C200HW-ZW3AT1-E
Protocol Support Software

Operation Manual

Revised March 1997

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 information that, if not heeded, is likely to result in loss of life or serious injury.

⚠WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

⚠Caution Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

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.

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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TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the Protocol Support Software and includes the sections described below.

This is one of two manuals provided for the Communications Boards. The other manual is the *C200HW-COM01 to C200HW-COM06-E Communications Board Operation Manual*, and it is provided separately. The *C200HX/C200HG/C200HE Operation Manual* and *Installation Guide* may also be required when developing actual applications.

This manual is intended for the following personnel:

Personnel in charge of installing FA devices
Personnel designing FA systems
Personnel managing FA facilities

Please read this manual carefully and be sure you understand the information provided before attempting to install and/or operate the Protocol Support Software. **Be sure to read the precautions provided in the following section.**

Section 1 Outline of the Protocol Support Software outlines the functions of the Protocol Support Software and describes the operating environment, installation procedure, and setting the applications environment.

Section 2 Creating Communications Sequences describes how to edit and manage communications sequences.

Section 3 Creating Messages describes how to edit and manage send/receive messages and receive matrices.

Section 4 Managing Protocol Data describes how to manage, save, and load protocol data that has been created, and how to transfer the protocol data to the PC.

Section 5 Other Functions describes monitoring PC words and tracing transmission lines.

Section 6 Troubleshooting describes errors that can occur and troubleshooting methods for them.

Appendix A Related PC Memory Area Words and Bits describes the data areas of the PC that are related to the Protocol Support Software.

Appendix B Related PC Setup Words describes the portions of the PC system setup related to the Protocol Support Software.

Appendix C Creating a Protocol shows the procedure for creating a simple protocol. Use this information are reference when creating actual protocols.

⚠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.

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.

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.

⚠ 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.
- 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.
- 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.

⚠ 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.

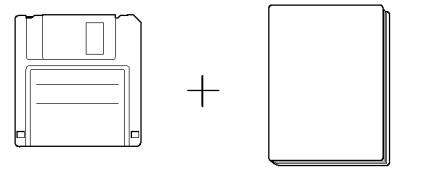
SECTION 1
Outline of the Protocol Support Software

This section outlines the functions of the Protocol Support Software and describes the operating environment, installation procedure, and the setting of the usage environment.

1-1 Package Contents

When you receive the Protocol Support Software, first check to be sure that the model number is correct and then check to be sure that the package contains the following items.

- **Installation disk**
  Model number C200HW-ZW3AT1-E
  3.5” 2HD, 1 disk
- **Operation Manual**
  C200HW-ZW3AT1-E Protocol Support Software Operation Manual
  (i.e., this manual)



Installation disk Operation Manual

Note DOS and data disks are not included with the Protocol Support Software. Purchase these products separately.

3.5” Disks
Open the window by sliding the tab provided on the back of the floppy disk. To release write protection, return the tab to the original position to close the window.

1-2 Functions of the Protocol Support Software

The Protocol Support Software was developed to allow users to create specific protocols using the protocol macro function supported by communications boards. The Protocol Support Software contains 12 standard protocols. These standard protocols can be used as they are or can be used after modification.

The functions of the Protocol Support Software are outlined below.

- Protocols can be set easily in interactive operations using menus
- Up to 1,000 send/receive sequences can be registered. One sequence consists of up to 16 steps.
- The transmission system, link words, the monitoring time, and the response method can be set for each sequence. As the transmission system, Xon/Xoff, RS/CS, modem, delimiter, and contention controls are supported.
- A repeat count, send/receive commands, send/receive messages, reception matrices, next processing, and error processing can be set for each step.
- The value of variable N, wild cards, channel calling, and constants can be set for transmission destination addresses and send/receive data. Since the value of variable N is incremented whenever a step is repeated, a message can be sent to multiple Units and data stored in table format can be sent consecutively onto a channel.
- Error check codes, such as SUM, LRC, or CRC, and responses can be automatically attached to send/receive messages. At reception, the specified error check code is generated automatically for error control.
- Steps can be terminated or interrupted during processing or control can be passed to the next step or any step by defining the next process at normal termination (End, Goto, Next, or Abort) or the error process at error termination (End, Goto, Next, or Abort).

- Up to 15 types of possible reception messages can be defined in a reception matrix and the next process or error process can be defined for each message.
- Using the Protocol Support Software, up to 20 protocols can be created including 12 standard protocols. The following send/receive sequence data, send/receive message data, and reception matrix data can be created in each protocol.

Data created	Maximum possible data size
Send/receive sequence data	60 sequences
Send/receive message data	300 messages (including send/receive messages)
Reception matrix data	100 matrices

1-3 Operating Environment

The Protocol Support Software is used to create send/receive sequences using the protocol macro function supported by communications boards. The operating environment of the Protocol Support Software is described next.

Hardware Requirements

The hardware environment for operating the Protocol Support Software is as follows:

Computer

IBM PC/AT or compatible computer that satisfies the minimum requirements.

Minimum Requirements

The following table lists the minimum requirement for supporting the Protocol Support Software.

Condition item	Condition
CPU	80386/80486
Memory	440k bytes or more free
Hard disk	1M bytes or more free
Floppy disk drive	1 drive min.
Extended memory	1M byte or more of extended memory is desirable to use the software comfortably.
Operating system	DOS V6.□
Display	640 × 480 dots (VGA)
Keyboard	101,106 keyboard

Note The Protocol Support Software will not operate under MS-Windows.

1-3-1 Printers

The Protocol Support Software supports the following laser printers or 136-column printers.

Model	Manufacturer
4208-502	IBM
LP-1600	Epson
FX-800	
LaserJet 4	Hewlett Packard

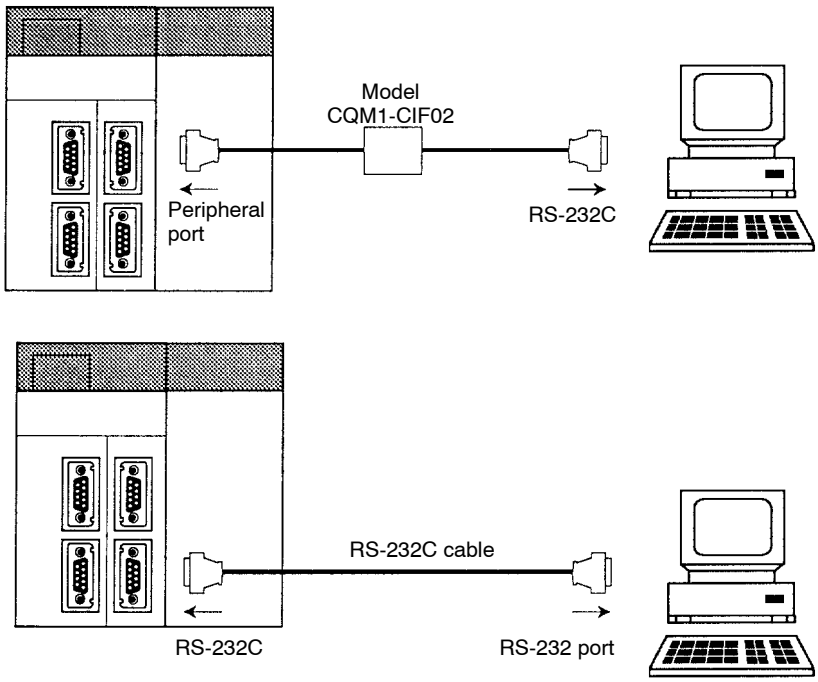
1-4 Preparations for Using the Protocol Support Software

Make the following preparations before using the Protocol Support Software.

1-4-1 Connecting to a C200HX/C200HG/C200HE

When transferring protocol data that was created by the Protocol Support Software to the C200HX/C200HG/C200HE, use the following cables to connect the computer and C200HX/C200HG/C200HE.

Communications procedure	Cable used	Connector on the computer	Connector on the PC
Peripheral bus	CQM1-CIF02	RS-232C	Peripheral port



Note See *1-12 Setting the Applications Environment* to set the peripheral bus procedure or host link procedure on the C200HX/C200HG/C200HE.

When creating a specific RS-232C cable, join the connectors as follows.

Connectors and Cables

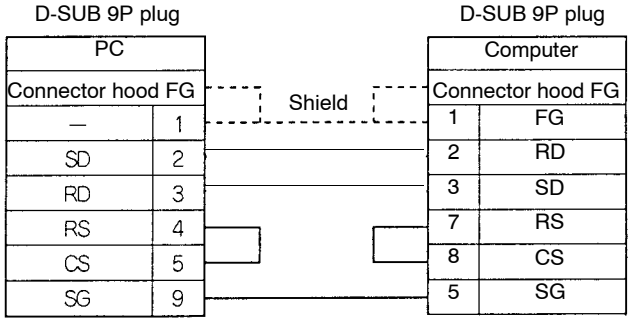
Component name	Model	Manufacturer
XW2D-0901 connector (9-pin, IBM PC/AT or compatible side, female)	Model XM2A-0901 (connector)	OMRON
	Model XM2S-0911 (connector hood)	
Recommended cable	UL2464 AWG28 × 5P IFS-RVV-SB (UL item)	Fujikura Wire
	AWG28P × 5P IFVV-SB (non-UL item)	
	UL2464-SB 5P × AWG28 (UL item)	Hitachi Wire
	CO-MA-VV-SB 5P × AWG28 (non-UL item)	
Wire path length	Up to 15 m	

Computer Connection Signals

Pin number	Symbol	Circuit name
1	FG	Protective Ground
2	RD	Receive Data
3	SD	Send Data
7	RTS	Request To Send
8	CTS	Clear To Send
5	SG	Signal Ground

Wiring Cables

The following diagram shows the wiring of the cables connecting a Programmable Controller (PC) and a computer.



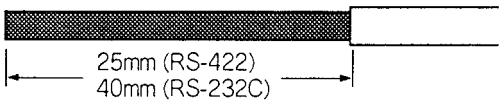
Cable Processing (End Connected to FG)

1, 2, 3...

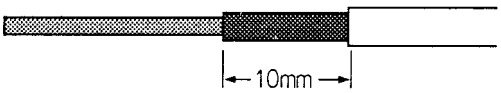
See the diagrams for the lengths required in each set.

1. Cut the cable to the required length.

2. Peel the sheath using a razor blade without damaging the shield weaving.



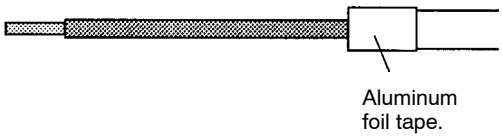
3. Remove the shield using scissors.



4. Peel the core wire of each wire using a stripper.

5. Fold back the shield wire.

6. Wrap aluminum foil tape on top of the folded shield.

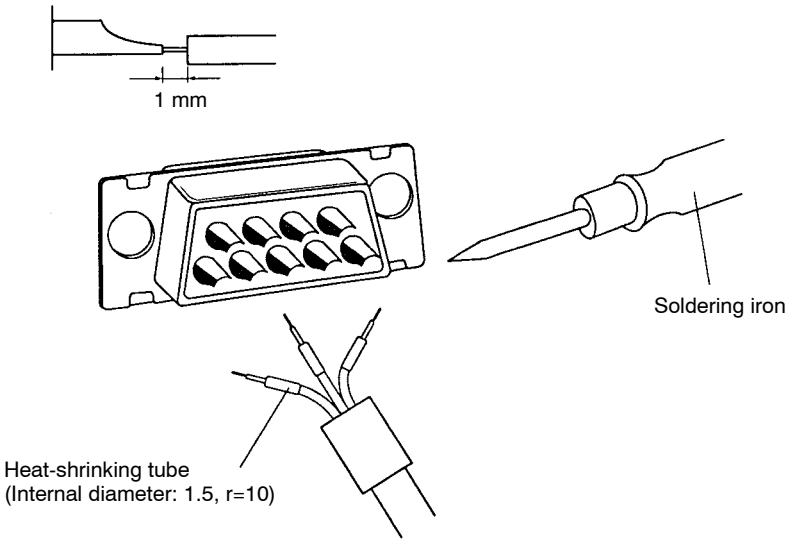


Soldering

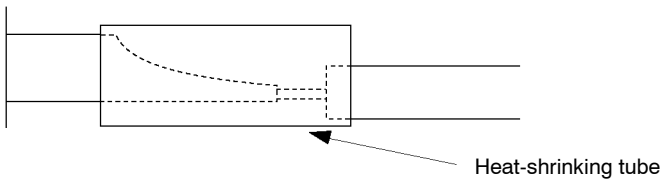
Solder as described next.

1, 2, 3...

1. Place a heat-shrinking tube around each wire.
2. Presolder each wire and to its connector pin.
3. Solder each wire firmly in place.

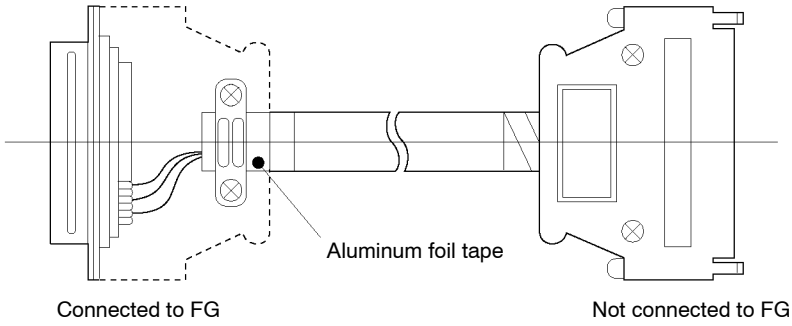


4. Move the heat-shrinking tube to the soldered section and shrink the tube by heating it.



Assembling Hood

Assemble the connector hood as shown below.



1-5 Installing the Protocol Support Software

This section describes the procedure for installing the system program of the Protocol Support Software onto a hard disk.

Note

1. In this section, the hard disk is drive C, the floppy disk is drive A, and the installation directory is C:\PSS.
2. Initialize the hard disk and install DOS before installing the system program. Refer to your DOS manual for the procedures for initializing the hard disk and installing DOS.

1-5-1 DOS Version 6.0 or Higher

1, 2, 3... 1. Turn on the computer power supply. C:\> will be displayed on the screen.

```
C:\>
```

2. Insert the installation disk into the floppy disk drive.
3. Change the current drive to a floppy disk drive by entering A: and pressing the Enter Key.

```
C:\>A:
A:\>
```

4. Execute the installation program by entering PSSINST C:\PSS and pressing the Enter Key.

```
A:\>PSSINST C:\PSS
```

Note Enter the installation directory name following PSSINST. Use the absolute path name.

5. The following message will be displayed.

```
A:\>ECHO OFF
Will install Protocol Support Software.
Press any key to continue ....
```

6. When any key is pressed, the required files in the installation disk will be copied on to the hard disk automatically.

```
A:\>ECHO OFF
Will install Protocol Support Software.
Press any key to continue ....
Copying SSS1CPLC.COM
Copying ASYNC-PC.COM
Copying NPPROTCL.EXE
```

7. When the files have been copied, the following message will be displayed.

```
AUTOEXEC.BAT is changed.
Installation is completed normally. Please reset
the system.
```

1-6 Starting and Ending the Protocol Support Software

This section describes how to start and end the Protocol Support Software.

1-6-1 Starting

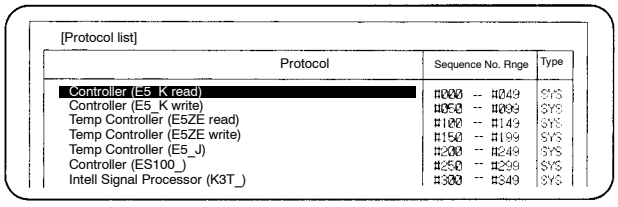
Use the following procedure to start the Protocol Support Software.

1, 2, 3... 1. Enter the following from the DOS prompt.

```
C:>PSS
```

Note The drive and directory in which the Protocol Support Software is installed must have been set in the environment variable PATH, or you must be in the directory in which the Protocol Support Software is installed when you type the above command.

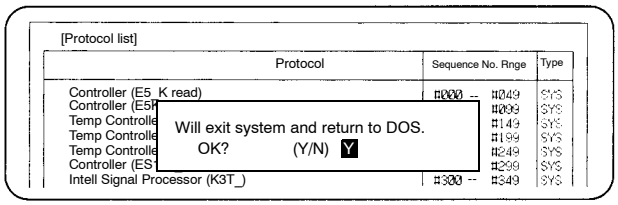
2. The Protocol Support Software will be started and the initial screen will be displayed.



1-6-2 Ending

Use the following procedure to end the Protocol Support Software.

1, 2, 3... 1. Press the F10 (End) Key from the initial screen The following message will be displayed.



2. Press either of the following keys.

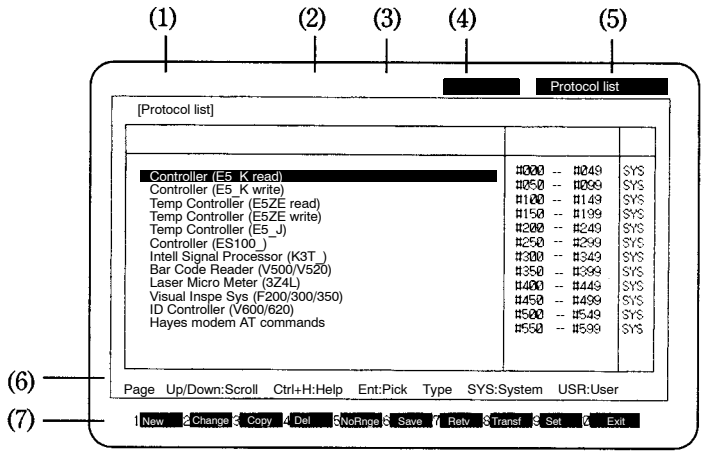
   Y: The Protocol Support Software will be terminated and control will returned to DOS.

   N: The message will be cleared and the display will returned to the initial screen.

1-7 Initial Screen

When the Protocol Support Software is started, the initial screen (i.e., the protocol list screen) will be displayed. Control can be passed to a required screen by selecting a protocol on the initial screen or pressing a function key.

The contents displayed on the initial screen are shown below.



Number	Display area	Contents
1	Message display area	When an error occurs while using the Protocol Support Software, the error is indicated here and a message is displayed. Refer to *Section 6 Troubleshooting* for the handling of error messages. Messages form the PC are also displayed in this area.
2	Unit No.	Displays the unit number of the destination for host link connection.
3	Mode	Displays the operating mode of the PC during online operation.
4	Function name	Displays the name of the function currently being processed.
5	Subfunction	Displays the name of the subfunction currently being processed.
6	Help	Displays operational information, such as keys for the previous and next screens.
7	Function keys	Displays the function set for each function key. To use a particular function, press the corresponding function key.

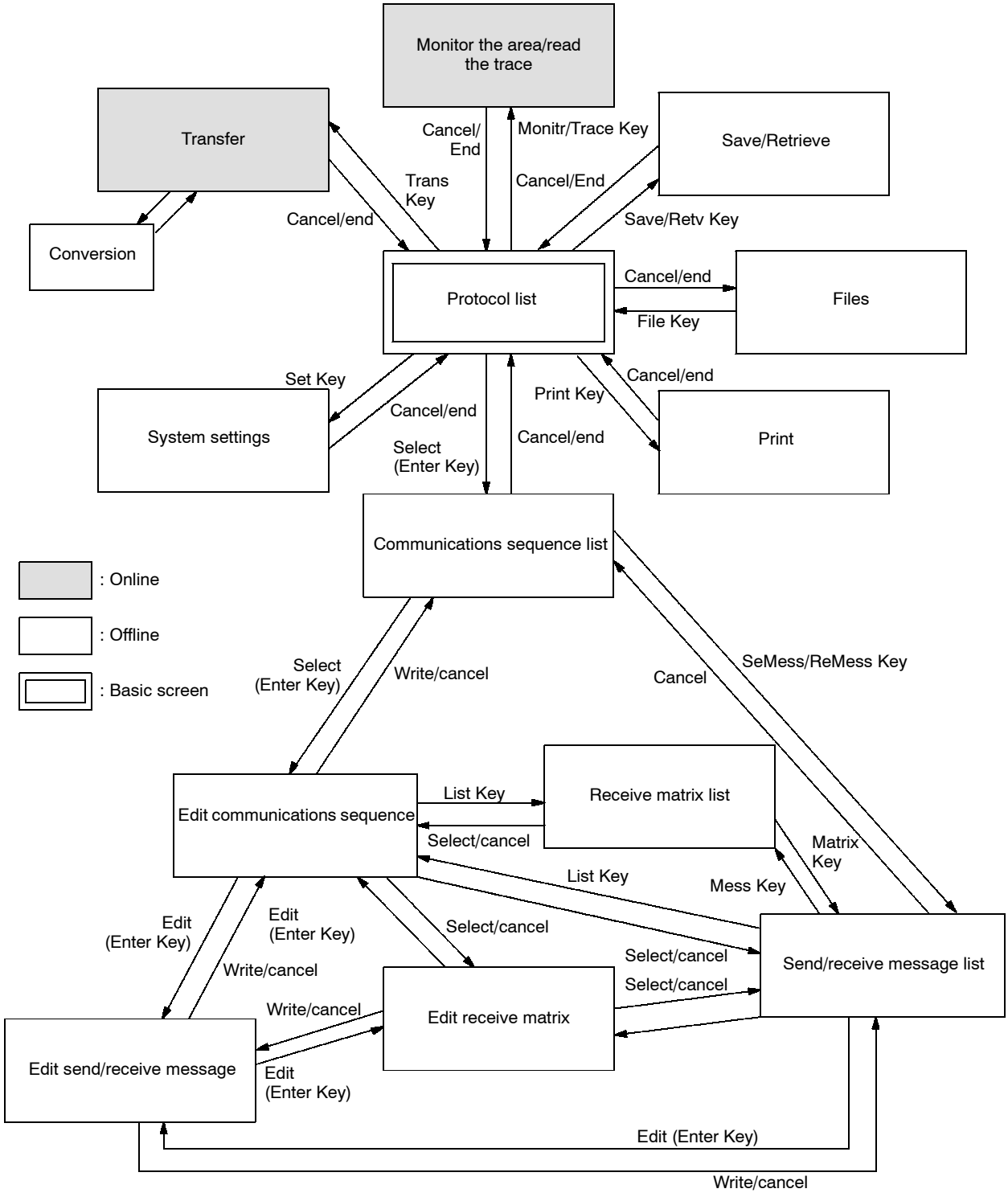
1-8 Functions

The following table lists functions of the Protocol Support Software.

Function name	Subfunction	Contents
Protocol list	---	Displays a list of the protocols that are registered.
	Create Protocol	Creates a new protocol.
	Delete protocol	Deletes a protocol.
	Copy protocol	Copies a protocol.
	Change protocol name	Changes a protocol name.
	Sequence No. range	Sets the sequence numbers to be used by the protocol.
Save	Save all	Saves the protocol data and system settings.
	Save protocol	Saves the protocol data of the specified protocol.
	Save system settings	Saves the system settings.
Retrieve	Retrieve all	Retrieves the protocol data and system settings.
	Retrieve protocol	Retrieves the protocol data of the specified protocol.
	Retrieve system settings	Retrieves the system settings.
System settings	Environment	Sets the printer and a default data directory path.
	Communications	Sets the PC communications parameters.
	PC setup	Sets the PC setup.
Transfer/Protocol	PC protocol list	Displays a list of protocols that are registered for the PC.
	File protocol list	Displays a list of protocols in an object file.
	PC ->Computer	Reads protocol data from the PC.
	Computer ->PC	Writes protocol data to the PC.
	Computer <--> PC	Compares protocol data between the PC and support software.
	Protect	Sets/releases protection of protocol data.
Transfer/PC setup	PC -> Computer	Reads setup information from the PC.
	Computer -> PC	Writes setup information to the PC.
Area monitor	---	Changes the monitor word or the present value of the specified word.
Trace/Read trace	---	Traces a transmission line and reads trace data.
Print	Print all	Prints all protocol data.
	Print protocol	Prints the protocol data of the specified protocol.
Files	Files	Displays a file list of the specified drive.
	Copy file	Copies the specified file.
	Delete file	Deletes the specified file.
	Change name	Changes the name of the specified file.
	Change drive	Changes the drive of the file display.
Communications sequence list	---	Displays a list of sequences in the specified protocol.
	Copy sequence	Copies the specified sequence.
	Delete sequence	Deletes the sequence.
	Change sequence name	Changes the name of the specified sequence.
Send message list/ Receive message list		Displays a list of send messages and received messages in the specified protocol.
	Copy message	Copies the specified message.
	Delete message	Deletes the specified message.
	Change message name	Changes the message name of the specified message.
Receive matrix list	---	Display a list of receive matrices of the specified protocol.
	Copy matrix	Copies the specified matrix.
	Delete matrix	Deletes the specified matrix.
	Change matrix name	Changes the matrix name of the specified matrix.
Edit communications sequence	---	Edits a communications sequence.
Edit send message/ Edit receive message	---	Edits send/receive messages.
Edit receive matrix	---	Edits a receive matrix.

1-9 Screen Transitions

The screen display is switched as shown below by selecting an item from the initial screen or pressing a function key.



1-10 Keys

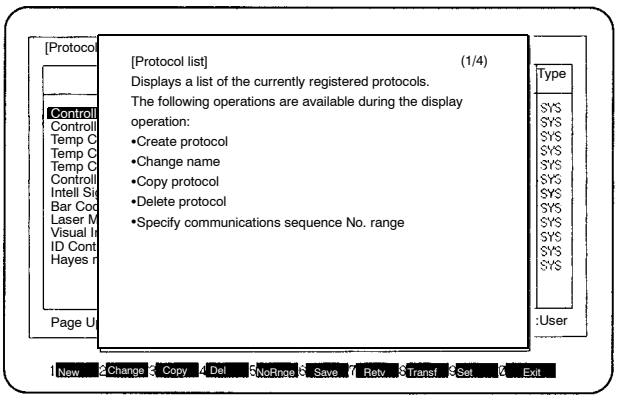
The following table lists the main keys that are used by the Protocol Support Software.

Key	Function
F1 to F10	Executes the function assigned to the function key.
Shift+ F1 to F10	Executes the function assigned to the function key.
Esc	Cancels the current processing.
Shift+ Esc	Returns control to each basic screen.
↑	Moves the cursor upwards.
↓	Moves the cursor downwards.
→	Moves the cursor to the right.
←	Moves the cursor to the left.
Back Space	Deletes the character immediately before the cursor position (valid for character input only).
Del	Deletes the character at the cursor position (valid for character input only).
Ins	Inserts one blank character at the cursor position (valid for character input only).
PageDown	Displays the next screen (valid only for list screen display and the online help function).
PageUp	Displays the previous screen (valid only for the list screen display and online help function).
Enter	Determines input and selection.
Ctrl + H	Displays only help information.
Home	Clears input data (valid at character input only).
Space	Clears input data (valid only for input of the character string to which the cursor cannot be moved).
End	Displays a file list.

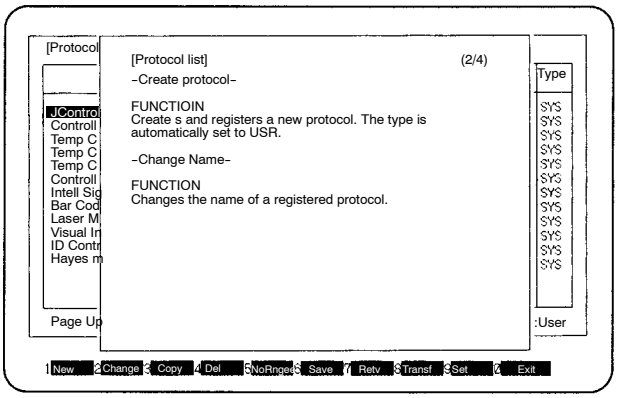
1-11 Online Help

Procedures for using the Protocol Support Software can be verified on the screen through an online help function.

1, 2, 3... 1. Display the screen whose operation is to be verified and press the Ctrl and H Keys simultaneously. An outline of the functions that can be executed on the screen and the function list will be displayed.



