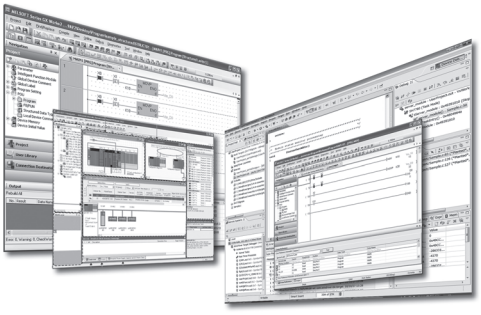
MITSUBISHI ELECTRIC

MELSOFT

Engineering Software

GX Configurator-SC Version 2 Operating Manual (Pre-defined protocol support function)

-SW2D5C-QSCU-E



• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.
In this manual, the safety instructions are ranked as "⚠WARNING" and "⚠CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Startup/Maintenance Precautions]

⚠ CAUTION
• Before starting online operations such as a communication test, consider the operation of the connected device and fully ensure safety.

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• CONDITIONS OF USE FOR THE PRODUCT •

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

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REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Jun., 2009	SH (NA)-080850ENG-A	First printing
Jan., 2010	SH (NA)-080850ENG-B	Model Addition L02CPU, L26CPU-BT Partial corrections About Manuals, Generic Terms and Abbreviations Used in This Manual, Chapter 1, Section 1.1, Section 3.2, Section 4.1, Section 4.2, Section 8.3.3, Section 8.3.6, Section 9.1, Section 9.3.3, Section 10.1 to 10.3, Chapter 11, Section 11.1 to 11.3, Section 11.3.1, Section 11.3.2, Section 11.4, Chapter 13, Section 13.1 to 13.3, Section 13.4.1 to 13.4.3, Appendix 1, Appendix 2.1 to 2.3, Appendix 3, Appendix 4.1 to 4.4, Appendix 5 Partial additions CONDITIONS OF USE FOR THE PRODUCT
Sep., 2010	SH (NA)-080850ENG-C	Partial corrections Generic Terms and Abbreviations Used in This Manual, Chapter 2, Section 3.2, Section 4.2, Section 9.3.3, Section 10.1 Partial additions Section 3.3

Japanese Manual Version SH-080817-D

INTRODUCTION

Thank you for choosing the Mitsubishi MELSOFT series Integrated FA software.
Read this manual and make sure you understand the functions and performance of MELSEC series programmable controller thoroughly in advance to ensure correct use.
Please make this manual available to the end user.

CONTENTS

About Manuals

The following lists the manuals relevant to this software package.
These manuals are separately available if necessary.

Related Manuals

Manual Name	Manual Number (Model Code)
Q Corresponding Serial Communication Module User's Manual (Basic) Explains the outline, applicable system configuration, specifications, pre-operation procedure, basic data communication method with the other device, maintenance, inspection, and troubleshooting for use of the module. (Sold separately)	SH-080006 (13JL86)
MELSEC-L Serial Communication Module User's Manual (Basic) Explains the specifications and usage of the module's special functions, the settings for use of the special functions, and the method of data communication with the other device. (Sold separately)	SH-080894ENG (13JZ40)
MELSEC-Q/L Communication Module User's Manual (Application) Explains the specifications and usage of the module's special functions, the settings for use of the special functions, and the method of data communication with the other device. (Sold separately)	SH-080007 (13JL87)
MELSEC-Q/L MELSEC Communication Protocol Reference Manual Explains how the other device performs read, write, etc. of PLC CPU data by making communication in the MC protocol using the serial communication module/Ethernet module. (Sold separately)	SH-080008 (13JF89)
GX Developer Version 8 Operating Manual (Startup) Explains the system configuration, installation method, and startup method of GX Developer. (Sold separately)	SH-080372E (13JU40)
GX Developer Version 8 Operating Manual Explains the program creation method, printout method, monitor method, debugging method, etc. using GX Developer. (Sold separately)	SH-080373E (13JU41)
GX Developer Version 8 Operating Manual (Function Block) Explains the function block creation method, printout method, etc. using GX Developer. (Sold separately)	SH-080376E (13JU44)
GX Configurator-SC Version 2 Operating Manual (Protocol FB support function) Explains the features, usage, and .setting method of each parameter of the protocol FB support function which supports the creation of programs for data communication by modules. (Sold separately)	SH-080393E (13JU46)

REMARK

The manuals are available separately in printed form as options. Please place an order with the manual number (model code) in the above table.

How to Use This Manual

The symbols used in this manual and their definitions and examples will be explained.

Symbol	Description	Example
[ ]	Menu name of the menu bar	[File]
<< >>	Tab name of the dialog box	<<Main>>
" "	Item name of the dialog box	"Name"
☐	Command button of the dialog box	Setting Button

PURPOSE

Purpose of the operation that is explained in the corresponding chapter, section or item.

BASIC OPERATION

Operation performed until the screen for actually achieving the purpose is displayed.

DISPLAY/SETTING SCREEN

Screen used to make setting and/or provide a display for the purpose.

DISPLAY/SETTING DETAILS

Explains the display/setting screen items.

Explains the especially noted items of the explanation, functions desired to be known, etc.

REMARK

Gives information useful as the knowledge related to the explanation.

Generic Terms and Abbreviations Used in This Manual

In this manual, the following generic terms and abbreviations are used to represent the GX Configurator-SC software package and PLC CPU modules. The module/package name is given when the target model name must be pointed out explicitly.

Generic Term/Abbreviation	Description
GX Configurator-SC	Generic product name of the model names SWnD5C-QSCU-E and SWnD5C-QSCU-EA. (n means Version 2 or later.)
Pre-defined protocol support function	Means the pre-defined protocol support function of GX Configurator-SC.
C24	Generic term for the QJ71C24, QJ71C24-R2, QJ71C24N, QJ71C24N-R2, QJ71C24N-R4, LJ71C24 and LJ71C24-R2.
Q Series C24N	Generic term for QJ71C24N, QLJ71C24N-R2 and QLJ71C24N-R4.
L Series C24	Generic term for LJ71C24 and LJ71C24-R2.
Intelligent function module utility	Utility in GX Configurator-SC.
Windows® 7	Generic term for the following: Microsoft® Windows® 7 Starter Operating System, Microsoft® Windows® 7 Home Premium Operating System, Microsoft® Windows® 7 Professional Operating System, Microsoft® Windows® 7 Ultimate Operating System, Microsoft® Windows® 7 Enterprise Operating System
Windows Vista®	Generic term for the following: Microsoft® Windows Vista® Home Basic Operating System, Microsoft® Windows Vista® Home Premium Operating System, Microsoft® Windows Vista® Business Operating System, Microsoft® Windows Vista® Ultimate Operating System, Microsoft® Windows Vista® Enterprise Operating System
Windows® XP	Generic term for the following: Microsoft® Windows® XP Professional Operating System, Microsoft® Windows® XP Home Edition Operating System
GX Developer	Generic product name of the product model names SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV and SWnD5C-GPPW-EVA. (n means Version 8 or later.)
QCPU (Q mode)	Generic term for the Q00J, Q00UJ, Q00, Q00U, Q01, Q01U, Q02(H), Q02PH, Q02U, Q03UD, Q03UDE, Q04UDH, Q04UDEH, Q06H, Q06PH, Q06UDH, Q06UDEH, Q10UDH, Q10UDEH, Q12H, Q12PH, Q12PRH, Q13UDH, Q13UDEH, Q20UDH, Q20UDEH, Q25H, Q25PH, Q25PRH, Q26UDH, and Q26UDEHCPU.
Redundant CPU	Generic term for the Q12PRH and Q25PRHCPU.
LCPU	Generic term for L02CPU and L26CPU-BT.

MEMO

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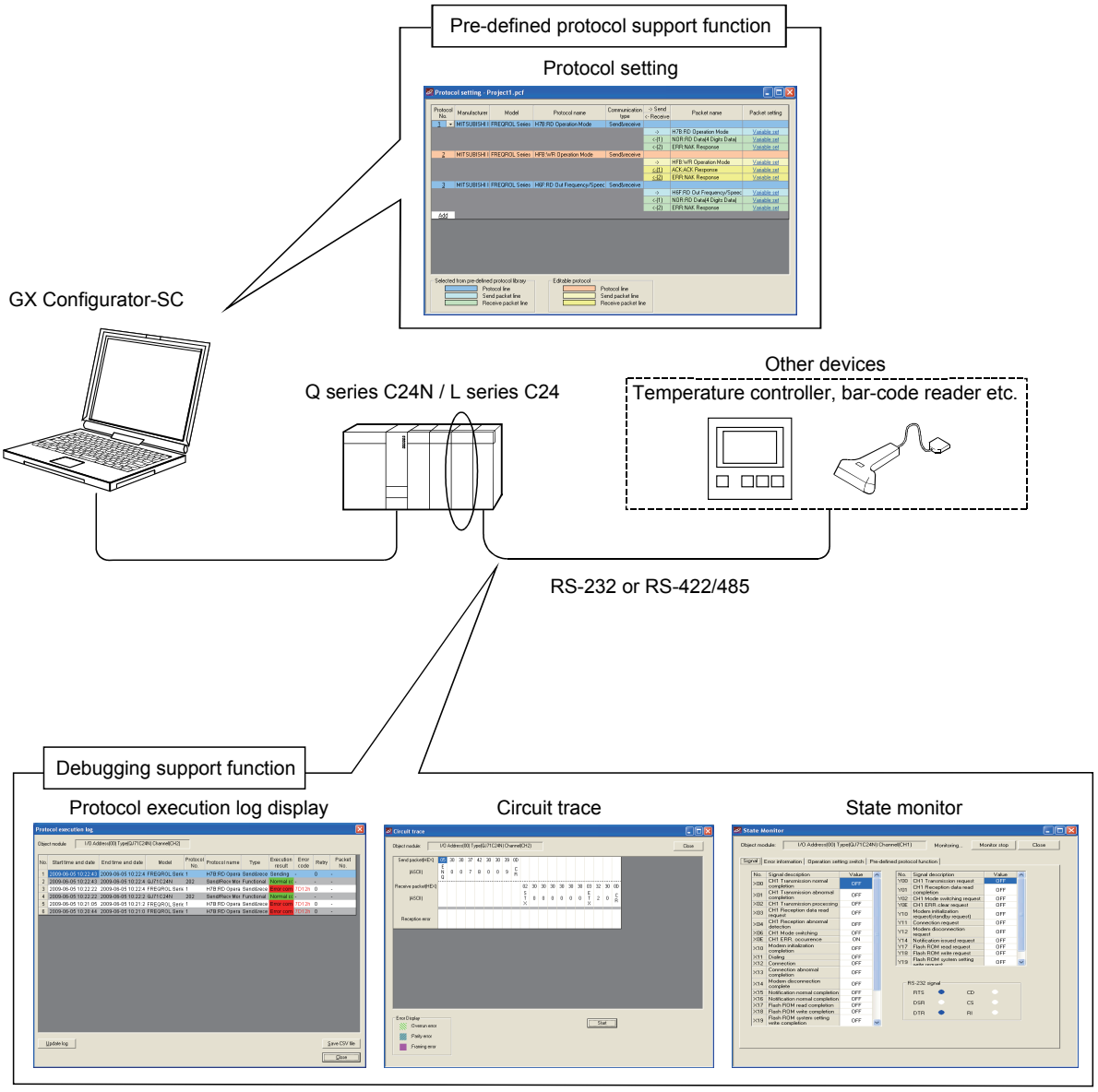
1 OVERVIEW

GX Configurator-SC Version 2 (hereafter abbreviated to GX Configurator-SC) is the software added into GX Developer for use.
Conventionally, to perform the protocol communication with other devices such as a bar-code reader using a non procedural protocol of Q/L series serial communication modules, communication processing programs used to have to be created in ladder language.
On the pre-defined protocol support function of GX Configurator-SC, the protocol setting can be configured just by writing pre-defined send/receive protocols to a flash ROM mounted on a Q series C24N / L series C24 module. The protocol communication with other devices can be easily performed only with the creation of a ladder program for protocol execution.
The communication debugging functions necessary for system startup is also provided.



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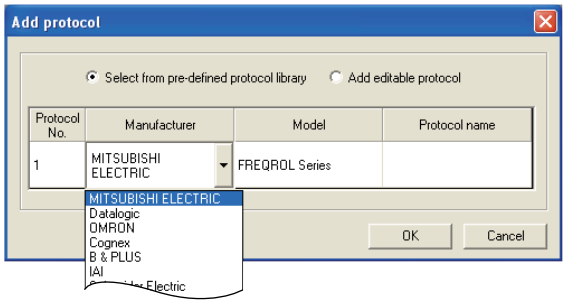
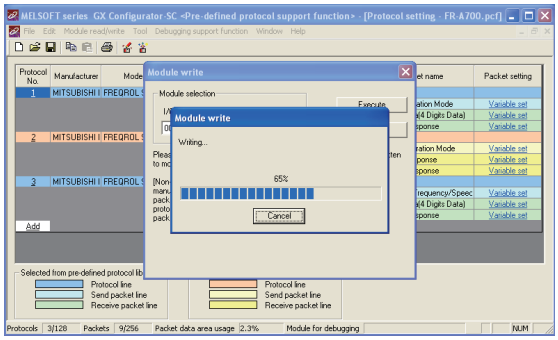
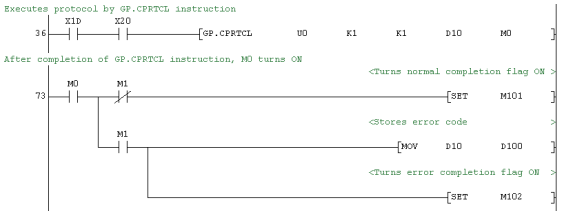
STEP 1 : Select a manufacturer, type, and protocol name of a device to be connected.



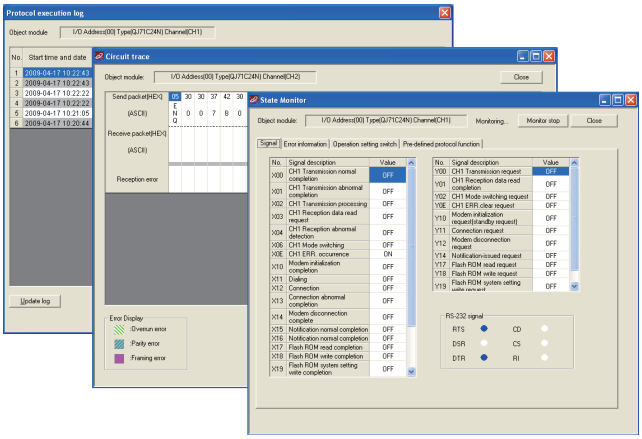
STEP 2 : Write the selected protocols to a module.



STEP 3 : Create a startup ladder program



Debugging support functions



In the pre-defined protocol support function, 'protocol' means the procedure to communicate with other devices and consists of the following information.

- Packet element (Packet format)
- Packet data
- Communication type

Protocols can be selected from the pre-defined protocol library or created/edited arbitrarily.

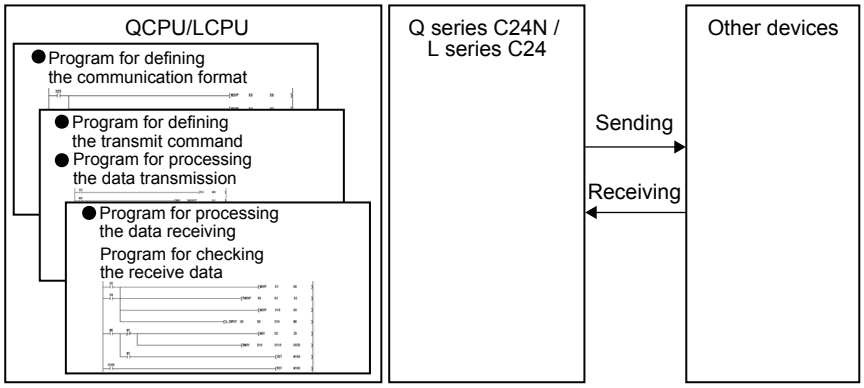
1.1 Features

(1) Easy to communicate with other devices

The use of transmission/receive protocols reduces the execution steps of ladder programs and enables the protocol communication with other devices easily!!

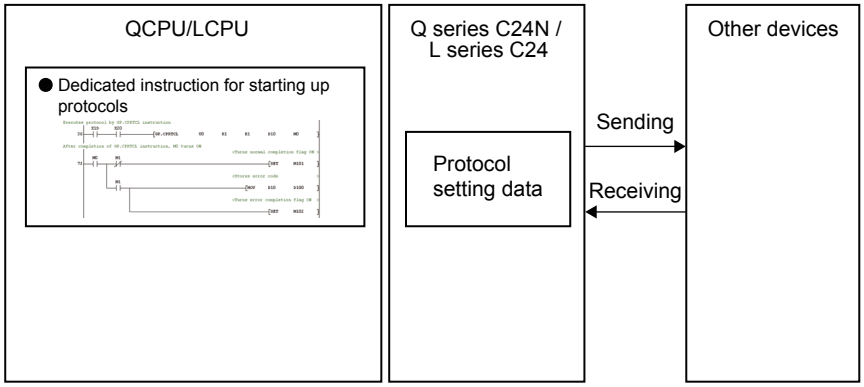
The protocol communication is available only by selecting pre-registered transmission/receive protocols, writing them to a flash ROM mounted on a Q series C24N / L series C24 module, and creating a easy ladder program using the dedicated instruction which is for starting up protocols.
In comparison with the communication using a non procedural protocol, man-hours of user application creation are reduced, because the Q series C24N / L series C24 module generates transmission packets and analyzes receive packets, and ladder programs to generate and analyze packets are no longer required.

＜Existing ladder programs (using the non procedural communication)＞



Using this function...

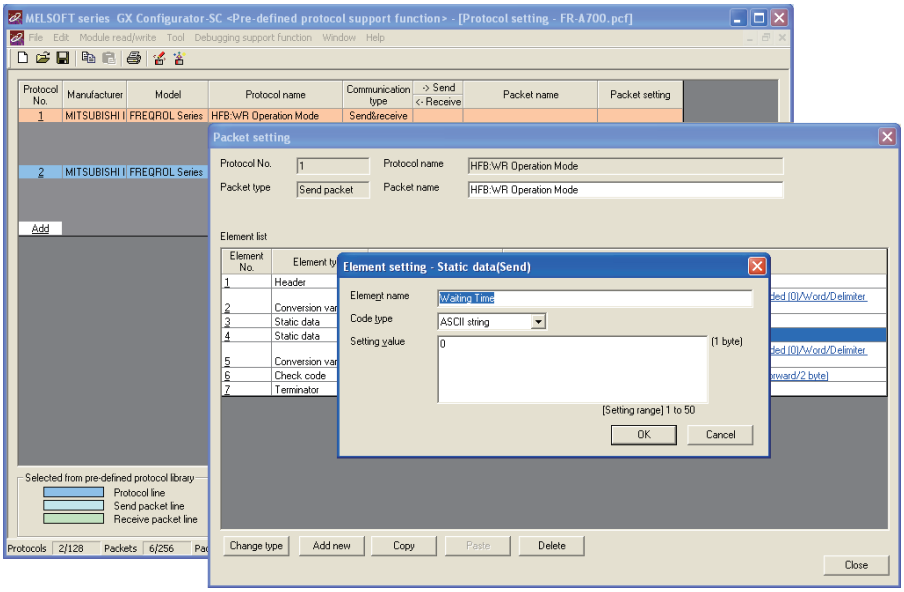
＜Ladder programs using the pre-defined protocol support function＞



(2) Easy to create and edit protocols

New send/receive protocols can be created easily!!

Protocols for the communication with other devices can easily be created and edited. This enables data communication with other devices for which standard protocols are not provided.
In addition, the list of the packet format and data of protocols can be displayed on the screen and confirmed in a comparison with protocols described in the manual of other devices.

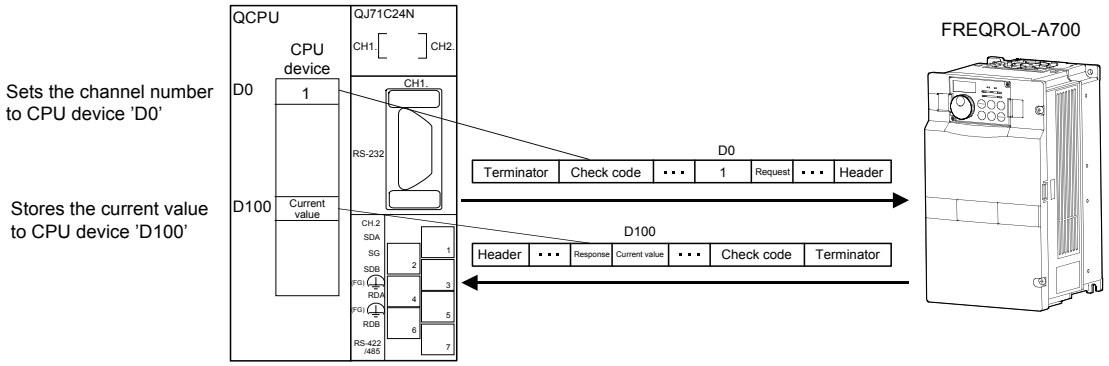


(3) Incorporation of CPU devices and buffer memory in packets

Devices to be incorporated in a packet can be registered using variables!!

When sending data, a user stores system-dependent variable elements, such as the channel number, as variables in CPU devices and buffer memory. The Q series C24N / L series C24 module automatically adds them to the specified positions in a send packet and sends it.
When receiving data, the Q series C24N / L series C24 module automatically transfers the data necessary such as read data to CPU devices and buffer memory.

< System example >



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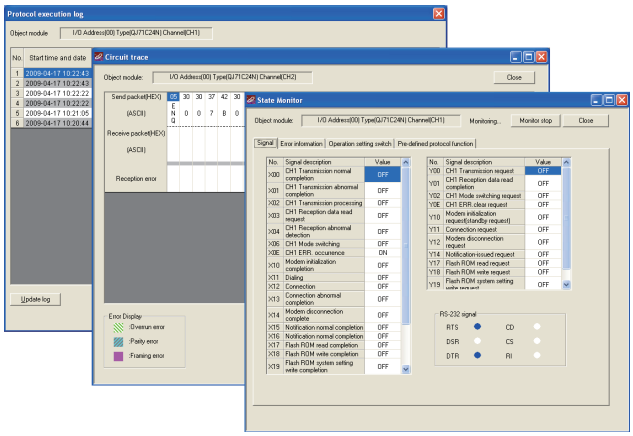
(4) Communication debugging support

Reduced debugging work for system construction!!

The following communication debugging functions which are necessary for system construction are available. Packet data on the line can be confirmed without any other tools.



(a) Protocol execution log display

The protocol name, start time and date, end time and date, and result etc. of protocols executed by Q series C24N / L series C24 modules can be monitored.

(b) Circuit trace

The transmission/receive packet data and communication signal wire condition between Q series C24N / L series C24 modules and device controllers can be traced.

(c) State monitor

The error status, communication signal wire condition, operation switch setting status, and execution status of communication protocols etc. of the C24 module can be monitored.

2 OPERATING ENVIRONMENT

This chapter explains the operating environment of the personal computer that uses GX Configurator-CS (the pre-defined protocol support function).

