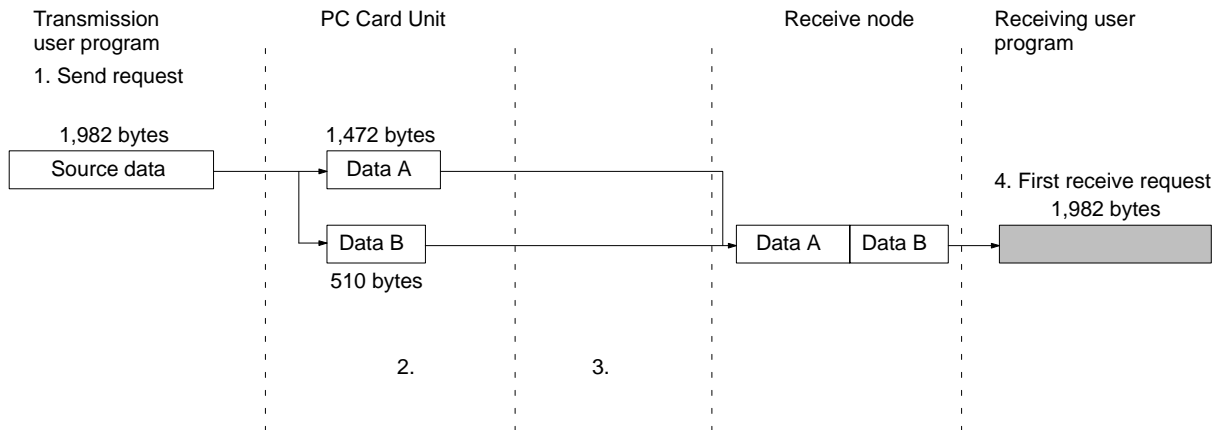
When using TCP protocol, the fragmented data is passed to the user program. Therefore, the receiving user program must be able to evaluate the end of the data transmission, and repeatedly send receive requests until all data has been received. The receive request is sent twice in the example shown above, but the data would be even more fragmented if a router were included in the communications path, and the number of receive requests would need to be increased accordingly.

When making the receive request, it is not necessary to specify the same data length as the transmitted data length. For example, if the length setting is shorter than the actual length of the data, all the data can be received by repeating the receive requests.

**When Using UDP**

An example of fragmentation and transmission of data using the UDP is shown in the following illustration.

- 1, 2, 3... 1. The transmission user program sends a request to send 1,982 bytes of data.
- 2. The PC Card Unit fragments the transmission data into Data A with 1,472 bytes and Data B with 510 bytes.
- 3. Data A and Data B are sent consecutively.
- 4. When the receiving user program sends a request to receive 1,982 bytes of data, Data A and Data B are linked to restore the original data which is passed to the user program.



As shown above, the UDP protocol handles data communications as data-grams, so that the transmitted data is restored to the original data before being passed to the user program. Consequently, if the data length in the receive request is set to the length of the transmitted data, the entire data can be received using a single receive data request.





































































































































































