2. When the PageDown Key is pressed, the next page of the explanation of the function will be displayed.



Note a) When the PageUp Key is pressed, the display is returned to the previous page.

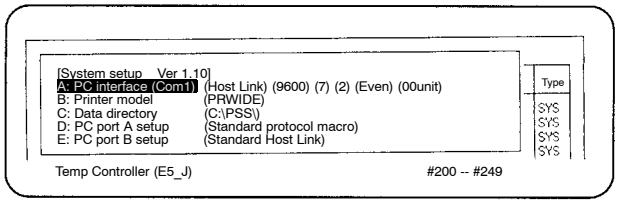
b) The number of pages available and the current page are displayed at the top right corner of the screen.

3. When the Esc Key is pressed, the help screen is cleared.

1-12 Setting the Applications Environment

Use the following procedure to set the applications environment before using the Protocol Support Software.

1, 2, 3... 1. Press the F9 (Set) Key from the initial screen. The System Setting screen will be displayed.



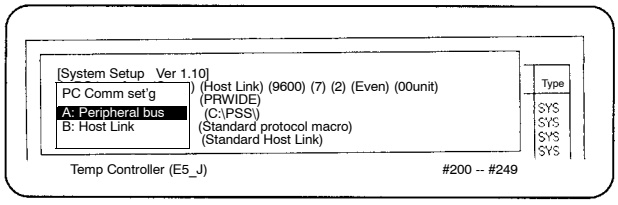
2. Move the cursor to one of the following and press the Enter Key.

A: PC interface	Sets the communications parameters between the PC and Protocol Support Software.
B: Printer model	Sets the printer to be used.
C: Data directory	Sets the default directory name to be displayed when a file is saved.
D: PC port A setup	Sets the communications parameters of the port A (RS-232C/RS-422A) of the communications board.
E: PC port B setup	Sets the communications parameters of port B (RS-232C) of the communications board

1-12-1 PC Communications Parameters

Use the following procedure to set the communications parameters between the PC and the Protocol Support Software.

1, 2, 3... 1. Select A:PC interface. The following will be displayed.



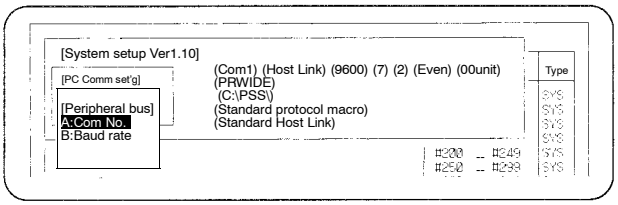
2. Set the communications procedure between the PC and the Protocol Support Software. Move the cursor to either of the following and press the Enter Key.

A: Peripheral bus
Communicates with a high-speed peripheral bus using a peripheral bus cable (model CQM1-CIF01).

B: Host link
Communicates with a host link procedure using a host link cable.

Peripheral Bus

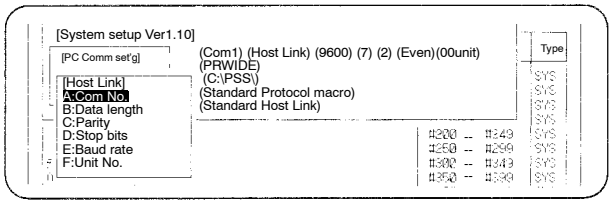
1, 2, 3... 1. When a peripheral bus is selected, the following will be displayed.



2. Set the baud rate when the peripheral bus is used. Move the cursor to one of the following and press the Enter Key. When the PC is initialized, the speed is set to 9,600 bps. Press the Esc Key to return to the original screen.
   A: 19,200
   B: 9,600
   C: 4,800

Host Link

1, 2, 3... 1. When the host link procedure is selected, the following will be displayed.



2. Select the communications parameters for the host link. Select each item and set the parameter as described below. Press the Esc Key to return to the original screen.

- Com No.

A: Com1	The communication port is Com1.
B: Com2	The communication port is Com2.
C: Com3	The communication port is Com3.
D: Com4	The communication port is Com4.

- Data length
  A: 7Bit The data length is 7 bits.
  B: 8Bit The data length is 8 bits.
- Parity
  A:Even Specifies an even parity.
  B:Odd Specifies an odd parity.
  C:No Does not set a parity bit.
- Stop bits
  A:1Bit One stop bit is used.
  B:2Bit Two stop bits.
- Baud rate
  A:19,200bps The baud rate is 19,200 bps.
  B:9,600bps The baud rate is 9,600 bps.
  C:4,800bps The baud rate is 4,800 bps.
  D:2,400bps The baud rate is 2,400 bps.
- Unit No.
  Enter the unit No. (00 to 31) of the PC to be used as the communications partner.

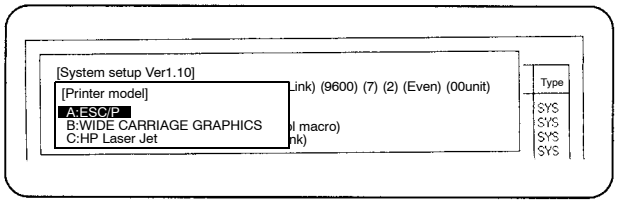
Note When the PC is initialized, the following parameters are set.

Com No.:	Com1
Data length:	7 bits
Parity:	Even
Stop bits:	2 bits
Baud rate:	9,600 bps
Unit No.:	Unit 0

1-12-2 Printer

Use the following procedure to select the model of the printer to be used.

1, 2, 3... 1. Select B:Printer model. The following screen will be displayed.



2. Move the cursor to one of the models and press the Enter Key.

Item	Model name	Manufacturer
ESC/P	FX-800	Epson
	LP-1600	
WIDE CARRIAGE GRAPHICS	4208-502	IBM
HP LaserJet	LaserJet 4	Hewlett Packard

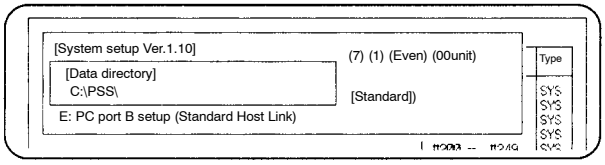
Note a) Set the printer as follows according to the selected model.
Epson Printers
Use the printer with the factory default parameters except for the following.
ESC/P super function: Valid

b) Set the printer according to the size of the form to be printed. The printable form size is a continuous form (136 columns) or B4 horizontal. An A4 horizontal form is also allowed by setting the printer. Refer to the manual of the printer to be used to set the form size.

1-12-3 Data Directory

Use the following procedure to set the default directory to be displayed when a file is saved.

1, 2, 3... 1. Select C:Data directory. The following will be displayed.

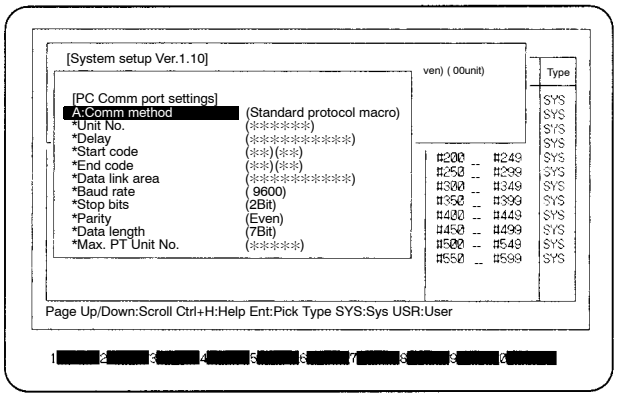


2. Enter the default directory (including the drive) to be displayed when a file is saved using up to 38 characters and press the Enter Key.
   Example: C:\PROTOCOL\

1-12-4 Setting Communications Ports A and B

Use the following procedure to set the communications parameters for RS-232C for port A/B of a communications board.

1, 2, 3... 1. Select D:PC port A setup or E:PC port B setup. The following will be displayed.

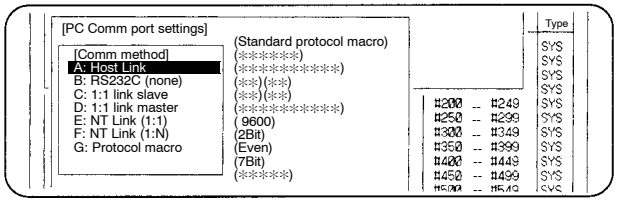


Note a) The items prefixed by asterisks (*) do not need to be set for the current communications method. Items that do not require settings under the communications method selected as per step 2 below are prefixed by asterisks.

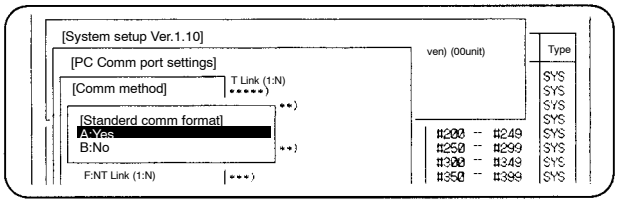
b) When the standard format is set for use, asterisks (*) are displayed for the data length, parity, stop bits, and baud rate.

c) Refer to the manuals for the communications system or used for details on communications methods and settings.

2. Now we'll set the communications parameters of RS-232C port A/B of the communications board. Select A:Comm method. The following screen will be displayed.



3. When one of the above communications methods is selected, the following screen will be displayed.



When the standard format is specified for the communications parameters, the communications parameters will be set as follows:
Data length: 7 bits
Parity: Even number
Stop bits: 2 bits
Baud rate: 9,600 bps
When the standard format is not specified, any conditions can be set.

Note If C:1:1 link slave, D:1:1 link master, E: NT Link (1:1), or F: NT Link (1:N) is selected, the above screen will not be displayed and the display will returned to the previous screen.

4. Set the necessary parameters according to the communications methods

1-13 SYSMAC Support Software (SSS) Option Registration

When the SYSMAC Support Software is used, the Protocol Support Software can be used while running the SYSMAC Support Software by registering the Protocol Support Software under the option menu of the SYSMAC Support Software. To register the Protocol Support Software under the option menu of the SYSMAC Support Software, the following conditions must have been satisfied.

- SYSMAC Support Software V1.1 must be installed.
- The Protocol Support Software must be installed.
- The directory name containing the execution file of the two applications described above must be registered in environment variable PATH.

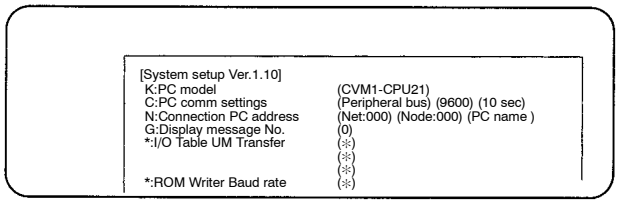
Note a) To check the environment variable PATH, enter the following at the DOS prompt.
C:\>PATH
Example:C:\>PATH
PATH=C:\DOS;C:\SYSMATE;C:\PSS
C:\SYSMATE is the directory containing the SYSMAC Support Software, and C:\PSS is the directory containing the Protocol Support Software.

b) The following procedures shows how to register the Protocol Support Software in the above installation environment.

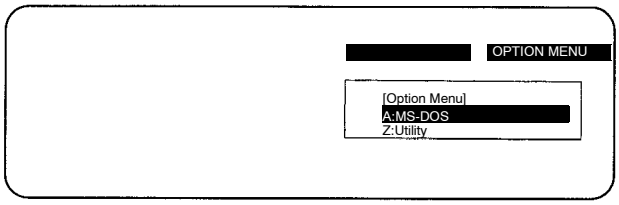
1, 2, 3... 1. Start the SYSMAC Support Software.

```
C:\>SSS
```

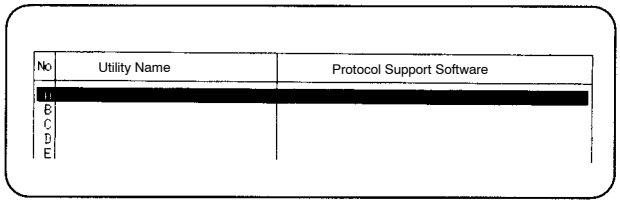
2. The initial SYSMAC Support Software screen will be displayed.



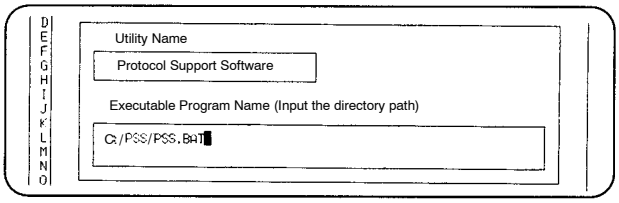
3. Move the cursor to the Option Menu at the top-right corner of the screen and press the Enter Key. An option menu will be displayed.



4. Select Z:Utility by pressing the Z Key.

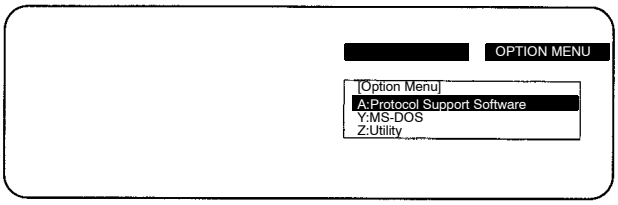


5. Move the cursor to a blank line and press the Enter Key. An input screen for a utility name and an execution program name will be displayed.
6. Enter a name for the option and press the Enter Key. Then, enter an executable program name and press the Enter Key.



Note Enter an absolute path name (including the drive) and an executable file name for the executable program name.

7. When the Esc Key is pressed, the display will return to the Option Menu screen.



8. Move the cursor to the utility name line for the Protocol Support Software on the option menu and press the Enter Key. The Protocol Support Software will be started.

Note a) The Protocol Support Software can also be started by entering the key corresponding to the option menu item.

b) To return control to the SYSMAC Support Software, press the F10 Key (End) on the Protocol Support Software initial screen. The display will return to the option menu screen of the SYSMAC Support Software.

c) Refer to the *SYSMAC Support Software V1.1 Operation Manuals* for details.

SECTION 2
Creating Communications Sequences

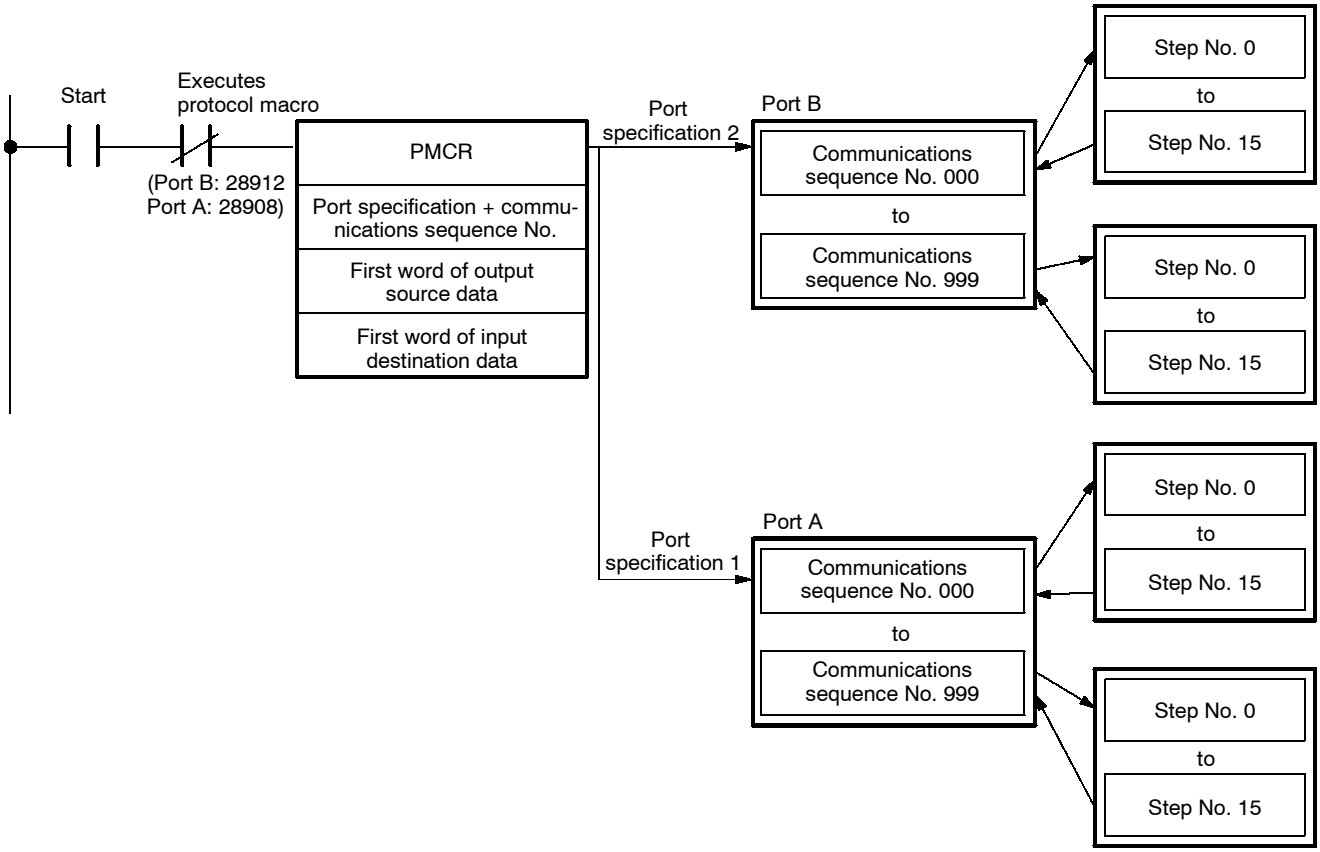
This section describes how to edit and manage communications sequences.

2-1 Creating Communications Sequences

The protocol macro function allows a user to create original communications procedure. Users can freely edit communications procedures (called communications sequences) for various communications devices, such as general-purpose components connected to RS-232C or RS-422/485 interfaces, and can execute these procedures using the PMCR instruction.

2-1-1 Structure of Communications Sequences

Up to 1,000 (0 to 999) sequences can be registered and used. Each communications sequence consists of up to 16 steps.



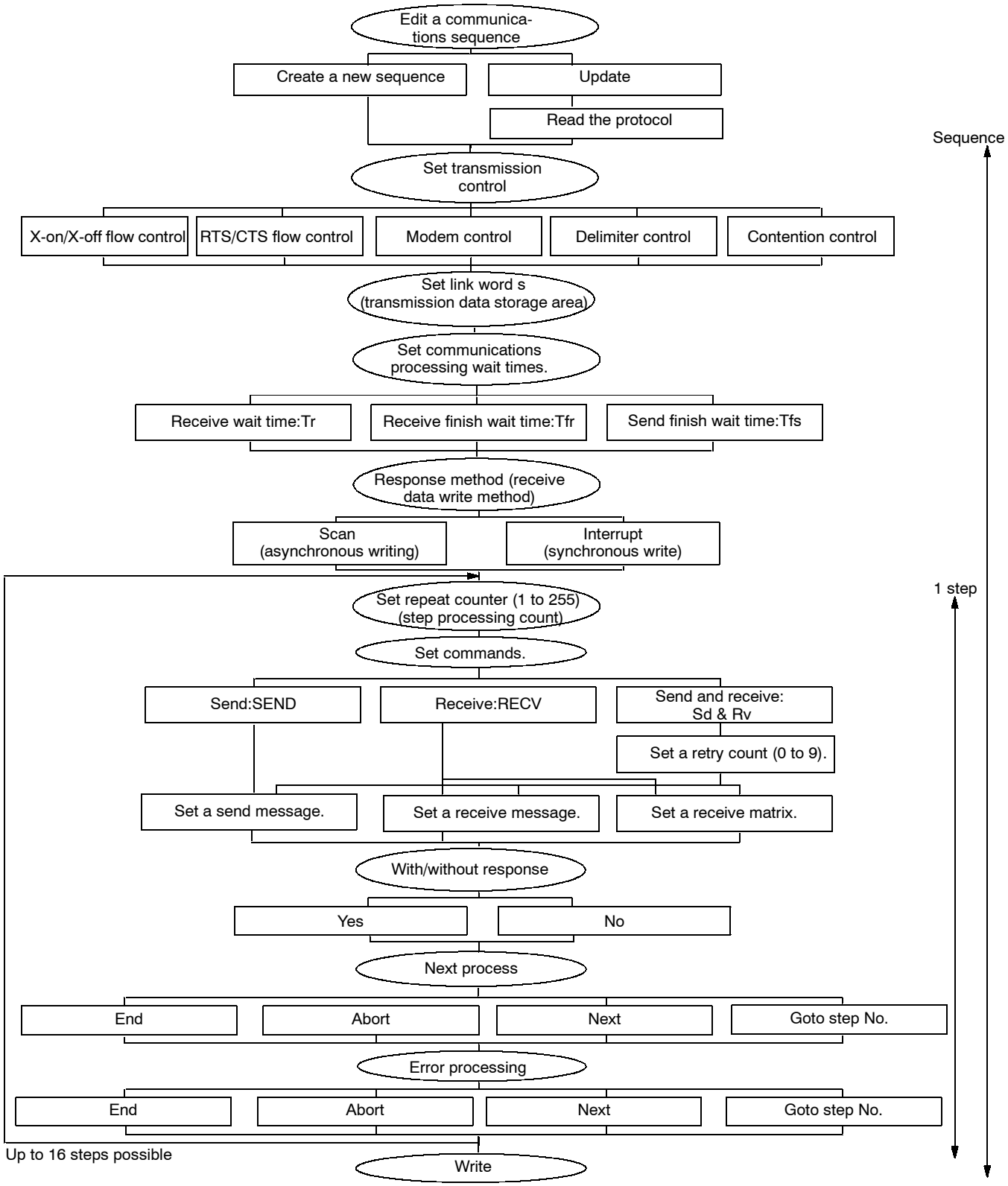
2-1-2 Communications Sequence Settings

The settings that can be made for communications sequence using the Protocol Support Software are shown in the following table.

Unit	Item	Contents	Settings
Sequence	Transmission control	Set transmission control method such as X-on/X-off flow control or RTS/CTS flow control.	X-on/X-off, RTS/CTS, modem control, delimiter control, and contention control
	Link words	Set words for which data is shared between the PC and a Communications Board.	CIO, LR, HR, AR, DM, or EM address
	Wait times	Set wait times for communications processing.	Receive wait, receive finish, send finish Units of 0.01 s, 0.1 s, 1 s, or 1 min
	Response method	Set the timing for writing data that was received.	Scan or interrupt notification
Step	Repeat counter	Set the repeat count for the step.	Constants 1 to 255, or CIO, LR, HR, AR, DM, or EM address
	Commands	Set the communications commands.	Send, Recv, or Send & Recv
	Retry count	Set an error retry count when the command setting is Send&Recv.	0 to 9
	Send wait time	Set the wait time required to send data at transmission.	Units of 0.01 s, 0.1 s, 1 s or 1 min
	Send message	Set send data when the command is Send or Send&Recv.	Header, address, length, data, error check code, and terminator
	Receive message	Set expected receive data when the command is Recv or Send&Recv.	Header, address, length, data, error check code, and terminator
	Receive matrix	Set expected receive data (up to 15 sets) and change the processing according to the receive data when the command is Recv or Send&Recv.	Header, address, length, data, error check code, terminator, next process
	With/without response	Set whether the data that was received is written.	Yes or No
	Next process	Set the next step to which control is to be passed when a step is terminated normally.	End, Goto, Next, Abort
	Error process	Set the next step to which control is to be passed when a step is terminated in error.	End, Goto, Next, Abort

2-1-3 Creating Communications Sequences

The diagram below shows the setting of a communications sequence and the entire setting procedure flow. See *2-2 Editing Communications Sequences* and subsequent sections for individual settings and setting procedures.

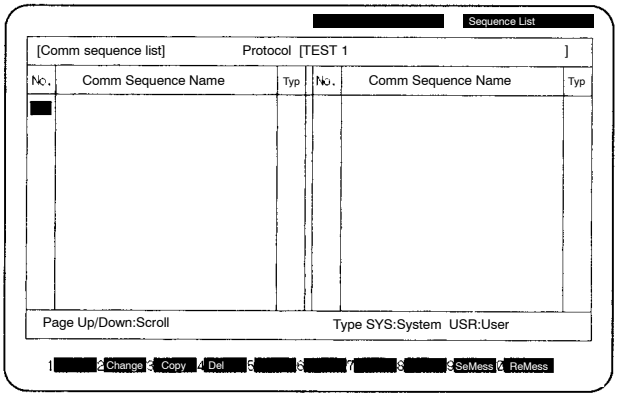


2-2 Editing Communications Sequences

Use the following procedure to set communications sequences.

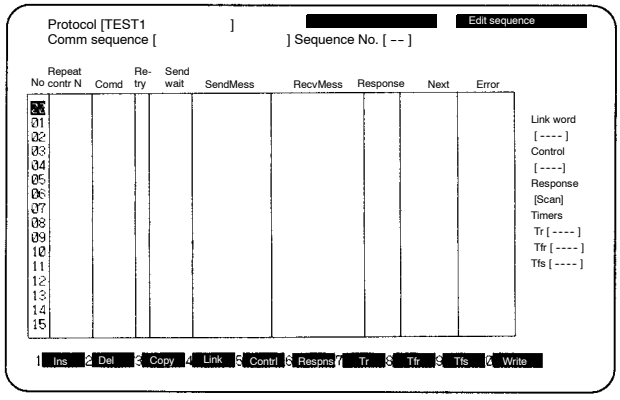
1, 2, 3...

1. Move the cursor to the protocol for which a communications sequence is to be set in the protocol list on the initial screen and press the Enter Key. The following Communications Sequence Setting screen will be displayed.



Note When creating a new protocol, press the F01 Key (New) from the initial screen, enter the name of the protocol to be created using up to 15 full-size characters, and press the Enter Key. The name of the protocol that was entered will be displayed in the last line of the protocol list. Select the protocol. See *Section 4 Managing Protocol Data* for details.

2. To create a new sequence, move the cursor to a line whose No. field is empty (only the top line can be selected among the empty fields) and press the Enter Key. To change a sequence that has already been set, move the cursor to the line and press the Enter Key.



3. Set each item as described in the following sections.

2-2-1 Link Words

Specify the words for storing data transmitted with external data devices. Two sets of link words can be set and used simultaneously. Link words are refreshed each PC scan. When link words are used as the storage destination for receive and send data, the link words set here must be specified as the Read Words or Write Words when editing messages. See the description of data attributes in Section *3 Creating Send Messages* for details on read and write words. The settings for link words are as follows:

- Word area

  Set the area containing the words to be used as a link words.

- Total number of I/O words

  Set the total number of link words to be used for sending and the number to be used for receiving.

- First link word

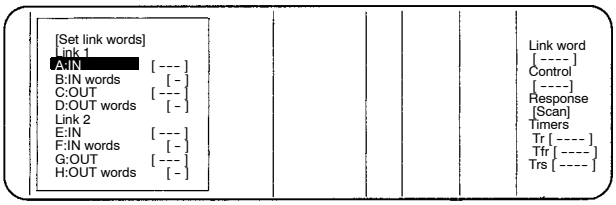
  Set the first word of the link words to be used for sending and the first word to be used for receiving.

  The following table lists the memory areas that can be used as link words.

Area	Range
CIO	000 to 511
LR	00 to 63
HR	00 to 99
AR	00 to 27
DM	0000 to 6655
EM	0000 to 6143
None	Not used

Note EM banks cannot be specified. Only the current bank can be used.

1, 2, 3... 1. Press the F4 Key (Link) from the Communications Sequence Setting screen. The Link Word Setting screen will be displayed.



2. Move the cursor to one of the above items to be set and press the Enter Key. The cursor will move to a data input field.

   A:IN
   Set the first word in the area in which receive data is to be stored. After pressing one of the function keys, enter a word address, and press the Enter Key. The first word address that was entered will be displayed in the IN input field.

   F2(None): An area is not set.

   F3(CIO): Sets the CIO area for the first word.

   F4(LR): Sets the LR area for the first word.

   F5(HR): Sets the HR area for the first word.