Item		Peripheral device
Installation (add-in) target		GX Developer Version 8.78G (English version) or later[*1*2]
Computer		Windows® -based personal computer
	CPU	Refer to the following table "Operating system and performance required for personal computer".
	Required memory	
Hard disk space	For installation	65MB or more
	For operation	20MB or more
Display		800 × 600 dots or more resolution[*3]
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version) Microsoft® Windows Vista® Home Basic Operating System (English version) Microsoft® Windows Vista® Home Premium Operating System (English version) Microsoft® Windows Vista® Business Operating System (English version) Microsoft® Windows Vista® Ultimate Operating System (English version) Microsoft® Windows Vista® Enterprise Operating System (English version) Microsoft® Windows® 7 Starter Operating System (English version) Microsoft® Windows® 7 Home Premium Operating System (English version) Microsoft® Windows® 7 Professional Operating System (English version) Microsoft® Windows® 7 Ultimate Operating System (English version) Microsoft® Windows® 7 Enterprise Operating System (English version)
Essential software package		GX Configurator-SC Version 2.20W or later is required.

*1: To use LCPU and L Series C24, use GX Developer Version 8.89T or later.
*2: To install GX Configurator-SC to a Windows® 7-based personal computer, use GX Developer Version 8.91V or later.
*3: Resolution of 1024 × 768 dots or more is recommended for Windows Vista® or Windows® 7.

Point

- For precautions in installation of GX Configurator-SC for each operating system, refer to “Method of installing the MELSOFT Series” included in the utility package. For Windows Vista® and Windows® 7, refer to the technical bulletin: “Installation procedure, precautions, and corrective actions for problems regarding Windows Vista-based personal computer” and “Products compatible with Windows 7 and precautions for installation”, as additional information.

Operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Required memory
Windows® 95 (Service Pack 1 or later)	Pentium® 300MHz or more	64MB or more
Windows® 98	Pentium® 300MHz or more	64MB or more
Windows® Me	Pentium® 300MHz or more	64MB or more
Windows NT® 4.0 Workstation (Service Pack 3 or later)	Pentium® 300MHz or more	64MB or more
Windows® 2000 Professional	Pentium® 300MHz or more	64MB or more
Windows® XP Professional	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition	Pentium® 300MHz or more	128MB or more
Windows Vista® Home Basic	Pentium® 1GHz or more	1GB or more
Windows Vista® Home Premium	Pentium® 1GHz or more	1GB or more
Windows Vista® Business	Pentium® 1GHz or more	1GB or more
Windows Vista® Ultimate	Pentium® 1GHz or more	1GB or more
Windows Vista® Enterprise	Pentium® 1GHz or more	1GB or more
Windows® 7 Starter	Pentium® 1GHz or more	1GB or more
Windows® 7 Home Premium	Pentium® 1GHz or more	1GB or more
Windows® 7 Professional	Pentium® 1GHz or more	1GB or more
Windows® 7 Ultimate	Pentium® 1GHz or more	1GB or more
Windows® 7 Enterprise	Pentium® 1GHz or more	1GB or more

Point

- When Windows® XP, Windows Vista® or Windows® 7 is used, the following new functions cannot be used.
  If any of the following new functions is used, this product may not operate normally.
  - Start of application in Windows® compatible mode
  - Fast user switching
  - Remote desktop
  - Big fonts (Details setting of Screen properties)

  Additionally, 64-bit Windows® XP, Windows Vista® and Windows® 7 are not available.
- In Windows Vista® and Windows® 7, log in as a user having User authority or higher.
- When Windows® 7 is used, the following new functions cannot be used.
  - Windows XP Mode
  - Windows Touch

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3 FUNCTION LIST

This chapter explains the functions and menu of the pre-defined protocol support function.

3.1 Function List

The functions of the pre-defined protocol support function are listed below.

(1) Pre-defined protocol support function

Function		Function outline	Reference Section
Protocol setting		Sets protocols of a module used in the pre-defined protocol support function.	Chapter 8
Packet setting		Displays the packet element list and launches setting functions for configurable elements.	Chapter 9
	Element setting	Sets a variety of data to packet elements.	Section 9.3
	Device batch setting	Sets devices used in protocols all at once. In addition, displays the list of devices being used.	Section 9.4 Section 9.5
Writing data to module		Writes the setting data on the Protocol setting screen to a selected module.	Section 10.1
Reading data from module		Reads data of the protocol settings written in a selected module and displays data on the Protocol setting screen.	Section 10.2
Verifying data with module		Verifies the protocol setting being opened with that read from a selected module.	Section 10.3

(2) Debugging support function

Function	Function outline	Reference Section
Circuit trace	Traces the transmission/receive packet data and communication signal wire condition.	Section 11.3
	• Save/read of trace data Saves/reads the data obtained by the circuit trace.	Section 11.3.4
State monitor	Monitors the error status, communication signal wire, etc. of the QJ71C24(-R2/R4).	Section 11.4
Protocol execution log display	Displays the protocol execution logs and protocol execution results of a module to which the protocol setting is set.	Section 11.2

3.2 Applicable CPUs and Modules

CPUs and modules applicable to the pre-defined protocol support function are shown below.

(1) Applicable CPU

QCPU (Q mode) excluding Redundant CPU, and LCPU

(2) Applicable modules

The following table shows the modules to which the pre-defined protocol support function can be applied and their function range.

Applicable modules and function ranges

Applicable module		Pre-defined protocol support function	Debugging support function		
			Circuit trace	State monitor	Protocol execution log display
Q series C24 modules	QJ71C24, QJ71C24-R2	×	×	○	×
	QJ71C24N*1, QJ71C24N-R2*1, QJ71C24N-R4*1	○	○	○	○
LCPU	LJ71C24, LJ71C24-R2	○	○	○	○

*1: Use a function version B module with a serial number of which the first five digits are '10122' or higher.

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3.3 Applicable versions of relevant products

The following table shows versions of modules and software applicable to the functions.

<Q series>

Function		Applicable version			
		GX Configurator-SC	GX Developer	QJ71C24N, QJ71C24N-R2, QJ71C24N-R4	QJ71C24, QJ71C24-R2
Debugging support function	State monitor	Version 2.20W or later	Version 8.78G or later	○	○
	Circuit trace				×
	Protocol execution log display			Function version B module with a serial number of which the first five digits are 10122 or higher[*1]	
Pre-defined protocol support function	Writing data to module				
	Reading data from module				
	Protocol setting				
	Select from pre-defined protocol library				
	Setting editable protocol				
	Copying/pasting protocol				
	Packet setting				
	Element setting				
	Device batch setting				
	Setting device list				
	Verify data with module				

○: Applicable (Without restrictions by product version) ×: Not applicable

*1: For the following settings of "Element setting", use a function version B module with a serial number of which the first five digits are 11062 or higher.

A protocol setting data error may occur when any of the following data are set and written to the Q series C24N with the serial number of which first five digits are '10122'.

- For Conversion variable (Refer to Section 9.3.4): Sign ("Signed"), Sign character, Number of decimals (other than "No decimal point"), or Delimiter (other than "No delimiter")
- For Non-verified reception (Refer to Section 9.3.6): Data length ("variable number of characters")

<L series>

Function		Applicable version		
		GX Configurator-SC	GX Developer	LJ71C24N, LJ71C24N-R2
Debugging support function	State monitor	Version 2.21X or later	Version 8.89T or later	○
	Circuit trace			
	Protocol execution log display			
Pre-defined protocol support function	Writing data to module			
	Reading data from module			
	Protocol setting			
	Packet setting			
	Setting device list			
	Verify data with module			

○: Applicable (Without restrictions by product version)

MEMO

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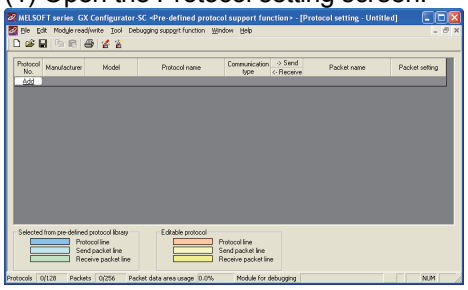
4 PRE-DEFINED PROTOCOL SUPPORT FUNCTION OPERATING PROCEDURE

4.1 Procedure from Setting through Writing

This section explains the operating procedure for writing protocols to a module with the pre-defined protocol support function, using the actual screen as an example.

(1) Open the Protocol setting screen.



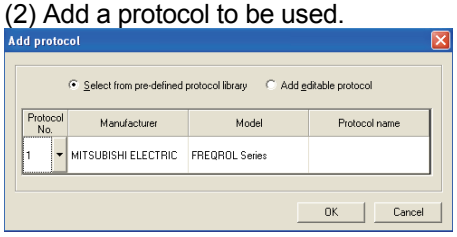
Operation:

[File] → [New] (Refer to Section 8.1.1.)

or

[File] → [Open] (Refer to Section 8.1.2.)

(2) Add a protocol to be used.



Operation:

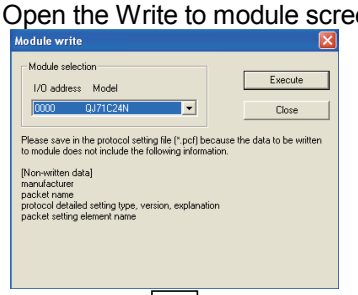
[Edit] → [Add protocol] (Refer to Section 8.3.1.)

↓

The Add protocol screen is displayed. Select either of 'Select from pre-defined protocol library' or 'Add editable protocol'.

For 'Select from pre-defined protocol library', a protocol can be selected from the pre-defined protocol library.
For 'Add editable protocol', desired packet elements can be set.
(Refer to Chapter 9.)

(3) Open the Write to module screen.



Operation:

[Module read/write] → [Write to module]
(Refer to Section 10.1.)

↓

The Module write screen is displayed.

(4) Write the protocol setting to a specified module (Q series C24N / L series C24 module).

Operation:

Select a module to which the protocol setting is to be written and click the Execute button.

↓

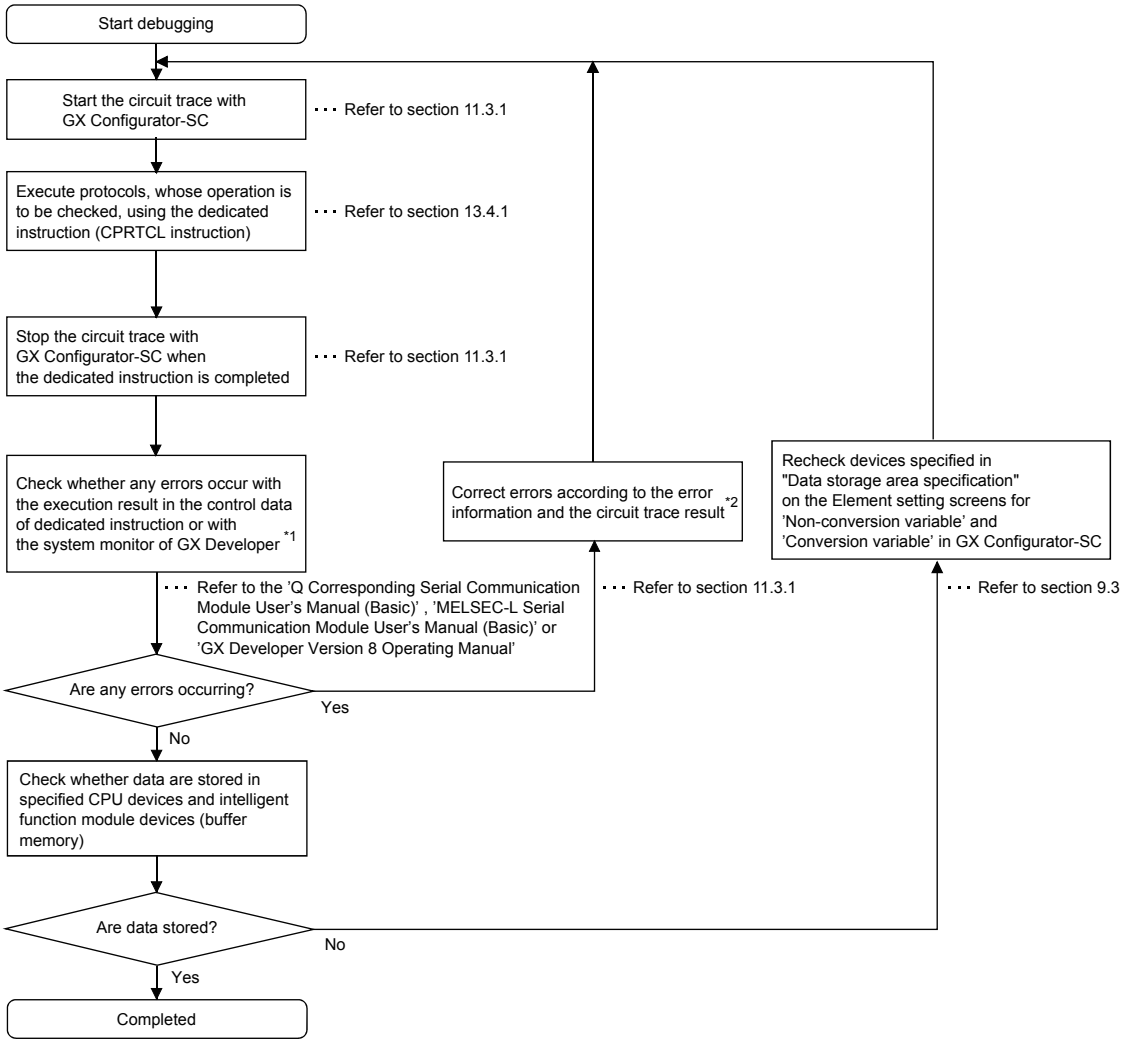
The protocol setting is registered to a flash ROM mounted on a Q series C24N / L series C24 module.

Point

The protocol setting can be read from a specified module (Q series C24N / L series C24 module) as well. For details, refer to Section 10.2.

4.2 Procedure for Debugging

The following chart shows the procedure for the operation check with other devices (the procedure for debugging).



*1: When a number of protocols is specified in the dedicated instruction, the execution result can be checked by each protocol in the protocol execution log.
*2: Methods for checking an error factor
(1) Identify an error factor by an error code.
(2) Check the following items when a transmission monitoring timeout error occurs.
1) Cable connection (whether a cable looses.)
2) Whether the transmission is stopped due to the DTR control
(3) Check the following items when a receive wait timeout error occurs.
1) Cable connection (whether a cable looses.)
2) Whether the transmission from other devices is stopped due to the DTR control
3) The circuit trace result
・Whether the transmission from other devices is stopped
・Whether the data missing occurs due to the receive error
・Whether the data (packets) sent from other devices include errors

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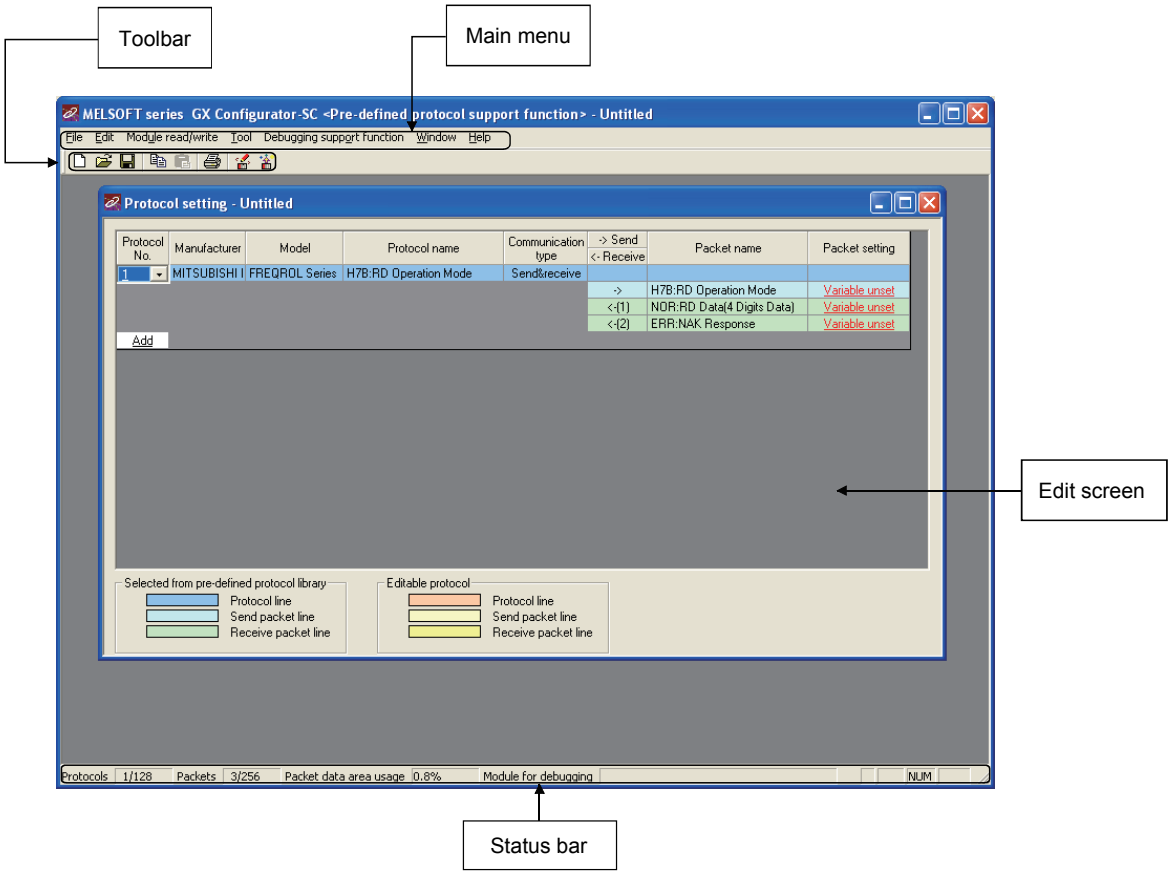
5 SCREEN DISPLAY

This chapter explains the screen display and names of the pre-defined protocol support function.

5.1 Screen Display

The basic screen display of the pre-defined protocol support function is shown below.



The following table indicates the names and functions.

Name	Function
Main menu	Select the menu item.
Toolbar	Click the selected button to execute the function.
Edit screen	Protocol setting, the trace screen etc. are available.
Status bar	Displays status of various items.

5.2 Menu List

The following table indicates a menu list of the pre-defined protocol support function.

Menu			Shortcut Keys	Reference
File	New		Ctrl + N	Section 8.1.1
	Open		Ctrl + O	Section 8.1.2
	Close		—	Section 8.1.3
	Save		Ctrl + S	Section 8.1.4
	Save as		—	Section 8.1.4
	Print		Ctrl + P	Chapter 12
	Exit		—	Chapter 7
Edit	Add protocol		—	Section 8.3.1
	Change to editable protocol		—	Section 8.3.2
	Protocol detailed setting		—	Section 8.3.3
	Add receive packet		—	Section 9.2.1
	Delete		Delete	Section 8.3.5
	Copy		Ctrl + C	Section 8.3.6
	Paste		Ctrl + V	Section 8.3.6
	Delete multiple protocols		—	Section 8.3.5
	Copy multiple protocols		—	Section 8.3.6
	Paste multiple protocols		—	Section 8.3.6
	Device batch setting		—	Section 9.4
Module read/write	Write to module		—	Section 10.1
	Read from module		—	Section 10.2
	Module verification		—	Section 10.3
Tool	Setting device list		—	Section 9.5
Debugging support function	Module selection		—	Section 11.1
	Protocol execution log		—	Section 11.2
	Circuit trace	Circuit trace	—	Section 11.3.1
		Open circuit trace file	—	Section 11.3.3
		Save as circuit trace file	—	Section 11.3.4
		Circuit trace option	—	Section 11.3.2
	State monitor		—	Section 11.4
Window	Cascade		—	—
	Tile horizontally		—	—
Help	Product information		—	Appendix 1

5.3 Toolbar

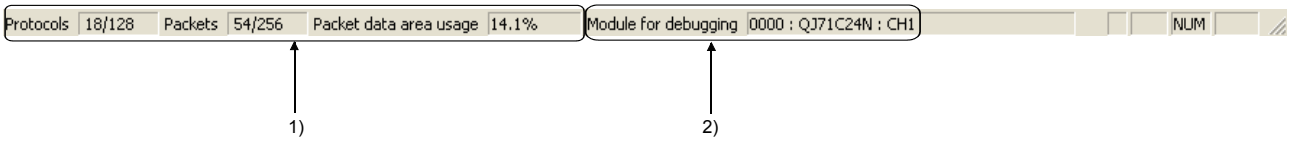
When the cursor is moved over any of the buttons, the tool tip is displayed.
The following table lists the tool buttons.

Tool Button	Tool Tip
	New
	Open
	Save
	Copy
	Paste
	Print
	Write to module
	Read from module

5.4 Status Bar

The status bar displays status information.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

No.	Display/Setting Details
1)	Displays the percentage of each setting to its higher limit on the Protocol setting screen. (For the details, refer to Section 8.3.)
2)	Displays the module name, I/O address, and channel of a debugging object module being selected.

6 STARTING PRE-DEFINED PROTOCOL SUPPORT FUNCTION

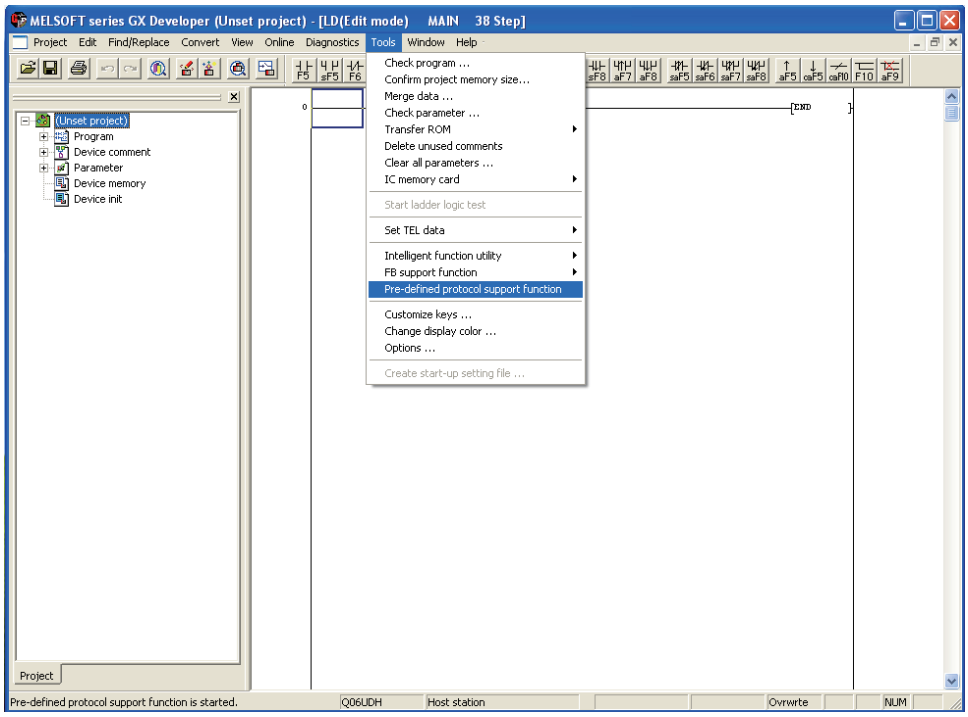
PURPOSE

To start the pre-defined protocol support function from GX Developer.