   F6(AR): Sets the AR area for the first word.

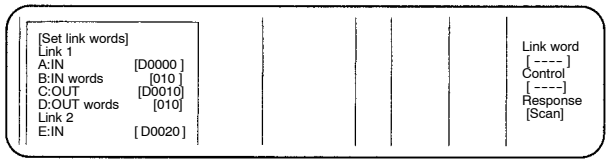
   F7(DM): Sets the DM area for the first word.

   F8(EM): Sets the EM area for the first word.

   B: IN words
   Sets the number of words to be allocated beginning from the first word that stores receive data. When the number of words is entered and the Enter Key is pressed, the number of words that was entered will be displayed in the input field.

   C: OUT
   Sets the first word and area to stores send data. The setting method is the same as for IN.

D: OUT words
Sets the number of words to be allocated from the first word that stores send data. The setting method is the same as for the IN words.



Note a) E. F, G, and H are set for link 2. Set these items in the same way as for link 1, above.

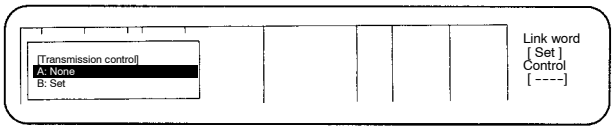
b) EM banks cannot be specified.

2-2-2 Transmission Control

Specify the transmission control method. Five transmission control methods are available as indicated in the following table. Set the same transmission control method as that specified by the communications partner.

Transmission control	Function
Xon/Xoff flow control	Controls data flow using the Xon code (13H) and Xoff code (11H) so that the data size does not exceed the buffer size when a large amount of data is transmitted.
RTS/CTS flow control	Controls data flow using signals called RTS and CTS so that the data size does not exceed the buffer size when a large amount of data is transmitted.
Modem control	Used for handshaking with a modem. This transmission control method is used also for 1:N (N≧1) connection on a RS422/485 transmission line.
Delimiter control	Used to transmit a large amount of data by delimiting the data into multiple frames using a delimiter.
Contention control	Used to obtain the transmission right in point to point contention communications (SECS protocol, etc.).

1, 2, 3... 1. Press the F5 Key (Contrl) from the Communications Sequence Setting screen. The following Processing Selection screen will be displayed.

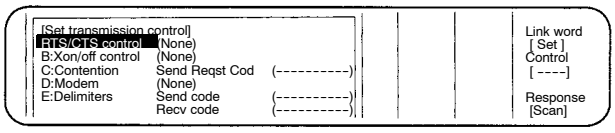


2. Move the cursor to either of the following and press the Enter Key.

A: None A transmission control method is not set. The Processing Selection screen will be cleared and "–" will be displayed in the control parameter field.

B: Set A transmission control method is set.

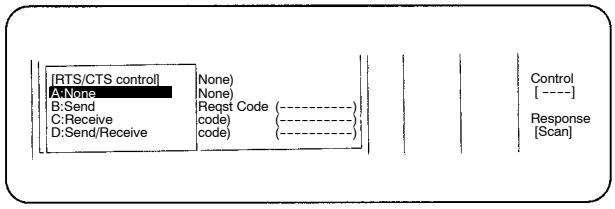
3. When B:Set is selected, the following Transmission Control screen will be displayed.



4. Move the cursor to one of the following parameters and press the Enter Key.

A:RTS/CTS control

Data is transmitted through RTS/CTS flow control. The following RTS/CTS Control screen will be displayed.



Move the cursor to one of the following and press the Enter Key.

A: None
RTS/CTS flow control is not performed.

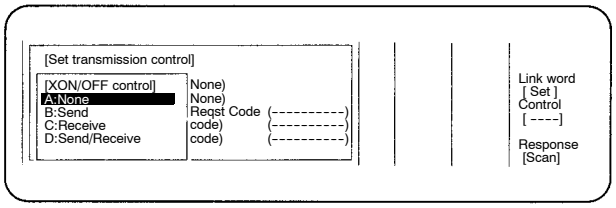
B: Send
RTS/CTS flow control is performed only when sending. At send processing, the CTS signal is monitored. When the signal is set to OFF, send processing is interrupted and when the signal is set to ON, send processing is restarted.

C: Receive
RTS/CTS flow control is performed only when receiving. At receive processing, the RTS signal is set to ON and the system waits for receive data. When receive data exceeds 200 bytes, the RTS signal is set to OFF and reception terminates. Therefore, when RTS/CTS flow control is performed at receive processing, the maximum number of bytes received at each step is 200. The RTS single is set to ON at reception of the next step and data can be received continuously. If the size of the data exceeds 200 bytes, create a sequence so that data is divided into multiple steps in order to receive data in 200-byte units.

D: Send / **Receive**
RTS/CTS flow control is performed for both send and receive processing.

B: Xon/Xoff control

Data is transmitted through Xon/Xoff flow control. The following Xon/Xoff Control screen will be displayed.



Move the cursor to one of the following options and press the Enter Key.

A: None
Xon/off flow control is not performed.

B: Send
Xon/off flow control is performed only when sending. When the Xoff code is received during sending, the processing is interrupted. When the Xon code is received subsequently, send processing is restarted.

C: Receive

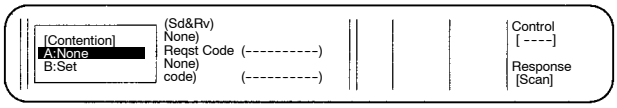
Xon/off flow control is performed only when receiving. If the receive data exceeds 200 bytes, the Xoff code is sent and receive processing terminates. Therefore, when Xon/off control is performed at receive processing, the maximum number of bytes that can be received at each step is 200 bytes. At reception of the next step, data can be received continuously by sending the Xon code. When receiving data exceeding 200 bytes, create a sequence so that data is received in 200-byte units by dividing it into multiple steps.

D: Send / Receive

Xon/off flow control is performed for both send and receive processing.

C: Contention

Data is transmitted under contention control. The following Contention control processing screen will be displayed.



Move the cursor to either of the following options and press the Enter Key.

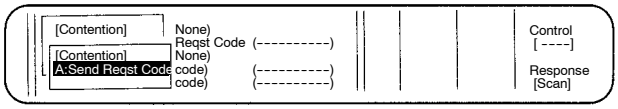
A: None

Contention control is not performed.

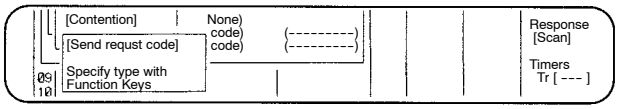
B: Set

Contention control is performed. To obtain a the right to send, send a send request code. If the transmission partner does not have priority, create a sequence so that send data is sent after receiving a receive enable code. If the transmission partner has priory, reception of a receive enable code must be verified at the first step. Create a sequence so that if a received enable code is not detected, a receive enable code is sent from this side, transmission is awaited from the partner and if a receive enable code is detected, send data is transmitted.

If B:Set is selected, the following Send Request Code setting screen will be displayed.

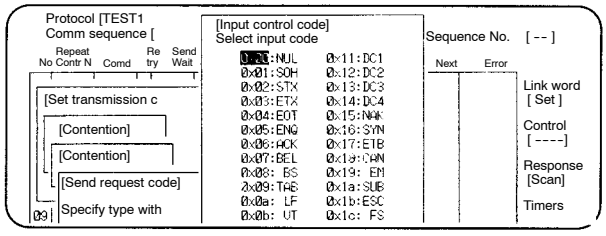


When the Enter Key is pressed, the following Send Request code setting screen will be displayed.



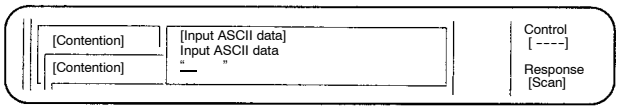
Press one of the function keys.

F1 (code): A control code is used as the send request code. The following control code selection screen will be displayed.



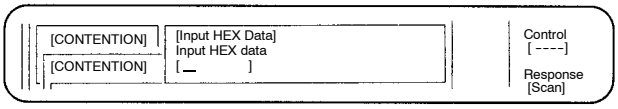
Move the cursor to one of the special codes and press the Enter Key. The selected special code will be displayed in the send request code field.

F2 (ASCII): ASCII characters are used as the send request code. The following ASCII data input screen will be displayed.



Enter the ASCII characters (up to 4 characters) to be sent as the send request code and press the Enter Key. The ASCII characters that were entered in the send request code field will be displayed.

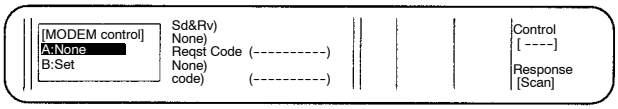
F3 (HEX): Hexadecimal digits are used as the send request code. The following Hex data input screen will be displayed.



Enter the Hex data (up to 8 digits) to be sent as the send request code and press the Enter Key. The Hex data that was entered in the send request code field will be displayed.

D: Modem

Data is transmitted through modem control. The following Modem Control setting screen will be displayed.



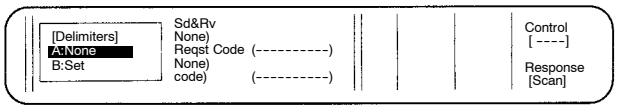
Move the cursor to either of the following options and press the Enter Key. The contents that were set will be displayed in the modem control field.

A: None
Modem control is not performed.

B: Set
Modem control is performed. The ER signal is set to ON at the beginning of the sequence. When data is sent, the RTS signal is set to ON and when data is received the signal is set to OFF. At the end of the sequence, the ER signal is set to OFF.

E: Delimiters

Data is transmitted through delimiter control. The following Delimiter Control processing selection screen will be displayed.

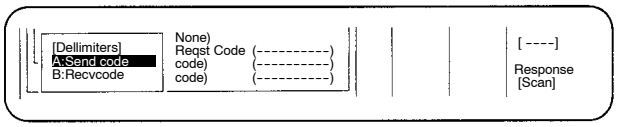


Move the cursor to either of the following parameters and press the Enter Key.

A: None
Delimiter control is not performed.

B: Set

Delimiter control is performed. When a terminator is not defined in the send message, the delimiter set in the send code is sent at the end of the send data. Further data will not be sent until the delimiter set in the receive code is received from the partner. When the delimiter set in the receive code has been received at reception, the delimiter that was set in the send code is sent and data is received continuously. If the receive data exceeds 200 bytes, reception ends. Subsequent data is received at the next step. When Set is selected, the following Delimiters screen will be displayed.



Move the cursor to either of the following options and press the Enter Key.

A: Send code

Set the code of the delimiter for send processing. The setting method is the same as for a send request code.

B: Recv code

Set the code of the delimiter for receive processing. The setting method is the same as for a send request code.

5. When all the settings are completed, press the Esc Key. The Set Transmission Control screen will be cleared.

2-2-3 Response Method

Use the following procedure to set the notification method when data that was received in the area specified in the third operand of the PMCR instruction is written. This setting is valid only when the specification of the write area is indicated in the third operand of the PMCR instruction and Yes is specified for the setting of the Response:Yes/No. The following two response methods are available.

Scan

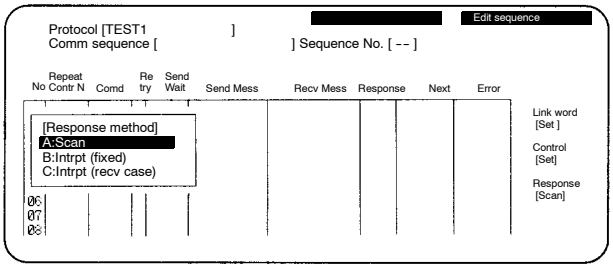
The timing of received data in memory corresponds to the PC scan (when PC services communications). The write processing to memory is not synchronized with receive processing and a time delay occurs.

Interrupt

An interrupt is issued to the PC at reception and received data is written to memory immediately. A specific ladder interrupt program can also be executed by specifying an interrupt program No. (0 to 255).

1, 2, 3...

1. Press F6 Key (Respns) from the Set Sequence screen. The following Response setting screen will be displayed.



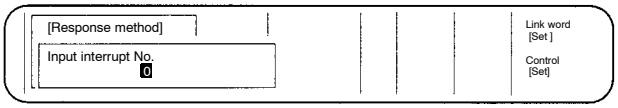
2. Move the cursor to one of the following options and press the Enter Key.

A: Scan

The timing of writing receive data in the memory area of the PC depends on the PC scan. (Receive processing and write processing are performed asynchronously).

B: Interrupt (Fixed)

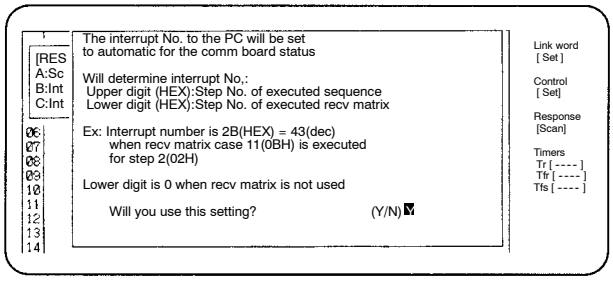
An interrupt is used for PC whenever data is received and receive data is written to the memory area immediately. In this case, a ladder interrupt program can be executed by specifying an interrupt program No. (0 to 255). The following message will be displayed.



Enter an interrupt program No. (0 to 255) and press the Enter Key.

C: Interrupt (Recv case)

An interrupt is issued for the PC whenever data is received. The received data is written to the memory area immediately. In this case, a ladder interrupt program can be executed by automatically calculating the interrupt program No. (0 to 255) according to the execution state of the Communications Board. The following messages are displayed.



Select either of the following options and press the Enter Key.

Y: The interrupt program to be executed by automatic calculation is determined.

N: This setting is canceled.

Note a) The interrupt program No. is calculated as follows:
Upper digit (HEX):Step No. of executed sequence
Lower digit (HEX):Step No. of executed recv matrix

Ex: Interrupt number is 2B(HEX) = 43(dec)
when recv matrix case 11(0BH) is executed
for step 2(02H)

Lower digit is 0 when recv matrix is not used

Will you use this setting? (Y/N)

b) By creating an interrupt program according to the calculation expression described above, the related interrupt program can be executed according to the execution state of the Communications Board.

2-2-4 Monitor Times

The following procedure can be used to set monitor times for transmission processing. Four units of time can be set and the precision 1 ms max. When the time exceeds the monitor time, the processing set in the retry count and error process for each step is performed.

Monitor Time Ranges

The following table lists the units and ranges of monitor times that can be set.

Unit	Range
0.01 s (10 ms)	00 to 99
0.1 s (100 ms)	00 to 99
1 s	00 to 99
1 min	00 to 99

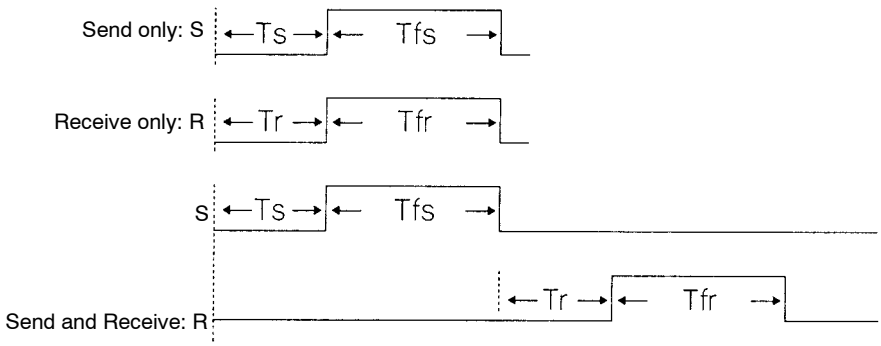
Contents Monitored

The following table lists the items that can be set for monitoring.

Type	Contents
Receive wait time: Tr	Monitors the time until the first byte (start character) is received after the receive command of the step is recognized.
Receive finish time: Tfr	Monitors the time from reception of the first byte (start character) to reception of the last byte of the data (end character).
Send finish time: Tfs	Monitors from transmission of the first byte (start character) to transmission of the last byte of the data (end character).

Monitor Time Timing Chart

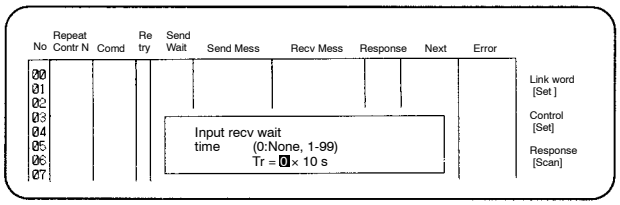
The monitor time timing chart for each send and receive process is shown below.



1, 2, 3...

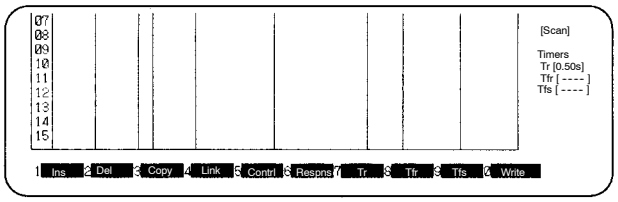
1. Press one of the function keys on the Communications Sequence setting screen.

   F7 (Tr): Set a monitor time from recognition of a receive command to reception of the first byte of the data (start character). The following Receive Wait Time setting screen will be displayed.



   Select the time unit by pressing one of the function keys.
   F1 (10ms): 0.01 s
   F2 (100 ms): 0.1 s
   F3 (1 s): 1 s
   F4 (1 min): 1 min

Enter a monitor time within the range from 0 to 99 and press the Enter Key. The monitor time that was set will be displayed in the Tr field of the monitor timer.



F8 (Tfr): Set a monitor time from reception of the first byte of the data (start character) to the last byte of the data (end character). The setting method is the same as for Tr.

F9 (Tfs): Set a monitor time from transmission of the first byte of the data (start character) to the last byte of the data (end character). The setting method is the same as for Tr.

2-2-5 Repeat Counter

Set the number of times the step is to be repeated. The count can be set by entering a value between 1 and 255 or by reading word contents (without conversion). When a value between 1 and 255 is set in the repeat counter, the value of counter N will be incremented whenever the step is executed.

The value of N at execution of the first step is ±0. When variable N is used for setting the address of a send/receive message or data, variable N will be incremented by one automatically whenever the step is repeated.

For instance, when communications is performed with multiple communications devices connected 1:N using the same send/receive message, the value of variable N used as the address is updated by a repeat counter. When a large amount of data is sent by dividing it into multiple frames, variable N used as the frame No. is updated by a repeat counter.

Control is not passed to the process specified as the next process or error process as long as the execution count of the step does not reach the repeat counter value. After the execution count reaches the specified value, control is passed to the next process or error process When a repeat counter and a retry counter are set concurrently, counter N will not be updated until the number of times the step is executed reaches the retry count. Counter N is updated after there are no more retries and the number of executions of the step has reached the repeat count.

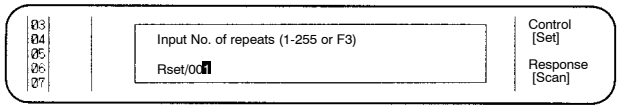
1, 2, 3... 1. Move the cursor to the repeat counter N of the step on the Communications Sequence screen and press one of the following function keys.

F1 (Rset): The step is executed the specified number of times after the value of counter N is initialized to 0.

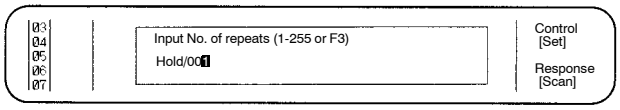
F2 (Hold): The step is executed the specified number of times while retaining the current value of counter N.

2. One of the following messages will be displayed.

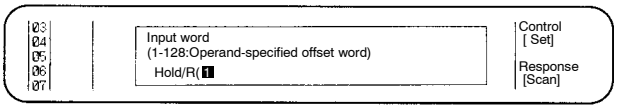
When the F1 Key (Rset) is pressed.



When the F2 Key (Hold) is pressed.

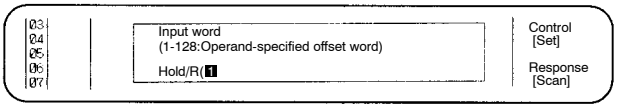


3. Enter the number of times (1 to 255) the step is to be repeated. When specifying a word address instead of a constant, press the F3 Key (Word). The following word setting screen will be displayed.



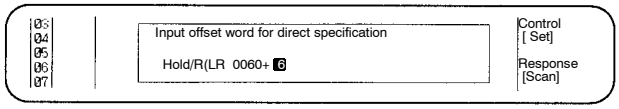
When specifying the area that was specified in the second operand of the PMCR instruction, enter the word address.

Example: 1 (area specified in the second operand of the PMCR instruction + address of the first word)

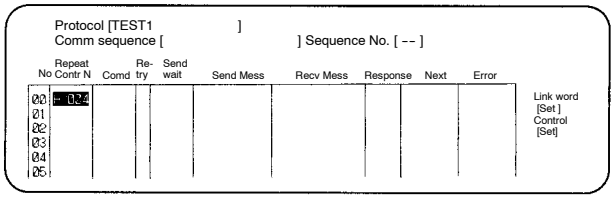


When setting another memory area, press the function key to which the area is assigned and enter the word address.

Example: F4 (LR) 0060 (Enter Key) 6 (Enter Key) Specifies LR 0066.



4. When a count is entered, the set value will be displayed in the item for repeat counter N.



Note a) When setting a repeat counter using a word (without conversion), the repeat counter N itself cannot be used.

b) Refer to the *Section 3 Creating Messages* for details on reading word contents.

2-2-6 Commands

Set to one of the following three transmission commands for execution in a step.

Send Only: Send The send messages set in the step are sent.

Receive Only: Recv The receive messages that were set in the step or messages that were sent based on the receive matrix are received.

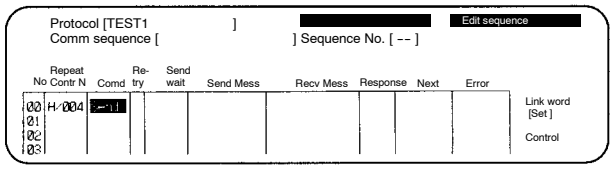
Send and Receive: Sd&Rv After the send messages that were set in the step are sent, the receive messages that are set in the step and the messages that were sent based on the receive matrix are received.

The following table lists the items that can be set for each command.

Setting item	Command		
	SEND	RECV	SD & RV
Repeat counter	Yes	Yes	Yes
Retry count	No	No	Yes
Send wait time	Yes	No	Yes
Send messages	Yes	No	Yes
Receive messages	No	Yes	Yes
Response:Yes/No	Yes	Yes	Yes
Next process No.	Yes	Yes	Yes
Error process No.	Yes	Yes	Yes
Transmission control	Yes	Yes	Yes
Link words	Yes	Yes	Yes
Receive wait time: Tr	–	Yes	Yes
Receive finish time: Tfr	–	Yes	Yes
Send finish time: Tfs	Yes	–	Yes
Response method	–	Yes	Yes

1, 2, 3...

1. Move the cursor to the command field of the step and press one of the function keys.
   - F1 (Send): Only send processing is executed.
   - F2 (Recv): Only receive processing is executed.
   - F3 (Sd&Rv): Send processing, then receive processing are executed.
2. When the Enter Key is pressed, the selected commands will be displayed in the command field.



2-2-7 Retry Count

A retry count is valid only when Sd&Rv is set for the transmission commands. When a retry occurs, the current step is re-executed. When the step is executed for the specified number of retries, control is passed to the error process if a retry occurs again.

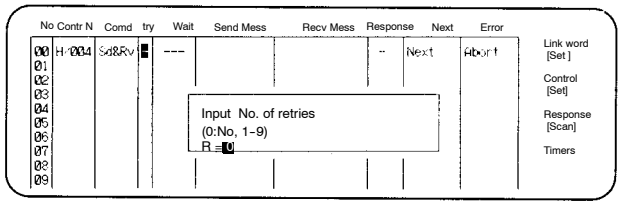
Allowed Retry Counts 0 to 9 (when 0 is specified, no retries are executed.)

Retry Factors The send finish time has been reached.
The receive wait time has been reached.
The receive finish time has been reached.

A transmission error occurred during receive processing (a factor that turned CIO28304 or CIO28312).
A message other than the messages set in receive messages is received.
An error occurred in the Error Check code.

Note For retries, send processing is executed regardless of the wait time.

1, 2, 3... 1. Move the cursor to the retry field of the step and press the Enter Key. The Retry Count setting screen will be displayed.



2. Enter a retry count between 0 and 9 and press the Enter Key. The count that was set in the retry field will be displayed.

2-2-8 Send Wait Time: Ts

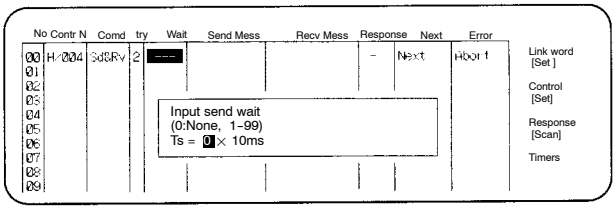
Set the time to be waited until a send message is sent for send processing. The counting of a wait time starts from the following point and the accuracy is 1 ms max.

- Send or Send&Recv of the step is recognized.
- The entire processing has completed when repetition is specified for the step.

The send wait time setting range is from 0 to 99 (0: no wait). The setting unit can be selected from the following four types.

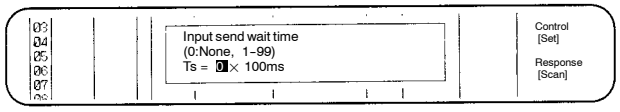
Unit	Range
0.01 s (10 ms)	00 to 99
0.1 s (100 ms)	00 to 99
1 s	00 to 99
1 min	00 to 99

1, 2, 3... 1. Move the cursor to the send wait time field of the step and press the Enter Key. The Send Wait Time setting screen will be displayed.

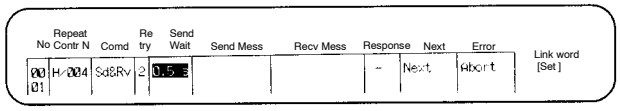


2. Press the related function key to set the time unit.

F1 (10 ms): 0.01 s
F2 (100 ms): 0.1 s
F3 (1 s): 1 s
F4 (1 min): 1 min



3. Enter wait time between 0 and 99 and press the Enter Key. The send wait time that was set will be displayed.



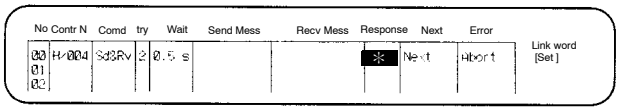
2-2-9 Response:Yes/No

Use the following procedure when the third operand of the PMCR instruction is specified as storage words for the receive data, to set whether the receive message is stored in the area when receive processing of the step terminates. This setting is valid only when receive data storage words are specified for the third operand of the PMCR instruction (invalid when link words or an memory area words are directly specified).

- Response:Yes
  A response method must be set in the Response Method parameter.
- Response:No
  Receive messages are read only and are not stored in memory.

1, 2, 3...

1. Move the cursor to the response field of the step and press either of the function keys.
   F1 (Yes): A response is sent.
   F2 (No): No response is sent.
2. When the Enter Key is pressed, "＊" (Response:Yes) or "–" (Response:No) will be displayed in the field.



2-2-10 Next Process

Use the following procedure to set the process to which control is to be passed when the step terminates normally. If the step does not terminate normally, control is passed to the next step based on the specification of error process.

If a receive matrix is set for the receive message, control is passed to the next step based on the next process set in the receive matrix.

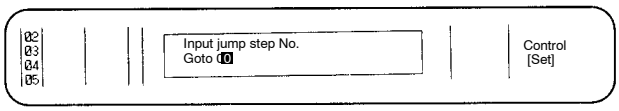
The following four types of contents can be set.

Next process	Processing details
End	When this step is terminated, the sequence is terminated.
Next	When this step is terminated, the next step is executed.
Goto **	When this step is terminated, control is passed to the step No. specified in **.
Abort	When this step is terminated, the step is aborted and the sequence is terminated.

1, 2, 3...

1. Move the cursor to the next process field of the step and press one of the function keys.
   F1 (End): Terminates the processing of the sequence.

F2 (Goto): Executes the processing of the specified step No. The following jump destination step No. setting screen will be displayed.

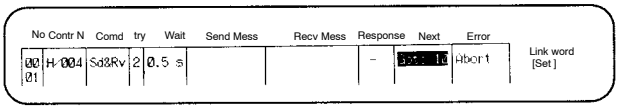


Enter the number of the next step to be executed.

F3 (Next): The next step is executed.

F4 (Abort): Processing is interrupted at the step and the sequence is terminated.

2. When the Enter Key is pressed, the processing that was set is displayed in the field.



2-2-11 Error Process

Set the process to which control is passed when the step is terminated in error. (When a step is terminated normally, control is passed to the next step based on the specification of the next process.)

If a receive matrix is set in a receive message also, control is passed to the next step based on the setting in the error process for error termination.

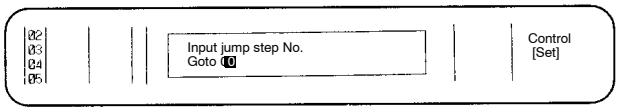
The following four types of contents can be set.

Next process	Processing details
Abort	When the step is terminated abnormally, the step is aborted and the sequence is terminated.
Goto**	When the step is terminated abnormally, control is passed to the step No. specified in **.
Next	When the step is terminated abnormally, control is passed to the next step.
End	When the step is terminated abnormally, the sequence is terminated.

1, 2, 3... 1. Move the cursor to the error process field of the step and press one of the following function keys.

F1 (End): Processing is terminated for the sequence.

F2 (Goto): Processing of the specified step No. is executed. The following jump destination step No. setting screen will be displayed.



Enter the number of the next step to be executed.

F3 (Next): Processing of the next step No. is executed.

F4 (Abort): Processing is interrupted at the step and the sequence is terminated.

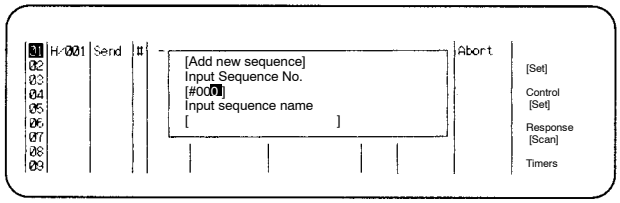
2. When the Enter Key is pressed, the process that was set is displayed in the field.

2-2-12 Write

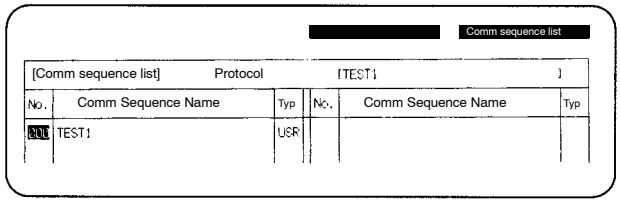
Use the following procedure to write the communications sequences that were set.

1, 2, 3...

1. When all the settings are completed on the Communications Sequence setting screen, move the cursor to the sequence No. field and press the F10 Key (Write). The sequence name input screen will be displayed.



2. Enter a sequence name and press the Enter Key. The name will be displayed on the Sequence List screen.



2-3 Managing Communications Sequences

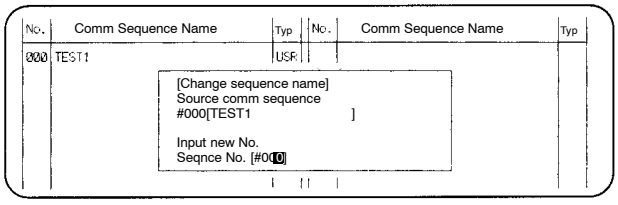
This section describes how to change names, copy, and delete communications sequences that were registered. Communications sequences, communications messages, and receive matrices are ones that are copied or deleted.

2-3-1 Changing Sequence Names

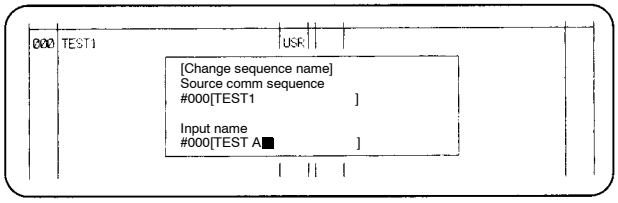
Use the following procedure to change the name of a sequence that has been registered.

1, 2, 3...

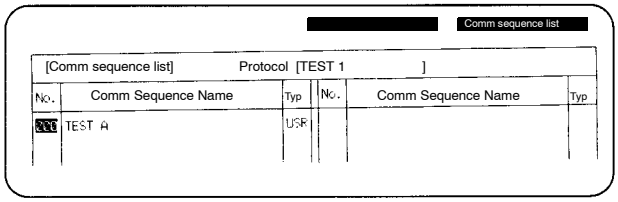
1. Move the cursor to the sequence No. field on the Communications Sequence list screen and press the F2 Key (Change). The following Change Sequence Name screen will be displayed.



2. Enter a new sequence No. and press the Enter Key. The sequence name input field will be displayed.



3. Enter a new sequence name (up to 30 characters) and press the Enter Key. The changed sequence name will be displayed in the sequence list.

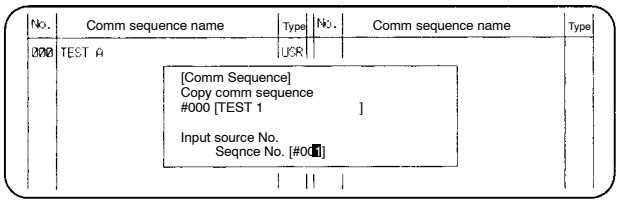


2-3-2 Copying Sequences

Copy registered sequences.

1, 2, 3...

1. Move the cursor to the sequence No. field to be copied on the Communications Sequence List screen and press the F3 Key (Copy). The following Change Sequence Name screen will be displayed.
2. Enter a new sequence number and press the Enter Key; a sequence name input field will be displayed. Enter a new sequence name (up to 30 characters) and press the Enter Key.



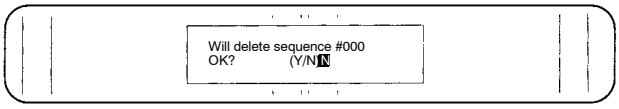
3. The sequence that was copied will be displayed at the bottom line of the sequence list.

2-3-3 Deleting Sequences

Delete sequences that have been registered.

1, 2, 3...

1. Move the cursor to the sequence No. field to be deleted on the Communications Sequence List screen and press the F4 Key (Del). The following confirmation message will be displayed.



2. Press either of the following keys and Enter Key.
   Y: The specified sequence key is deleted.
   N: Deletion is canceled.

2-3-4 Displaying Send/Receive Messages

Use the following procedure to display the send or receive messages that have been registered.

1, 2, 3...

1. Press the F9 Key (SeMess) or F10 Key (ReMess) on the Communications Sequence List screen.
2. A list of send messages or receive messages that have been registered will be displayed.

Note See *3-3 Managing Send/Receive Messages* for operation on the Send/Receive Message List screen.

2-3-5 Adding, Deleting, and Copying Steps

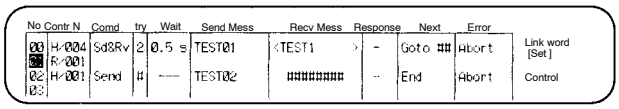
Use the following procedures to add, delete, or copy steps. Communications sequence information, send/receive messages, and receive matrices that are included in the step are deleted or copied.

Adding Steps

Use the following procedures to add a step

1, 2, 3...

1. Move the cursor to the Step No. field before which the step is to be added on the Communications Sequence Setting screen and press the F1 Key (INS).
2. The step at which the cursor is set is moved down and an empty step setting line will be displayed.



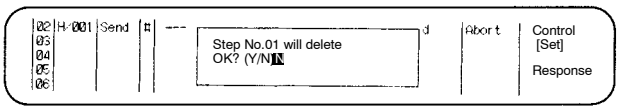
Note If the Up/Down Cursor Key is pressed without entering any data in the step that was added, the step will be deleted.

Deleting Steps

Use the following procedures to delete a step.

1, 2, 3...

1. Move the cursor to the step No. field to be deleted on the Communications Sequence Setting screen and press the F2 Key (Del).



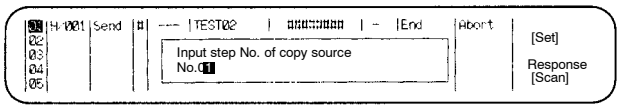
2. A confirmation message will be displayed. Enter either of the following options and press the Enter Key.
   Y: The specified step is deleted.
   N: Deletion is canceled.

Copying Steps

Use the following procedures to copy a step.

1, 2, 3...

1. Move the cursor to the step No. field to be copied on the Communications Sequence setting screen and press the F3 Key (Copy). The following message will be displayed.



2. Enter the step No. (00 to 15) to be used as the copy destination and press the Enter Key. The contents of the step specified in *item 1.* will be copied to the step No.

SECTION 3
Creating Messages

This section describes editing and managing send/receive messages and receive matrices.

3-1 Creating Send/Receive Messages

The following table lists the items that are set for send/receive messages and the data attributes that can be set for each item.

Message item / Data attribute		Header		Address		Length		Data		Error check code		Terminator	
		Send message	Receive message	Send message	Receive message	Send message	Receive message	Send message	Receive message	Send message	Receive message	Send message	Receive message
Constants													
ASCII “□□□□” HEX [□□□□]		Yes	Yes	Yes	Yes	–	–	Yes	Yes	–	–	Yes	Yes
Reserved characters: CR, STX, etc.		Yes	Yes	–	–	–	–	Yes	Yes	–	–	Yes	Yes
Non-converted variables													
Linear expression using variable (N)		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Wild card (*)		–	–	–	Yes	–	–	–	Yes	–	–	–	–
Word read R		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Word write W		–	–	–	Yes	–	–	–	Yes	–	–	–	–
Automatic conversion	LNG	–	–	–	–	Yes	Yes	–	–	–	–	–	–
	SUM, LRC, CRC	–	–	–	–	–	–	–	–	Yes	Yes	–	–
Variables converted to ASCII													
Linear expression using variable (N)		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Wild card (*)		–	–		Yes	–	–	–	Yes	–	–	–	–
Word read R		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Word write W		–	–	–	Yes	–	–	–	Yes	–	–	–	–
Automatic conversion	LNG	–	–	–	–	Yes	–	–	–	–	–	–	–
	SUM, LRC, CRC	–	–	–	–	–	–	–	–	Yes	–	–	–
Variables converted to hexadecimal													
Linear expression using variable (N)		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Wild card (*)		–	–	–	Yes	–	–	–	Yes	–	–	–	–
Word read R		–	–	Yes	Yes	–	–	Yes	Yes	–	–	–	–
Word write W		–	–	–	Yes	–	–	–	Yes	–	–	–	–
Automatic conversion	LNG	–	–	–	–	–	Yes	–	–	–	–	–	–
	SUM, LRC, CRC	–	–	–	–	–	–	–	–	–	Yes	–	–

3-1-1 Data Items

The following data items form a send/receive message;

Header	Address	Length	Data	Error check code	Terminator

Header

- Set the data that indicates the beginning of the send/receive message frame.
- At reception, data from the header is received as the message.
- Only constants can be set as the data attribute.

Address

- Set the unit number or other information to be used as the message destination.
- At reception, a Unit checks the address to see whether the message is being sent to it or to another Unit.
- When a Word Write or a wild card is set as the data attribute, a Unit does not check whether the message is addressed it or not. All messages are received (broadcast).
- The address to which the message is to be sent can be updated automatically by using the repeat counter.

Length

- The length indicates the number of bytes in the message frame and is appended automatically before the message.
- At reception, only the data size has meaning.

Note Reception terminates only when the terminator is received.

Data

- Set the contents of the send/receive message.
- For send messages, the data forms the contents of the message.
- For receive messages, the contents is compared to messages that are received for verification.

Error Check Code

- Set the error check code such as SUM, LRC, or CRC.
- At send processing, the data is calculated with the error check code that was set and the value is sent as the check code.
- At receive processing, error checking is done by matching the check code that was received and the check code calculated from the data that was received.
- The following tables lists the types of error check codes that can be set.

Error check code	Data type	Data size
No check	–	–
LRC (horizontal parity)	BIN ASCII	1 byte 2 bytes
CRC-CCITT	BIN ASCII	2 bytes 4 bytes
1-byte SUM	BIN ASCII	1 byte 2 bytes
2-byte SUM	BIN ASCII	2 bytes 4 bytes

Terminator

- Set the code that indicates the end of the message frame.
- At send processing, the message in the frame is terminated after the terminator is sent. When a terminator is not set, send processing is terminated when the last data of the send message is sent.
- Receive processing ends when a terminator is received. When a terminator is not set, receive processing ends when the last data set in the receive message is received.

- When the number of bytes of the last data set in the receive message is set as a Wild Card, receive processing ends when the buffer becomes full (256 bytes). When flow control (X-on/X-off, RS/CS) is set, however, the X-off code is set when the amount of data reaches 75% of the buffer size (200 bytes) and receive processing ends.

3-1-2 Data Attributes

The data attributes that can be used for send/receive messages are described below.

Constants

The following data attributes can be set using constants.

Attribute	Contents	Specification	Display
ASCII data	Enclose the data with quotation marks (") and specify ASCII data.	"12345"	"12345"
HEX data	Enclose the data with brackets [ ] and specify hexadecimal data.	[5A2B]	[5A2B]
Reserve characters	Specify the code for control characters such as CR, LF, and STX.	0x0d	CR

Variables

There are three types of variables, and all three of these have an attribute which makes it possible to specify the direction in which conversion data is read or written (forward or reverse).

Forward: Lower (word/bit) to higher. Reverse: Higher (word/bit) to lower.

Variables	Read/Write direction		Function	
	Forward	Reverse	Read	Write
Unconverted variables	(X,Y)	~(X,Y)	Reads or writes Y-byte data from the specified X address.	
Variables converted to ASCII	$(X,Y)	~$(X,Y)	Converts Y÷2 byte hexadecimal data to Y-byte ASCII data from the specified X addresss.	Converts Y-byte hexadecimal data to (Y× 2) byte ASCII data from the specified X address.
Variables converted to hexadecimal	&(X,Y)	~&(X,Y)	Converts Y×2 byte ASCII data to Y-byte hexadecimal data from the specified X address.	Converts Y-byte ASCII data to (Y÷2) byte hexadecimal data from the specified X address.

X and Y Settings

X of variable (X,Y) is the execution address and indicates "to where" or "from where." Y is the data size (byte) and indicates "how much." The range of Y is from 0 to 255. The conversion of three types of variables when X is a constant are shown below.

- **Unconverted Variables**

  (127,3) → 000127

  The data is converted to 3-byte data by right-justifying 127 and padding the high-order byte and 4 bits with 000.

- **Variables Converted to ASCII**

  $ (200,4) → 30323030

  The data is converted to 4-byte data by right-justifying the ASCII 323030 of the high-order digits of 200 (2 → 32, 0 → 30) and padding the high-order byte with the ASCII (30) for 0.

- **Variables Converted to Hexadecimal**

  & (38,4) → 00000008

  The data is converted to 4-byte data by right-justifying the ASCII (8) for 38, which is assumed to be hexadecimal, and padding the high-order 3 bytes and 4 bits with 0000000.

The contents that can be set in execution address X and data size Y are described below.

1, 2, 3... 1. **Linear Expressions Containing Variables (N)**

• Form: aN+b

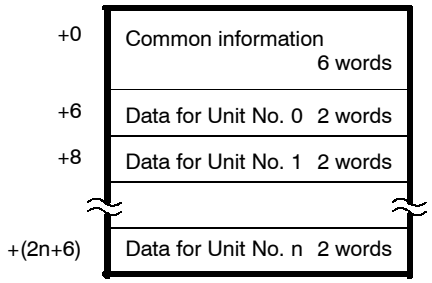
a: Coefficient (0 to 255), only the constant is valid if the value is 0.

b: Constant (0 to 255). Sets the number of words.

N: Repeat counter value

• Explanation

When data such as the Unit No. is stored in IOM consecutively, this method is useful for setting the first address.



If a linear expression is used when data of the related Unit No. specifies the first address (actually valid address) of the record that is started, the result will be as follows: 2N+6

2. **Wild Cards**

• Format: *

• Explanation

Can be set only when for the address or data of the receive message.

Addresses: All the messages are received without checking the address.

Data: All the messages are received without verifying receive data.

• Wild Cards in Variables

a) When a Wild Card Is Specified for X in (X,Y)
Data of the size indicated by Y is excluded from verification check of the expected message.

b) When a Wild Card Is Specified for Y in (X,Y)
The data size is calculated under the following conditions.

When the Next Message Is a Terminator:
The data size from the message to the terminator is calculated.

When the Next Message Is an Automatic Variable:
The data size from the message to the automatic variable is calculated. However, when a wild card is specified for Y in the automatic variable specification, the data size will not be calculated until the condition changes.

When The Next Message Is a Constant and Is 4 Bytes or Less:
The data size from the message to the constant (constant up to 4 bytes) is calculated.

When There Is No Next Message (the Message Is the Last Message):
The data size is calculated from the message to the end of the receive data.

When the Next Message Is a Variable or a Constant Other Than the Ones Described Above:
The system assumes that a wild card is also specified for Y in the next message and the data size will not be calculated until the condition changes.

c) A wild card can be specified for X of (X,Y) for both the address and data, however, a wild card can be specified for Y for data only.

3. **Word Reads**

• Format R (z)

R: Word read option

z: Offset value from the beginning of the word area that was set (linear expressions using variable N can also be used).

• Explanation

Word data from IOM is read and the data is used. The following three methods are available for setting a words.

a) **Operand Specifications**

The words set in the second operand of the PMCR instruction are used.

R (1): Beginning of words set in second operand of PMCR + 1
R (3): Words set in second operand of PMCR + 3
R (2N+1): Words set in second operand of PMCR + 2N + 1

b) **Link Word Specifications**

Link words set in the communications sequence are used.

R (O1+5): Word set for output area 1 of the link words + 5
R (I2+4N+1): Word set for input area 2 of the link words + 4N + 1

The following reserved words are available for link word specification:

I1, I2: Input words 1 and 2 to communications (PC) section from external device

O1, O2: Output words 1 and 2 to external device from communications (PC) section

c) **Direct Specifications**

The IOM area is set directly.

R (CIO 0100): Word CIO 0100 is set.
R (DM 0000+2N+4): Word DM 0000+2N+4 is set.
R (LR0060+6): Word LR 0060+6 (LR 0066) is set.

The following reserved words are available for IOM area specification.

CIO 0000 to 0511: I/O, IR, and SR area words
LR 0000 to 0063: Link area words
HR 0000 to 0099: Hold area words
AR 0000 to 0027: Auxiliary storage area words
DM 0000 to 6655: Data memory area words
EM 000000 to 026143: Expansion data memory (Bank number is set.)

Note 00 to 02 are the bank numbers of the expansion data memory.

The following examples show cases of non-converted variables, variables converted to ASCII, and variables converted to hexadecimal when word read is specified.

• Non-converted Variables (R (z),y)

Data consisting of y bytes, where the high-order byte of address z is the beginning of the data.

(R (DM0000) ,5) → 3132333435 (hexadecimal digits)

DM 0000 3132
DM 0001 3334
DM 0002 3536

• Variables Converted to ASCII $ (R (z) ,y)

Data consisting of y digits from the lowest digit in hexadecimal digits is converted to ASCII beginning in order from the highest digit, where address z is defined as the lowest word.

$ (R (DM0000) ,5) → 3831323334 (hexadecimal digits)

DM 0000 1234 (31323334)
DM 0001 5678 (35363738)

• Variables Converted to Hexadecimal & (R (z) ,y)

Data consisting of y words is converted from the lowest word in hexadecimal digits, where address z is defined as the lowest word in hexadecimal beginning in order from the high-order byte of the highest word.

& (R (DM0000) ,3) → 123456 (hexadecimal digits)

DM 0000	3132 (“12”)
DM 0001	3334 (“34”)
DM 0002	3536 (“56”)

4. **Word Writes**

Use this function when writing word data (receive data) to IOM. This function can be set for receive messages only.

• Format W (z)

W: Word Write option

z: Offset value from the beginning of the words that are set (linear expressions using variable N are also possible).

• Explanation

Word data in IOM is read and the data is used. The following three word setting methods are available.

a) **Operand Specifications**

The words set in the third operand of the PMCR instruction are used.

W (1): Beginning of words set in third operand of PMCR + 1
W (3): Words set in third operand of PMCR + 3
W (2N+1): Words set in third operand of PMCR + 2N + 1

b) **Link Word Specifications**

Link words set in the communications sequence are used.

W (I1+5): Word set for input area 1 of the link words + 5
W (I2+4N+1): Word set for input area 2 of the link words + 4N + 1

The following reserved words are available for link word specification:

I1, I2: Input words 1 and 2 to communications (PC) section from external device

c) **Direct Specifications**

The IOM area is set directly.

W (CIO 0100): Word CIO 0100 is set.
W (DM 0000+2N+4): Word DM 0000+2N+4 is set.
W (LR0060+6): Word LR 0060+6 (LR 0066) is set.

The following reserved words are available for IOM area specification.

CIO 0000 to 0511: I/O, IR, and SR area words
LR 0000 to 0063: Link area words
HR 0000 to 0099: Hold area words
AR 0000 to 0027: Auxiliary storage area words
DM 0000 to 6655: Data memory area words
EM 0000 to 6143: Expansion data memory (for the current bank)
EM 000000 to 036143: Expansion data memory (Bank number is set.)

The following conversion examples show cases of non-converted variables, variables converted to ASCII, and variables converted to hexadecimal.

• Non-converted variables (W (z) ,y)

Receive data consisting of y bytes is stored sequentially from the high-order byte of address z. When the receive data is an odd number of bytes, the low-order byte of the largest address to be written is 00.

(W (DM0000) ,5) → DM0000 1234
DM0001 5678
DM0002 9A00 ← 00 is entered.

Receive data: When 123456789A (hexadecimal)

• Variables Converted to ASCII $ (W (z) ,y)

Receive data consisting of y bytes is converted to ASCII one characters at a time and stored sequentially from the last data that was converted starting from the low-order byte of address z.

$ (W (DM0000) ,3) → DM0000 3132 ← (“12”)
DM0001 3334 ← (“34”)
DM0002 3536 ← (“56”)

Receive data: When 123456 (hexadecimal)

• Variables Converted to Hexadecimal $ (W (z) ,y)

Receive data consisting of y bytes of is converted by byte to hexadecimal and stored sequentially from the last data that was converted starting from the low-order byte of address z. When receive data cannot be converted to by byte to hexadecimal, the data is converted to 0 except for the following cases.

a) When the beginning of receive data is “-”, the data is converted to F (hexadecimal) and the data is stored so that the highest digit of the maximum address becomes F.

b) When the receive data contains “.”, “.” is ignored and the data equivalent of “.” is not stored.

& (W (DM0000) ,5) → DM0000 2345
DM0001 0001

Receive data: When 3132333435 (hexadecimal) → “12345” (ASCII code)

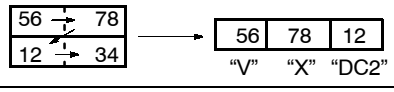
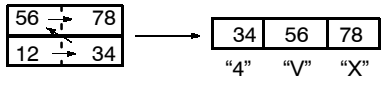
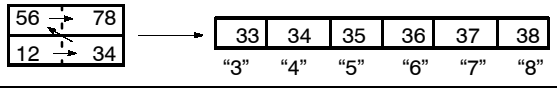
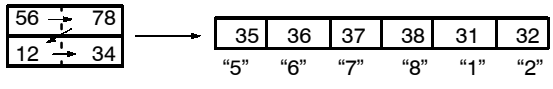
5. **Automatic Variables**

Use automatic variables when setting the length or error check code. When an automatic variable is set and the initial value, start position, and end position of a send message are set, the system automatically generates the length and error check code assuming the initial values and adds the information to the message when sending. At receive processing, the Unit compares the error check code that was received with the error check code that was calculated from the message that was received.

Variable Designation Examples

The following tables indicate the data conversion status when data is transferred from a PC to a communications port and from a communications port to a PC.

Reading Data From a CPU Unit to a Communications Port

Unconverted variables (R(DM0000), 3)	
Reverse-direction unconverted variables ~(R(DM0000), 3)	
ASCII converted variables $ (R(DM0000), 3)	
Reverse-direction ASCII converted variables ~$ (R(DM0000), 3)	

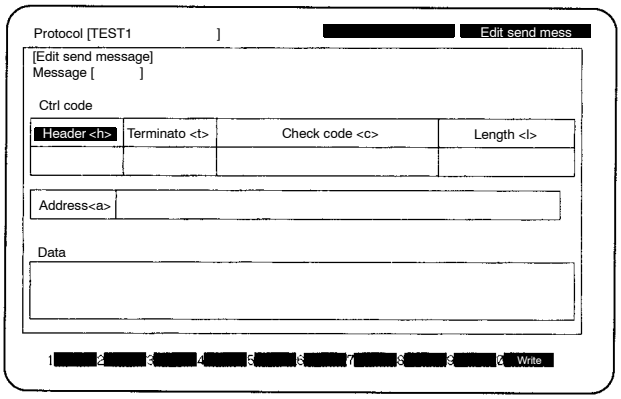
Writing Data From a Communications Port to a CPU Unit

Unconverted variables (W(DM0000), 5)	31 32 33 34 35 "1" "2" "3" "4" "5"	DM0000 31 → 32 DM0001 33 → 34 DM0002 35 → 00
Reverse-direction unconverted variables ~(W(DM0000), 5)	31 32 33 34 35 "1" "2" "3" "4" "5"	DM0000 31 → 35 DM0001 32 → 33 DM0002 00 → 31 Note 1
Hexadecimal converted variables & (W(DM0000), 5)	31 32 33 34 35 "1" "2" "3" "4" "5"	DM0000 23 → 45 DM0001 00 → 01 Note 1
Reverse-direction hexadecimal conversion ~& (W(DM0000), 5)	31 32 33 34 35 "1" "2" "3" "4" "5"	DM0000 12 → 34 DM0001 50 → 00 Note 1

Note When writing data to a CPU Unit, 0 will be stored in the empty bits of write data larger than 16 bits.

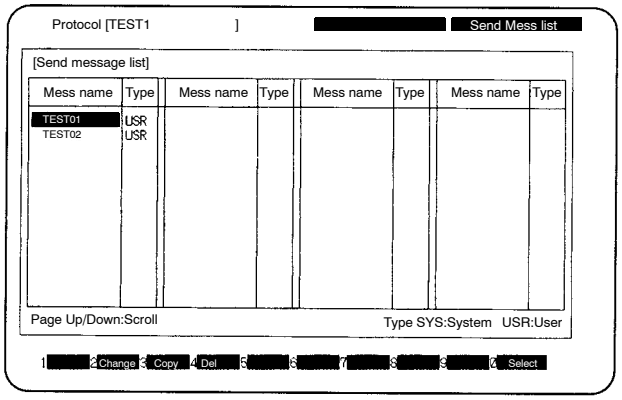
3-2 Editing Send/Receive Messages

1, 2, 3... 1. Move the cursor to the send message field or the receive message field and press the Enter Key. The Send/Receive Message setting screen will be displayed.

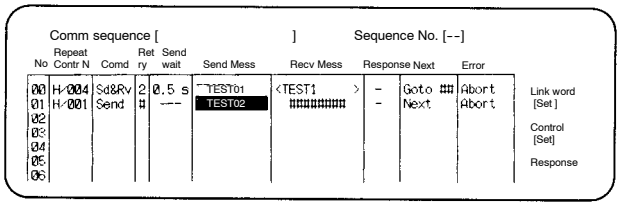


2. Set the following items one by one.

Note a) To display a list of registered send/receive messages, press the F1 Key (List) with the cursor at the send message or receive message input field.



b) To set the same settings of one of the send/receive messages already existing on the screen, move the cursor to the message and press the F10 Key (Select). The message will be displayed in the send/receive message input field and the same settings will be set.