BASIC OPERATION

1. Select the [Tools] → [Pre-defined protocol support function] menu.
2. The pre-defined protocol support function starts.

DISPLAY/SETTING SCREEN



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7 ENDING OF PRE-DEFINED PROTOCOL SUPPORT FUNCTION

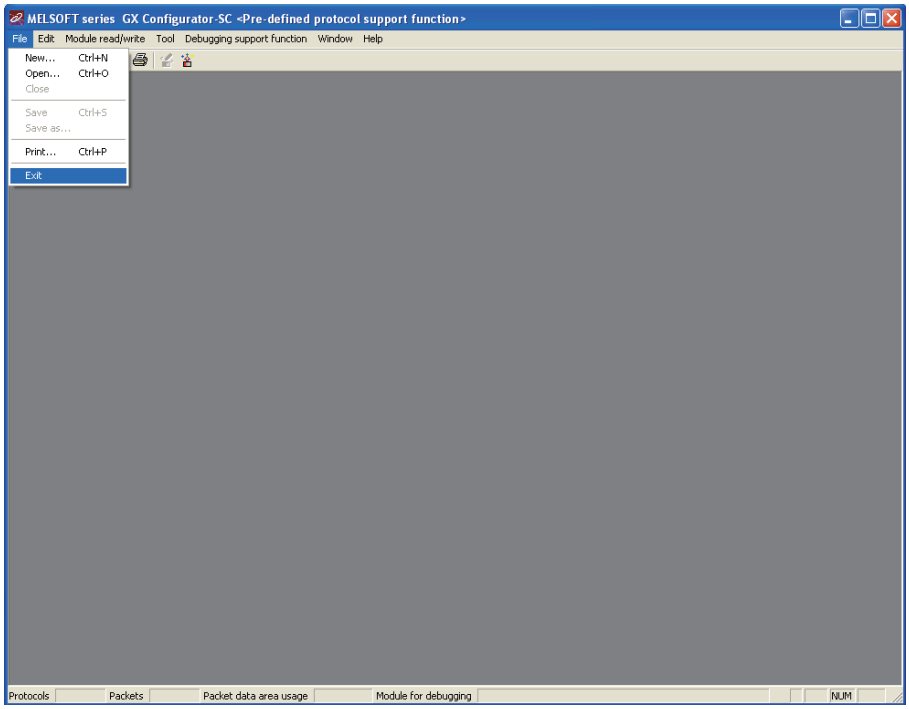
PURPOSE

To end the pre-defined protocol support function.

BASIC OPERATION

Select the [File] → [Exit] menu.

DISPLAY/SETTING SCREEN



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8 PROTOCOL SETTING FUNCTION

The following lists File/Edit operations.

Function	Function outline	Reference
Creating new files	Creates a new protocol setting file.	Section 8.1.1
Opening files	Opens an existing protocol setting file.	Section 8.1.2
Closing files	Closes a protocol setting file being open.	Section 8.1.3
Saving files	"Saves" or "Saves as" a protocol setting file being edited.	Section 8.1.4
Adding protocols	Adds a protocol.	Section 8.3.1
Changing to editable protocols	Changes a protocol selected from the pre-defined protocol library to an editable one.	Section 8.3.2
Protocol detailed setting	Configures the number of retries of a protocol and whether to clear OS area (receive data area) before protocol execution etc.	Section 8.3.3
Setting send/receive parameters in a batch	Configures all receive settings/send settings of the protocol detailed setting at once.	Section 8.3.4
Deleting protocols/packets	Deletes a protocol/packet.	Section 8.3.5
Copying and pasting protocols/packets	Copies and pastes a protocol/packet.	Section 8.3.6

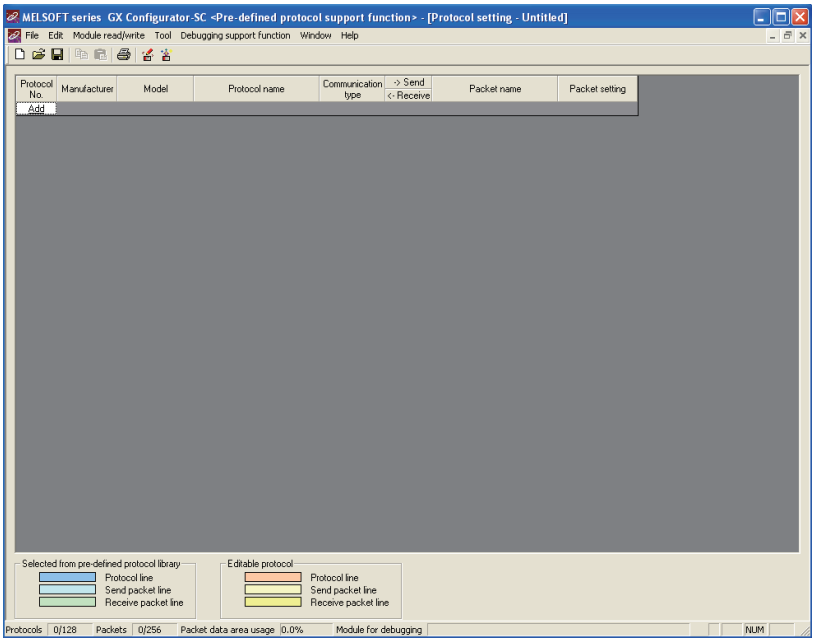
8.1 File Operation

8.1.1 Creating new files

BASIC OPERATION

1. Select the [File] → [New] menu ( ).
2. The Protocol setting screen is displayed.

DISPLAY/SETTING SCREEN



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8.1.2 Opening files

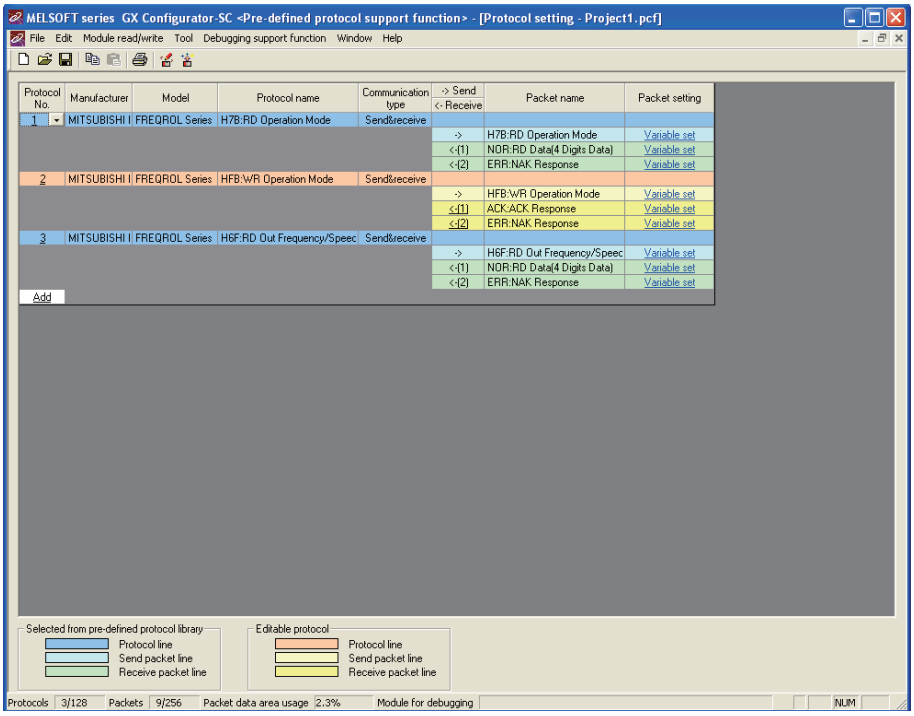
PURPOSE

To read an existing protocol setting file.

BASIC OPERATION

1. Select the [File] → [Open] menu ( ).
2. Select a protocol setting file (*.pcf).
3. Click the Open button.
4. The Protocol setting screen is displayed.

DISPLAY/SETTING SCREEN



8.1.3 Closing files

PURPOSE

To close a protocol setting file being open.

BASIC OPERATION

1. Select the [File] → [Close] menu.
2. If the setting has been changed, the confirmation message for saving a protocol setting file is displayed.
   - Click the Yes button to save and close the protocol setting file.
   - Click the No button to close the protocol setting file without saving it.

8.1.4 Saving files

PURPOSE

Save a protocol setting file being edited.

BASIC OPERATION

(1) Saving a protocol setting file over the old one

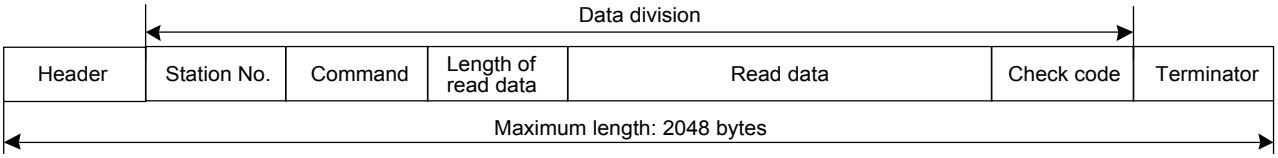
1. Select the [File] → [Save] menu ( ).
2. A protocol setting file being edited is saved over the old one.

(2) Saving a protocol setting file with a name

1. Select the [File] → [Save as] menu.
2. Set the "File path" and "File name".
3. Click the Save button.
4. A protocol setting file being edited is saved with a name.

8.2 Communication Type of Protocols

Send packets to other devices and receive packets from other devices at the time of process execution are registered in a protocol.
The following shows an example of the packet configuration. For details of packet elements, refer to Chapter 9.



The pre-defined protocol function performs communication with other devices using the following procedures (communication types). For the operation image of each communication type, refer to Appendix 2.

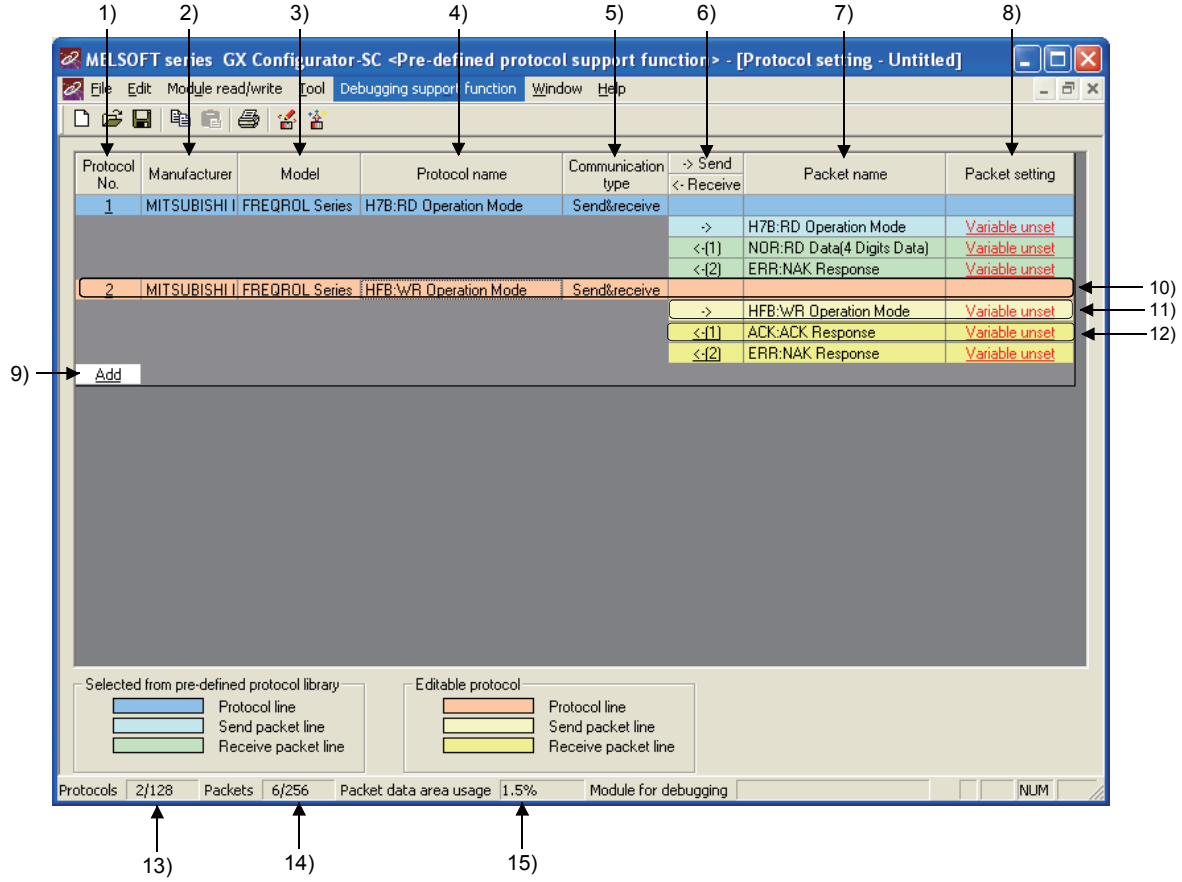
Communication type name	Description
Send only	Sends a send packet once. One send packet is required.
Receive only	Receives a packet if it matches any of up-to-16 defined receive packets. One or more receive packets are required.
Send & receive	Sends a send packet, and then receives a packet if it matches any of up-to-16 defined receive packets. One send packet and one or more receive packets are required.

8.3 Protocol Edit Operation

PURPOSE

To set protocols to be defined to modules on the Protocol setting screen.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

No.	Item	Display/Setting Details
1)	Protocol No.	Set a protocol number to be used in a pre-defined protocol dedicated instruction for ladder programs. The assignable number is 1 to 128.
2)	Manufacturer	Displays the manufacturer's name of a target device of a protocol to be set.
3)	Model	Displays the target model of a protocol to be set.
4)	Protocol name	Displays the name of a protocol to be set.
5)	Communication type	Display the communication type in a protocol to be set. Send only : Sends one send packet once. Receive only : Receives a packet if it matches any of up-to-16 defined receive packets. Send&Receive : Sends one send packet, and receives a packet if it matches any of up-to-16 defined receive packets.

No.	Item	Display/Setting Details
6)	-> Send/<- Receive	Displays the packet direction. Send : -> Receive : <-(1) to <-(16) A receive packet number is displayed in ().
7)	Packet name	Displays the packet name.
8)	Packet setting	Displays the existence or non-existence of variables in an element, and set or unset of variables. With 'Variable unset', 'Element unset' or 'Element error', the setting cannot be written to the module. No variable : There is no variable in the element. Variable set (in blue) : All variables are set. Variable unset (in red) : There are one or more unset variables. Element unset (in red) : There is no element in the editable protocol. Element error (in red) : The element does not meet requirements.
9)	Cell for adding protocol	The Add protocol screen is displayed by clicking this cell or pressing the Enter key.
10)	Protocol line	One protocol line is displayed for each protocol. Up to 128 lines can be displayed per a module. The background is displayed in the following colors. Protocol selected from the pre-defined protocol library : Deep sky blue Editable protocol : Orange
11)	Send packet line	One send packet line is displayed for each send packet. ('Send' means the communication toward an external device from a module.) The line numbers per a protocol varies depending on its communication type. 'Receive only' : 0 line 'Send only' 'Send&receive' : 1 line The background is displayed in the following colors. Protocol selected from the pre-defined protocol library : Light sky blue Editable protocol : Light yellow
12)	Receive protocol line	One receive packet line is displayed for each receive packet. ('Receive' means the communication toward a module from an external device.) The line numbers per a protocol varies depending on its communication type. 'Send only' : 0 line 'Receive only' 'Send&receive' : 1 to 16 lines The background is displayed in the following colors. Protocol selected from the pre-defined protocol library : Pale green Editable protocol : Yellow
13)	Number of registered protocols	Displays the number of registered protocols out of a maximum of 128.
14)	Number of registered packets	Displays the number of registered packets out of a maximum of 256.
15)	Packet data area usage	Displays the percentage of the size of packet data being registered in the maximum registerable area of the packet data area (flash ROM area in a module to store packet data for communication with other devices).

8.3.1 Adding protocols

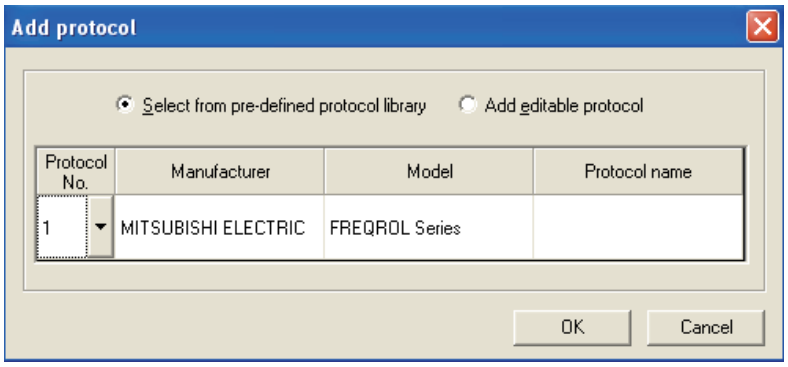
PURPOSE

To add a protocol.

BASIC OPERATION

1. Display the Protocol setting screen, and click the cell for adding protocol or press the Enter key.
2. The Add protocol screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Select from pre-defined protocol library	Select this item to select a protocol from the pre-defined protocol library and add it, specifying “Protocol No.”, “Manufacturer”, “Model”, and “Protocol name”. Items other than “Protocol No.” cannot be changed after a protocol addition.
Add editable protocol	Select this item to add a protocol which can be edited arbitrarily, specifying only “Protocol No.”. “Manufacturer”, “Model”, and “Protocol name” can be changed after a protocol addition.
Protocol No.	Set the number of the protocol to be added.
Manufacturer	Set a manufacturer’s name of the protocol to be added.
Model	Set a model of the protocol to be added.
Protocol name	Set a name of the protocol to be added.
OK button	Fixes the setting and closes the screen.
Cancel button	Cancels the setting and closes the screen.

POINT

When “Select from pre-defined protocol library” is selected, “Send/receive data storage area” in a Non-conversion variable/Conversion variable can only be configured in packet elements.

8.3.2 Changing to editable protocols

PURPOSE

To change a protocol selected from the pre-defined protocol library to an editable one.

BASIC OPERATION

1. Display the Protocol setting screen, and select a line of a protocol to be changed.
2. Select the [Edit] → [Change to editable protocol] menu.
3. The confirmation message is displayed. Click the Yes button.

Point

Once a protocol has been changed to an editable protocol, it cannot be restored.

8.3.3 Protocol detailed setting

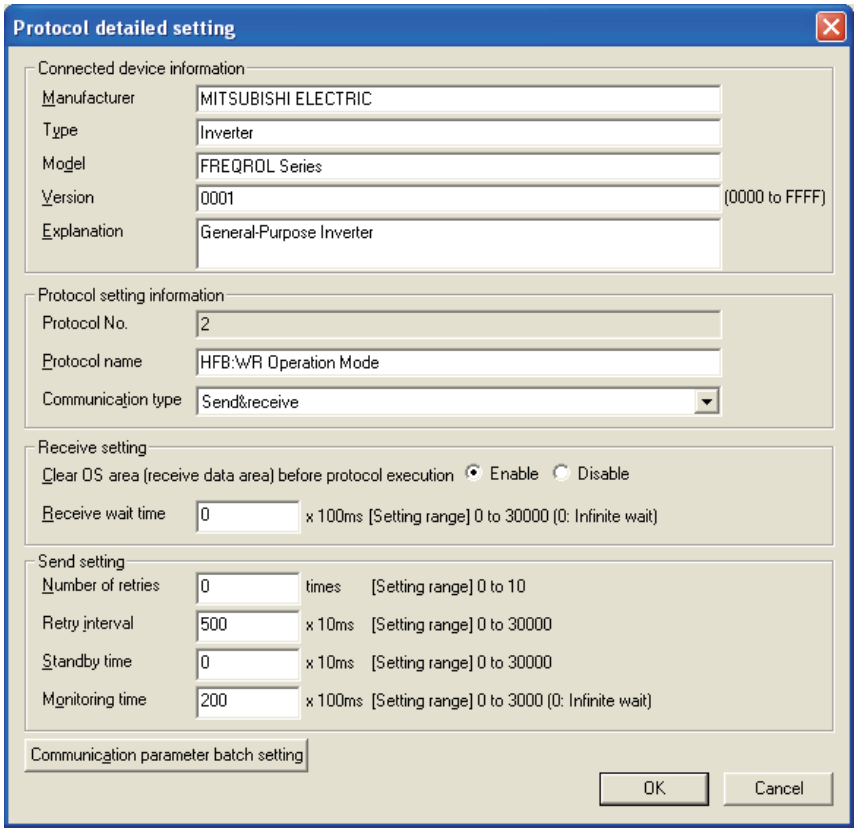
PURPOSE

To configure the number of retries of a protocol and whether to clear OS area (receive data area) before protocol execution etc.

BASIC OPERATION

1. Display the Protocol setting screen, and select a line of a protocol to be set.
2. Select the [Edit] → [Protocol detailed setting] menu.
3. The Protocol detailed setting screen is displayed.

DISPLAY/SETTING SCREEN



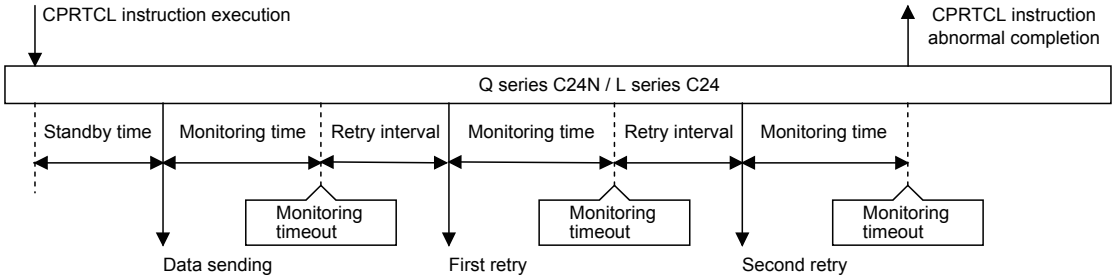
DISPLAY/SETTING DETAILS

Item		Display/Setting Details
Connected device information*1	Manufacturer	Set a manufacturer's name of the protocol.
	Type	Set a device type of the protocol.
	Model	Set a model of the protocol.
	Version	Set a device version of the protocol.
	Explanation	Set a description for a device of the protocol.
Protocol setting information*1	Protocol No.	Displays a protocol number of the selected protocol.
	Protocol name	Set a protocol name of the protocol.
	Communication type	Select a communication type of the protocol.
Receive setting	Clear OS area (receive data area) before protocol execution	Select whether to clear the OS area (receive data area) of the Q series C24N / L series C24 module before the protocol execution. If this item is not selected, the data that the Q series C24N / L series C24 module received before the protocol execution also become a receive target of the protocol.
	Receive wait time	Set waiting time after the Q series C24N / L series C24 module turns to the waiting for reception status. If the communication with other devices is not available due to a cable disconnection etc. and no matched packet can be received within the set time, the Q series C24N / L series C24 module determines an error and cancels the waiting for reception status.
Send setting	Number of retries	Set the number of times the Q series C24N / L series C24 module retries to send when the sending from the Q series C24N / L series C24 module has not been completed within the set time of "Monitoring time". The Q series C24N / L series C24 module determines an error if the sending has not been completed despite the specified number of times of sending retries.
	Retry interval	Set the interval between the failure of sending from the Q series C24N / L series C24 module and the retry when the sending from the Q series C24N / L series C24 module has not been completed within the set time of "Monitoring time".
	Standby time	Set standby time between when a protocol set to the Q series C24N / L series C24 module turns to the execution status and when it actually sends the data. By setting this item, the send timing of the Q series C24N / L series C24 module can be adjusted to readiness of other devices to receive data.
	Monitoring time	Set waiting time between when the Q series C24N / L series C24 module turns to the sending status and when the sending is completed. If the communication with other devices is not available due to a cable disconnection etc. and the sending cannot be completed within the set time, the Q series C24N / L series C24 module determines an error and cancels the sending status.