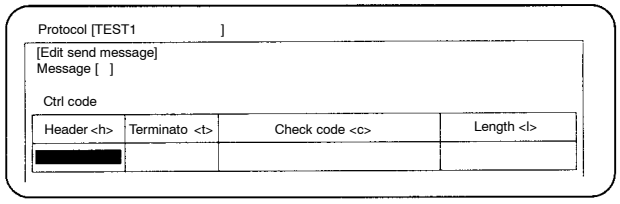
c) When setting a send/receive message similar to the message that was previously registered, copy the similar message in advance using the above method and modify it as required. In this way, you can enhance send/receive message creation efficiency.

d) To delete a send/receive message, move the cursor to the send/receive message input field to be deleted and press the F4 Key (Del). The send/receive message that was set will be deleted.

Header

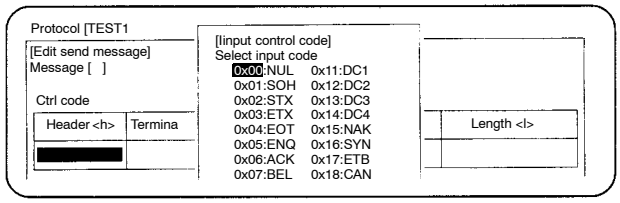
Use the following procedure to set the code prefix the send/receive message. At receive processing, subsequent data will not be recognized as a message until the header is received.

1, 2, 3... 1. Move the cursor to the header and press the Enter Key. The cursor will move to the header input field.

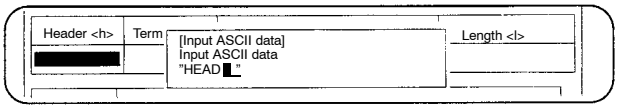


2. Press one of the following function keys.

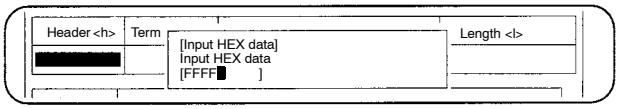
F1 (Code): Assigns a special code to a header. The Special Code selection screen will be displayed. Move the cursor to one of the codes and press the Enter Key. The selected control code will be input.



F2 (ASCII): Assigns an ASCII character to a header. The ASCII Data Input screen will be displayed. Enter an ASCII character and press the Enter Key.



F3 (HEX): Assigns hexadecimal data to a header. When the HEX Data Input screen is displayed, enter the hexadecimal data and press the Enter Key.



F4 (None): Does not set any data to a header.

3. Enter a header and press the Enter Key. The header that was entered will be displayed in the input field and the cursor will move to the header field.

Terminator

Use the following procedure to set the code that indicates the end of the send/receive message. For receive processing, the receive processing ends when the terminator is received.

1, 2, 3...

1. Move the cursor to a terminator item and press the Enter Key. The cursor will move to the terminator input field.
2. Set a terminator using the same procedure as for a header.

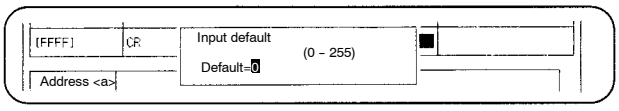
Check Code

Use the following procedure to specify an error check code calculation method.

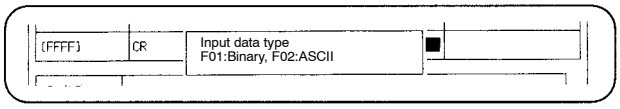
1, 2, 3...

1. Move the cursor to the check code item and press the Enter Key. The cursor will move to the check code input field.
2. Press one of the following function keys.

F1 (LRC): Executes the error check with LRC (horizontal parity). The Initial Value Input screen will be displayed.



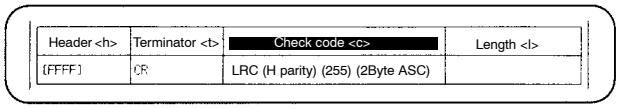
Enter the number of words (0 to 255) for the check code calculation range and press the Enter Key. The following Data Type setting screen will be displayed.



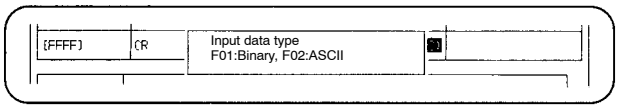
Press either of the following function keys.

F1 (BIN): The data type is binary (1 word).

F2 (ASCII): The data type is ASCII (2 words).



F2 (CRC): The error check is performed by the CRC-CCITT method. The following Data Type setting screen will be displayed.



Press either of the function keys.

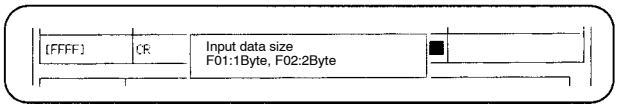
F1 (BIN): The data type is binary (2 words).

F2 (ASCII): The data type is ASCII (4 words).

Note a) When 1 byte is selected as the data size, the data is one word in binary and two words in ASCII.

b) When 2 bytes is selected as the data size, the data is two words in binary and four words in ASCII.

F3 (SUM): The error check is performed by the SUM method. The following Data Size setting screen will be displayed.

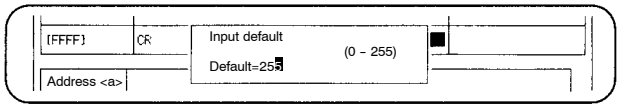


Press either of the function keys.

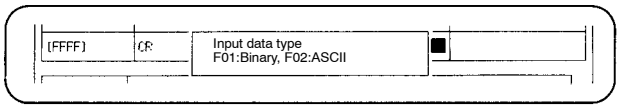
F1 (1Byte): The size of binary data is one word.

F2 (2Byte): The size of binary data is two words.

The following Initial Value Input screen will be displayed. Enter the number of words for the check code calculation and press the Enter key.



The following Data Type setting screen will be displayed.



Press one of the following function keys.

F1 (BIN): The data is binary (1 word or 2 words)

F2 (ASCII): The data is ASCII (2 words or 4 words).

F4 (None): No Error Check code is set.

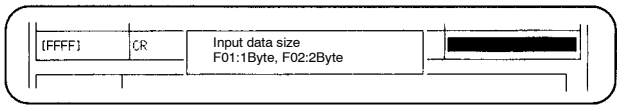
Length

Use the following procedure to set the length. The data length is the length following the Length setting in a frame and is calculated automatically at send processing. The Length data added when sending.

1, 2, 3...

1. Move the cursor to the length item and press the Enter Key. The cursor will move to the length input field.
2. Press the following keys.

F1 (Vari): Sets the length as an automatic variable. The following Data Size setting screen will be displayed.

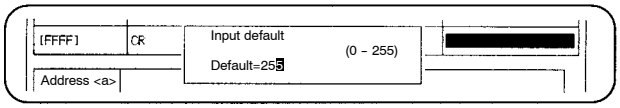


Press either of the function keys.

F1 (1Byte): The data size of the length field is set to one word.

F2 (2Byte): The data size of the length field is set to two words.

The Initial Value Input screen will be displayed.

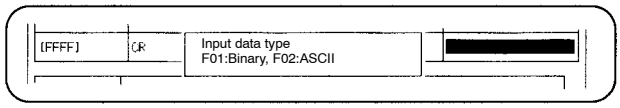


Enter the data length of the message and press the Enter Key.

When the data size of the length field is one word: 0 to 255

When the data size of the length field is two words: 0 to 65535

The Data Type setting screen will be displayed.



Press either of the following function keys.

F1 (BIN): The Length data is binary.

F2 (ASCII): The Length data is ASCII.

F4 (None): The Length is not set.

Address

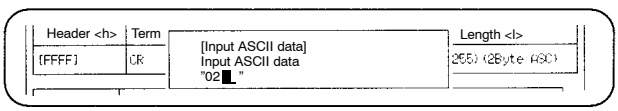
Use the following procedure to set the message destination (unit No.).

1, 2, 3...

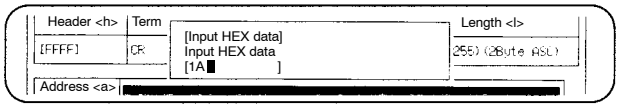
1. Move the cursor to the address item and press the Enter Key. The cursor will move to the address input field.
2. Press one of the following function keys.

F1 (Const): Sets the address with a constant. Press either of the following function keys.

F2 (ASCII): Sets the address with ASCII data. The following ASCII data input field will be displayed. Enter a Unit No. and press the Enter Key.

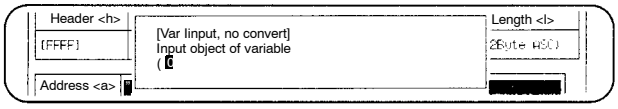


F3 (HEX): Sets the address with hexadecimal. The following HEX data input field will be displayed. Enter a Unit No. and press the Enter Key.

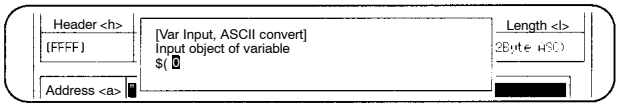


F2 (Vari): Sets the address as a variable. Press either of the following function keys.

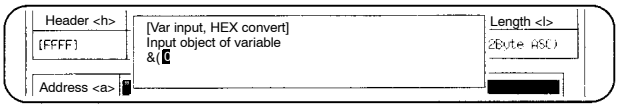
F1 (NoConv): Sets the address with a non-converted variable. The following address input screen will be displayed. Enter an execution address and press the Enter Key. The cursor will move to the data size input field. Enter a data size and press the Enter Key.



F2 (ASCII): Inputs the address as a variable converted to ASCII. The following address input screen will be displayed. Enter an execution address and press the Enter Key. The cursor will move to the data size input field. Enter a data size and press the Enter Key.



F3 (HEX): Inputs the address as a variable converted to hexadecimal. The following address input screen will be displayed. Enter an execution address and press the Enter Key. The cursor will move to the data size input field. Enter a data size and press the Enter Key.



Note Variable N, wild cards (receive message only), Word Reads, and Word Writes (receive message only) can be used to set execution addresses and data sizes for variables. The following function keys can be used to input variable N and for specifying areas.

F1 (N)

N+ is input automatically.

F3 (Word)

An area and a link words are assigned to the function keys and displayed. When a function key is pressed, the area and a word number input field will be displayed on the screen.

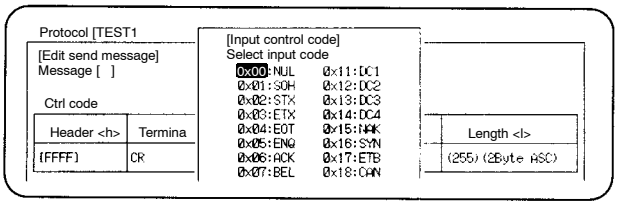
Data Use the following procedure to set the send/receive message.

1, 2, 3... 1. Move the cursor to a data item and press the Enter Key. The cursor will move to a data input field.

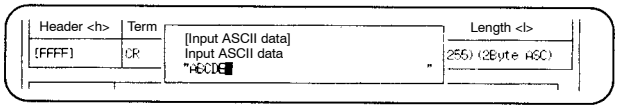
2. Press either of the following function keys.

F1 (Const): Sets the data as a constant. Press one of the following function keys.

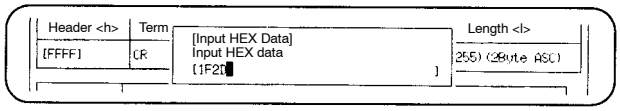
F1 (Code): Sets the message with a control code. The following control Code selection screen will be displayed. Move the cursor to one of the codes and press the Enter Key.



F2 (ASCII): Sets the messages with ASCII data. The following Message Input screen will be displayed. Enter a message with ASCII data and press the Enter Key.



F3 (HEX): Sets the message with HEX data. The following Message Input screen will be displayed. Enter a message with HEX (hexadecimal) data and press the Enter Key.



F2 (Vari): Sets the message as a variable. The setting method is the same as for an address.

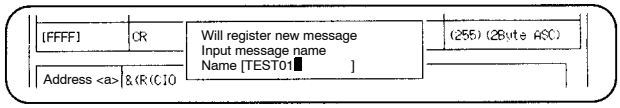
Note A header, a length, an error check code, and a terminator forming a send/receive message can be set for the data in addition to a constant or a variable. See Section *3-1 Creating Send/Receive Messages* for details.

3-2-1 Write

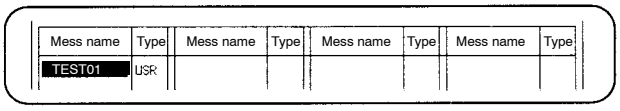
Use the following procedure to register the send/receive message that has been set.

1, 2, 3...

1. Press the F10 Key (Write) after all the settings are completed on the Send/Receive Message setting screen. The Message Name Input screen will be displayed.
2. Enter a message name and press the Enter Key.



3. The name will be displayed in the send/receive message input field.



3-2-2 Deleting Messages

Use the following procedure to delete messages that have been written.

1, 2, 3...

1. Move the cursor to the send/receive message field on the Edit Sequence screen.
2. Press the F4 Key (Del). The message will be deleted.

Note Even if a message is deleted on the Edit Sequence screen, the message data will remain. To delete the message data, delete the message data from the Send/Receive Message List screen.

3-3 Managing Send/Receive Messages

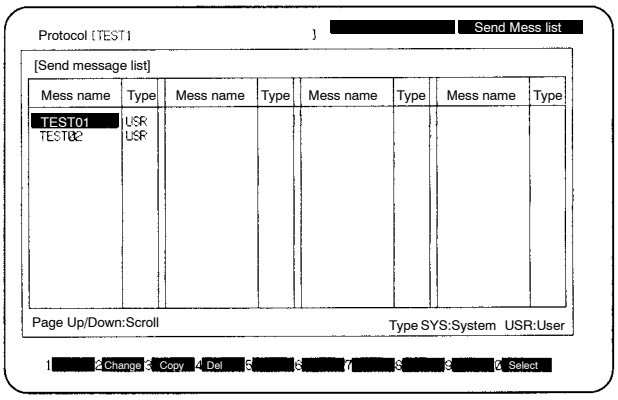
Lists of send/receive messages can be displayed to change names, copy messages or delete messages.

3-3-1 Displaying a Message List

Use the following procedure to display a list of send/receive messages that have been registered.

1, 2, 3...

1. Move the cursor to the send message or receive message input field.
2. Press the F1 Key (List). A list of the send messages or receive messages that have been registered will be displayed.



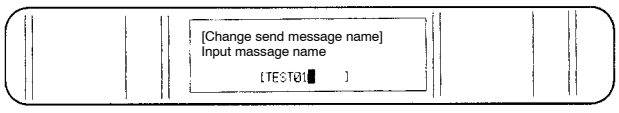
Note A send or receive message list can also be displayed by pressing the F9 Key (SeMess) or the F10 Key (ReMess).

3-3-2 Changing Message Names

Use the following procedure to change the name of messages that has been registered on the send/receive message list.

1, 2, 3...

1. Move the cursor to the message line of the message whose name is to be changed on the Send/Receive Message List screen and press the F2 Key (Change). The Message Name Input screen will be displayed.



2. Enter a new send/receive message name and press the Enter Key. The changed message name will be displayed.

Note When a message is deleted from the Message List screen, the messages used in steps will also be deleted. Be careful when deleting any messages.

3-3-3 Copying Send/Receive Messages

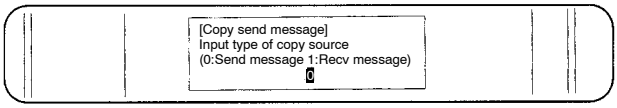
Use the following procedure to copy a message that has been registered on the send/receive message list. Send messages can also be copied as receive messages.

Copying Send Messages

Use the following procedure to copy a message that has been registered on the send message list. The message can also be copied as a receive message list.

1, 2, 3...

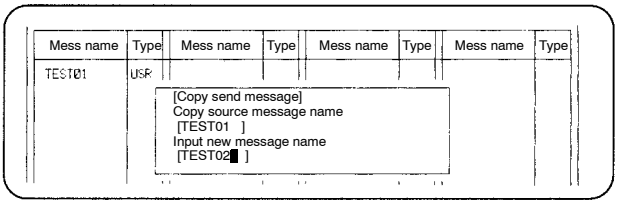
1. Move the cursor to the line of the message to be copied on the Send Message List screen and press the F3 Key (Copy). The Copy Destination Type screen will be displayed.



2. Enter one of the following options and press the Enter Key.

   0: The message is copied as a send message.
   1: The message is copied as a receive message.

3. The Message Name Input screen will be displayed. Enter a new send or receive message name and press the Enter Key. The specified message will be displayed in the send or receive message list with the new name that was set.

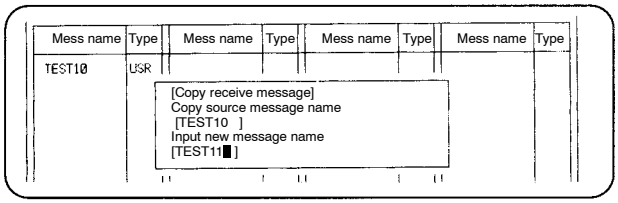


Copying Receive Messages

Use the following procedure to copy messages that have been registered on the receive message list. Receive messages cannot be copied as send messages.

1, 2, 3...

1. Move the cursor to the line of the message to be copied on the Receive Message List and press the F3 Key (Copy). The Message Name Input screen will be displayed.



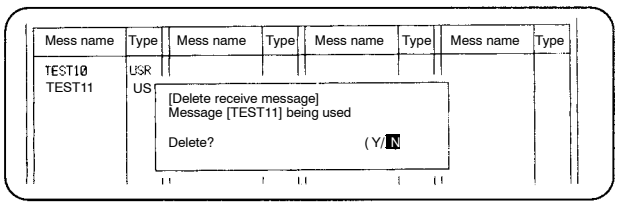
2. Enter a new receive message and press the Enter Key. The specified message will be displayed in the list with the new name.

3-3-4 Deleting Messages

Use the following procedure to delete a message that has been registered in the Send/Receive Message List.

1, 2, 3...

1. Move the cursor to the line of the message to be deleted in the Send/Receive Message List screen and press the F4 Key (Del). A verification message will be displayed.



2. Press either of the following keys and the Enter Key.

   Y: The specified message is deleted.
   N: Deletion is canceled.

3-4 Editing Receive Matrices

Use the following procedure to set a receive matrix when there is more than one possible message expected and next process is to be changed for each receive message.

Receive Message

Up to 15 messages can be set in a receive matrix. “Other” must also be set when to enable processing when a message other than the receive messages in the matrix is received.

Next Process

In a receive matrix, set the next process after each receive message is received. The following four settings are available.

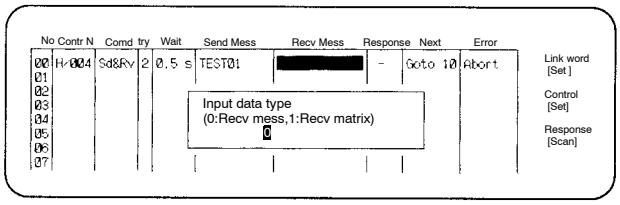
- **End Sequence Processing: End**
  When the receive message is received, the sequence processing ends.
- **Go to Set Step No.: Goto****
  When the receive message is received, control is passed to the communications sequence that was set for **.
- **Go to Next Step: Next**
  When the receive message is received, control is passed to the next step.
- **Abort Processing: Abort**
  When the receive message is received, the step is interrupted and the sequence ends.

Note

1. When an error occurs, processing is performed based on the contents of the Error Process of the step of the communications sequence.
2. A receive matrix can be set for the receive message when the command setting for the step is set to Recv (receive).
3. A receive matrix can be copied from a list screen also. Matrix name changes, copying, and deletion processing on the Matrix screen are the same as for message editing.

1, 2, 3...

1. When the command setting for the step is Recv (receive) and the Enter Key is pressed in the receive message field, the following Data Type selection menu will be displayed.

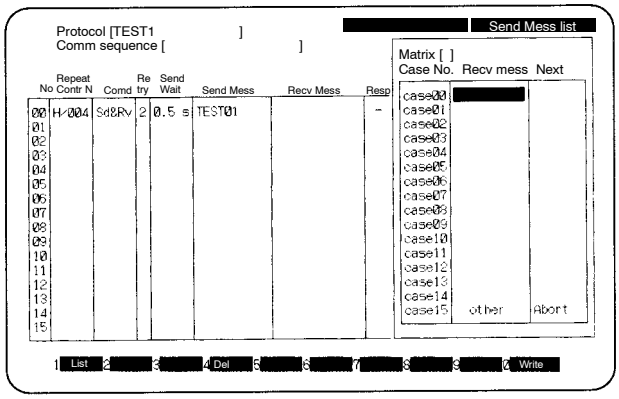


2. Press either of the following keys and the Enter Key.

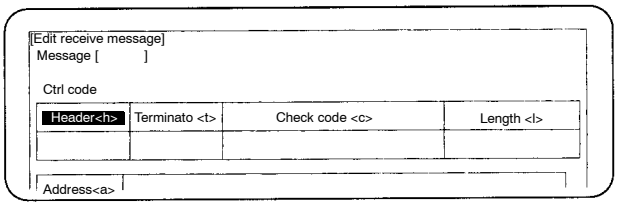
   0: Recv mess
   Set a receive message. See the description of message editing for the setting method.

   1: Recv matrix
   Set a receive matrix.

3. When "1:Recv matrix' is selected, the Receive Matrix setting screen will be displayed.



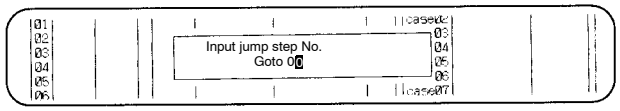
4. Move the cursor to the receive matrix input field and press the Enter Key. The Receive Message setting screen will be displayed. Set receive messages in the same procedure for receive message editing.



5. The cursor will move to the next process input field. Press one of the following function keys.

   F1 (End): When the step ends, the sequence ends normally.

   F2 (Goto): Control is passed to the specified step No. The following Step No. Input screen will be displayed.



   Enter a step No. of the jump destination and press the Enter Key.

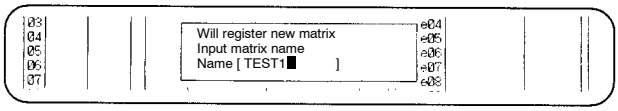
   F3 (Next): Control is passed to the next step.

   F4 (Abort): The step is interrupted and the sequence ends.

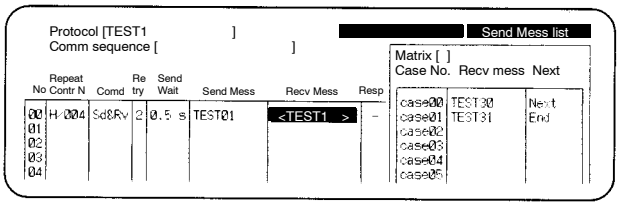
6. Set as many receive matrices as required using the same procedure.
7. The receive message input field for case 15 will already be set to "other." Set the next process only.

   Note For "other," set the next process to be used when a message that does not match any message in the receive matrix is received.

8. Press the F10 Key (Write) when the receive matrix has been set. The matrix name input field will be displayed.



9. Enter a receive matrix name and press the Enter Key. The name that has been input will be displayed in the matrix name display field and receive message input field.



Note a) When Write processing is performed, the matrix is also registered in the Matrix List screen.

b) Matrix names can be changed, and the matrices copied or deleted on the Receive Matrix List screen, in the same way as for the Send/Receive Message List screen.

c) When the matrix list is displayed with the cursor on the receive message input field on the Receive Matrix setting screen, any matrix can be selected and the Enter Key pressed to input the matrix into the receive message input field. This procedure can be used to efficiently create new matrices by modifying existing matrices.

SECTION 4
Managing Protocol Data

This section describes how to manage, save, and retrieve protocol data that has been created, and how to transfer the protocol data to the PC.

4-1 Managing Protocol Data

This section describes the procedures for creating, copying, and deleting protocol data and changing protocol data names. The following data can be deleted or copied.

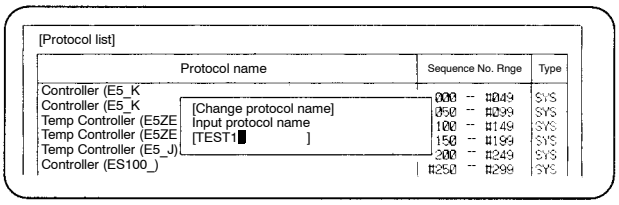
Data	Unit of deletion or copying
Protocol data	Protocol data for a specified protocol
Communications sequences	Sequence data for a specified protocol
Send/receive messages	Message data for a specified protocol
Receive matrices	Receive matrix data for a specified protocol

4-1-1 Creating New Protocols

Use the following procedure to create a new protocol.

1, 2, 3...

1. Press the F1 Key (New) from the initial screen. The following message will be displayed.
2. Enter the name of the protocol to be created using up to 30 characters and press the Enter Key.

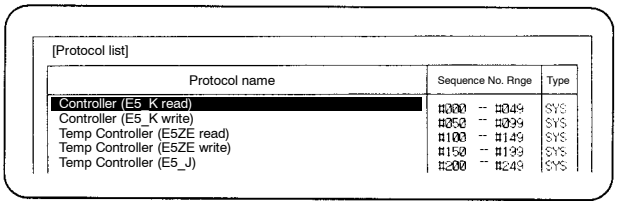


Note a) USR will be displayed in the extension field automatically.

b) When a protocol name that already is being used is entered, the error message “Already defined” will be displayed. Enter a different name.

c) No more than 20 protocols can be registered.

3. The protocol name that was input will be displayed on the last line of the protocol list.

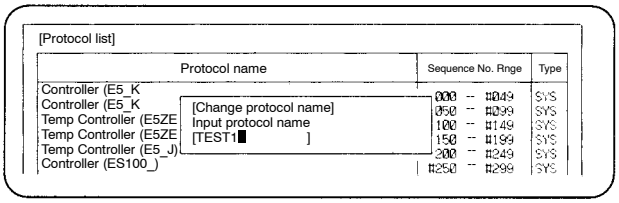


Note To edit the communications sequence, refer to *2-2 Editing Communications Sequences.*

4-1-2 Changing Protocol Names

Use the following procedure to change the registered protocol name. Names of protocols with an SYS extension cannot be changed.

1, 2, 3... 1. Select the protocol to be changed from the protocol list and press the F2 Key (Change). The following message will be displayed.

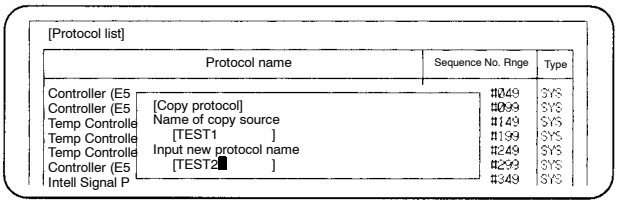


2. Enter a new protocol name and press the Enter Key.

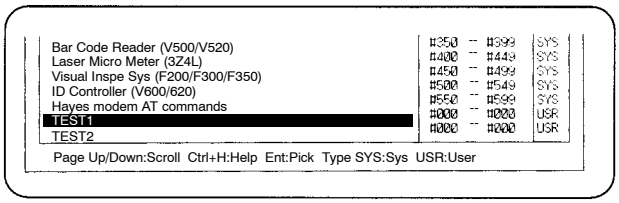
4-1-3 Copy

Use the following procedure to copy a protocol. Protocols with an SYS extension can be copied, but the extension of the new protocol will be USR.

1, 2, 3... 1. Select the protocol to be copied from the protocol list and press the F3 Key (Copy). The following message will be displayed.
2. Enter a new protocol name and press the Enter Key.



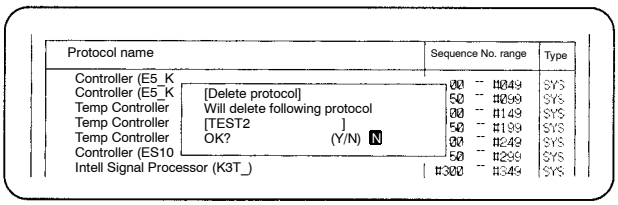
3. The name of the protocol that was copied will be displayed on the last line of the protocol list.



4-1-4 Deleting Protocols

Use the following procedure to delete a protocols. Protocols with an SYS extension cannot be deleted.

1, 2, 3... 1. Select the protocol to be deleted from the protocol list and press the F4 Key (Del). The following message will be displayed.



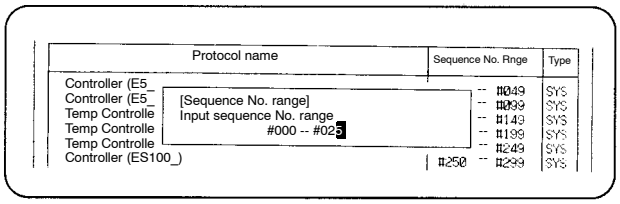
2. Press either of the following keys and the Enter Key.
   Y: Deletes the protocol.
   N: Cancels deletion.

4-2 Specifying Communications Sequence Number Ranges

Use the following procedure to specify the range of the communications sequence numbers that are used by a specified protocol. An error will occur if the specified range is smaller than the one of the registered communications sequence. Sequence number ranges cannot be set for protocols with an SYS extension.

1, 2, 3...

1. Select the protocol for which the communications sequence number range is to be set from the protocol list and press the F5 Key (NoRnge). The following message will be displayed.
2. Enter a starting number and press the Enter Key. The cursor will be moved to the ending number input field. Enter an ending number and press the Enter Key. Example: 000 (Enter Key) 025 (Enter Key)



Note a) To return to the starting number input field from the ending number input field, press the BackSpace Key.

b) The cursor cannot be moved between the starting and ending number input fields.

c) To change a number, enter a new number from the beginning.

3. The message will be cleared and the sequence number range of the protocol will be displayed with the specified range.

4-3 Saving and Retrieving Protocol Data

This section provides the procedures for saving and retrieving protocol data and system settings. The data items that can be saved and retrieved are listed in the following table

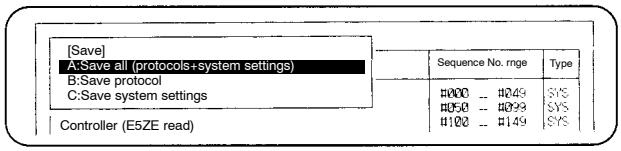
Item	Save/retrieve unit		
	Save/retrieve all	**Save/retrieve protocol**	**Save/retrieve system settings**
Protocols	All protocol data	Protocol data for the specified protocol	–
Communications sequences	All sequence data	Sequence data for the specified protocol	–
Send/receive messages	All message data	Message data for the specified protocol	–
Receive matrices	All matrix data	Matrix data for the specified protocol	–
System settings	PC port A/B setting data	–	PC port A/B setting data

4-3-1 Save

Use the following procedure to save the selected protocol on to a disk.

1, 2, 3...

1. Press the F6 Key (Save) on the initial screen. The following message will be displayed.



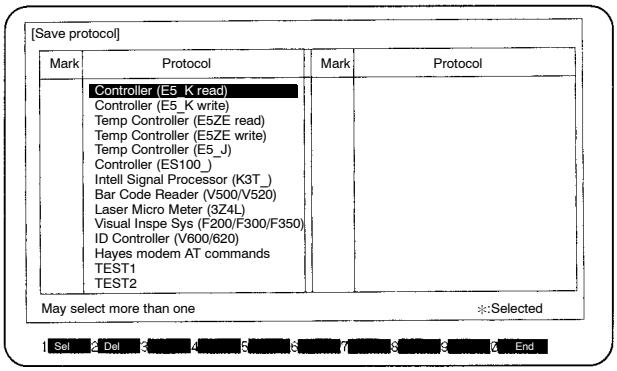
2. Select one of the following options and press the Enter Key.

   A: Save all (protocols + system settings)
   Saves setting data of all the protocols. Go to *item 6.*

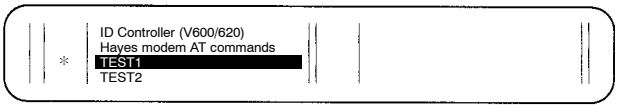
   B: Save protocol
   Saves protocol setting data that was selected. Go to *item 3.*

   C: Save system settings
   Saves system setting data. Go to *item 6.*

3. When B:Save protocol is selected, the following Protocol selection screen will be displayed.

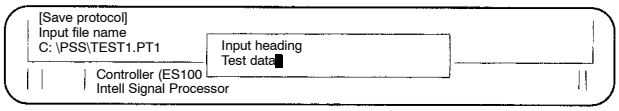


4. Move the cursor to the protocol to be saved and press the space or F1 Key (Sel). An asterisk (*) will be displayed in the protocol mark field. The protocol with "*" will be saved.



5. When all the protocols to be saved has been selected, press the F10 Key (End).
6. A file name input message will be displayed. Enter a file name using up to 8 characters (no extension is required) and press the Enter Key.

7. A message prompting input of a title will be displayed. Enter the title to be attached to the file to be saved (using up to 30 characters) and press the Enter Key.



Note a) To delete the asterisk mark, select the protocol and press the space or F2 Key (Del), the asterisk mark will be cleared and the protocol will not be saved.

b) The directory specified in the system setting will be displayed as the default for the directory to which the file is stored.

c) The extension will be displayed automatically.

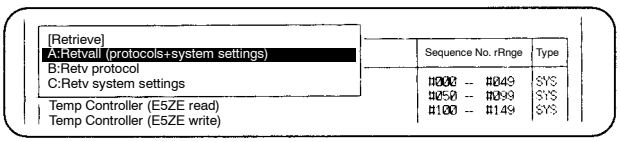
d) When the END Key is pressed, a list of the files that have been stored in a default directory will be displayed. When one of the files is selected, data can be overwritten to the file.

e) When the specified file name already exists, a confirmation message will be displayed. To overwrite the file, enter Y and to save the file with a different name, enter N and press the Enter Key.

4-3-2 Retrieve

Use the following procedure to retrieve protocol data or system settings from a disk.

1, 2, 3... 1. Press the F7 Key (Retv) on the initial screen. The following Retrieve specification screen will be displayed.



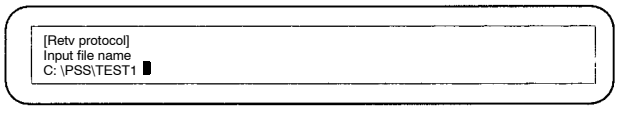
2. Select one of the following options.

A: Retrieve all
Retrieves all the files that have been saved.

B: Retrieve protocol
Retrieves files in which the protocols were saved.

C: Retrieve system settings
Retrieves files in which the system settings were saved.

3. A file name input message will be displayed. Enter the file name using up to eight characters (no extension is required) and press the Enter Key.



4. The specified file will be retrieved and will be displayed on the bottom line of the Protocol List screen.

Note a) The directory specified in system setting will be displayed as the default for the directory from which the file is retrieved.

b) The extension will be displayed automatically.

c) When the END Key is pressed, a list of the save files that have been stored in a default directory will be displayed. When one of the files is selected, the selected file can be retrieved.

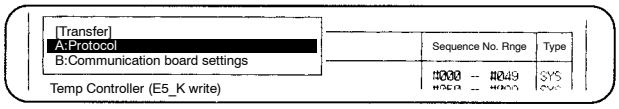
d) When Retrieve All is specified, the file is retrieved an overwritten over the current data. Therefore, a confirmation message will be displayed. Enter Y or N and press the Enter Key.
Y: Overwrites the current data (current data will no longer exits).
N: Cancels the retrieve.

e) When the same protocol as the protocol being retrieved already exists, a confirmation message will be displayed. Enter Y or N and press the Enter Key.
Y: Overwrites the current data (current data will no longer exists).
N: Cancels the retrieving.

4-4 Transferring Protocol Data

Use the following procedure to transfer the protocol or system setting data stored on the computer or Communications Board between the computer and a Communications Board. For instance, protocols created using the Protocol Support Software can be transferred to a Communications Board or the protocol or system setting data in a Communications Board can be transferred to the Protocol Support Software and edited on the computer.

1, 2, 3... 1. Press the F8 Key (Transf) on the initial screen. The Transfer data selection screen will be displayed.



2. Select either of the following options.

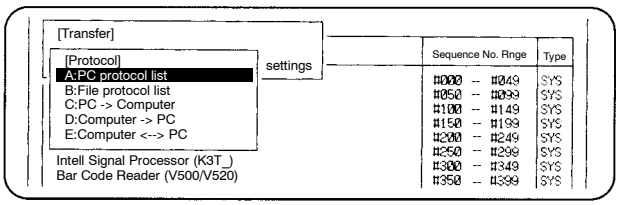
A: Protocol
Transfers protocol data.

B: Communication Board Setting
Transfers system setting data.

Protocol Data

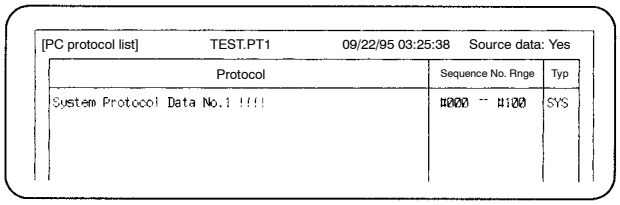
Use the following procedure for transferring protocol data.

1, 2, 3... 1. The transfer process submenu will be displayed.

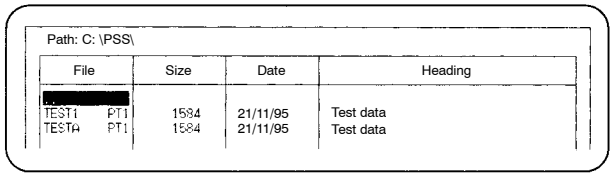


2. Select one of the following options.

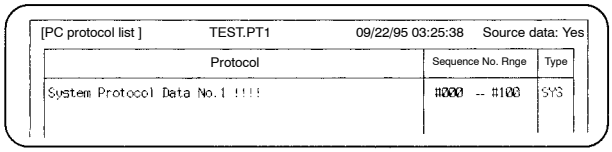
A: PC Protocol List
Protocol data stored in a Communications Board is read and the list will be displayed on the computer screen



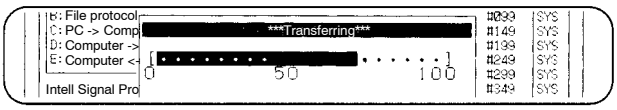
B: File Protocol List
A list of the protocol data files stored in the computer will be displayed.



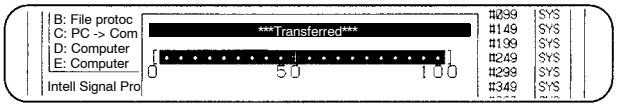
C: PC -> Computer
Protocol data stored in a Communications Board is transferred to the computer. A list of protocol data registered in the Communications Board will be displayed.



The transfer will start when the F1 Key (Start) is pressed.



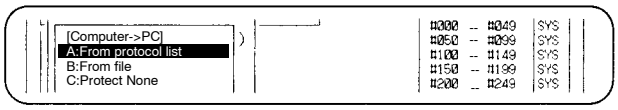
When transfer ends, the following screen will be displayed.



The transfer process can be cancelled by pressing any key. The protocol data transferred from the PC is stored with the file name displayed in the protocol list shown above.

D: Computer -> PC

The protocol data in the computer is transferred to a Communications Board. A processing selection menu will be displayed.



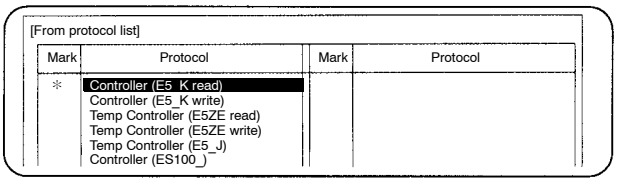
A: Protocol list

Select a protocol from the protocol list currently being edited to transfer the data. The following Protocol selection screen will be displayed. Move the cursor to the protocol data to be transferred and press the F1 Key (Sel). An asterisk (*) will be displayed.

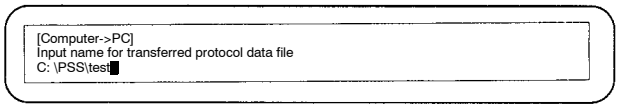
Note a) When the PC is running, the confirmation message "PC will be stopped. OK ? (Y/N)" will be displayed. Enter Y and press the Enter Key to continue. The Protocol selection screen will be displayed and the PC mode will be set to PROGRAM mode.

b) Move the cursor to a protocol data with an asterisk and press the F2 Key (Del) to clear the asterisk so the protocol data will not be transferred.

⚠ Caution Change the operating mode of the PC only after checking that the facility will not be influenced by stopping operation. Serious or unexpected results may occur if a system is abruptly stopped.



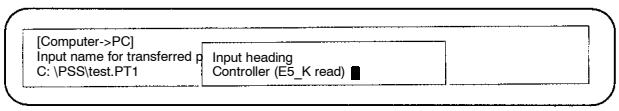
Once asterisks are appended to all the protocol data items to be transferred. Press the F10 Key (End). The following File Name Input screen will be displayed.



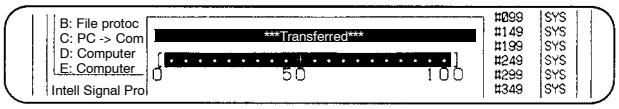
Enter a file name (up to eight characters) and press the Enter Key. The following Title Input screen will be displayed.

Note a) An extension is not required for the file name, the extension ".PT1" will be automatically added.

b) When a protocol is transferred by selecting from a protocol list, the protocol data is also saved when transferred.



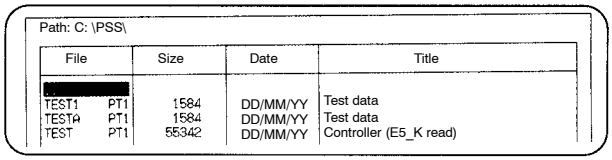
Enter a title (up to 30 characters) and press the Enter Key. Transferring will be displayed and the transfer will start. When transfer ends, “Transferred” will be displayed.



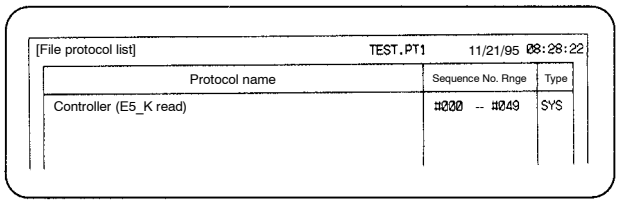
When the Esc Key is pressed, control will returned to the Transfer processing submenu.

B: From File

Select a file from the protocol data files that have been saved to transfer it. A list of saved files that are stored in the drive will be displayed.



Move the cursor to one of the files and press the Enter Key. A list of the protocols that are stored in the file will be displayed.



Press the F1 Key (Start) to start the transfer. “Transferring” will be displayed. When transfer ends, “Transferred” will be displayed. Press the Esc Key to return to the Transfer submenu.

C: Protect

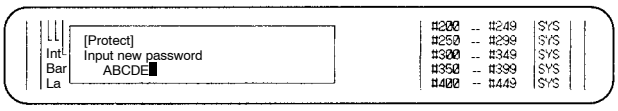
This function sets and releases protection of protocol data. The Protect function requests input of a password for PC → File Read processing and File → PC Write processing. When the password that was entered does not match, the function disables execution of PC → File Read processing and File → PC Write processing.

The Processing selection submenu will be displayed.

Select either of the following options.

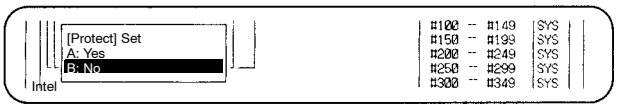
A: Yes:

Sets the Protect to be set.

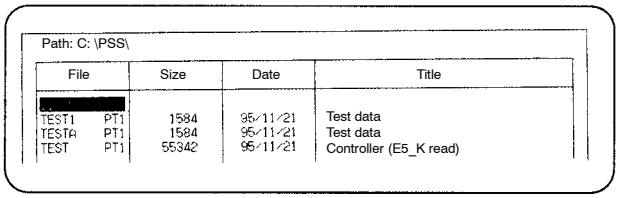


Enter a password (up to eight alphanumeric characters with no spaces) and press the Enter Key. Control is returned to the submenu.

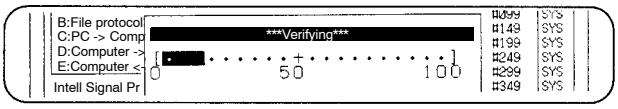
B: No
Releases Protect.



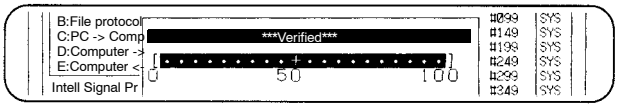
E: Computer <--> PC
This function compares the protocol data saved in the computer with the protocol data that is stored in the PC. A list of protocol data files stored in the data drive will be displayed.



Move the cursor to the protocol to be compared and press the Enter Key. The Protocol List screen will be displayed.



When the F1 Key (Start) is pressed, “Verifying” will be displayed and when confirmation ends, “Verified” will be displayed.



When the Esc (or 1) Key is pressed, control is returned to the Transfer submenu.

Note a) Confirmation is performed for each communications sequence. When a confirmation error has occurred, a message to confirm the error will be displayed and process will be interrupted. Press the 1 Key to return control to the submenu.

b) If all the sequences match without causing a confirmation error, “Verified” will be displayed. Press the 1 Key at this point to return control to a submenu.

Communications Board Settings

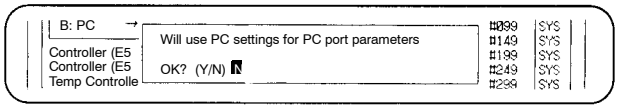
Use the following procedure to read/write system setting data for a communications port of a Communications Board.

1, 2, 3... 1. The following submenu will be displayed.

2. Select either one of the following options.

A: PC → Computer

This function reads the communications port setting data of a Communications Board and displays it on the computer screen. The following confirmation screen will be displayed.



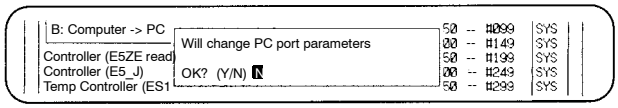
Enter Y or N and press the Enter Key.

Y: Reads communications port setting data of a Communications Board and replaces the computer system settings.

N: Cancels the reading of communications port setting data.

B: Computer → PC

This function transfers communications port setting data of the PC Setup to a Communications Board. The following confirmation screen will be displayed.



Enter Y or N and press the Enter Key.

Y: Transfers communications port setting data of the PC Setup to a Communications Board.

N: Cancels transfer of communications port setting data.

Note When the computer running the Protocol Support Software and PC are connected using a port of a Communications Board, the setting data of the communications port that is connection can be changed. Changes, however, can cause communications errors.

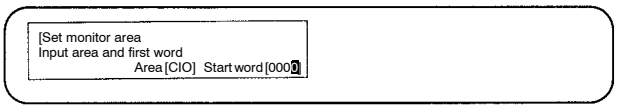
SECTION 5
Other Functions

This section describes monitoring PC words and the transmission line tracing.

5-1 Monitoring PC Words

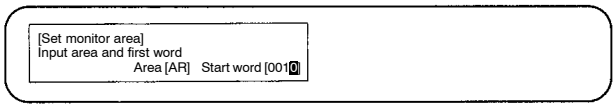
Use the following procedure to monitor a specified word or change the present value.

1, 2, 3... 1. Press SHIFT+F8 Keys (Monitr) from the initial screen. The following monitor specification screen will be displayed.



⚠ Caution Change the operating mode of the PC only after checking that there will be no influence on the facility. Changing mode abruptly can have serious or unexpected results.

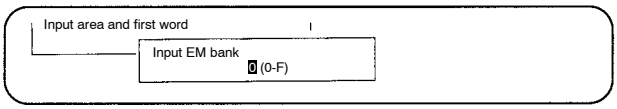
2. Press the function key for the area to be monitored and enter the starting word.



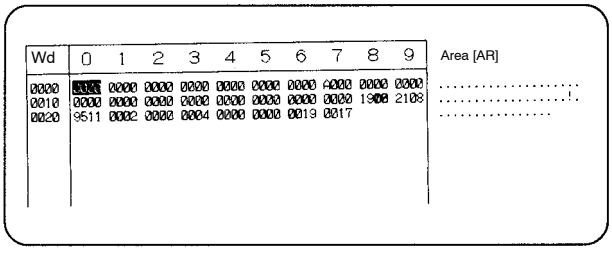
Note a) The following areas are assigned to function keys.
F1 (CIO), F2 (LR), F3 (HR), F4 (AR), F5 (DM), and F6 (EM)

b) The following area ranges can be specified.
CIO 0000 to 0511
LR 0000 to 0063
HR 0000 to 0099
AR 0000 to 0027
DM 0000 to 6655
EM 0000 to 6143

c) When EM is specified as the area, the bank specification screen will be displayed.



3. When the Enter Key is pressed, the monitor screen for the specified word will be displayed.



4. To change the present value, move the cursor to the word position and enter hexadecimal data (monitoring will be halted).

⚠ Caution Change the memory values only after checking that the facility will not be influenced. Serious or unexpected results can occur if memory values are changed without knowing the results.

Note Monitoring can be repeated by pressing the F1 Key (Area).

5. When the Esc Key is pressed, the monitor screen is cleared and control is returned to the monitor specification screen.

5-2 Tracing Transmission Lines

Transmission data and transmission signals of up to 670 characters can be traced to debug communications sequences.

Tracing Method

The following two tracing methods are available.

- **Continuous Traces**
  The trace is executed until stopped. When the trace buffer becomes full during tracing, data will be discarded starting from the oldest data.
- **Short Traces**
  The trace ends when the trace buffer becomes full. The entire trace data from the start of trace remains in the trace buffer.

Trace-related Bits

Trace related flags are listed in the following table.

Type	Port	Address	State
Continuous Trace Start/Stop Bit	Port A	28902	The continuous trace starts on the rising edge and ends on the falling edge.
	Port B	28903	This bit is Invalid during short traces.
Short Trace Start/Stop Bit	Port A	28904	The short trace starts on the rising edge and ends on the falling edge.
	Port B	28905	This bit is Invalid during continuous traces.
Trace Execution/Completion Flag	Port A	28600	ON: Continuous or short trace being executed.
	Port B	28601	OFF: Short trace stopped by full buffer (when Short Trace Start/Stop Bit is still ON).

Note
a) The ON/OFF status of control signals is not sampled accurately. Use the results as reference only.
b) The ON/OFF status of the RS, CS, ER, and DR signals is sampled when one character of transmission data is sent or received. Changes without data transmission or changes during transmission of one character are not sampled.
c) The ON/OFF status of the CS and DR signals may be different before or after the reception finished data of a receive message.

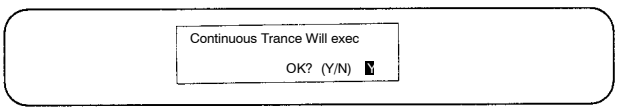
1, 2, 3...

1. When the SHIFT+F7 Keys (Trace) are pressed from the initial screen, the following processing selection submenu will be displayed. Move the cursor to one of the following options and press the Enter Key.

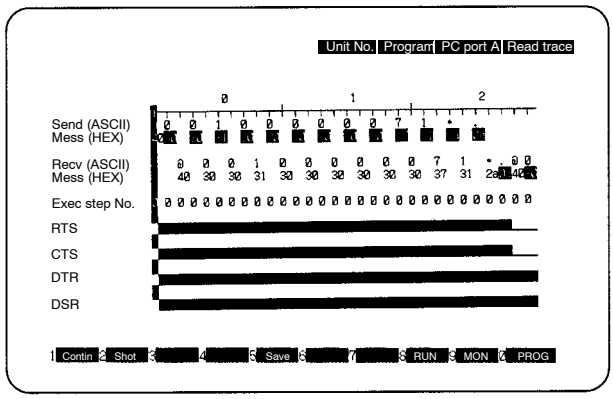
⚠ Caution Change the operating mode of the PC only after checking that there will be no influence on the facility. Changing mode abruptly can have serious or unexpected results.

A: PC port A

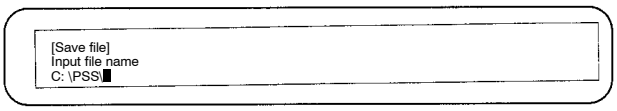
PC communications port A is traced. When the F1 Key (Contin) is pressed, the following confirmation screen will be displayed.



Enter Y and press the Enter Key. The continuous trace will start and the Trace screen will be displayed.



When the F5 Key (Save) is pressed, the following File Name Input screen will be displayed.



Enter the file name (up to eight characters) in which trace data is to be saved and press the Enter Key. Trace data is saved in a data drive.

Note a) An extension will be displayed automatically. Input of an extension is not required.

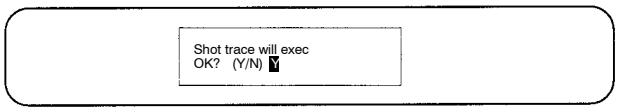
b) When the F8 Key (RUN) is pressed, the PC will change to RUN mode.

c) When the F9 (MON) Key is pressed, the PC will change to a MONITOR mode.

d) When the F10 Key (PROG) is pressed, the PC will change to a PROGRAM mode.

e) Set the PC to RUN mode during the trace.

When the F2 Key (Shot) is pressed, the following confirmation screen will be displayed.



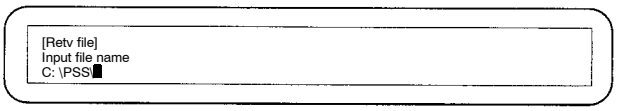
When Y is entered and the Enter Key is pressed, short trace starts and the Trace screen will be displayed.

B: PC port B

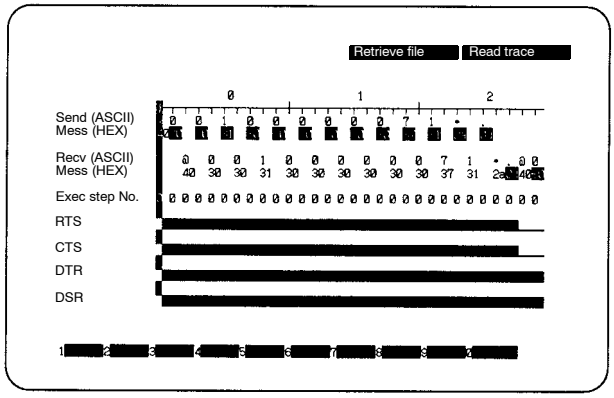
PC port B is traced. The operation procedure is the same as for PC port A.

C: Retv file

The trace data that was saved can be retrieved using this function. The following file name input screen will be displayed.



Enter a file name (up to eight characters) and press the Enter Key. The trace data that was saved will be displayed on the screen.



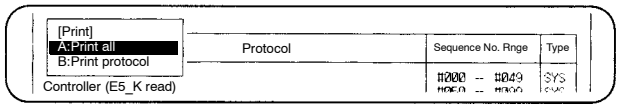
Note a) When PC is executing a trace, “Tracing” will be displayed.

b) When there is no trace data, the error message “No trace data” will be displayed.

5-3 Print

Use the following procedure to print protocol data.

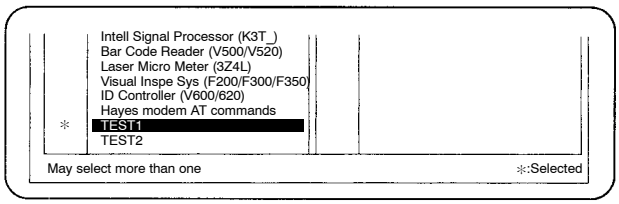
1, 2, 3... 1. Press the SHIFT+F9 Keys (Print) from the initial screen. The following processing selection screen will be displayed.