*1: For a protocol selected from the pre-defined protocol library, "Connected device information" and "Protocol setting information" cannot be modified.

Item	Display/Setting Details
Communication parameter batch setting button	Displays the Communication parameter batch setting screen. For details, refer to Section 8.3.4.
OK button	Fixes the setting and closes the screen.
Cancel button	Cancels the setting and closes the screen.

(Example) When the setting value of “Number of retries” is 2, the Q series C24N / L series C24 module determines an error at the following timing if it cannot send the data.



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8.3.4 Setting send/receive parameters in a batch

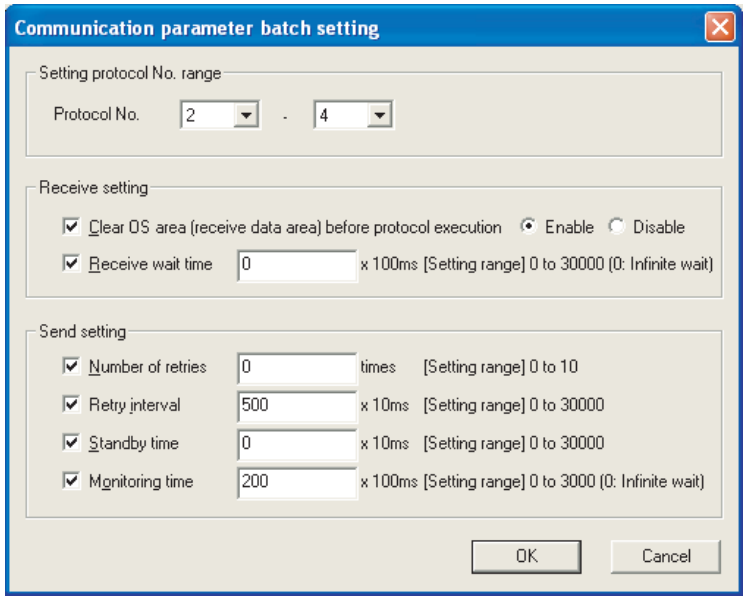
PURPOSE

To configure parameters used for sending/receiving a protocol.

BASIC OPERATION

1. Display the Protocol detailed setting screen, and click the Communication parameter batch setting button.
2. The Communication parameter batch setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Setting protocol No. range	Select the start number and end number of the range of protocols to be set at once.
Receive setting/ Send setting	Specified values of selected items are to be set.
OK button	Fixes the setting and returns to the Protocol detailed setting screen.
Cancel button	Cancels the setting and returns to the Protocol detailed setting screen.

8.3.5 Deleting protocols/packets

PURPOSE

To delete a protocol/packet.

BASIC OPERATION

1. Display the Protocol setting screen, and select a line of a protocol/packet to be deleted.
2. Select the [Edit] → [Delete] menu, or press the Delete key.
3. The line of the protocol/packet is deleted.

Point

- To delete multiple protocols at once, select [Edit] → [Delete multiple protocols] and specify the range.
- A send packet cannot be deleted.
- A receive packet cannot be deleted when its communication type is “Send & receive” or “Receive only” and there is only one receive packet.
- A packet in a protocol selected from the pre-defined protocol library cannot be deleted.

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8.3.6 Copying and pasting protocols/packets

PURPOSE

To copy and paste a protocol/packet.

BASIC OPERATION

(1) Copying one by one

1. Display the Protocol setting screen and select a line of a protocol/packet to be copied.
2. Select the [Edit] → [Copy] menu, or press the Ctrl + C key.
3. The line of the protocol/packet is copied.
4. Display the destination Protocol setting screen/Packet setting screen, and select the destination line of a protocol/packet.
5. Select [Edit] → [Paste] menu, or press the Ctrl + V key.
6. The selected line of the protocol/packet is overwritten.

(2) Copying more than one in a batch

Batch copy is available for diverting multiple protocols/packets to another pre-defined protocol support function window at a time.

1. Display the Protocol setting screen of the copy source.
2. Select the [Edit] → [Copy multiple protocols] menu.
3. Specify the range of the protocol numbers to copy in the Copy multiple protocols screen.
4. Display the destination Protocol setting screen.
5. Select the [Edit] → [Paste multiple protocols] menu.
6. Data in the protocol/packet lines of the protocol numbers of the copy source range are overwritten. (The protocol numbers of the copy source and of the destination become the same.)

Point

- A send packet cannot be pasted to a receive packet, and a receive packet cannot be pasted to a send packet.
- A packet cannot be pasted to a protocol selected from the pre-defined protocol library.

9 PACKET SETTING FUNCTION

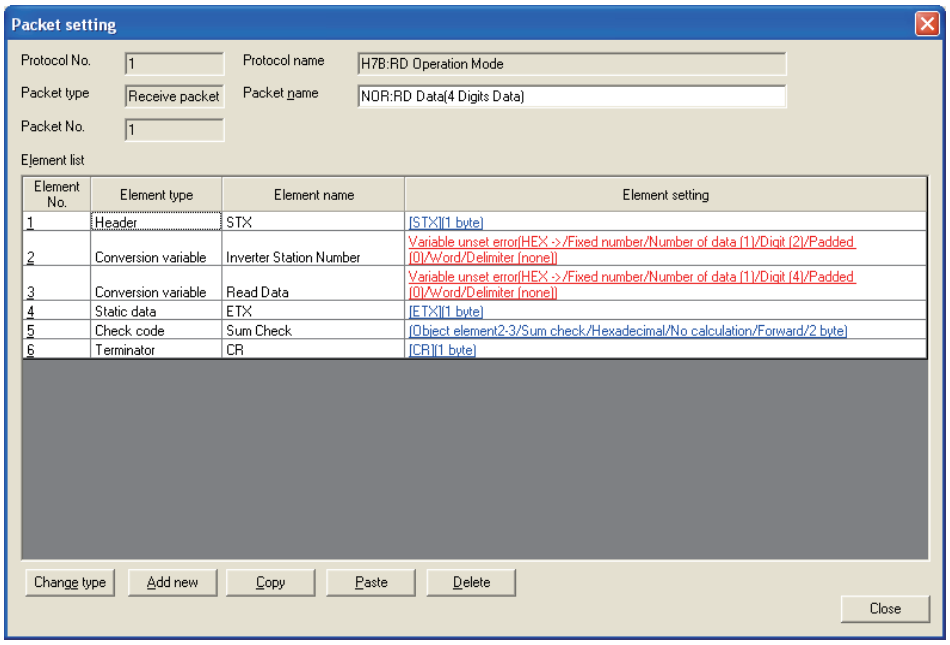
PURPOSE

To display an element list of a registered packet according to a set protocol.

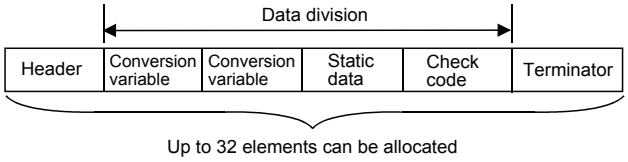
BASIC OPERATION

1. Display the Protocol setting screen, select a send packet/receive packet, and click it.
2. The Packet setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item		Display/Setting Details
Protocol No.		Displays the protocol number of the specified protocol.
Protocol name		Displays the protocol name of the specified protocol.
Packet type		Displays 'Send packet' or 'Receive packet' as the type of the specified packet.
Packet name		Set the packet name of the specified packet.*1
Packet No. (Receive packet only)		Displays the packet number of the receive packet.
Element list	Element No.	Displays the number of the packet element.
	Element type	Displays the type of each element. For details, refer to Section 9.1.  Header/Length/Static Data/Non-conversion variable/Conversion variable/ Non-verified reception/Check code/Terminator
	Element name	Displays the name of each element.
	Element setting	Displays the setting outline of each element. For the display details, refer to [Element display example] in this section. Display contents may vary depending on types of elements. To display the respective setting screen, click an editable cell*2 or press the Enter key.
Change type button*3		Changes the type of the packet element. For details, refer to Section 9.2.2.
Add new button*3		Adds a new packet element. For details, refer to Section 9.2.1.
Copy button		Copies the packet element at the cursor position.
Paste button*3		Pastes the copied packet element to the line next to the cursor position.
Delete button*3		Deletes the packet element at the cursor position.
Close button		Closes the Packet setting screen.

*1: Not editable for a protocol selected from the pre-defined protocol library.

*2: Displayed in red when a Variable unset error, Element error or Calculating range error occurs, and displayed in blue when no error occurs.

*3: Not selectable for a protocol selected from the pre-defined protocol library.

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[Element display example] (For details of elements, refer to Section 9.1)

Element type	Display content		Display example
Header Static Data Terminator	Code type is ASCII string	Displays the setting value (ASCII string) with " ", and data length with ( ).	"TEXT"(4byte)
	Code type is ASCII control code	Displays the setting value (ASCII control code) with [ ], and data length with ( ).	[CR](1byte)
	Code type is HEX	Displays a setting value (HEX), and data length with ( ).	1AB2C3(3byte)
Length	Range for calculation of data length		Object element3-8
	Displays the code type using elliptical expressions. ASCII hexadecimal : Hexadecimal ASCII decimal : Decimal HEX : HEX		Hexadecimal
	Displays the data flow using elliptical expressions. Forward direction (upper byte -> lower byte) : Forward Reverse direction (lower byte -> upper byte) : Reverse Byte swap (by word) : byte		Forward
	Data size		2 byte
Non-conversion variable	For 'Fixed length', displays the address range of a device or buffer to be specified as a variable with [ ]. For 'Variable length', additionally displays the starting address of a device or buffer memory which specifies the data length with another [ ].		Fixed length: [D1-D2] Variable length: [D1] [D2-D11]
	Fixed length/Variable length		Fixed length
	Length of send/receive data		600 byte
	Displays the unit of stored data using elliptical expressions. Lower byte + Upper byte : Lower/Upper byte Lower bytes only : Lower byte		Lower/Upper byte
	Displays the byte swap using elliptical expressions. Disable (lower -> upper) : No swap Enable (upper -> lower) : Swap		Swap

Element type	Display content	Display example
Conversion variable	For 'Fixed number of data', displays the address range of a device or buffer to be specified as a variable with [ ]. For 'Variable number of data', additionally displays the starting address of a device or buffer memory which specifies the data length with another [ ].	Fixed number of data: [D1-D2] Variable number of data: [D1] [D2-D11]
	Displays "Conversion" using elliptical expressions. HEX -> ASCII decimal : -> Dec HEX -> ASCII hexadecimal : -> Hex ASCII decimal -> HEX : Dec ->) ASCII hexadecimal -> HEX : Hex ->	-> Hex
	Fixed number of data/Variable number of data	Variable number
	Displays 'Number of data' using elliptical expressions.	Number of data (3)
	Data digits ("Digit (variable)" is displayed when the value is '0'.)	Digit (3)
	Displays a blank-padded character (0/Space).	Padded (0)
	Displays the conversion unit using elliptical expressions. Word : Word Double word : Double	Double
	Displays whether signed or not. Unsigned Signed	Signed
	When 'Signed' is selected in "Sign", displays the sign character using elliptical expressions. None : none + : + 0 : 0 Space :space	Sign character (none)
	Displays the number of decimals using elliptical expressions.	Decimal (5)
	Displays the delimiter using elliptical expression. No delimiter : none Comma : comma Space : space	Delimiter (comma)

Element type	Display content	Display example
Check code	Range for calculation of a check code	Object element2-7
	Displays the processing method using elliptical expressions. Horizontal parity : Parity Sum check : Sum check 16-bit CRC (for MODBUS) : CRC MOD	Parity
	Displays “Code type” using elliptical expressions. ASCII hexadecimal : Hexadecimal ASCII decimal : Decimal HEX : HEX	Hexadecimal
	Displays the complement calculation using elliptical expressions. No complement calculation : No calculation One's complement : 1 complement Two's complement : 2 complement	1 complement
	Displays the data flow using elliptical expressions. Forward direction (upper byte -> lower byte) : Forward Reverse direction (lower byte -> upper byte) : Reverse Byte swap (by word) : byte	Forward
	Data size	2 byte
Non-verified reception (Receive only)	Displays the check size with ( ). (When the value is 0, displays ‘Variable’.)	(123 byte)

9.1 Packet elements

A packet consists of packet elements.
Up to 32 elements can be placed in a packet, and the maximum data length is 2048 bytes per a packet.
This section shows details of packet elements. For data examples of packet elements, refer to Appendix 4.

(1) Header

Use this element when a specific code/character string exists at the beginning of a packet.

- At sending : Sends a specified code and character string.
- At receiving : Verifies a header and receive data.

The following table lists the items.

Item	Description	Remark
Element name	Set a name of the element.	-
Code type	Select a data type of the setting value. ASCII string/ASCII control code/HEX	-
Setting value	Set data within 1 to 50 bytes. Code type / Setting range: ASCII string: 20_H to $7F_H$ ASCII control code: 00_H to $1F_H$, and $7F_H$ of control code HEX: 00_H to FF_H of hexadecimal data	(Setting example) ASCII string : ”ABC” ASCII control code : STX HEX : FFFF

Point

- Only one Header can be placed in a packet.
- A Header can be placed only at the beginning of a packet.

(2) Static Data

Use this element when a specific code/character string such as command exists in a packet.

- At sending : Sends a specified code and character string.
- At receiving : Verifies the receive data.

Multiple Static Data elements can be placed to desired positions in the data division.
The items are the same as ones explained in (1) in this section.

(3) Terminator

This element indicates the end of a packet. Use this element when a code/character string indicating the end of the packet is included.

The following table lists the items.

Item	Description	Remark
Element name	Set a name of the element.	-
Code type	Set a data type of the setting value. ASCII string/ASCII control code/HEX	-
Setting value	Set data within 1 to 50 bytes. Code type / Setting range: ASCII string: 20_H to $7F_H$ ASCII control code: 00_H to $1F_H$, and $7F_H$ of control code HEX: 00_H to FF_H of hexadecimal data	(Setting example) ASCII string : "ABC" ASCII control code : STX HEX : FFFF

Point

- Only one Terminator can be placed in a packet.
- Only a Check code and Static Data can be placed behind a terminator.

(4) Length

Use this element when an element indicating the data length is included in a packet.

- At sending : Calculates the data length of a specified range, and adds the result to a send packet.
- At receiving : Verifies the data (setting value) corresponds to the length in the receive data as the data length of a specified range.

The following table lists the items.

Item		Description		Remark
Element name		Set a name of the element.		-
Code type		Select a format of the data length. ASCII hexadecimal/ASCII decimal/HEX		-
Data length		Select the data length on the line. The range is 1 to 4.		-
Data flow		Forward direction (upper byte -> lower byte)	At sending : Sends a calculated length, from the upper byte. At receiving : Receives data, from the upper byte.	Not settable when "Data length" is 1 byte
		Reverse direction (lower byte -> upper byte)	At sending : Sends a calculated length, from the lower byte. At receiving : Receives data, from the lower byte.	
		Byte swap (by word)	At sending : Sends a calculated length swapping the upper byte and lower byte by word. At receiving : Receives data swapping the upper byte and lower byte by word.	
Calculating range	start	Set the starting element number of the calculating range. The range is 1 to 32.		-
	end	Set the ending element number of the calculating range. The range is 1 to 32.		

Point

- Only one Length can be placed in a packet.
- When there is no element other than a Length, an element error occurs.
- When the number of digits of calculation result is greater than that specified in "Data length", digits greater than the specified digit are omitted (ignored).
  Example) When '2 bytes' is specified in "Data length" and the calculation result is '123 bytes', the data length is considered as '23'.
- When any of a Non-conversion variable (Variable length), Conversion variable (Variable number of data), Conversion variable (Fixed number of data/Variable number of digits[*1]), and Non-verified reception (Variable number of characters) is placed behind a Length and they are not included in the calculation range of the Length, place any of the following data immediate after the Non-conversion variable (Variable length), Conversion variable (Variable length) or Non-verified reception.
  Static Data
  Terminator
  Check code + Static Data
  Check code + Terminator
- When "Code type" is 'ASCII hexadecimal', a corresponding packet is regarded as a mismatch packet if a string except for '0'-'9' 'A'-'F' 'a'-'f' is received.
- When "Code type" is 'ASCII decimal', a corresponding packet is regarded as a mismatch packet if a string except for '0'-'9' is received.

*1: Excluding a case where "Number of data" is '1' and "Delimiter" is not 'No delimiter'.

(5) Non-conversion variable

Use this element to send the data of a CPU device or buffer memory as a part of a send packet, or store a part of a receive packet to a CPU device or buffer memory.

The following lists the items.

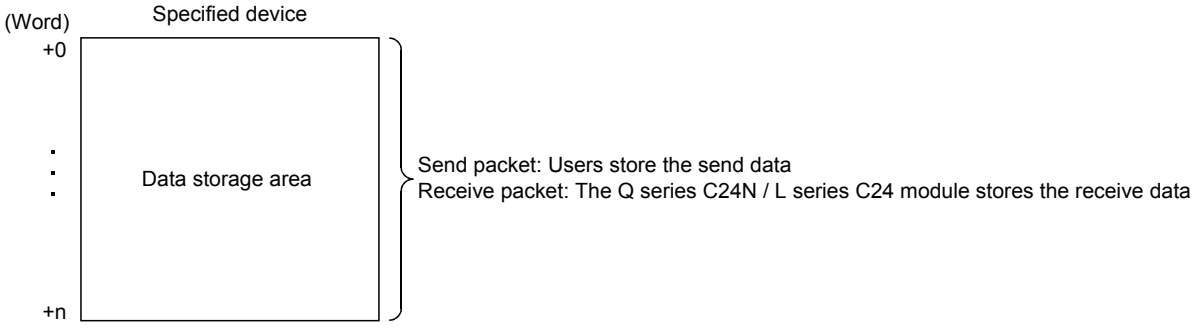
Item	Description	
Element name	Set a name of the element.	
Fixed length/Variable length	Fixed length	Sends and receives the data whose length is fixed.
	Variable length	At sending : Specifies the data length at the time of the protocol execution and sends data. At receiving : Receives data of which the length is variable.
Data length/ Maximum data length	Set the length of data to be sent and received. (For the variable length data, set the maximum data length that can be specified to the data length storage area.) The range is 1 to 2048.	
Unit of stored data	Lower byte + Upper byte	At sending : Sends each one word (2 bytes) data in the data storage area in the order of the lower byte to the upper byte. At receiving : Stores the receive data to the data storage area in the order of the lower byte to the upper byte.
	Lower bytes only	At sending : Sends each lower byte of data in the data storage area. The Q series C24N / L series C24 module ignores each upper byte of the data. At receiving : Stores the receive data to each lower byte in the data storage area. Q series C24N / L series C24 module stores 00_H to each upper byte.
Byte swap	Disable (lower -> upper)/ Enable (upper -> lower)	At sending : When 'Enable' is selected, sends data swapping the upper byte and lower byte by word (2 bytes). When "Unit of stored data" is 'Lower byte + Upper byte' and "Data length" is an odd number of bytes, sends the upper byte at transmission of the last byte. When "Unit of stored data" is 'Lower bytes only' and "Data length" is an odd number of bytes, sends data without any byte swap at transmission of the last byte. At receiving : When 'Enable' is selected, receives data swapping the upper byte and lower byte by word (2 bytes). When "Unit of stored data" is 'Lower byte + Upper byte' and "Data length" is an odd number of bytes, stores the last byte to the upper byte. When "Unit of stored data" is 'Lower bytes only' and "Data length" is an odd number of bytes, stores the last byte without any byte swap.
Data storage area specification	Specify a starting device to store variable value.	

The following explains the configuration of the data storage area.

(a) When “Fixed length/Variable length” is ‘Fixed length’

An area starting from the device number which is specified on the Element setting screen is considered as the ‘data storage area’.

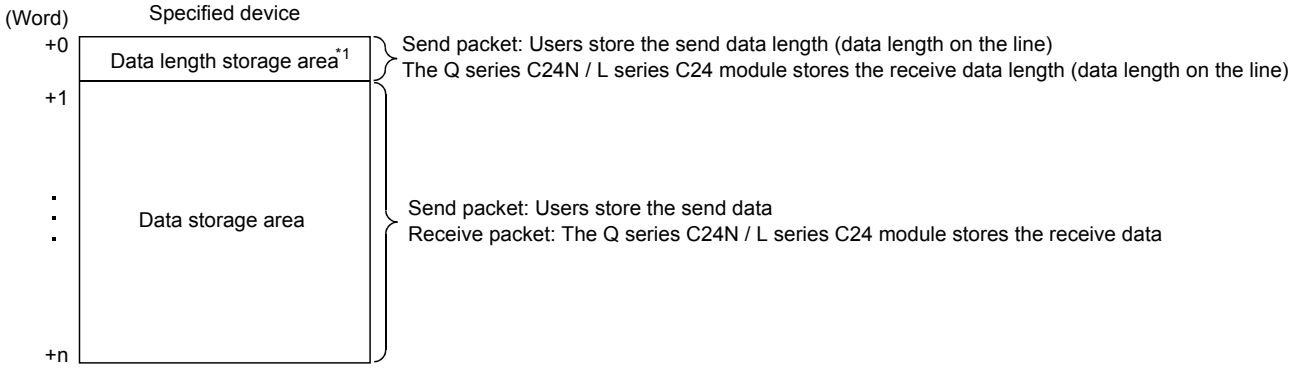
* The data storage area to be occupied varies depending on the setting of “Unit of stored data”.
  - When ‘Lower byte + Upper byte’ is selected, the same size as the data length is occupied.
    (However, when the data length of a send packet is an odd number, the upper byte (lower byte in case of ‘Byte swap’) of the last device is not sent. When the data length of a receive packet is an odd number, the last data is stored with one byte of 00H.)
  - When ‘Lower bytes only’ is selected, twice size of the data length is occupied.



(b) When “Fixed length/Variable length” is ‘Variable length’

An area starting from the device number which is specified on the Element setting screen +1 is considered as the ‘data storage area’.

* The data storage area to be occupied varies depending on the setting of “Unit of stored data”.
  - When ‘Lower byte + Upper byte’ is selected, the same size as the data length + one word (length for the data length storage area) are occupied. (However, when the data length of a send packet is an odd number, the upper byte (lower byte in case of ‘Byte swap’) of the last device is not transmitted. When the data length of a receive packet is an odd number, one byte of 00_H is added to the last data and stored.)
  - When ‘Lower bytes only’ is selected, twice size of the data length + one word (length for the data length storage area) are occupied.



*1: The unit of data length is byte.