2. Move the cursor to either of the following options and press the Enter Key. A confirmation message will be displayed.

A: Print all: Prints data of all the protocols that have been registered.

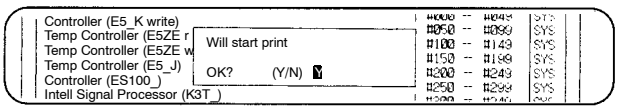
B: Print protocol: Prints the specified protocol data. The Protocol List screen will be displayed. Move the cursor to the protocol to be printed and press the space or F1 Key (Select).



Note a) An asterisk will be displayed in the mark field of the protocol for which the space or F1 Key (Select) is pressed indicating the data is to be printed.

b) When the cursor is moved to the protocol with an asterisk and the space or F2 Key (Del), the asterisks is cleared and the data is excluded from printing.

3. When the F10 Key (End) is pressed, the following confirmation message will be displayed.



4. Press either of the following keys and press the Enter Key.
   Y: Starts printing. “Printing” will be displayed.
   N: Cancels printing.

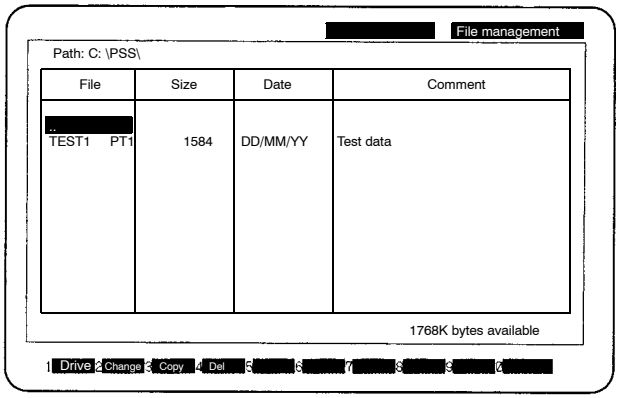
5-4 File Management

Use the following procedures to manage protocol data on disks.

File List

Use the following procedure to display a list of files stored in a disk.

Press the SHIFT+F10 Keys (File) from the initial screen. The following File List screen will be displayed.



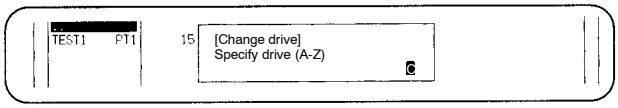
Note a) The directory of the drive registered in the system settings will be displayed first.

b) To change the directory, move the cursor to the line with .. displayed in the file name field and press the Enter Key. The directory can also be changed by setting the cursor to the line with <DIR> displayed in the size field and pressing the Enter Key.

Changing Directories

Use the following procedure to change the directory for which the list is displayed.

1, 2, 3... 1. Press the F1 Key (Drive). The following screen will be displayed.



2. Enter the drive number (A to Z) whose list is to be displayed and press the Enter Key.

Note a) When the specified drive does not exist, the error message “No drive” will be displayed. Specify another drive.

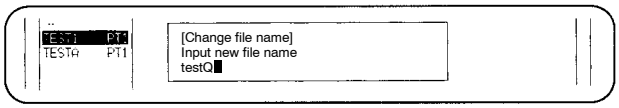
b) When the drive is not ready, the error message “Drive not ready” will be displayed. Set the disk and press the F1 Key (Drive) again.

Changing File Names

Use the following procedure to change a file name.

1, 2, 3...

1. Move the cursor to the file name to be changed and press the F2 Key (Change). The following message will be displayed.



2. Enter a new file name (the extension cannot be input) and press the Enter Key.

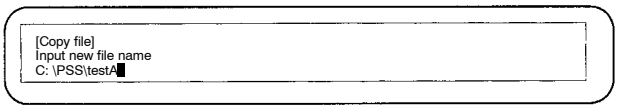
Note An extension cannot be input. The same extension as the original file name will be used.

Copying Files

Use the following procedure to copy a file.

1, 2, 3...

1. Move the cursor to the name of the file to be copied and press the F3 Key (Copy). The following message will be displayed.



2. Enter a path name (drive, directory, and file name) of the copy destination and press the Enter Key. File copy starts.

Note a) An extension cannot be input for the file name. The extension of the copy source will be used automatically.

b) When a file with the same name already exists in the destination directory, the error message “Same path name cannot be used” will be displayed. If the file is not to be overwritten, copy using a different file name.

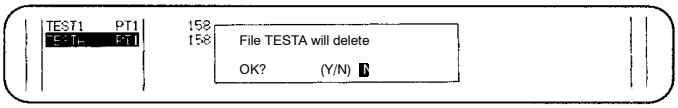
c) If the specified path contains an error, the error message “Wrong path” will be displayed. Enter a correct path name.

File Deletion

Use the following procedure to delete a file.

1, 2, 3...

1. Move the cursor to the file name to be deleted and press the F4 Key (Del). The following confirmation message will be displayed.



2. Enter either of the following keys and press the Enter Key.
Y: Deletes the file.
N: Cancels deletion.

SECTION 6
Troubleshooting

This section describes the symptoms of errors and the methods for handling them.

When an error occurs during operation of the Protocol Support Software, an error message will be displayed on the screen. In this case, remove the cause of the based on the information in the following table.

Errors are organized in the alphabetical order.

Error message		Cause	Action
A	Already defined	The protocol name specified in protocol name change already exists. The sequence number specified in a write operation for a new sequence editing already exists. The name specified for a copy or change operation for a message or matrix list already exists. The message name specified in a write process for a new message already exists.	Specify a number or name that does not exist.
B	Battery error	Batteries are not connected or the batteries have run out.	Check the battery connection or replace the batteries.
C	Cannot execute	The operation cannot be executed. In the editing of communications sequences, data was copied or inserted after the maximum number of steps was reached.	Remove the cause. Delete obsolete steps and execute the operation.
	Cannot execute in RUN mode	The processing cannot be executed since the PC is in RUN mode.	Change the operating mode of the PC and execute again.
	Cannot execute trace	The Trace Execution Flag of the specified port indicates an error.	Check CIO 289.
	Capacity exceeded	The protocol data to be transferred is too large.	Reduce the number of protocols to be transferred to delete obsolete sequences.
	Communications error	An error occurred while the PC connection was disabled or in progress.	Check the PC Setup and peripheral system settings. Check also the connection cables and PC power supply.
	Conversion error	An attempt was made to transfer (convert) a protocol that cannot be converted.	Check the contents of the error message displayed and execute the operation after correcting the error.
	CPU waiting	Initialization of the Communications Board has not ended.	Refer to the PC manual.
	Cycle time exceeded	The cycle execution time of the program was too long.	Check the user program.
D	Data error	Data of illegal form was input in data section alphanumeric input in send/receive message editing.	Input data of the correct format.
	Disk is write protected	The floppy disk is protected from writing.	Release the write protection and execute the operation.
	Drive error	The drive contains an error.	Check the specified drive.
	Drive not ready	The disk is not set or the drive is not available.	Insert a floppy disk and execute the operation.
E	<ERROR MESSAGE FILE> OPEN ERROR !!	At PSS activation, the error message file cannot be opened.	Reinstall the file.
F	File access error	An error occurred during file R]read or write processing.	Remove the error.
	File already exists	The file name specified in the file name change already exists.	Specify a file name that does not exist already.
	First screen	When screen switching is allowed, an attempt was made to switch to the previous screen from the first screen.	Press an appropriate key.
H	Host link mode error	Incorrect host link mode	Check the Host Link Unit switch.

Error message		Cause	Action
I	Illegal next process	The specified step does not exist in the next process or error process of the sequence or matrix.	Check the setting of the next process/error process.
	<INITIALIZE ERROR> !!	At PSS activation, message memory cannot be allocated.	Create free memory and execute the operation.
	Input text string	Input of a protocol name, a sequence name, a message name, or matrix name was attempted without entering a character string. Input of ASCII or hexadecimal data was attempted without entering a character string at message editing.	Input after entering a character string.
	Insufficient capacity	No free space is available on the disk.	Create free space and execute the operation.
	Insufficient disk capacity	The disk space required for execution is not available.	Create a free space on the disk and execute the operation.
	Insufficient memory	The memory required for PSS activation cannot be allocated.	Create a free memory area by modifying CONFIG.SYS and execute the operation.
	I/O bus error	There is an error between the CPU and an I/O Unit.	Refer to the PC manual.
	I/O confirmation error	The I/O table does not match the actual state of the I/O Units that are installed.	Refer to the PC manual.
	I/O setting error	The I/O table does not match the actual state of the I/O Units that are installed.	Refer to the PC manual.
L	Last screen	An attempt was made to switch to the next screen from the last screen.	Enter an appropriate key.
M	Memory error	The user memory of the PC contains an error.	Refer to the PC manual.
	<MESSAGE FILE> OPEN ERROR !!	At PSS activation, the message file cannot be opened.	Reinstall the file.
	Message not set	There is an empty send/receive message in sequence editing.	Set a message or a matrix in the send/receive message field.

Error message		Cause	Action
N	No drive	An attempt was made to access a non-existent drive.	Specify an existing drive.
	No data	No selection mark was put on the protocol list selection.	Select at least one item and then end processing.
	No drive connected	The drive does not exist.	Specify an existing drive.
	No EM	An attempt was made to monitor the EM area from the PC without EM being installed.	Execute the operation using the PC with EM installed.
	No END instruction	The END instruction is not entered.	Check the user program.
	No protocol data	Protocol data has not been registered in the PC. An attempt was made to save protocol data when there is no protocol (0). At attempt was made to change a name, copy, delete, or change the sequence number range of the protocol when there is no protocol (0).	Transfer protocol data. Execute the operation after creating a protocol.
	No sequence number available	A copy was attempted when the existing sequences have used up the entire sequence number range.	Change the sequence number range.
	No source data; cannot execute	Source data does not exist in the protocol that was registered in the PC.	Retrieve the protocol data file that was saved in advance or at transfer (computer → PC).
	No such data	Operation ended without entering any selection mark in the protocol list selection. All data in the message/matrix list was deleted. An attempt was made to display a list when there were no messages or matrices.	Select at least one item and end the operation. Execute the operation after creating data.
	No such file	The specified file name does not exist.	Specify a file name that exists.
	No system files	Files required for execution do not exist.	Reinstall the system.
	Not all items have been set	Processing was interrupted without inputting a send or receive code when contention control or delimiter control was set for the transmission control parameter setting in communications sequence editing.	End processing after inputting a send or a receive code.
	No trace data	An attempt was made to read a trace for a port without trace data.	Execute a trace and read the data.
P	Printer error	The printer was disconnected during printing.	Check the printer connection cable.
	Printer not ready	An error occurred with the printer at the start of printing.	Check the printer connection or power supply.
	Protocol data destroyed	The checksum for the protocol data registered in the PC contains an error.	Transfer correct protocol data.
	Protocol macros not supported	The protocol macro function is not supported.	Use a board that supports the protocol macro function.
R	Response error	The communications response is incorrect.	Check the communications cable and communications method.

	Error message	Cause	Action
S	Same as copy source	The same name as for the copy source was specified when data was copied in a send/receive message or receive matrix list.	Specify a name difference from the copy source.
	Same number as copy source	The same sequence No. as for the copy source was specified when a sequence was copied.	Specify a different No.
	Same path name cannot be used	The same path was specified for a file copy.	Specify a different path name.
	Same sequence number cannot be used	An attempt was made to transfer the protocol data with duplicated sequence numbers.	Check the sequence number.
	Sequence range exceeded	An attempt was made to change or copy data to a sequence number that exceeds the sequence number range. A sequence number exceeds the new sequence number range.	Execute the program after checking the sequence number range.
	Special I/O error	An error occurred in Special I/O.	Check the Special I/O Units.
	Specified bank does not exist.	An attempt was made to monitor the area for a non-existing EM bank.	Specify an existing EM bank.
	Specified range is too small	In the sequence number range change, a range smaller than the existing sequence number range was specified.	Check the existing sequences and change the range.
	System data cannot be changed	The name or range of a system protocol was changed in a protocol list.	Execute the operation from a user protocol.
	System data cannot be deleted	An attempt was made to delete a system protocol.	Execute the operation for a user protocol.
	System error FAL??	The FAL instruction was executed by the program.	Check the user program.
	System error FALS??	The FALS instruction was executed by the program.	Check the user program.
	System error:FAL9C	Communications Board error	Check the related memory areas in Appendix A and the PC Setup in Appendix B. Check also the protocol data PMCR instruction.
T	This data is used more than once	Control was passed to editing of the send/receive message or receive matrix that is used by multiple sequences.	Care is necessary because the data is used by multiple sections.
	Too many sequences	A sequence was copied after the number of communications sequences reached the maximum limit.	Delete obsolete sequences and execute the operation.
	Too much data	An attempt was made to add or insert data in a send/receive message when the data size in the data section is too large.	Reduce the data size and execute the operation.
	Too much PC data	The protocol data to be transferred is too large.	Reduce the number of protocols to be transferred or delete obsolete sequences.
	Too many I/O units	The number of I/O Units exceeded the limit.	Refer to the PC manual.
	Too many matrices	An attempt was made to copy or create matrices after the number of matrices reached the maximum limit.	Delete obsolete matrices and execute the operation.
	Too many messages	A message was copied or created after the number of messages reached the maximum limit.	Delete obsolete messages and execute the operation.
	Too many protocols	An attempt was made to copy or create a protocol after the number of protocols edited reached the maximum limit or an attempt was made to retrieve data exceeding the maximum limit.	Create or retrieve protocol data within the maximum limit, which is 20.
	Trace already in progress	An attempt was made to execute a trace during execution of another trace.	Stop the trace and execute the operation.
	Trace being executed	Trace data was read for the port that is currently executing a trace.	Read data after stopping the trace.

Error message		Cause	Action
V	Value of setting is incorrect	In numeric input, a value outside of the range was input.	Input a value within the range.
W	Wrong drive designation	The specified drive (directory) is incorrect.	Specify an appropriate drive.
	Wrong file name	An illegal file name was specified.	Specify a correct file name.
	Wrong key input	The key that was input is not allocated.	Input an appropriate key.
	Wrong password	An incorrect password was entered for protected protocol data.	Enter the correct password.
	Wrong path	The specified path name does not exist or the path name is too long.	Check the path.
	Wrong path name	The drive or path name is incorrect.	Specify an appropriate path name.
	Wrong PC model	The wrong PC is connected.	Connect the correct model of PC.
	Wrong position	Data was copied, changed, deleted, or inserted with no data is set at the cursor position.	Execute the operation at an appropriate position.

Appendix A
Related PC Memory Area Words and Bits

Word	Bit(s)	Function name	Read/ Write
CIO 268 Communications Board information for FAL9C	00	Watchdog timer error for the Communications Board	--
	01	Port recognition error (hardware error)	R
	02	Protocol data error (protocol data checksum error due to memory corruption)	R
	03 to 10	Reserved for future expansion	R
	11	Port B protocol macro error (error relating PMCR)	R
	12	Port A protocol macro error (error relating PMCR)	R
	13 to 15	15: System setting error 14: Above error for port A 13: Above error for port B	R
CIO 283	00 to 03	Port A error code (All modes) 0:No error 1:Parity error 2:Framing error 3:Overrun error 4:FCS error 5:Timeout error 6:Checksum error 7:Command error	R
	04	ON for communication error at port A (all modes)	R
	05	Port A Send Ready Flag (host link, non-procedure mode)	R
	06	Port A Reception Completed Flag (host link, non-procedure mode)	R
	07	Port A Reception Overflow Flag (host link, non-procedure mode)	R
	08 to 11	Port B error codes (All modes) 0:No error 1:Parity error 2:Framing error 3:Overrun error 4:FCS error 5:Time-out error 6:Checksum error 7:Command error	R
	12	ON for communication error at port B (all modes)	R
	13	Port B Send Ready Flag (host link, non-procedure mode)	R
	14	Port B Reception Completed Flag (host link, non-procedure mode)	R
	15	Port B Reception Overflow Flag (host link, non-procedure mode)	R
CIO 284	00	Port A Communications In-progress Flag for Unit PT0 (NT link 1:N mode)	R
	to	to	|
	07	Port A Communications In-progress Flag for Unit PT7 (NT link 1:N mode)	R
	00 to 15	Port A Receive counter (non-procedure mode)	R
CIO 285	00	Port B Communications In-progress Flag for Unit PT0 (NT link 1:N mode)	R
	to	to	|
	07	Port B Communications In-progress Flag for Unit PT7 (NT link 1:N mode)	R
	00 to 15	Port B Receive counter (non-procedure mode)	R
CIO 286	00	Port A Trace In-progress Flag (both continuous/short traces) (protocol macro mode)	R
	01	Port B Trace In-progress Flag (both continuous/short traces) (protocol macro mode)	R
	02 to 07	Reserved for future expansion.	R
	08 to 11	Port A Protocol macro error code (protocol macro mode) 0:No error 1:No protocol macro function 2:Sequence number error 3:Receive data write area exceeded (IOM area exceeded) 4:Protocol data error	R
	12 to 15	Port B Protocol macro error code (protocol macro mode) 0:No error 1:No protocol macro function 2:Sequence number error 3:Receive data write area exceeded (IOM area exceeded) 4:Protocol data error	R

Word	Bit(s)	Function name	Read/ Write
CIO 287	00 to 03	Port A execution completion matrix case No. (0 to F) (protocol macro mode)	R
	04 to 07	Port A execution completion message step No. (0 to F) (protocol macro mode)	R
	08 to 14	Not used.	R
	15	Port A CIO 287 storage enable 0:Disable;1:Enable	R
CIO 288	00 to 03	Port B execution completion matrix case No. (0 to F) (protocol macro mode)	R
	04 to 07	Port B execution completion message step No. (0 to F) (protocol macro mode)	R
	08 to 14	Not used.	R
	15	Port B CIO 288 storage enable 0:Disable;1:Enable	R
CIO 289	00	Port A Restart Bit (all modes)	W
	01	Port B Restart Bit (all modes)	W
	02	Port A Continuous Trace Start/Stop Bit (protocol macro mode)	W
	03	Port B Continuous Trace Start/Stop Bit (protocol macro mode)	W
	04	Port A Short Trace Start/Stop Bit (protocol macro mode)	W
	05	Port B Short Trace Start/Stop Bit (protocol macro mode)	W
	06 to 07	Not used.	W
	08	Port A Instruction Execution Flag (at execution of instruction)	R
	09	Port A Transmission Message Error Processing Execution Flag (protocol macro mode)	R
	10	Not used.	R
	11	Port A Abort Bit (protocol macro mode)	W
	12	Port B Execution Instruction Flag (at execution of instruction)	R
	13	Port B Transmission Message Error Processing Execution Flag (protocol macro mode)	R
	14	Not used.	R
	15	Port B Abort Bit (protocol macro mode)	W

Appendix B
Related PC Setup Words

Various parameters in the PC Setup relating to the Communications Board must be specified in advance for each RS-232C (or RS-422/485) port to perform communications based using the Communications Board. The Communications Board system settings that are allocated to the PC Setup in the DM area of the PC are shown in the following table.

Note 1. Specify the Communications Board system settings using the DM monitor function of the SYSMAC Support Software or System Settings of the Protocol Support Software. When the settings are incorrect (outside of the range or contradiction errors), the system will operate with the initial settings (default values). However, setting data remains in DM as it is.

2. The system error FAL-9C and a FAL-9B will be generated if errors are detected.

Word	Bit	Mode	Details	Remarks
DM6550	00 to 03	Host link Non-procedure Protocol macro	Port B communications parameter, standard settings enable 0: Standard settings (default) → Start bits: 1 bit Data length: 7 bits Parity: Even Stop bits: 2 bits Baud rate: 9,600 bps 1: Individual settings → Settings in DM6551 used.	---
	04 to 07	Host link Non-procedure 1:1 link	CTS control enable 0: Disabled (default) 1: CTS enabled	---
	08 to 11	1:1 link master 1:N NT link	Port B 1:1 link master: Link words 0: LR00 to LR63 (default) 1: LR00 to LR31 2: LR00 to LR15 Port B 1:N NT link: Maximum PT unit No. 1 to 7 (BCD) or 1 to 3 for C200HE-CPU□□-E	Cannot be changed 1:1 link is set.
	12 to 15	All modes	Port B mode 0: Host link (default) 1: RS232 non-procedure 2: 1:1 link slave 3: 1:1 link master 4: 1:1 NT link (1:1) 5: 1:N NT link 6: Protocol macro	
DM6551	00 to 07	Host link Non-procedure Protocol macro	Port B baud rate (bps) 00:1200 (default) 02:4800 04:19200 01:2400 03:9600	Valid for individual settings only (see DM6550, bits 00 to 03)
	08 to 15	Host link Non-procedure Protocol macro	Port B frame format (default: 00) 00: Start bits 1, Data length 7, Stop bits 1, Parity Even 01: 1, 7, 1, Odd 02: 1, 7, 1, None 03: 1, 7, 2, Even 04: 1, 7, 2, Odd 05: 1, 7, 2, None 06: 1, 8, 1, Even 07: 1, 8, 1, Odd 08: 1, 8, 1, None 09: 1, 8, 2, Even 10: 1, 8, 2, Odd 11: 1, 8, 2, None	

Word	Bit	Mode	Details	Remarks
DM6552	00 to 15	Host link Non-procedure	Port B send delay: 0000 (default) to 9999: Unit 10 ms	Check if RS-232 port communications are not possible (max. delay; 99 s)
DM6553	00 to 07	Host link	Port B host link mode unit No. 00 (default) to 31 (unit No.)	
	08 to 11	Non-procedure	Port B non-procedure mode start code enable 0: Disabled (default); 1: Enabled	Valid when non-procedure mode start code is enabled in, DM6554, bits 00 to 07
	12 to 15	Non-procedure	Port B non-procedure mode end code enable 0: Disable (Specify the number of receive data items) (default) 1: Enable (Specify the end code) 2: CR, LF	If 0: DM6554 contains number of receive data items. If 1: DM6554 contains the end code. If 2: DM6554 may contain any data.
DM6554	00 to 07	Non-procedure	Port B non-procedure mode start code 00 (default) to FF (binary)	Valid when non-procedure start code is enabled. Can be updated.
	08 to 15	Non-procedure	Port B When 0 is specified in DM6653: 12 to 15 Number of non-procedure receive data items (binary) 00: (default: 256 bytes) 01 to FF:(1 to 255 bytes) When 1 is specified in DM6653: 12 to 15 Non-procedure mode end code (binary) 00 (default) to FF	Invalid when non-procedure end code is enabled 00: Default (256 bytes)
DM6555	00 to 03	Host link Non-procedure Protocol macro	Port A communications parameter, standard settings enable 0: Standard settings (default) → Start bits: 1 bit; Data length: 7 bits; Parity: Even; Stop bits: 2 bits; Baud rate: 9,600 bps 1: Individual settings → Settings in DM6656 used.	---
	04 to 07	Host link Non-procedure 1:1 link	CTS control enable 0: Disabled (default) 1: CTS enabled	---
	08 to 11	1:1 link master 1:N NT link	Port A 1:1 link master: Link words 0: LR00 to LR63 (default) 1: LR00 to LR31 2: LR00 to LR15 Port A 1:N NT link: Maximum PT unit No. 1 to 7 (BCD) or 1 to 3 for C200HE-CPU□□-E	Cannot be changed 1:1 link is set.
	12 to 15	All modes	Port A mode 0: Host link (default) 1: RS232 non-procedure 2: 1:1 link slave 3: 1:1 link master 4: 1:1 NT link (1:1) 5: 1:N NT link 6: Protocol macro	

Word	Bit	Mode	Details	Remarks
DM6556	00 to 07	Host link Non-procedure Protocol macro	Port A baud rate (bps) 00:1200 (default) 02:4800 04:19200 01:2400 03:9600	Valid for individual settings only (see DM6555, bits 00 to 03)
	08 to 15	Host link Non-procedure Protocol macro	Port A frame format (default: 00) 00: Start bits 1, Data length 7, Stop bits 1, Parity Even 01: 1, 7, 1, Odd 02: 1, 7, 1, None 03: 1, 7, 2, Even 04: 1, 7, 2, Odd 05: 1, 7, 2, None 06: 1, 8, 1, Even 07: 1, 8, 1, Odd 08: 1, 8, 1, None 09: 1, 8, 2, Even 10: 1, 8, 2, Odd 11: 1, 8, 2, None	
DM6557	00 to 15	Host link Non-procedure	Port A send delay: 0000 (default) to 9999: Unit 10 ms	Check if RS-232 port communications are not possible (max. delay; 99 s)
DM6558	00 to 07	Host link	Port A host link mode unit No. 00 (default) to 31 (unit No.)	
	08 to 11	Non-procedure	Port A non-procedure mode start code enable 0: Disabled (default); 1: Enabled	Valid when non-procedure mode start code is enabled in, DM6559, bits 00 to 07
	12 to 15	Non-procedure	Port A non-procedure mode end code enable 0: Disable (Specify the number of receive data items) (default) 1: Enable (Specify the end code) 2: CR, LF	If 0: DM6559 contains number of receive data items. If 1: DM6559 contains the end code. If 2: DM6559 may contain any data.
DM6559	00 to 07	Non-procedure	Port A non-procedure mode start code 00 (default) to FF (binary)	Valid when non-procedure start code is enabled. Can be updated.
	08 to 15	Non-procedure	Port A When 0 is specified in DM6558: 12 to 15 Number of non-procedure receive data items (binary) 00: (default: 256 bytes) 01 to FF:(1 to 255 bytes) When 1 is specified in DM6558: 12 to 15 Non-procedure mode end code (binary) 00 (default) to FF	Invalid when non-procedure end code is enabled 00: Default (256 bytes)

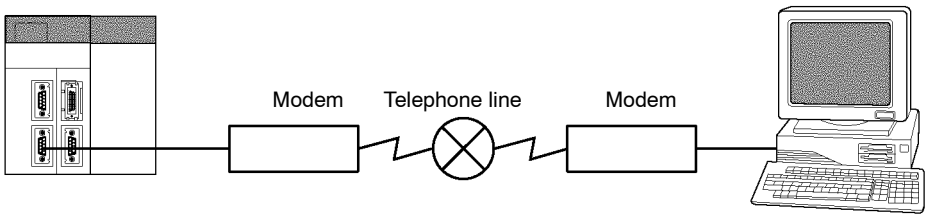
Appendix C
Creating a Protocol

This appendix demonstrates how to create a simple protocol to show the use of each function of the Protocol Support Software. For this example, data is transmitted through a telephone call via modems (handling Hayes AT commands). The overall process is as follows: A call is placed, data is send and received, an escape is executed when 0 is received, and the call is disconnected.

Connecting the Communications Board

Connection Cables

RS-232C strait cable is used to connect the a modem (external device) and the Communications Board.



Transmission Control Parameters

Modem control procedures are set to enable connection via telephone lines through modems.

Transmission Data Storage Words

Three methods are available for allocating the transmission data storage words; specifying through the operands of the PMCR instruction, specifying link words, and direct specification. Since the operands can be specified dynamically in the PMCR instruction of the ladder program, the operands are used here.

PMCR Instruction Operands

When the operands of the PMCR instruction is used as the storage destination of transmission messages, determine the contents of the first operand (port and communications sequence No.), second operand (send data storage words), and third operand (receive data storage words) to store the necessary send data in the words determined here.

The following diagram shows word assignments.

• Send words (dial command + telephone number): From DM 0000

DM0100	DM0101	DM0102	DM0103	DM0104	DM0105	DM0106	DM0107	DM0108	DM0109
0010	0016	4154	4454	3033	2D30	3132	332D	3435	3637
		AT	DT	03	−0	12	3−	45	67

Length of dial character string sent to the modem (bytes)

Used by the PMCR instruction. Length of this code (words)

• Receive words (receive data storage destination): From DM 0256

Communications Sequences

Common Parameters

Determine the common parameters (link words, transmission control procedure, response method, and monitoring times) for the communications sequence. For this example, only the transmission procedure and the response method are set.

Transmission control procedure: Modem
Response method: Scan

Designing Sequences

Convert a communications sequence status transition diagram to the steps that can be edited on the Edit Communications Sequence screen and set jump destinations of normal results (next process) and for Error Result (error process) for each step. For this example, the following sequences are involved.

Sequence No. 000: Modem Initialization

Sends a modem initialization command and initializes the modem connected to the Communications Board.

- STEP 00: Sends a modem initialization command.

  Normal Results
  Branches according to a receive matrix. Create the following receive matrix according to the result code (initialization yes/no) from the modem.

  Result code 0: End
  Result code 4: Goto 01
  Other result code: Goto 01

  Error Result

  Goto 01

- STEP 01: Sends a modem initialization command again after one second.

  Normal Results
  Branches according to the receive matrix.

  Result code 0: End
  Result code 4: Goto 02
  Other result code: Goto 02

  Error Result

  Go to STEP 02.

- STEP 02: Sends a modem initialization command again after one second.

  Normal Results
  Branches according to the receive matrix.

  Result code 0: End
  Result code 4: End
  Other result code: End

  Error Result

  End

Sequence No. 001: Dialing

When modem initialization terminates normally, a telephone number is sent using AT commands. The step structure is shown below.

- STEP 00: Sends a telephone number using the AT command.

  Normal Results
  Branches according to the receive matrix.

  Result code 4: End
  Result codes of
  1, 6, 7, 8, and 9: Goto 01
  Result code of 234: End
  Other result code: Goto 01

  Error Result

  Goto 01.

- STEP 01: Sends the telephone number again after one minute.

  Normal Results
  Branches according to the receive matrix.

  Result code 0: End
  Result codes of
  1, 6, 7, 8, and 9: Goto 02

Result code of 234: End
Other result code: Goto 02

Error Result

Goto 02.

• STEP 02: Sends the telephone number again after one minute.

Normal Results
Branches according to the receive matrix.

Result code 4: End
Result codes of
1, 6, 7, 8, and 9: End
Result code of 234: End
Other result code: End

Error Result

End

Sequence No. 002: Data Transmission

When the call is connected, SEND OK is sent, data from the partner is awaited and the received data is stored in the words specified in the third operand of the PMCR instruction. The escape code is send when 0 is received, the mode is switched to the escape mode from the online mode, and the telephone line is disconnected.

• STEP 00: Sends SEND OK and waits for reception of data.

Normal Results
Branches control according to the receive matrix.

Receiving 0: Goto 02
Other than 0: Write the received data and Goto 01.

Error Result

Goto 01

• STEP 01: Sends SEND OK again after five seconds and waits for reception.

Normal Results
Branches control according to the receive matrix.

Receiving 0: Goto 02
Other than 0: Write the received data and Goto 01.

Error Result

Goto 01

• STEP 02: Sends the escape code.

Normal Results
Branches control according to the receive matrix.

Result code 0: Goto 03
Result code 4: Goto 02
Other result code: Goto 03

Error Result

Goto 02

• STEP 03: Sends a line disconnection command.

Normal Results
Branches control according to the receive matrix.

Result code 0: End
Result code 4: Goto 03
Other result code: Goto 03

Error Result

Goto 03

Creating the Communications Sequences

The procedure for creating a protocol using the Protocol Support Software is described below.

Common Parameters

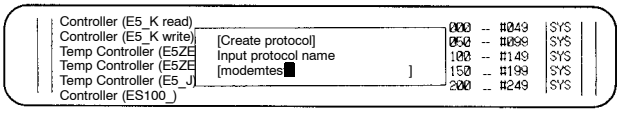
Set the transmission control procedure and response method as common sequence parameters.

Transmission Control

Set the modem control procedure as the transmission control procedure using the following procedure.

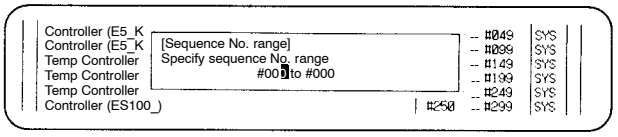
1, 2, 3...

1. Press the F1 Key (New) from the initial screen. The following protocol name input screen will be displayed. Enter a protocol name and press the Enter Key.

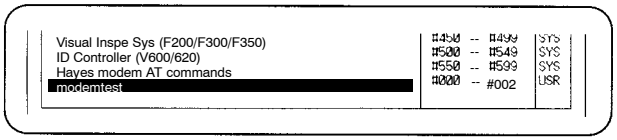


2. The protocol name that was entered will be displayed on the bottom line of the initial screen.

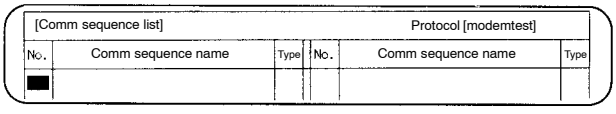
3. Press the F5 Key (NoRnge). The following sequence number range specification screen will be displayed. For this example, enter 0, press the Enter Key, enter 2, and press the Enter Key to set the sequence number range to from 000 to 002.



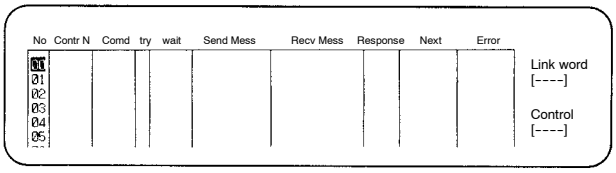
4. The sequence number range that was changed will be displayed on the initial screen.



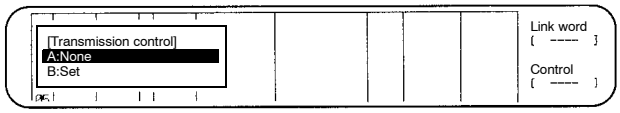
5. Move the cursor to the line and press the Enter Key. The Communications Sequence List screen will be displayed.



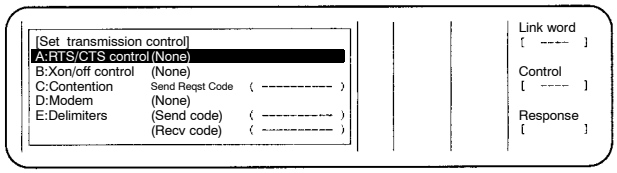
6. Press the Enter Key. The step setting screen will be displayed.



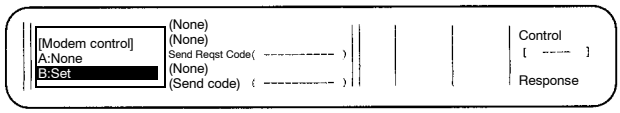
7. Press the F5 Key (Contrl) and set the transmission control procedure.



8. Select B:Set. The Transmission Control setting screen will be displayed.



9. Set B:Set for the modem control procedure.



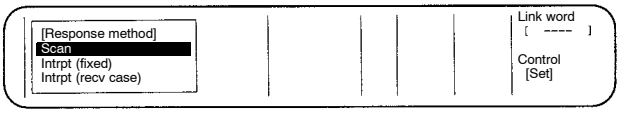
Note When the settings are completed, press the Esc Key. Control is returned to the previous screen.

Setting a Response Method

Set the scan method as the response method using the following procedure.

1, 2, 3...

1. Press the F6 Key (Respns). The Response Method setting screen will be displayed.
2. Select A:Scan.

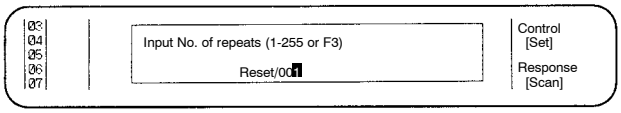


Creating Steps

Setting the Repeat Counter

Since a modem initialization command is sent once only, set 1 as the repeat counter using the following procedure.

Move the cursor to the repeat counter input field and press the F1 Key (Reset). The following repeat count setting screen will be displayed. Enter 1 and press the Enter Key.

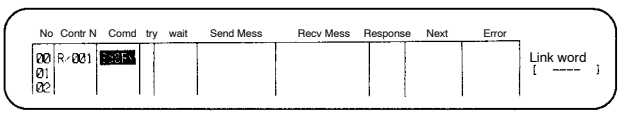


Setting Commands

Select Send&Recv using the following procedure. A modem initialization command (AT command) is set and a result code is received from a modem.

1, 2, 3...

1. Move the cursor to the command input field.
2. Press the F3 Key (Sd&Rv) and press the Enter Key.



Setting Send Messages

Set the modem initialization command as described below. The following items must be set for a modem initialization command.

Command echo:	None
Result code display format:	Numeric format
Baud rate displayed at connection:	Yes
Busy and dial tone detection:	Yes
Error correction/data compression display at connection:	Yes
MNP setting:	Yes (auto reliable mode)
MNP class display:	Class 4
V.42 compression and error setting:	None
Inter-terminal modem flow control:	None
ER signal control:	Always ON
Escape code:	+

The AT command corresponding to the above modem initialization items (MD24FB10V: Manufactured by OMRON) is as follows:

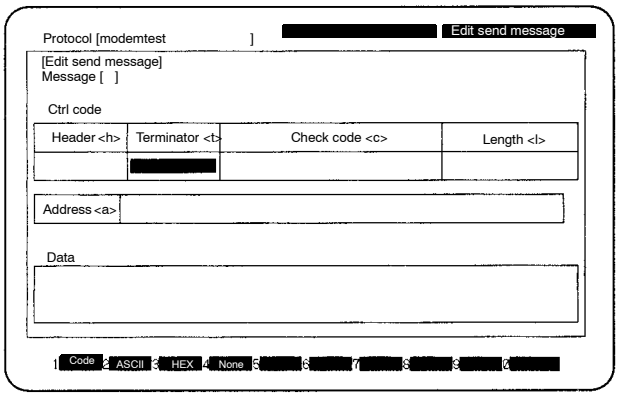
ATE0V0X4\V2\N3%C0*C0\X1

Note

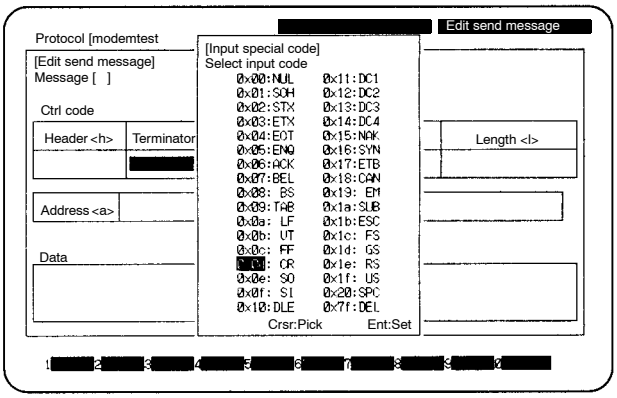
1. The data format (baud rate, data length, parity, and stop bits) of the modem is set via the data format of the Communications Board by issuing of the AT command from the device (Communications Board) connected to the modem.
2. The modem initialization command is valid until the modem power supply is turned off after it has transmitted at the beginning of the protocol.
3. To keep the ER signal ON, DIP switch pins 3 and 4 must be always set to ON in this model (MD24FB10V: Manufactured by OMRON).

1, 2, 3...

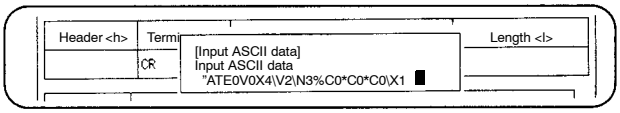
1. Move the cursor to the send message input field and press the Enter Key. The Send Message Input screen will be displayed. Move the cursor to the terminator item and press the Enter Key. The cursor will move to the terminator input field.



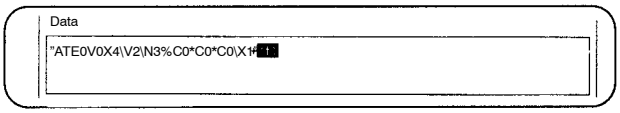
2. When the F1 Key (Code) is pressed, the following special code input screen will be displayed. Move the cursor to CR and press the Enter Key twice.



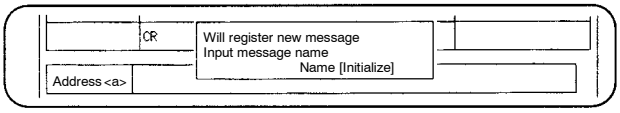
3. Move the cursor to the data input field.
4. Press the F1 Key (Const) and then the Enter Key.
5. Press the F2 Key (ASCII). The ASCII data input screen will be displayed. Enter the previous initialization command and press the Enter Key.



6. Move the cursor to the right, press the F6 Key (Termin), and press the Enter Key.



7. The setting of a transmission message is completed. Press the F10 Key (Write). The message name input field id displayed. Enter a message name and press the Enter Key.

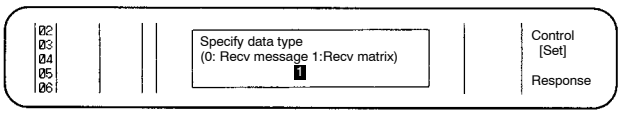


Setting the Receive Matrix

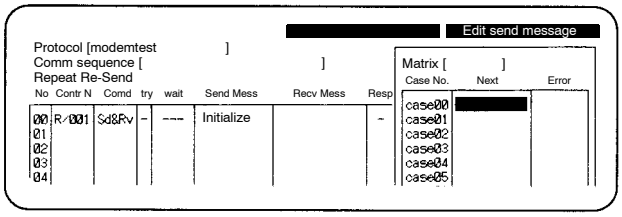
The receive matrix is set so that when a result code (OK, etc.) is received from the modem after sending the modem initialization command, control is passed to the next process according to the result code that was received.

1, 2, 3...

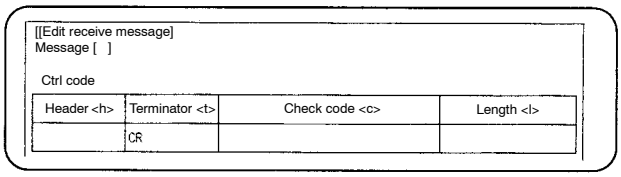
1. Move the cursor to the receive message input field on the Step setting screen and press the Enter Key. The data type setting screen will be displayed.
2. Enter 1 and press the Enter Key to select 1:Receive matrix.



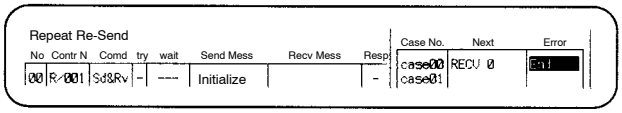
3. The Receive Matrix setting screen will be displayed.



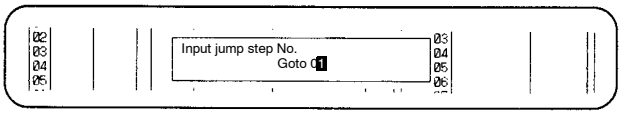
4. Press the Enter Key. The Receive Message setting screen will be displayed.



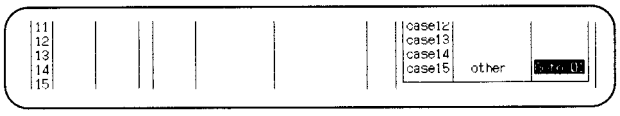
5. Set the following using the same procedure as for a send message.
   Data: 0 (result code of OK in numeric format)
   Terminator: CR
   Message name: RECV0
6. Move the cursor to the next process and press the F1 Key (End) and Enter Key.



7. Move the cursor to the receive message input field of the next line and set the process to be performed when the result code is 4 using the procedure indicated in items 2 and 3.
   Data: 4
   Terminator: CR
   Message name: RECV4
8. Move the cursor to the next process setting field and press the F2 Key (Goto). The jump destination process No. input field will be displayed.
9. Enter 1 and press the Enter Key.



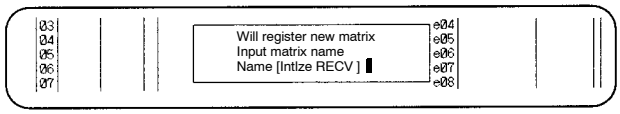
10. Move the cursor to the next process setting of the bottom line, “other,” and set in the same way as described in step 8., above



Note To return control from the Receive Matrix setting screen to the Step setting screen without writing any settings, press the Esc Key.

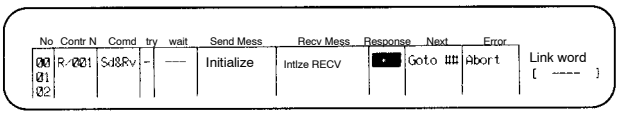
11. Move the cursor to the receive message input field and press the F10 Key (Write). The Matrix name input screen will be displayed.

12. Enter a matrix name and press the Enter Key.



Setting Response Notification Set the scan method as the method for storing the messages that were received using the following procedure.

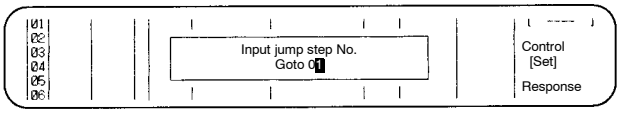
Move the cursor to the response notification setting field, press the Enter Key and F2 Key (Yes). An asterisk will be displayed in the response notification setting field.



Setting the Error Process Specify the jump destination when an error occurs. For this example, pass control to step No. 01.

Note The next process is not set in the Step setting screen since it is set in the receive matrix.

Set step No. 01 as the jump destination using the same method as for step 8 in *Setting the Receive Matrix.*



Error Processing for Initialization Command The processing to be preformed when the initialization command was not executed properly must be set in steps No. 01 and 02. Basically, set the same contents in steps No. 01 and 02 as that of step No. 00. Set one second as the send wait time to delay retrying the initialization. The following settings are those that are different from those of step No. 00

- Step No. 01

  Next process for result code 4 in the receive matrix: Goto 02
  Other: Goto 02
  Error process in the step setting screen: Goto 02

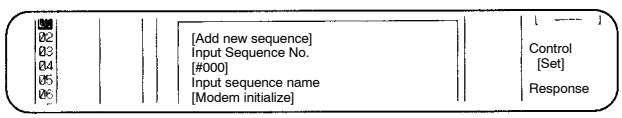
- Step No. 02

  Next process for result code 4 in the receive matrix: End
  Other: End
  Error process in the step setting screen: End

Writing Sequences When creation of a sequence is completed, set and write the sequence No. and sequence name using the following procedure.

1, 2, 3...

1. Move the cursor to the step No. field in the Step setting screen and press the F10 Key (Write). The Sequence No. and Sequence Name registration screen will be displayed.
2. Enter a sequence number and a sequence name and press the Enter Key after each.



Dialing

Here, set the dialing operation for connecting the partner modem via a telephone line after initializing the modem. The phone number can be set in a send message as a constant. For this example, however, the word read method is used, and the phone number is stored in advance in the words specified in the second operand of the PMCR instruction.

The contents set in for the dialing sequence are as follows:

Repeat counter:	Once only at reset
Command:	Send&Recv
Retry count:	Not set
Send wait:	Not set (step No. 00), 1 minute (step Nos.01 and 02)
Transmission control:	Modem

Note In step Nos.01 and 02, the number is redialed at an interval of one minute (send wait) when the dial call is unsuccessful.

Send message: Data “(R, (2),R (1))” + terminator “CR”

Note (R (2),R(1)) indicates word read, R(2) indicates the word offset from the word specified in the second operand of the PMCR instruction in the execution address section, R(1) indicates the first word (storing the data size) of the words specified in the second operand of the PMCR instruction.

Receive matrix: Set the receive matrix for the result codes from the modem, as listed in the following table.

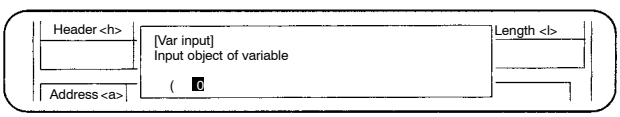
Case	Result code	Receive message	Next process STEP 0	Next process STEP 1	Next process STEP 2
00	1	Data “1” + terminator “CR”	Goto 01	Goto 02	End
01	4	Data “4” + terminator “CR”	End	End	End
02	6	Data “6” + terminator “CR”	Goto 01	Goto 02	End
03	7	Data “7” + terminator “CR”	Goto 01	Goto 02	End
04	8	Data “8” + terminator “CR”	Goto 01	Goto 02	End
05	9	Data “9” + terminator “CR”	Goto 01	Goto 02	End
06	234	Data “234” + terminator “CR”	End	End	End
other			Goto 01	Goto 02	End

Response notification:	Not set
Next process:	Not set (set in receive matrix)
Error processes:	Goto 01 (step No. 00) Goto 02 (step No. 01) End (step No. 02)

The procedure to set the send messages is shown below.

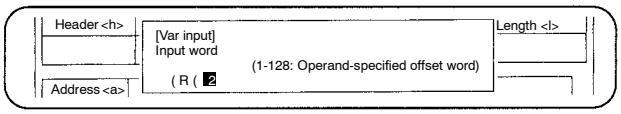
1, 2, 3...

1. Move the cursor to the data input field of a send message and press the F2 Key (Vari).
2. Press the F1 Key (NoConv) is pressed. The Variable Input screen (no conversion) will be displayed.

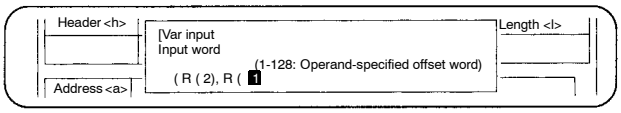


3. Press the F3 Key (Word). The word setting field will be displayed.

4. Set a word offset (1 to 128) from the words (storing a telephone number) specified in the second operand of the PMCR instruction. Since the telephone number is set beginning the second word is used for this example, enter 2 and press the Enter Key.



5. Specify the data size. Since the data is stored in the first word of the words specified in the second operand of the PMCR instruction, enter 1 instead of 2 and press the Enter Key in the same way as for step 3. (specification of word read)



6. Enter the terminator CR. See items 1. to 6. on pp.98 and 99 for the procedure.
7. Set a receive matrix. See p.99 for the procedure.

Setting the Data Communications Sequences

This example shows the procedure to set the character string SEND OK, wait for data from the partner, store the received data in the words specified in the third operand of the PMCR instruction, send an escape code when 0 is received, and disconnect the line.

Transmission Process

The contents to be set for the transmission sequence (steps No. 00 and 01) are shown below.

Repeat counter:	Reset once
Command:	Sd&Rv
Retry count:	Not set
Send wait:	Not set (step No. 00) 5 s (step No. 01)
Modem control:	Yes

Note Step No. 01 performs the same transmission process after five seconds.

Send message:	Data “SEND OK” + terminator “CR”
Receive matrix:	Set the following.

Case	Receive message	Next process STEP 0	Next process STEP 1
00	Data “0” + terminator “CR”	Goto 02	Goto 02
01	Data “(W (1), *)” + terminator “CR”	Goto 01	Goto 01
15	“Other”	Goto 01	Goto 01

Note (W(1),*) is word write specification and stores data from the first word of the words specified in the third operand of the PMCR instruction. The data size is a wild card and of variable length (however, 256 bytes max.).

Response notification: Yes

Note Received data is stored in the words specified in the third operand of the PMCR instruction using the scan method.

Next process:	Not set
Error process:	End

Escape Code Send Process (Step No. 02)

Here, the process is set to send an escape code (+++) before disconnecting the line and switching the modem to an escape mode.

The settings for the sequence are shown below.

Note The modem state is set to escape mode before sending the AT command for line disconnection.

Repeat counter: Reset once
Command: Sd&Rv
Retry count: 3 times
Send wait: 1.5 s

Note An escape code is sent up to three times.

Send message: Data “+++”
Receive matrix: Set the following.

Case	Result code	Receive message	Next process
00	0	Data “0” + terminator “CR”	Goto 03
01	4	Data “4” + terminator “CR”	Goto 02
15		“Other”	Goto 02

Response notification: None
Next process: Not set
Error process: Goto 02

Line Disconnection (Step No. 03)

Here, the mode is switched to escape mode and the AT command for line disconnection is sent.

The settings for the sequence for line disconnection are shown below.

Repeat counter: Reset once
Command: Sd&Rv
Retry count: 3 times
Send wait: 1.5 s

Note The AT command is sent up to three times.

Send message: Data “ATH0” + terminator “CR”

Note ATH0 is the AT command for line disconnection.

Receive matrix: Set the following.

Case	Result code	Receive message	Next process
00	0	Data “0” + terminator “CR”	End
01	4	Data “4” + terminator “CR”	Goto 03
15		“Other”	Goto 03

Response notification: None
Next process: Not set
Error process: Goto 03

Setting the Communications Board

When the communications sequences have been created, the communications port of a Communications Board must be set. Carry out the system settings of the Communications Board according to instruction in *Section 1 Outline of the Protocol Support Software*.

Note When using the modem used in this example (MD24FB10V: manufactured by OMRON), specify the baud rate for inter-modem communications as the baud rate setting of the Communications Board.

Saving Data

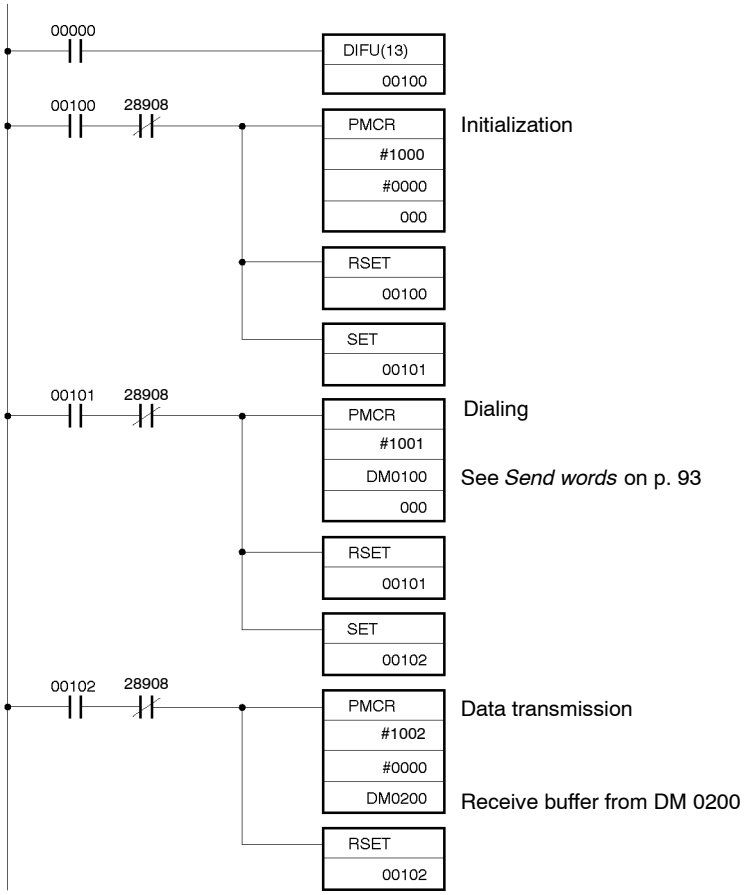
Save the communications sequences and PC setup that have been created. Refer to *Section 4 Managing Protocol Data* for the procedure.

Transferring Data

Transfer the communications sequences that have been created. Refer to *Section 4 Managing Protocol Data* for the procedure.

Creating the Ladder Program

Create the ladder program section for executing the communications sequences that have been created and transfer the program to PC. An example of a ladder program is shown below. For this example, protocol macros are executed for Communications Board port A.



Debugging

Execute the ladder program and check the operation. The trace function of the Protocol Support Software can be used to check the contents of the data transmitted on the line. Refer to *5-2 Tracing Transmission Lines* for the trace procedure.

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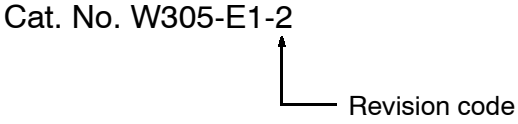
Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	June 1996	Original production
2	March 1997	**Page 25:** “N” defined for modem control in the table. **Page 44:** Variable information for data attributes corrected. **Page 48:** Variable designation examples added after *5. Automatic Variables*. **Pages 62, 63:** First screen on each page was replaced.