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Point

- When receiving variable length data whose length exceeds the “Maximum data length”, the Q series C24N / L series C24 module stores data as long as the maximum data length and omits the rest. (A protocol completes successfully.)
- In receive packet data from other devices, the Q series C24N / L series C24 module needs to be able to discriminate data corresponding to a Non-conversion variable from those of a Terminator or a Static Data following a Non-conversion variable.
  The receive process may not be performed normally if they cannot be classed.
  (Example)
  When value of a Terminator or value of a Static Data following a Non-conversion variable is used in a Non-conversion variable, the Q series C24N / L series C24 module recognizes it as data of a Terminator or a Static Data following a Non-conversion variable and performs the verify/receive process.
- Multiple Non-conversion variable (Fixed length) elements can be placed in a packet, and multiple Non-conversion variable (Variable length) elements can also be placed in a send packet. However, only one Non-conversion variable (Variable length) can be placed in a receive packet, and any of the following requirements need to be met.
  (a) Place any of the following data immediate after a Non-conversion variable
  Static Data
  Terminator
  Check code + Static Data
  Check code + Terminator
  (b) Place a Length before a Non-conversion variable and include the Non-conversion variable in the calculation range.

In addition, two or more of the following four elements cannot be placed in the same packet.

Conversion variable (Variable number of data)
Conversion variable (Fixed number of data and Variable number of digits) (Excluding a case where “Number of data” is ‘1’ and “Delimiter” is not ‘No delimiter’.)
Non-conversion variable (Variable length)
Non-verified reception (Variable number of characters)

(6) Conversion variable

This element converts the numerical data of a CPU device or buffer memory to an ASCII string and sends it, or converts the receive data (ASCII string) to the numerical data and stores it to a CPU device or buffer memory.

The following lists the items.

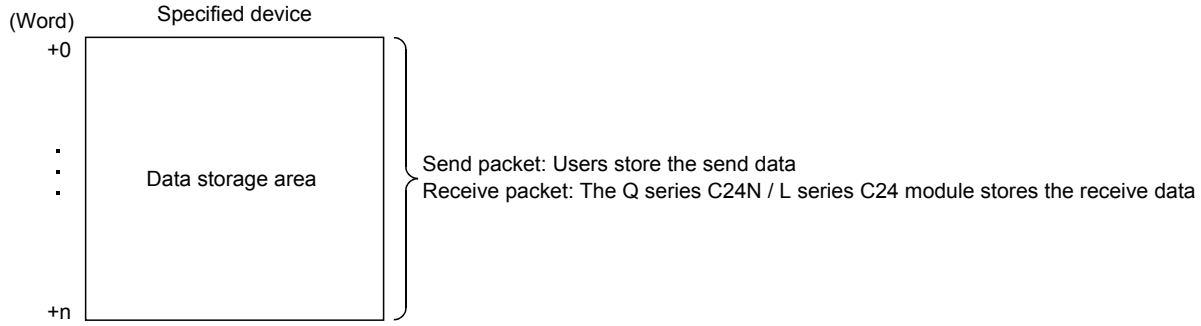
Item	Description			Remark
Element name	Set a name of the element.			-
Conversion	At sending	HEX -> ASCII decimal	Converts numeric value stored in the data storage area to ASCII decimal.	-
		HEX -> ASCII hexadecimal	Converts numeric value stored in the data storage area to ASCII hexadecimal.	
	At receiving	ASCII decimal -> HEX	Treats receive data as ASCII decimal, converts it to numeric value, and stores it to the data storage area.	
		ASCII hexadecimal -> HEX	Treats receive data as ASCII hexadecimal, converts it to numeric value, and stores it to the data storage area.	
Fixed number of data/ Variable number of data	Fixed number of data		Fixes the number of data to be sent and received.	-
	Variable number of data		At sending : Specifies the number of data at the time of the protocol execution and sends the data. At receiving : Receives data of which the number is variable.	For Variable number of digits, delimiters are required.
Number of data/ Maximum number of data	Set the number of data to be sent and received. (For 'Variable number of data', set the maximum number of data that can be specified to the data length storage area.) The range is 1 to 256.			-
Number of digits	1 to 10		Set the number of digits per one send and receive data. When the number of digits of data is less than the specified number of digits, upper digits are filled with blank-padded characters.	-
	Variable number of digits		At sending : Sends only the data division converted to an ASCII string in variable length. At receiving : Receives only an ASCII string of the data division in variable length.	-
Blank-padded character	0/Space		Select a character used to fill upper digits when "Number of digits" is not 'Variable number of digits' and the number of digits of send/receive data is less than the specified number of digits.	-
Conversion unit	Select how many words are manipulated as one data in the data storage area. For 'Word', converts data manipulating one word as one data. For 'Double word', converts data manipulating two words as one data.			-

Item	Description		Remark
Sign	Unsigned/Signed	Select whether to add signs to date in the data storage area. This item can be set when "Conversion" is 'HEX -> ASCII decimal' or 'ASCII decimal -> HEX'.	-
Sign character	None/+/0/Space	Select the sign character for positive value on line. This item can be set when "Conversion" is 'HEX -> ASCII decimal' or 'ASCII decimal -> HEX', and "Sign" is 'Signed'. The sign character for negative value is fixed to '-'.	-
Number of decimals	No decimal point/ Variable point/ 1 to 9	Select the decimal point position of data on line. This item can be set when "Conversion" is 'HEX -> ASCII decimal' or 'ASCII decimal -> HEX'.	-
Delimiter	No delimiter/ Comma/ Space	Select the delimiter inserted after one data. A delimiter is not added to the end of data when the number of data is 2 or more.	-
Data storage area specification	Specify a starting device to store variable value.		-

The following explains the configuration of the data storage area.

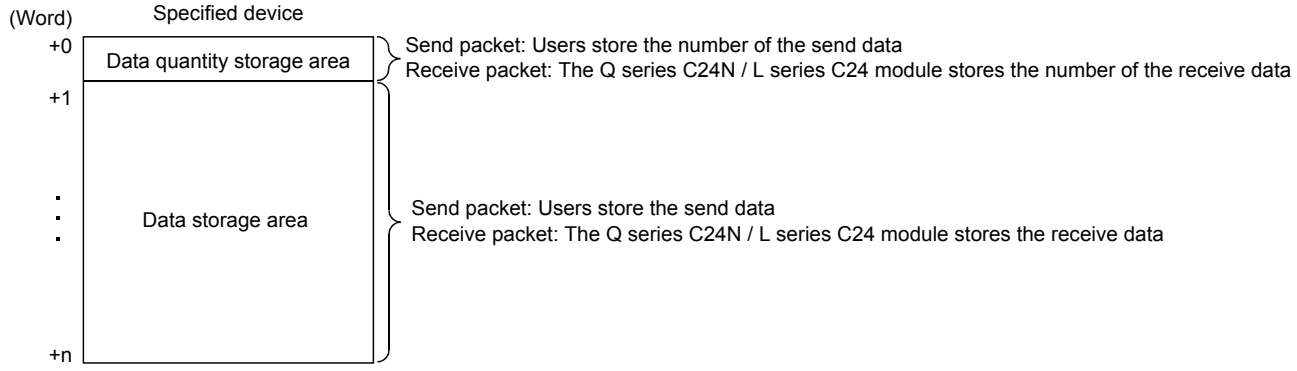
(a) When “Fixed number of data/Variable number of data” is ‘Fixed number of data’

An area starting from the device number which is specified on the Element setting screen is considered as the ‘data storage area’.



(b) When “Fixed number of data/Variable number of data” is ‘Variable number of data’

An area starting from the device number which is specified on the Element setting screen +1 is considered as the ‘data storage area’.



(c) Occupied size in data storage area

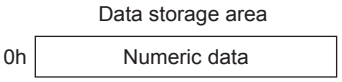
The size occupied in the data storage area varies depending on the settings of “Conversion unit” and “Number of digits”.

Setting item		Occupied size in data storage area per one data	Reference for data storage area configuration
Conversion unit	Number of decimals		
Word	No decimal point Fixed point	1 word	(d) Data storage area configuration 1)
	Variable point	2 words	(d) Data storage area configuration 2)
Double word	No decimal point Fixed point	2 words	(d) Data storage area configuration 3)
	Variable point	4 words	(d) Data storage area configuration 4)

(d) Data storage area configuration

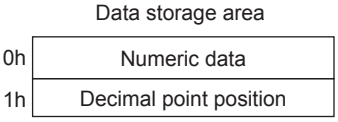
The following shows the data storage area configuration per one data.

1) “Conversion unit”: Word,
“Number of decimals”: No decimal point, Fixed point



2) “Conversion unit”: Word,
“Number of decimals”: Variable point

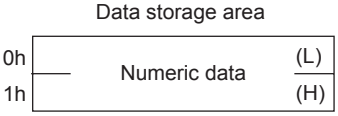
For ‘Variable point’, the decimal point position is set in the data storage area.



In the decimal point position area, the decimal point position is set as follows.

Send/receive data (number of digits is 10)	Numeric data	Decimal point position
12345	12345(3039H)	1(1H)
1234.5	12345(3039H)	10(0AH)
123.45	12345(3039H)	100(64H)
12.345	12345(3039H)	1000(3E8H)
1.2345	12345(3039H)	10000(2710H)

3) “Conversion unit”: Doubleword
“Number of decimals”: No decimal point, Fixed point



4) “Conversion unit”: Doubleword,
“Number of decimals”: Variable point

For ‘Variable point’, the decimal point position is set in the data storage area.

Data storage area

0h	Numeric data	(L)
1h		(H)
2h	Decimal point position	(L)
3h		(H)

In the decimal point position area, the decimal point position is set as follows.

Send/receive data (number of digits is 10)	Numeric data	Decimal point position
1234567890	1234567890(499602D2H)	1(1H)
123456789.0	1234567890(499602D2H)	10(0AH)
12345678.90	1234567890(499602D2H)	100(64H)
1234567.890	1234567890(499602D2H)	1000(3E8H)
:	:	:
1.234567890	1234567890(499602D2H)	1000000000(3B9ACA00H)

(e) Range of value that can be used in the data storage area

The following table shows the range of value that can be used in the data storage area.

Conversion	Sign	Conversion unit	Range of value
HEX -> ASCII decimal ASCII decimal -> HEX	Unsigned	Word	0 to 65535 (0H to FFFFH)
		Double word	0 to 4294967295 (0H to FFFFFFFFH)
	Signed	Word	-32768 to 32767 (8000H to FFFFH, 0H to 7FFFH)
		Double word	-2147483648 to 2147483647 (80000000H to FFFFFFFFH, 0H to 7FFFFFFFH)
HEX -> ASCII hexadecimal ASCII hexadecimal -> HEX		Word	0H to FFFFH
		Double word	0H to FFFFFFFFH

Point

In the Q series C24N / L series C24 module, an error may occur in any of the following cases.

- When "Conversion" is 'ASCII hexadecimal -> HEX', an ASCII -> BIN conversion error ($7F20_H$) may occur if a string except for '0'-'9' 'A'-'F' 'a'-'f' is received.
- When "Conversion" is 'ASCII decimal -> HEX', an ASCII -> BIN conversion error ($7F20_H$) may occur if a string except for '0'-'9' is received. However, the following are exempt from the ASCII -> BIN conversion error.

Item	Operation of Q series C24N / L series C24 modules
Sign/Sign character	When "Signed" is selected, a sign character can be received. However, an ASCII -> BIN conversion error ($7F20_H$) may occur when a sign character which is not at the beginning of a unit of data is received.
Number of decimals	When any other than "No decimal point" is selected, '.' (a period) can be received. However an ASCII -> BIN conversion error ($7F20_H$) may occur when '.' (a period) which is not at the specified digit is received. An ASCII -> BIN conversion error ($7F20_H$) may also occur when "variable point" is selected and '.' (a period) which is at the beginning or end of a unit of data is received.
Delimiter	When any other than "No delimiter" is selected, a delimiter can be received. However an ASCII -> BIN conversion error ($7F20_H$) may occur when a delimiter which is not at a boundary of data is received.

- When "Number of digits" is 'Variable number of digits', an invalid number of digits error ($7D19_H$) may occur if the number of digits of receive data exceeds the upper limit shown below.

Conversion unit	Conversion	Upper limit of the number of the receive data
Word	ASCII decimal -> HEX	Maximum 5 digits
	ASCII hexadecimal -> HEX	Maximum 4 digits
Double word	ASCII decimal -> HEX	Maximum 10 digits
	ASCII hexadecimal -> HEX	Maximum 8 digits

- When "Number of decimals" is 'Variable point' in a send packet, a decimal point position designation error ($7D21_H$) may occur if the decimal point position is greater than the number of digits.

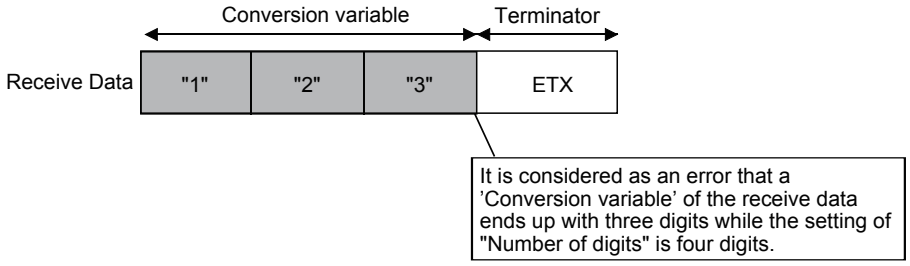
Point

[For the fixed number of data]

- When “Number of digits” is ‘Variable number of digits’, an invalid number of digits error ($7D19_H$) may occur if the number of digits of receive data is 0.

[For the variable number of data]

- A too few digits error ($7D18_H$) may occur if data of which number of digits are fewer than the digits specified in “Number of digits” are received.
  (Example for the case that the setting of “Number of digits” is 4)



- When receiving data of which the number exceeds the “Maximum number of data”, the Q series C24N / L series C24 module stores data as many as the maximum number of data and omits the rest. (A protocol completes successfully.)
- In receive packet data from other devices, the Q series C24N / L series C24 module needs to be able to discriminate data corresponding to a Conversion variable from those of a Terminator or a Static Data following a Conversion variable. The receive process may not be performed normally if they cannot be classed.
  (Example)
  When value of a Terminator or value of a Static Data following a Conversion variable is used in a Conversion variable, the Q series C24N / L series C24 module recognizes it as data of a Terminator or a Static Data following a Conversion variable and performs the verify/receive process.

Point

To place a Conversion variable in a packet, the following requirements need to be met.

(1) To place Conversion variable in send packet

Multiple Conversion variable elements can be placed in one packet, and they can be placed in desired positions in the data division.

(2) To place Conversion variable in receive packet

Multiple Conversion variable elements can be placed in one packet in cases other than [Variable number of data] and (a) - 1) of [Fixed number of data].

[Variable number of data]

Only one Conversion variable can be placed in one packet, and any of the following 1) and 2) need to be met.

1) For discriminating the data length of a Conversion variable, any of the following items is placed immediate after the Conversion variable.
   - Static Data
   - Terminator
   - Check code + Static Data
   - Check code + Terminator

2) A 'Length' is placed before a Conversion variable. (The Conversion variable needs to be included in the calculating range.)

[Fixed number of data]

(a) Variable number of digits

1) When the number of data is 2 or more, or the number of data is 1 with no delimiter, only one Conversion variable can be placed in a packet and it needs to be placed in the order mentioned in [Variable number of data].

2) When a Conversion variable (the number of data is 1, with delimiter, and variable number of digits) and the following four elements are placed in the same packet, these four elements need to be placed behind the Conversion variable (the number of data is 1, with delimiter, and variable number of digits).
   - Conversion variable (variable number of data)
   - Conversion variable (fixed number of data and variable number of digits) (The case of (a) – 1. Excluding a case where "Number of data" is '1' and "Delimiter" is not 'No delimiter'.)
   - Non-conversion variable (variable length)
   - Non-verified reception (variable number of characters)

   Note that two or more of these four elements cannot be placed in the same packet.

(b) Fixed number of digits (1 to 10)

1) When a Conversion variable (variable decimal point) and the four elements mentioned in (a) – 2), these elements need to be placed behind the Conversion variable (variable decimal point).

2) When a Conversion variable (unsigned) and the four elements mentioned in (a) – 2), these elements need to be placed behind the Conversion variable (unsigned).

(7) Check code

Use this element when an element indicating check code data is included in a packet.
The Q series C24N / L series C24 module automatically calculates a specified check code at timing of sending/receiving, and adds it to a send packet or detects an error of a receive packet.

The following table lists the items.

Item		Description		Remark
Element name		Set a name of the element.		-
Processing method		Select a calculating method. Horizontal parity/Sum check/16-bit CRC (for MODBUS)		-
Code type		ASCII hexadecimal ASCII decimal HEX	At sending : Select a format in which a calculated check code is sent. At receiving : Select a format in which data are received.	Not settable when "Processing method" is '16-bit CRC (for MODBUS)'
Data length		Select the data length on the line (byte). The range is 1 to 4.		Not settable when "Processing method" is '16-bit CRC (for MODBUS)'
Data flow		Forward direction (Upper byte -> Lower byte)	At sending : Sends a calculated check code, from the upper byte. At receiving : Manipulates receive data as a check code, from the upper byte.	Not settable when "Processing method" is '16-bit CRC (for MODBUS)'
		Reverse direction (Lower byte -> Upper byte)	At sending : Sends a calculated check code, from the upper byte. At receiving : Manipulates receive data as a check code, from the upper byte. Effective only if the data length is 2 to 4 (bytes).	
		Byte swap (by word)	At sending : Sends a calculated check code swapping the upper byte and lower byte by word. At receiving : Manipulates receive data as a check code swapping the upper byte and lower byte by word. Effective only if the data length is 4 bytes.	
Complement calculation		Select the complement calculation. No complement calculation/One's complement/Two's complement		Not settable when "Processing method" is '16-bit CRC (for MODBUS)'
Calculating range	start	Select the starting element number of the calculating range. The range is 1 to 32.		-
	end	Select the ending element number of the calculating range. The range is 1 to 32.		

Point

- When “Code type” is ‘ASCII hexadecimal’, an ASCII -> BIN conversion error ($7F20_H$) may occur if a string except for ‘0’-‘9’ ‘A’-‘F’ ‘a’-‘f’ is received.
- When “Code type” is ‘ASCII decimal’, an ASCII -> BIN conversion error ($7F20_H$) may occur if a string except for ‘0’-‘9’ is received.
- Only one Check code can be placed in a packet.
- Packet elements placed behind a Check code cannot be included in the calculating range.
- A Check code cannot be included in the calculated range.
- When a calculated check code (Sum check/Horizontal parity/16-bit CRC) does not match a received check code, a sum check error ($7F24_H$) may occur.
- One or more elements are required before a Check code.

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(8) Non-verified reception

Use this element when receive data include data not needed.
The Q series C24N / L series C24 module skips characters as many as the specified number if a receive packet includes a Non-verified reception.

The following table lists the items.

Item	Description		Remark
Element name	Set a name of the element.		-
Data length	0 (variable number of characters)	Set this item when the number of characters not to be verified varies in each of communication.	-
	1 to 2048 (specified number of characters)	Set the number of characters not to be verified.	

Point

- When "Data length" is '0', the following requirements need to be met.
  (1) Only one Non-verified reception can be placed in a packet.
  (2) Include a Non-verified reception in the calculating range of a Length.
  Otherwise, place any of the following data immediate after a Non-verified reception.
  Static Data
  Terminator
  Check code + Static Data
  Check code + Terminator
  (3) Two or more of the following four elements cannot be placed in the same packet.
  Conversion variable (Variable number of data)
  Conversion variable (Fixed number of data and Variable number of digits)
  (Excluding a case where "Number of data" is '1' and "Delimiter" is not 'No delimiter'.)
  Non-conversion variable (Variable length)
  Non-verified reception (Variable number of characters)
- In receive packet data from other devices, the Q series C24N / L series C24 module needs to be able to discriminate data corresponding to a Non-verified reception from those of a Terminator or a Static Data following a Non-verified reception. The receive process may not be performed normally if they cannot be classed.
  (Example)
  When value of a Terminator or value of a Static Data following a Non-verified reception is used in a Non-verified reception, the Q series C24N / L series C24 module recognizes it as data of a Terminator or a Static Data following a Non-verified reception and performs the verify/receive process.

9.2 Packet Edit Operation

9.2.1 Adding new elements

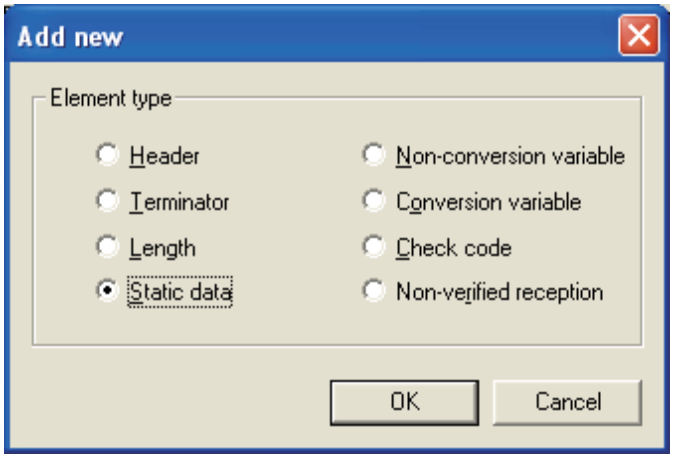
PURPOSE

To add an element.

BASIC OPERATION

1. Display the Packet setting screen, and click the Add new button.
2. The Add new screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element type	Select an element to be added.
OK button	Fixes the setting and closes the screen.
Cancel button	Cancels the setting and closes the screen.

Point

The order of elements can be changed by clicking an element number and changing it on the Packet setting screen.

9.2.2 Changing element types

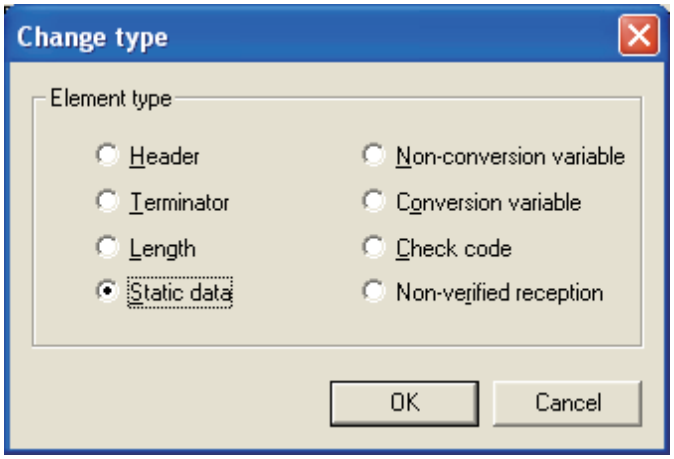
PURPOSE

To change a type of an element to another.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of an element to be changed.
2. Click the Change type button.
3. The Change type screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element type	Select a new element type.
OK button	Fixes the setting and closes the screen.
Cancel button	Cancels the setting and closes the screen.

9.3 Element Setting

9.3.1 Setting of Header/Static Data/Terminator

PURPOSE

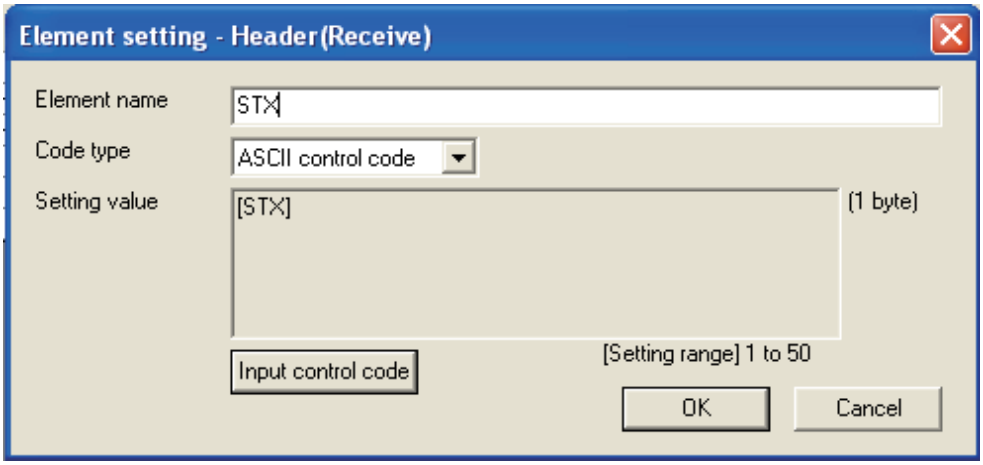
To configure a Header/Static Data/Terminator setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Header/Static data/Terminator in “Element setting” column or press the Enter key.
2. The Element setting screen is displayed.

(1) Element setting screen

DISPLAY/SETTING SCREEN



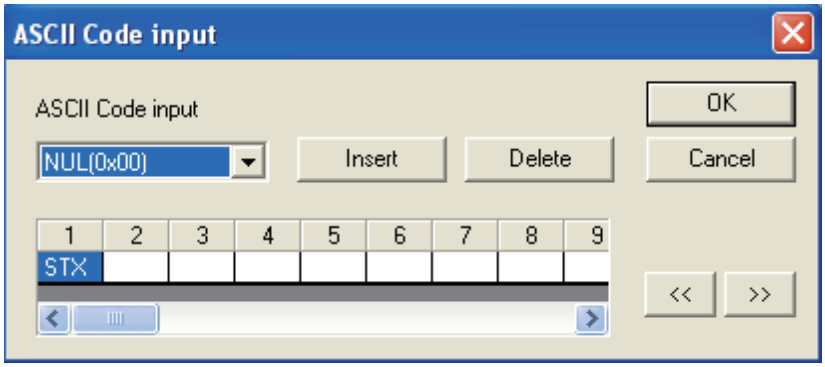
DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element.
Code type*1	Set a data type of setting value.
Setting value*1	Set value of a Header/Static Data/Terminator.
Input control code button	Set a control code on the ASCII Code input screen when “Code type” is ‘ASCII control code’.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (1) to (3) of Section 9.1.

(2) ASCII Code input screen

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
ASCII Code input	Select an ASCII code to be input.
Insert button	Inserts a selected ASCII code to the cursor position.
Delete button	Deletes data at the cursor position.
OK button	Fixes the setting and returns to the Element setting screen.
Cancel button	Cancels the setting and returns to the Element setting screen.

9.3.2 Setting of Length

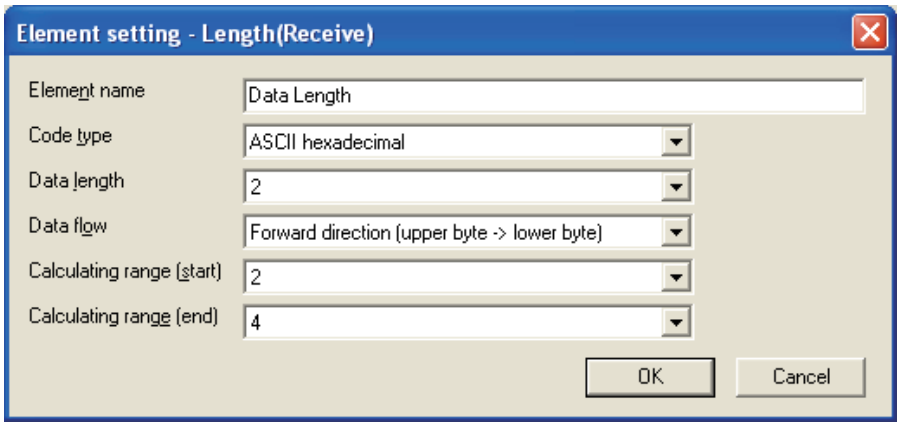
PURPOSE

To configure a Length setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Length in “Element setting” column or press the Enter key.
2. The Element setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element.
Code type*1	Select a send/receive format of the data length.
Data length*1	Select the data length on the line.
Data flow*1	Select the sequence of data when “Data length” is not ‘1’.
Calculating range*1	Select element numbers for the start and end of the calculating range.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (4) of Section 9.1.

9.3.3 Setting of Non-conversion variable

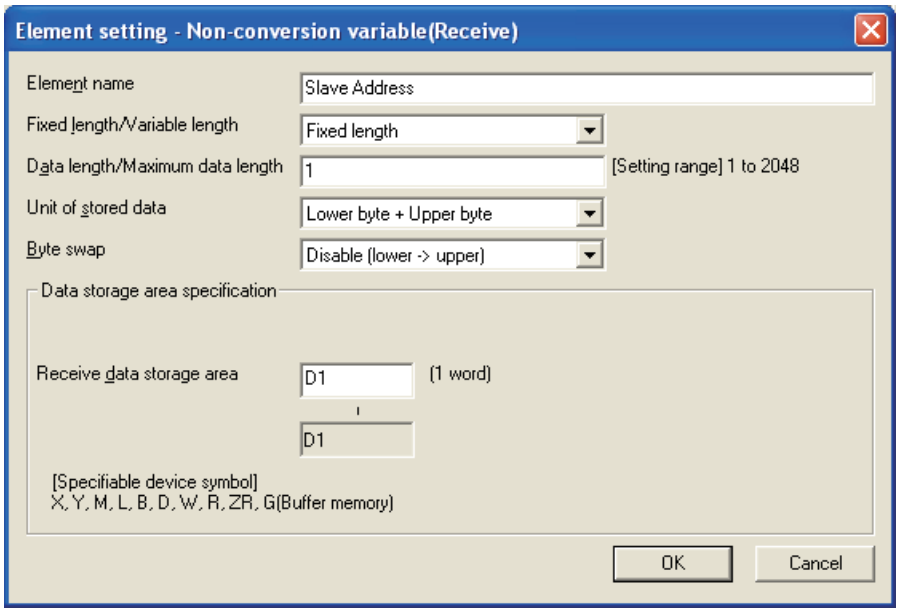
PURPOSE

To configure a Non-conversion variable setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Non-conversion variable in "Element setting" column or press the Enter key.
2. The Element setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element whose data storage area is to be set.
Fixed length/Variable length*1	Select 'Fixed length'/'Variable length'.
Data length/ Maximum data length*1	Set the data length. For 'Variable length', set the maximum data length that can be specified to the data storage area.
Unit of stored data*1	Select 'Lower byte + Upper byte'/' Lower bytes only'.
Byte swap*1	Select 'Disable (lower -> upper)'/'Enable (upper -> lower)' of "Byte swap" to be provided.
Send (receive) data length storage area*1 (For Variable length only)	Set a starting address of devices in which the data length of the send (receive) data of an element is stored. *1
Send (receive) data storage area*1	Fixed length : Set a starting address of devices in which the value of a variable is stored. *1 An ending address is automatically displayed. Variable length: According to the setting of the data storage area for the send (receive) area, automatically displays a starting address and ending address of devices in which the value of a variable is stored.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (5) of Section 9.1.

Applicable device list
<For Q series>

Category	Device type	Symbol	Device range					
			Other than those mentioned right	Q00/Q01 CPU	Q00JCPU	QnU(D)(E)(H)CPU (except for Q00UJ/Q00U/Q01U)	Q00U/Q01U	Q00UJ
Internal user*1, *2	Input	X	0 to 1FFFH	0 to 7FFH	0 to 7FFH	0 to 1FFFH	0 to 1FFFH	0 to 1FFFH
	Output	Y	0 to 1FFFH	0 to 7FFH	0 to 7FFH	0 to 1FFFH	0 to 1FFFH	0 to 1FFFH
	Internal relay	M	0 to 32767	0 to 32767	0 to 32767	0 to 61439	0 to 61439	0 to 61439
	Latch relay	L	0 to 32767					
	Link relay	B	0 to 7FFFH	0 to 7FFFH	0 to 7FFFH	0 to EFFFH	0 to EFFFH	0 to EFFFH
	Data register	D	0 to 32767	0 to 32767	0 to 32767	0 to 4212735	0 to 94207	0 to 32767
	Link register	W	0 to 7FFFH	0 to 7FFFH	0 to 7FFFH	0 to 4047FFH	0 to 16FFH	0 to 7FFFH
File register	File register	R*2	0 to 32767	0 to 32767	-	0 to 32767	0 to 32767	-
		ZR	0 to 1042431	0 to 1042431	-	0 to 4184063	0 to 65535	-
Buffer memory	Intelligent function module devices	G	1024 to 6911, 9728 to 16383, 20480 to 24575					

*1: Do not specify a local device.

*2: Specify devices within the range specified in the PLC parameter setting.

<For L series>

Category	Device type	Symbol	Device range	
			L02CPU	L26CPU-BT
Internal user*1, *2	Input	X	0 to 1FFFH	
	Output	Y	0 to 1FFFH	
	Internal relay	M	0 to 61439	
	Latch relay	L	0 to 32767	
	Link relay	B	0 to EFFFH	
	Data register	D	0 to 94207	0 to 421877
	Link register	W	0 to 16FFH	0 to 66FFFH
File register	File register	R*2	0 to 32767	
		ZR	0 to 65535	0 to 393215
Buffer memory	Intelligent function module devices	G	1024 to 6911, 9728 to 16383, 20480 to 24575	

*1: Do not specify a local device.

*2: Specify devices within the range specified in the PLC parameter setting.

(1) CPU device

When a CPU device is specified as the data storage area, the Q series C24N / L series C24 module performs the read/write CPU device process.
If the total length of variables used in a packet exceeds 1920 bytes, 'read CPU device process'/'write CPU device process' needs to be performed more than once, and the processing time might be longer.

(2) Intelligent function module devices (buffer memory)

High speed protocol processing is available because an intelligent function module device (buffer memory) is not affected by the sequence scan of a programmable controller CPU.

Point

When executing a protocol including a Non-conversion variable or Conversion variable, do not change the value of a CPU device specified as a variable during execution of the dedicated instruction.

9.3.4 Setting of Conversion variable

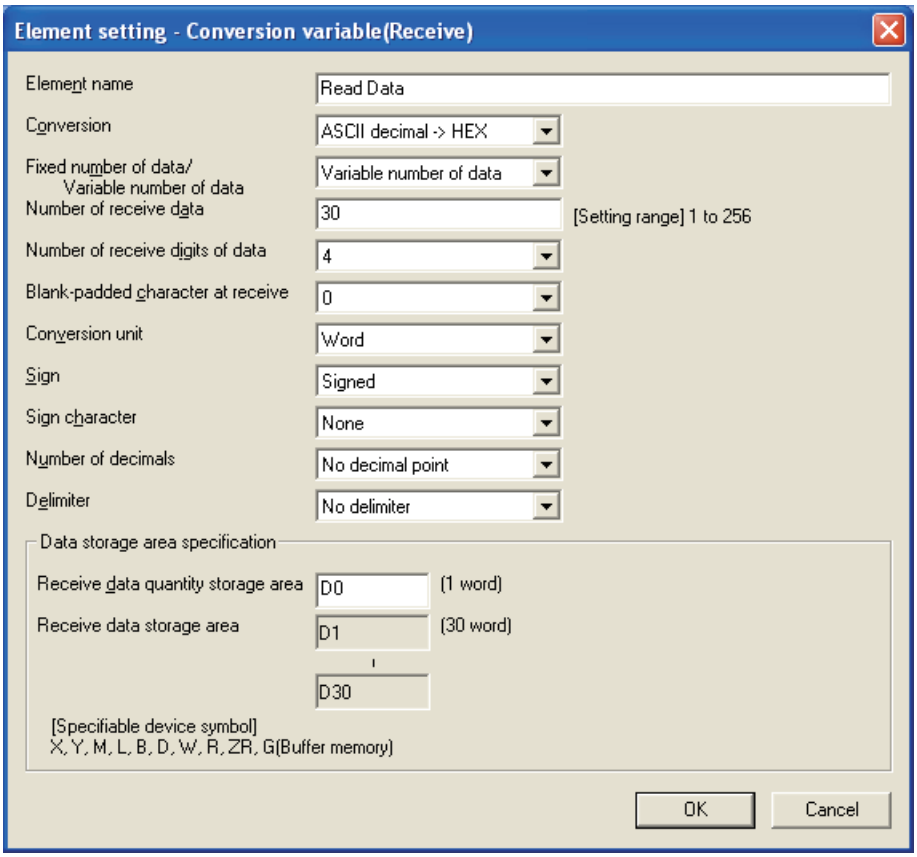
PURPOSE

To configure a Conversion variable setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Conversion variable in "Element setting" column or press the Enter key.
2. The Element setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element whose data storage area is to be set.
Conversion*1	At sending : 'HEX -> ASCII hexadecimal' 'HEX -> ASCII decimal' At receiving : 'ASCII hexadecimal -> HEX' 'ASCII decimal -> HEX'
Fixed number of data/Variable number of data*1	Select 'Fixed number of data'/'Variable number of data'.
Number of send (receive) data*1	Set the number of the data (1 to 256). For 'Variable number of data', set the maximum number of data that can be specified to the data number storage area.
Number of send (receive) digits of data*1	Select 1 to 10 or 'Variable number of digits'.
Blank-padded &character at send (receive) *1	Select 'Space'/'0'. The setting value is invalidated and '-' is displayed when "Number of send (receive) digits of data" is 'Variable number of digits'.
Conversion unit	Select 'Word'/'Double word'.
Send (receive) data quantity storage area*1 (For Variable number of data only)	Specify a starting address of devices in which the number of the send (receive) data of an element is stored.*2
Send (receive) data storage area*1	Fixed length : Specify a starting address of devices in which the value of a variable is stored.*2 An ending address is automatically displayed. Variable length : According to the setting of the data storage area for the send (receive) area, automatically displays a starting address and ending address of devices in which the value of a variable is stored.
Sign*1	Select 'Unsigned'/'Signed'.*3
Sign character*1	Select 'None'/'+'/'0'/'Space' when "Sign" is 'Signed'.
Number of decimals*1	Select 'No decimal point'/1 to 9/'Variable point'.*3
Delimiter*1	Select 'No delimiter'/'Comma'/'Space'.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (6) of Section 9.1.

*2: For the setting range, refer to the applicable device list in Section 9.3.3.

*3: Settable only when "Conversion" is 'HEX -> ASCII decimal' or 'ASCII decimal -> HEX'.

Point

When executing a protocol including a Non-conversion variable or Conversion variable, do not change the value of a CPU device specified as a variable during execution of the dedicated instruction.

9.3.5 Setting of Check code

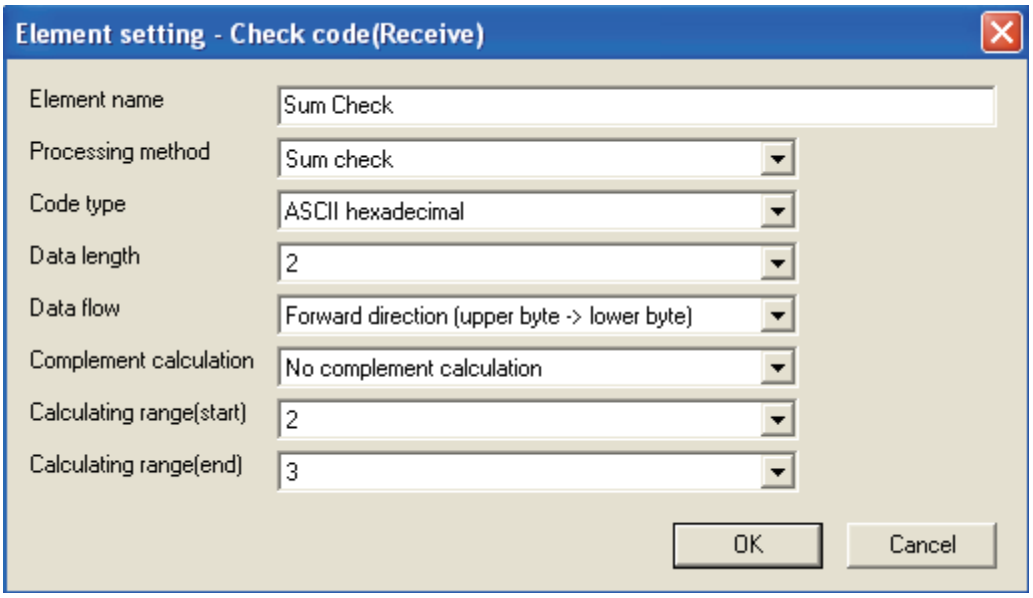
PURPOSE

To configure a Check code setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Check code in “Element setting” column or press the Enter key.
2. The Element setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element.
Processing method*1	Select a calculating method.
Code type*1*2	Select a send/receive format of a check code.
Data length*1*2	Select the data length on the line.
Data flow*1*2	Select the sequence of data when “Data length” is not ‘1’.
Complement calculation*1*2	Select a type of complement calculation.
Calculating range*1	Select element numbers for the start and end of the calculating range.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (7) of Section 9.1.

*2: Not settable when “Processing method” is ‘16-bit CRC (for MODBUS)’.

9.3.6 Setting of Non-verified reception

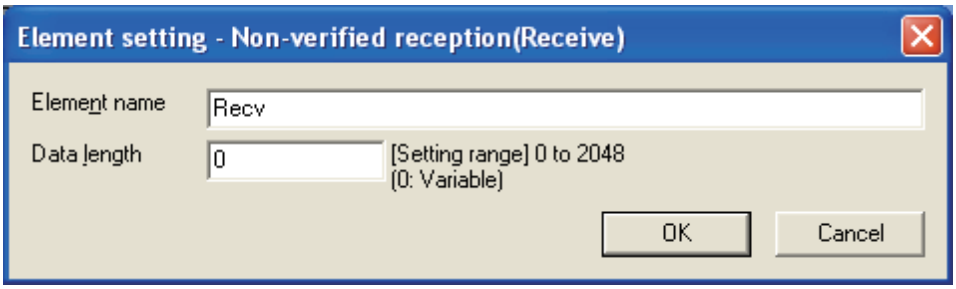
PURPOSE

To configure a Non-verified reception setting.

BASIC OPERATION

1. Display the Packet setting screen, and click a cell of Non-verified reception in "Element setting" column or press the Enter key.
2. The Element setting screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Element name*1	Set a name of an element.
Data length*1	Set the number of characters not to be verified.
OK button	Fixes the setting and returns to the Packet setting screen.
Cancel button	Cancels the setting and returns to the Packet setting screen.

*1: For details of each item, refer to (8) of Section 9.1.

9.4 Device Batch Setting

PURPOSE

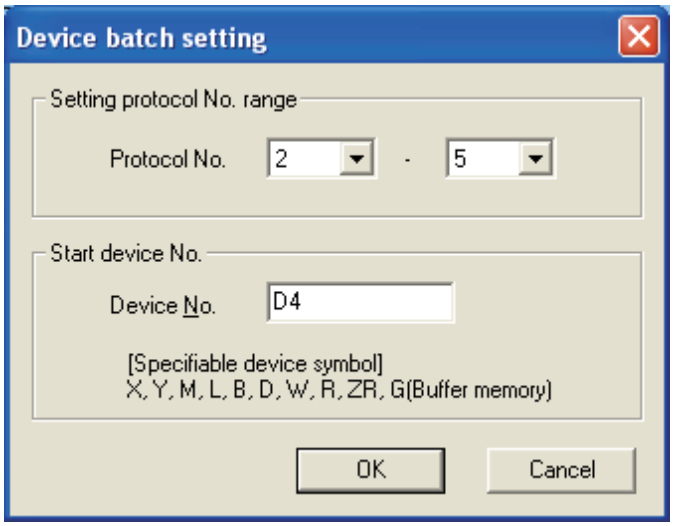
To configure devices used in protocols at once.

BASIC OPERATION

1. Select the [Edit] → [Device batch setting] menu.
2. The Device batch setting screen is displayed.

(1) Element setting screen

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Setting protocol No. range	Select a starting number and ending number of protocols to be configured at once.
Start device No.	Select a starting number of devices to be configured.
OK button	Fixes the setting and assigns devices in order of protocol number/packet number starting from the specified starting device.
Cancel button	Cancels the setting and closes the screen.

The following table shows an example when “Setting protocol No. range” is ‘2 to 5’ and “Start device No.” is ‘D4’.

Protocol No.	Packet No.	Element No.	Device	
			Before batch setting	After batch setting
1	Send	2	D1 - D3	D1 - D3
2	Receive (1)	1	D2 - D4	**D4 - D6**
		2	B80 - B9F	**D7 - D8**
	Receive (2)	2	D0 - D0	**D9 - D9**
3	Send	2	Variable unset (2 word)	**D10 - D11**
		3	Variable unset (1 word)	**D12 - D12**
4	Receive (1)	2	X10 - X1F	**D13 - D13**
5	Send	4	X30 - X4F	**D14 - D15**
	Receive (1)	2	D6 - D6	**D16 - D16**
		3	D7 - D8	**D17 - D18**
6	Receive (2)	2	D0 - D0	D0 - D0

9.5 Setting Device List

PURPOSE

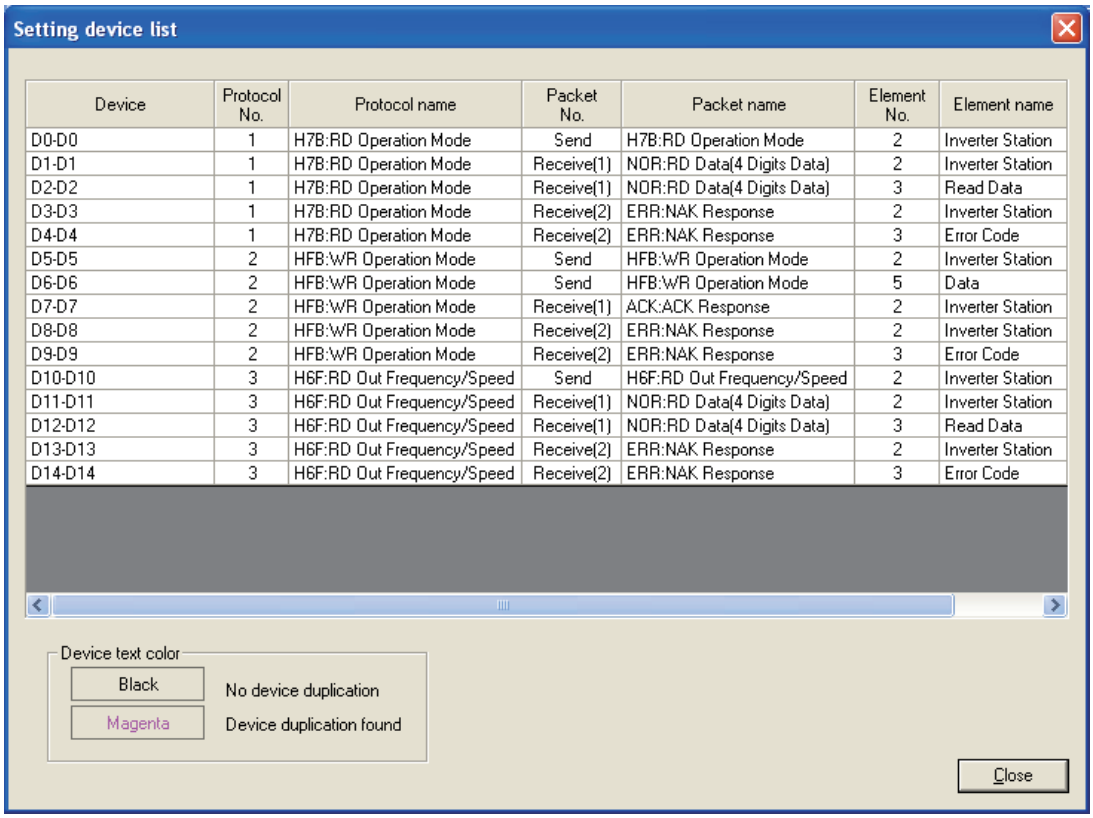
To display a list of devices used in protocols in list view.

BASIC OPERATION

1. Select the [Tool] → [Setting device list] menu.
2. The Setting device list screen is displayed.

(1) Element setting screen

DISPLAY/SETTING SCREEN



Device	Protocol No.	Protocol name	Packet No.	Packet name	Element No.	Element name
D0-D0	1	H7B:RD Operation Mode	Send	H7B:RD Operation Mode	2	Inverter Station
D1-D1	1	H7B:RD Operation Mode	Receive(1)	NOR:RD Data(4 Digits Data)	2	Inverter Station
D2-D2	1	H7B:RD Operation Mode	Receive(1)	NOR:RD Data(4 Digits Data)	3	Read Data
D3-D3	1	H7B:RD Operation Mode	Receive(2)	ERR:NAK Response	2	Inverter Station
D4-D4	1	H7B:RD Operation Mode	Receive(2)	ERR:NAK Response	3	Error Code
D5-D5	2	HFB:WR Operation Mode	Send	HFB:WR Operation Mode	2	Inverter Station
D6-D6	2	HFB:WR Operation Mode	Send	HFB:WR Operation Mode	5	Data
D7-D7	2	HFB:WR Operation Mode	Receive(1)	ACK:ACK Response	2	Inverter Station
D8-D8	2	HFB:WR Operation Mode	Receive(2)	ERR:NAK Response	2	Inverter Station
D9-D9	2	HFB:WR Operation Mode	Receive(2)	ERR:NAK Response	3	Error Code
D10-D10	3	H6F:RD Out Frequency/Speed	Send	H6F:RD Out Frequency/Speed	2	Inverter Station
D11-D11	3	H6F:RD Out Frequency/Speed	Receive(1)	NOR:RD Data(4 Digits Data)	2	Inverter Station
D12-D12	3	H6F:RD Out Frequency/Speed	Receive(1)	NOR:RD Data(4 Digits Data)	3	Read Data
D13-D13	3	H6F:RD Out Frequency/Speed	Receive(2)	ERR:NAK Response	2	Inverter Station
D14-D14	3	H6F:RD Out Frequency/Speed	Receive(2)	ERR:NAK Response	3	Error Code

DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Device list	Displays a list of devices being used. Displays information of device, protocol, packet, and element.
Close button	Closes the screen.

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10 WRITING/READING DATA TO/FROM MODULE

10.1 Writing Data to Module

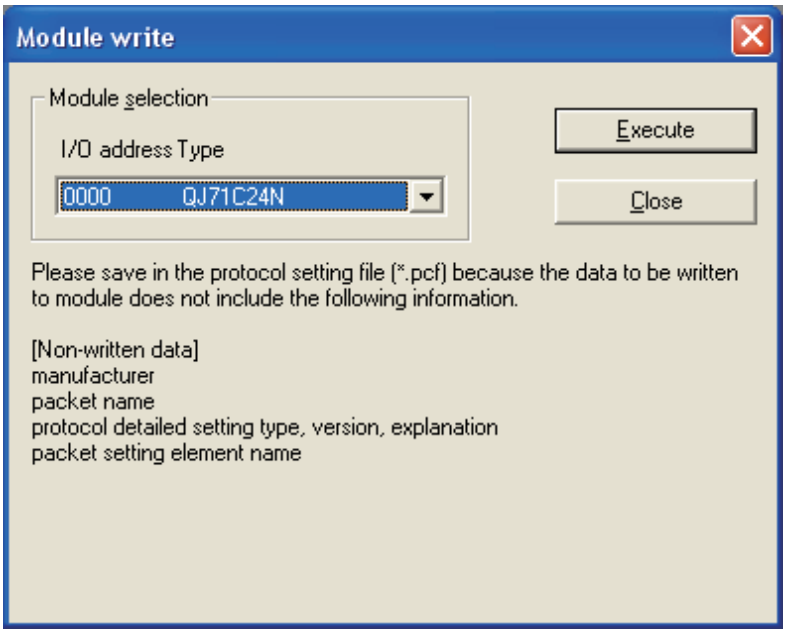
PURPOSE

To write data of registered protocol settings to a selected module.

BASIC OPERATION

1. Select the [Module read/write] → [Write to module] menu.
2. The Module write screen is displayed.
3. Select a module to which data to be written and click the Execute button.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Module selection	Select a module to which data to be written. The I/O address and type of a connected Q series C24N / L series C24 module are displayed in the combo box.
Execute button	Based on the setting in “Module selection”, starts writing data to the flash ROM.
Close button	Closes the screen.

Point

- A protocol setting data error may occur when any of the following data are set and written to the Q series C24N with the serial number of which the first five digits are '10122'.
  (1) Conversion variable
  "Sign" is 'Signed'
  "Number of decimals" is 1 to 9 or 'Variable point'
  "Delimiter" is 'Comma' or 'Space'
  (2) Non-verified reception
  "Data length" is '0' (variable number of characters)
- An error may occur when the protocol setting data is written to a module during execution of the CPRTCL instruction.
- The following data cannot be written to a module. Save these data in a protocol setting file.
  Manufacturer
  Packet name
  Type, version, explanation in the protocol detailed setting
  Element name in the packet setting
- The settings of editable protocols may not be correct when the Q series C24N / L series C24 module detects a protocol setting data error after protocol settings are written to it. In such case, correct the protocol settings according to the following procedure and rewrite them to the module.
  (1) Confirm the protocol number, packet number, and element number of the detected error in the Q series C24N / L series C24 module protocol setting error information (buffer memory 4086_H to 4089_H).
  (2) Confirm whether or not the following conditions are met in the packet setting in which the error has been detected.
  When any elements of (a) and any elements of (b) described in the following table are in the same packet, (a) must be placed before (b).

a	Conversion variable (Fixed number of data, Fixed number of digits (1 to 10 digits), No sign character)
	Conversion variable (Fixed number of data, Fixed number of digits (1 to 10 digits), Variable decimal point)
	Conversion variable (Fixed number of data, Variable number of digits, Number of data is 1, Delimiter is Comma or Space)
b	Non-conversion variable (Variable length)
	Conversion variable (Variable number of data)
	Conversion variable (Fixed number of data, Variable number of digits, Number of data is 1, No delimiter)
	Conversion variable (Fixed number of data, Variable number of digits, Number of data is 2 or more)
	Non-verified reception (Variable number of characters)

  (3) Modify the protocol setting, and rewrite it to the module.

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10.2 Reading Data from Module

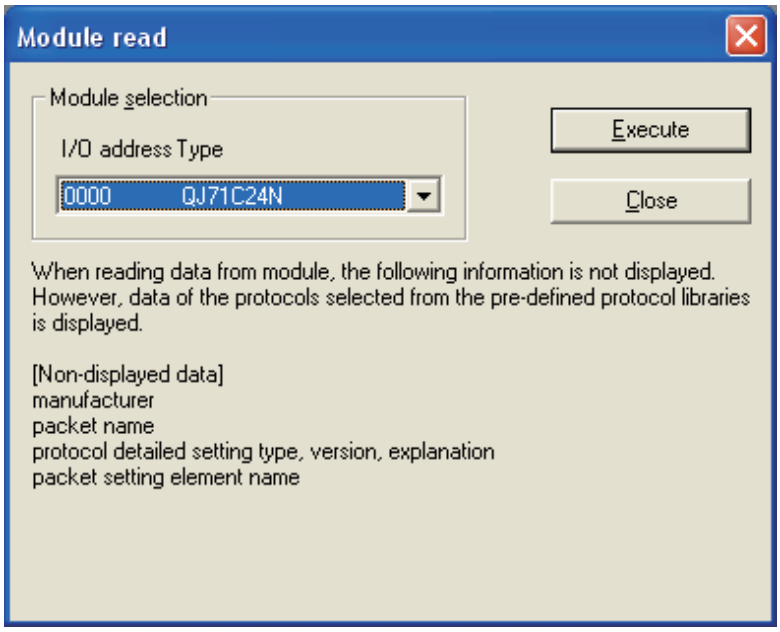
PURPOSE

To read data of protocol settings written to the selected module, and display data on the Protocol setting screen.

BASIC OPERATION

1. Select the [Module read/write] → [Read from module] menu.
2. The Module read screen is displayed.
3. Select a module from which data to be read and click the Execute button.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Module selection	Select a module from which data to be read. The I/O address and type of a connected Q series C24N / L series C24 module are displayed in the combo box.
Execute button	Based on the setting in “Module selection”, starts reading data from the flash ROM.
Close button	Closes the screen.

Point

- As the following data cannot be written to a module, these data are not displayed after the read from module operation. However, these data of a protocol selected from the pre-defined protocol library can be displayed.
  - Manufacturer
  - Packet name
  - Type, version, explanation in the protocol detailed setting
  - Element name in the packet setting

10.3 Verifying Data with Module

PURPOSE

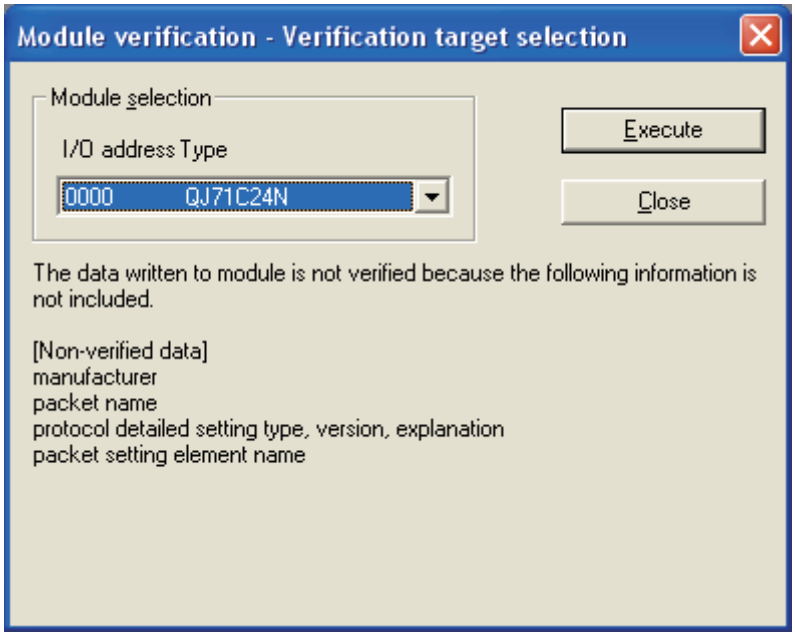
To compare the protocol setting being opened with that written to a selected module.

BASIC OPERATION

1. Select the [Module read/write] → [Module verification] menu.
2. The Verification target selection screen is displayed.
3. Select a verification target module and click the Execute button.
4. The Verification result screen is displayed.

(1) Verification target selection screen

DISPLAY/SETTING SCREEN

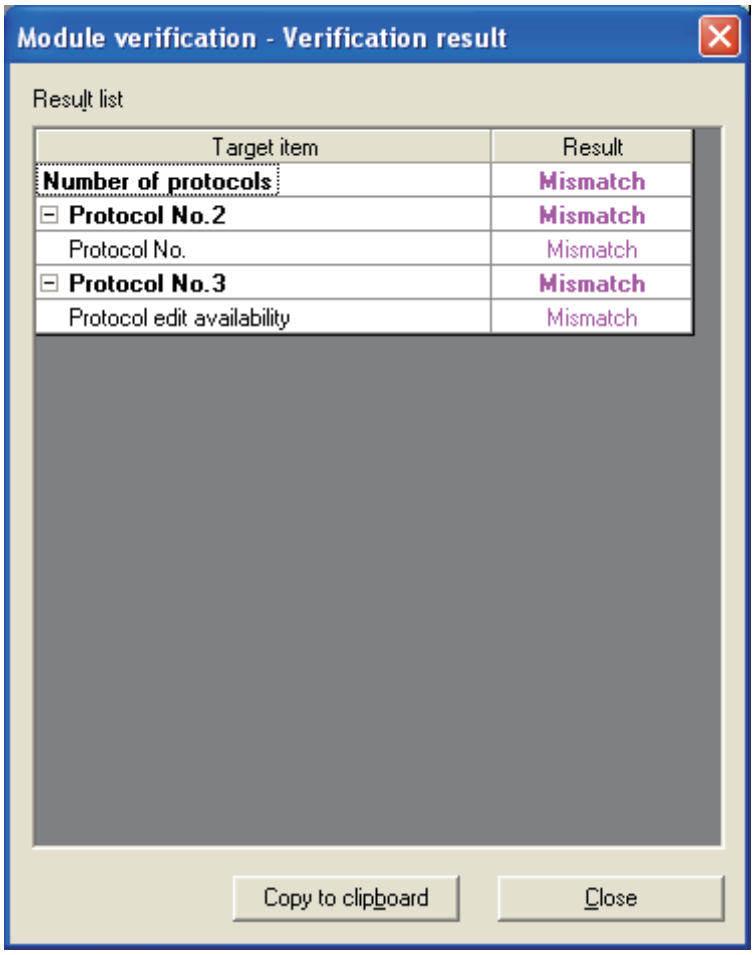


DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Module selection	Select a verification target module. The I/O address and type of a connected Q series C24N / L series C24 module are displayed in the combo box.
Execute button	Based on the setting in “Module selection”, starts comparing the protocol setting read from the module with that being open.
Close button	Closes the screen.

(2) Verification result screen

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Result list	Displays target items and verification result 'Match'/'Mismatch' of each item.
Copy to clipboard button	Copies all contents being displayed on the screen to the clip board in text format.
Close button	Closes the screen.

The following table shows contents of the result list.

Target item		Result
Number of protocols[*1]		Displays 'Mismatch' when the total of registered protocols is unmatched.
Protocol No.□ (□: 1 to 128)[*1]		Performs verification of the following target item for each protocol (1) to (5) with a corresponding protocol, and displays 'Mismatch' when any of the verification results are unmatched.
Target item for each protocol[*1*2]	(1) Protocol No.	Verifies if the corresponding protocol number exists, and displays 'Mismatch' when it only exists in the one side.
	(2) Protocol edit availability	Displays 'Mismatch' when the setting of "Selected from pre-defined protocol library"/" Editable protocol" is mismatched.
	(3) Protocol detailed setting information	Verifies the setting items (excluding "Manufacturer", "Type", "Version", and "Explanation") of the protocol detailed setting, and displays 'Mismatch' when any of the setting values are unmatched.
	(4) Number of packets	Displays 'Mismatch' when the number of registered packets is unmatched.
	(5) Packet setting information	Verifies the setting items (excluding "Packet name" and "Element name") of all packets registered in the corresponding protocol, and displays 'Mismatch' when any of the setting values are unmatched.

*1: Not displayed when all verification results of target items are matched.

*2: Target items for each protocol are verified in the order of (1) to (5), and the first unmatched item is only displayed.

Point

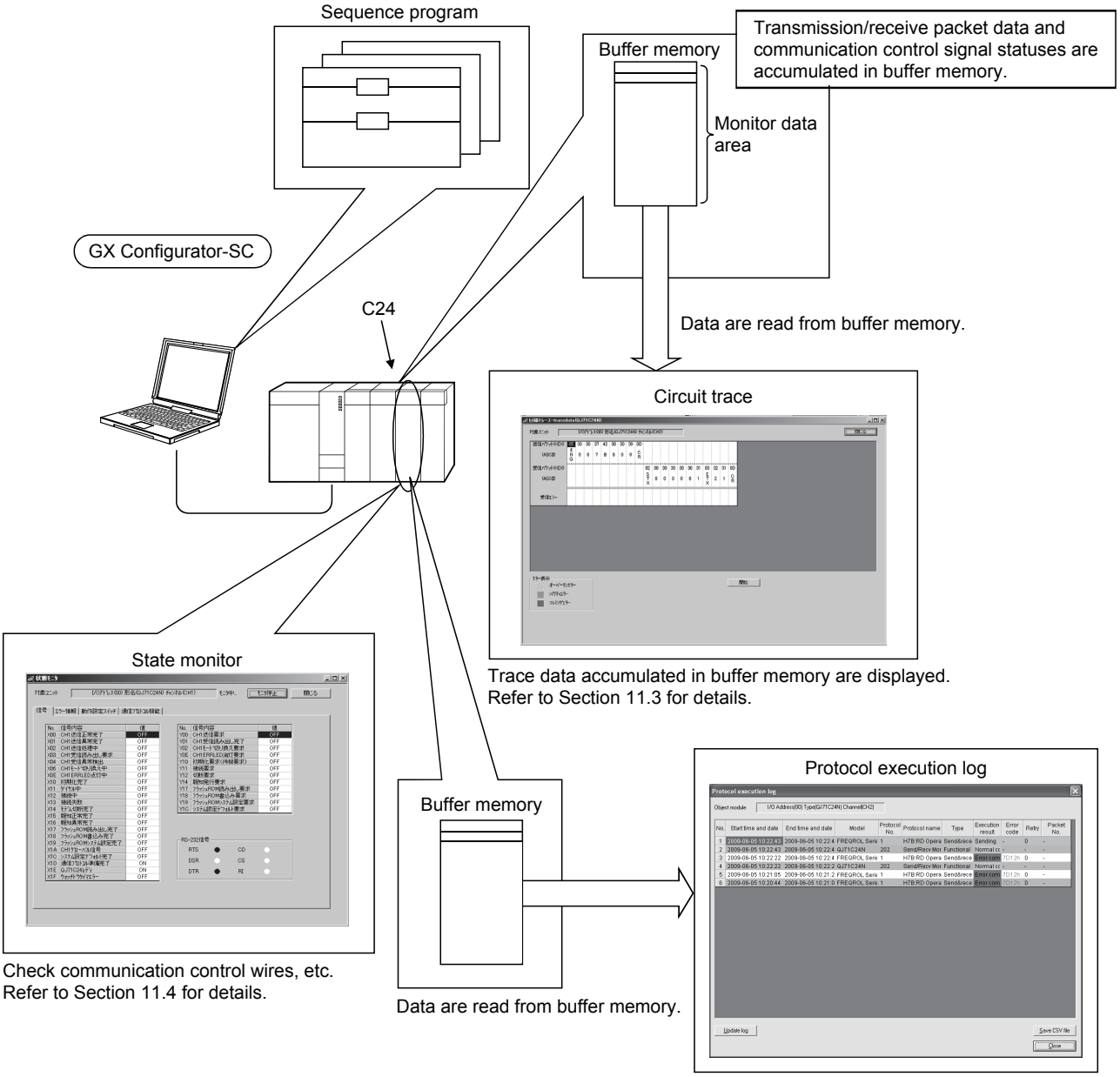
- As the following data cannot be written to a module, these data are not compared.
  Manufacturer
  Packet name
  Type, version, explanation in the protocol detailed setting
  Element name in the packet setting
- The Verification result screen is not displayed when there is not unmatched item in the verification results among the entire protocol data.

11 DEBUGGING SUPPORT FUNCTIONS

The debugging support functions are designed to support the debugging of communication processing with device controllers. The following functions are available to ease system startup work.

- Protocol execution log display
- Circuit trace
- State monitor

The following outlines the debugging support functions.



11.1 Selecting Module for Debugging

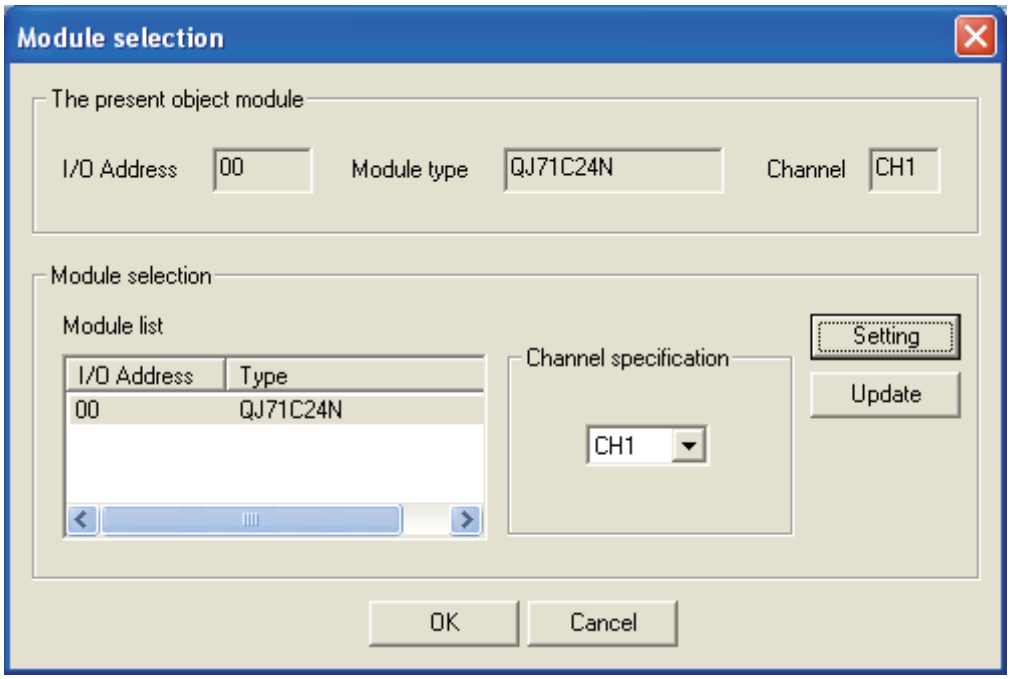
PURPOSE

To select a module to be debugged.
Protocol execution log display, circuit trace, and state monitor functions are executed for the selected module.

BASIC OPERATION

1. Click the [Debugging support function] → [Module selection] menu.
2. Select the I/O address and channel of the module to be debugged, and click the Setting button.
3. Clicking the OK button sets the module information.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
The present object module	Displays the information of the selected module.
Module list	Displays the list of selectable modules mounted on the same base.
Channel specification	Select the channel of the module.
Setting button	Sets the selected module and channel to the Object module.
Update button	Displays the latest module list.
OK button	Sets the data displayed in "The present object module" as the object module data.
Cancel button	Cancels the setting and closes the Module selection screen.

11.2 Protocol Execution Log Display

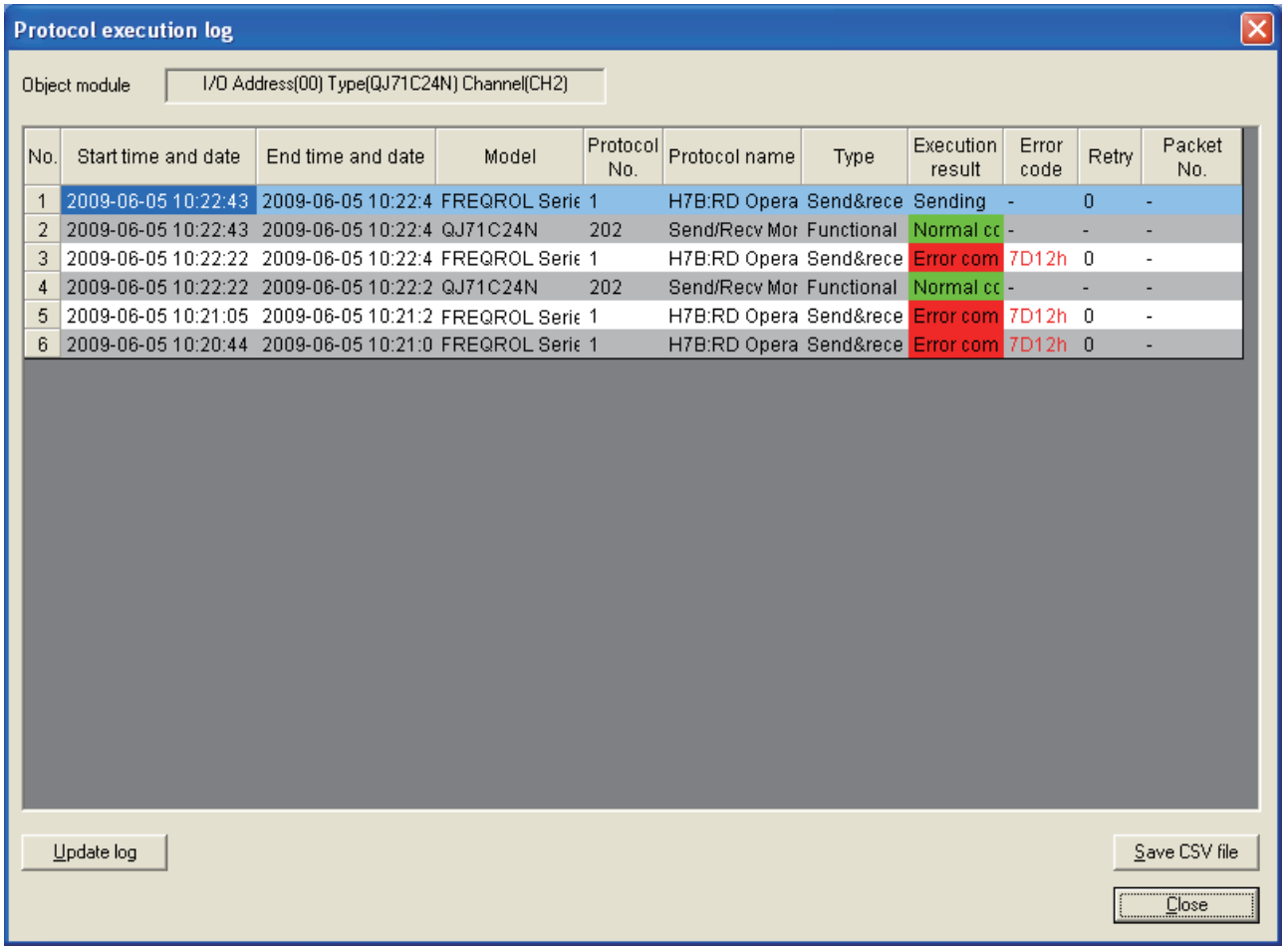
PURPOSE

To display the protocol execution logs and the protocol execution results when protocol settings are made.

BASIC OPERATION

1. Select a module to be debugged. (Refer to Section 11.1)
2. Click the [Debugging support function] → [Protocol execution log] menu.
3. The Protocol execution log screen is displayed.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Object module	Displays the target module (I/O address and module type) and channel of displayed protocol execution logs.
No.	Displays the execution logs in the order from the latest. Displays up to 32 logs.
Start time and date	Displays the start date of the protocol execution.
End time and date	Displays the end date of the protocol execution.
Model	Displays the external device name.
Protocol No.	Displays the executed protocol number.
Protocol name	Displays the executed protocol name.
Type	Displays the communication type of protocol: "Send only", "Receive only", "Send & receive" When the functional protocol (Refer to Section 13.4.3) is executed, "Functional protocol" is displayed. When the protocol number that is not written to the module is executed using the dedicated instruction (CPRTCL instruction), "Unregistered protocol No." is displayed.
Execution result	Displays the execution results of the protocols. Error completion: Displayed with red background. Normal completion: Displayed with light green background. For the protocol with "Waiting for transmission", "Sending", "Waiting for reception", and "Receiving", the corresponding logs are displayed in light blue.
Error code	Displays the error code of error completion in red when the execution result is an error completion. When the result is a normal completion, "-" is displayed.
Retry	Displays the number of send retries.
Packet No.	Displays the receive packet numbers which are matched by the verification.
Update log button	Obtains the latest log information from the buffer and redisplays them.
Save CSV file button	Saves the communication protocol execution logs being displayed to the CSV file.
Close button	Closes the Protocol execution log screen.

Point

The registration condition of log can be specified by the execution log option specification for buffer memory (buffer memory address: $40E2_H$, $40F2_H$) and intelligent function module utility.
The following are the registration conditions.

0^{th} bit is OFF (0): Stores the execution log for the protocols with the error completion only.

0^{th} bit is ON (1) : Stores the execution logs and the execution condition of all protocols.

Note that, only the logs of error protocols are displayed at the default setting. To display all logs of protocols, set the condition in the intelligent function module utility.
For details, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

11.3 Circuit Trace

PURPOSE

To trace the communication data and communication control signals with device controller.

REMARK

The circuit trace function displays the data accumulated in the monitor buffer of a module.

11.3.1 Starting the circuit trace

PURPOSE

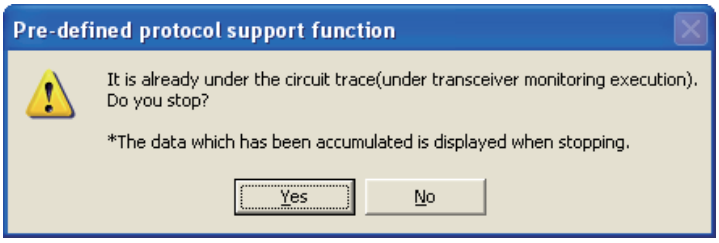
To trace the communication data and communication control signal status, store the trace data in the monitor buffer.

BASIC OPERATION

1. Select a module to be debugged. (Refer to Section 11.1)
2. Select the [Debugging support function] → [Circuit trace] → [Circuit trace] menu.
3. Click the Start button to start trace.
4. When the monitor buffer becomes full or the Stop button is clicked, the trace data are displayed.
5. Confirm the send/receive packets and communication control signals from the displayed trace result.

Point

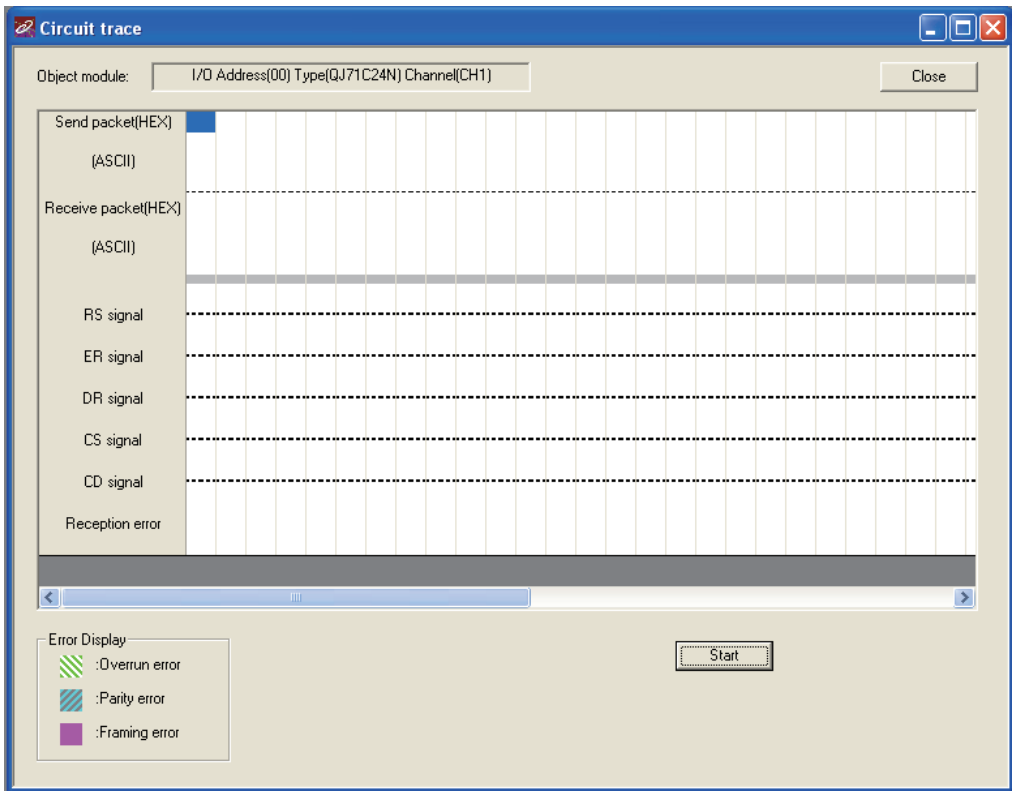
- When the circuit trace or communication data monitoring function has already been executed, the following confirmation message is displayed. For details of the communication data monitoring function, refer to the "MELSEC-Q/L Serial Communication Module User's Manual (Application)".



Item	Display/Setting
Yes button	The circuit trace is stopped and the data already accumulated are read and displayed.
No button	The message closes. However, the trace remains in the execution status.

- When only displaying the result of the previously executed circuit trace, it is not necessary to select a module.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Object module	Displays the information of the module on which the circuit trace is performed.
Send / receive packets	Displays send data and receive data respectively. For the data display format, the ASCII code or hexadecimal can be selected.
Communication control signals	The RS, ER, DR, CS and CD signal status and receive error are displayed as described below. ● RS, ER, DR, CS and CD signals All signals are displayed with blue lines -. When signal is ON : ⌐¬ When signal is OFF: ¬⌐ When the obtained data does not have signal information, the signal is displayed as an OFF status. ● Receive error Three different errors of overrun error, parity error and framing error are displayed. Overrun error: (Green) Parity error : (Light blue) Framing error: (Purple)
Start button	Starts tracing.
Stop button	Stops tracing. After a stop, the trace data accumulated in the monitor buffer are displayed.
Close button	Closes the Circuit trace screen.

11.3.2 Circuit trace option

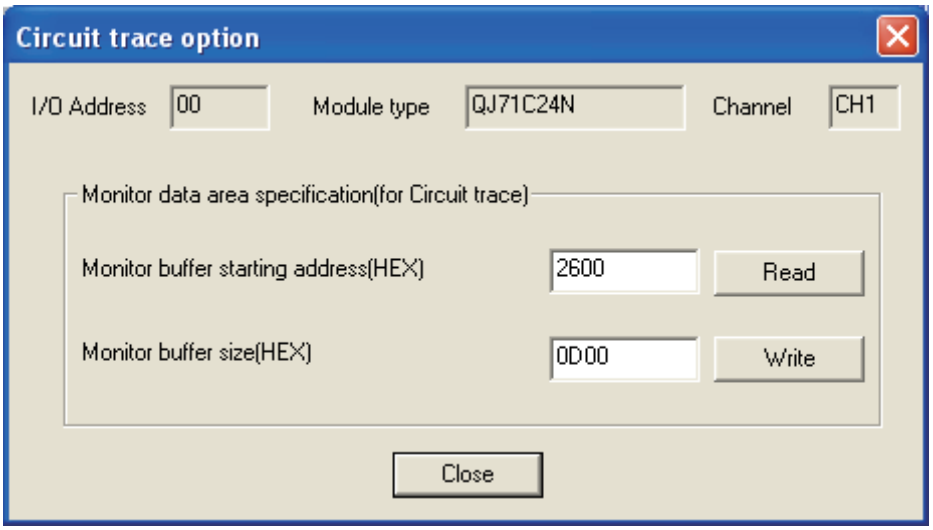
PURPOSE

To set the monitor buffer area starting address and size of a module that stores the circuit trace data.

BASIC OPERATION

1. Select the [Debugging support function] → [Circuit trace] → [Circuit trace] menu to display the Circuit trace screen.
2. Select the [Debugging support function] → [Circuit trace] → [Circuit trace option] menu to display the Circuit trace option screen.
3. Set the "Monitor buffer starting address" and "Monitor buffer size", and click the Write button.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Monitor buffer starting address setting	Set the starting address of the monitor buffer area that stores the trace data. Input the setting in hexadecimal. ● Input range CH1/CH2: 2600_H to $3FFD_H$ ($C00_H$ to $1AFD_H$ for the user-specified area)
Monitor buffer size setting	Set the size of the monitor buffer area that stores the trace data. Input the setting in hexadecimal. ● Input range CH1/CH2: 3 to 1A00 words (3 to F00 words for the user-specified area) Set the maximum address*1 for the trace data storage space to be in the range between 2602_H to $3FFF_H$. ($C02_H$ to $1AFF_H$ for the user-specified area) Note that the range of this value is checked at start of the circuit trace when using the user-specified area.
Read button	Reads the monitor buffer starting address and size from the selected module.
Write button	Writes the setting values of the "Monitor buffer starting address" and "Monitor buffer size" to the selected module.

*1: The maximum address for the trace data storage space is calculated by the following formula.
Maximum address for the trace data storage space = "Monitor buffer starting address" + "Monitor buffer size" - 1

11.3.3 Opening the circuit trace file

PURPOSE

To read and display the trace data saved in the personal computer.

BASIC OPERATION

Select the [Debugging support function] → [Circuit trace] → [Open circuit trace file] menu.

11.3.4 Saving the circuit trace file

PURPOSE

To save the trace data obtained by the circuit trace to the personal computer.

BASIC OPERATION

Select the [Debugging support function] → [Circuit trace] → [Save circuit trace file] menu.

11.4 State Monitor

PURPOSE

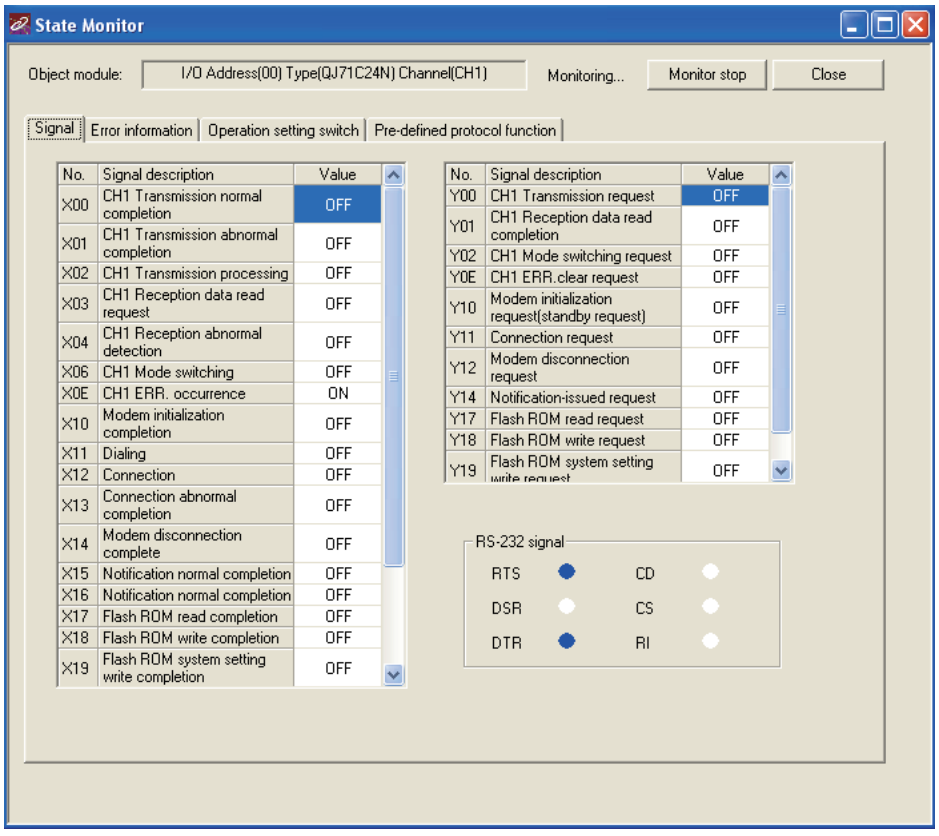
To monitor signals, communication error information, operation setting switches, and protocol execution status.

BASIC OPERATION

1. Select a module to be debugged. (Refer to Section 11.1)
2. Select the [Debugging support function] → [State monitor] menu.
3. Click the Monitor start button.
4. Click the <<Signal>> tab and confirm the signal status.
5. Click the <<Error information>> tab and confirm the error information.
6. Click the <<Operation setting switch>> tab and confirm the operation setting switch setting status.
7. Click the <<Pre-defined protocol function>> tab and confirm the protocol execution status

(1) <<Signal>> tab

DISPLAY/SETTING SCREEN



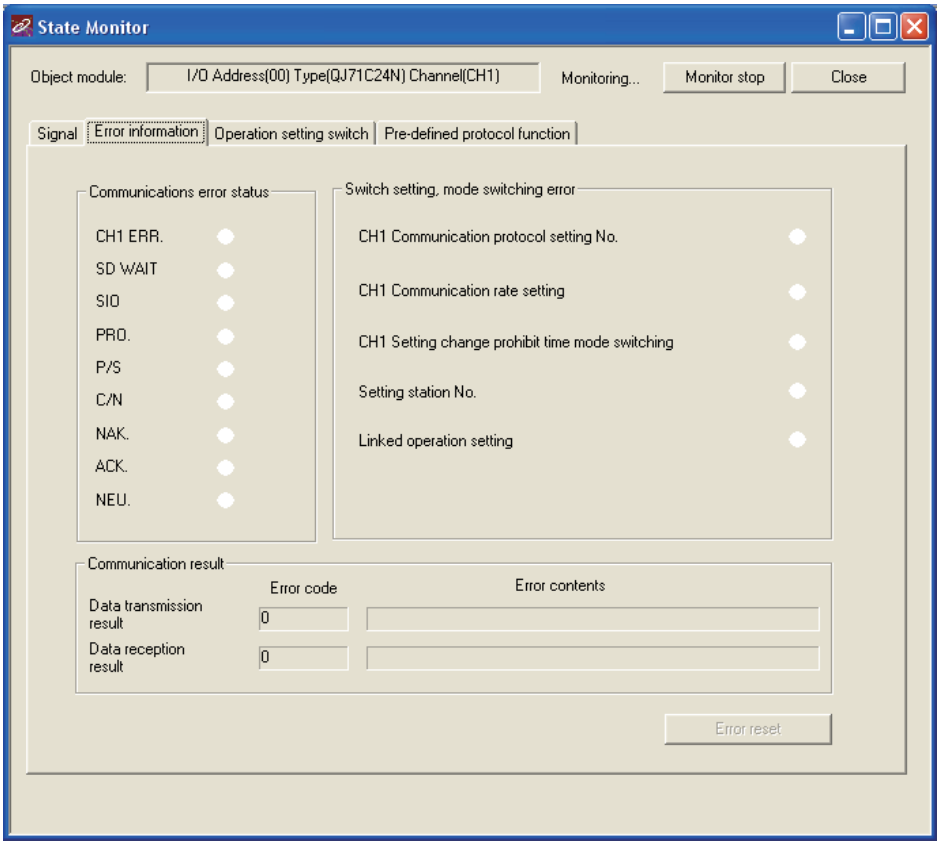
DISPLAY/SETTING DETAILS

Item	Display/Setting Details
X signal state monitor	Displays the ON/OFF status of the X signals.
Y signal state monitor	Displays the ON/OFF status of the Y signals.
RS-232 signal monitor	Displays the ON/OFF status of the RS-232 control signals.

Protocols can be executed while the Pre-defined protocol ready (X1D) is ON.
For details, refer to the user's manual of a target module.

(2) <<Error information>> tab

DISPLAY/SETTING SCREEN



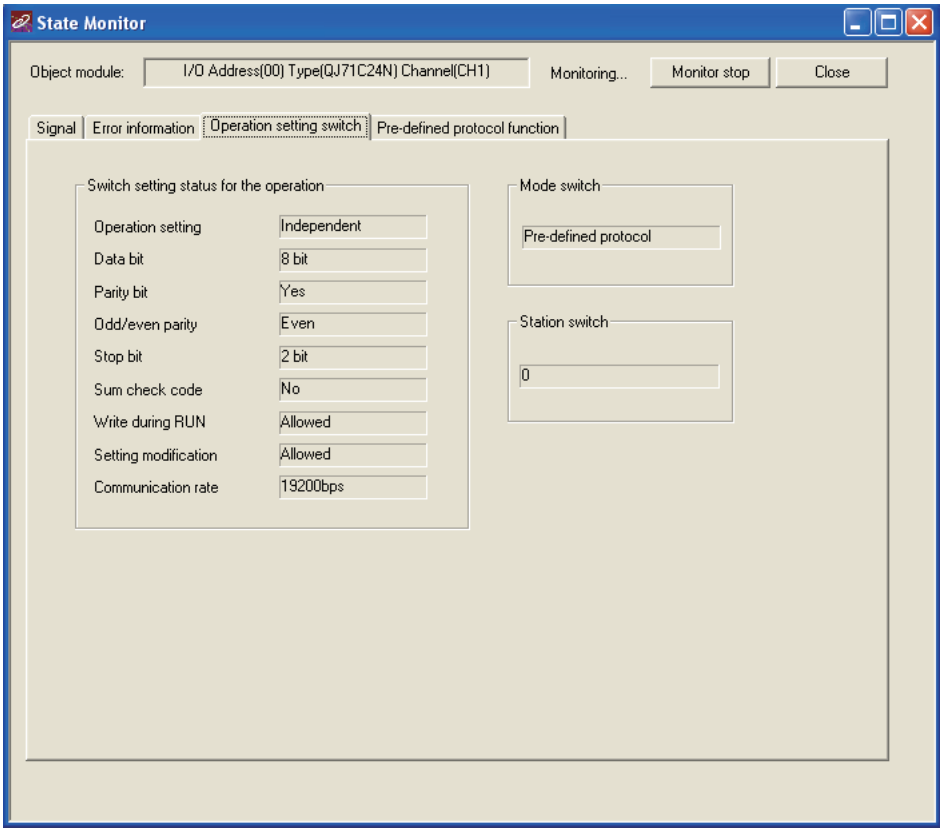
DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Communication error status	Displays the communication error status.
Switch setting, mode switching error	Displays the switch setting and/or mode selection error status.
Communication result	Displays the error status of the communication result.
Error reset button	Resets the error information when XnE on CH1 or XnF on CH2 is ON. Masked in any other cases.

For details, refer to the user's manual of a target module.

(3) <<Operation setting switch>> tab

DISPLAY/SETTING SCREEN



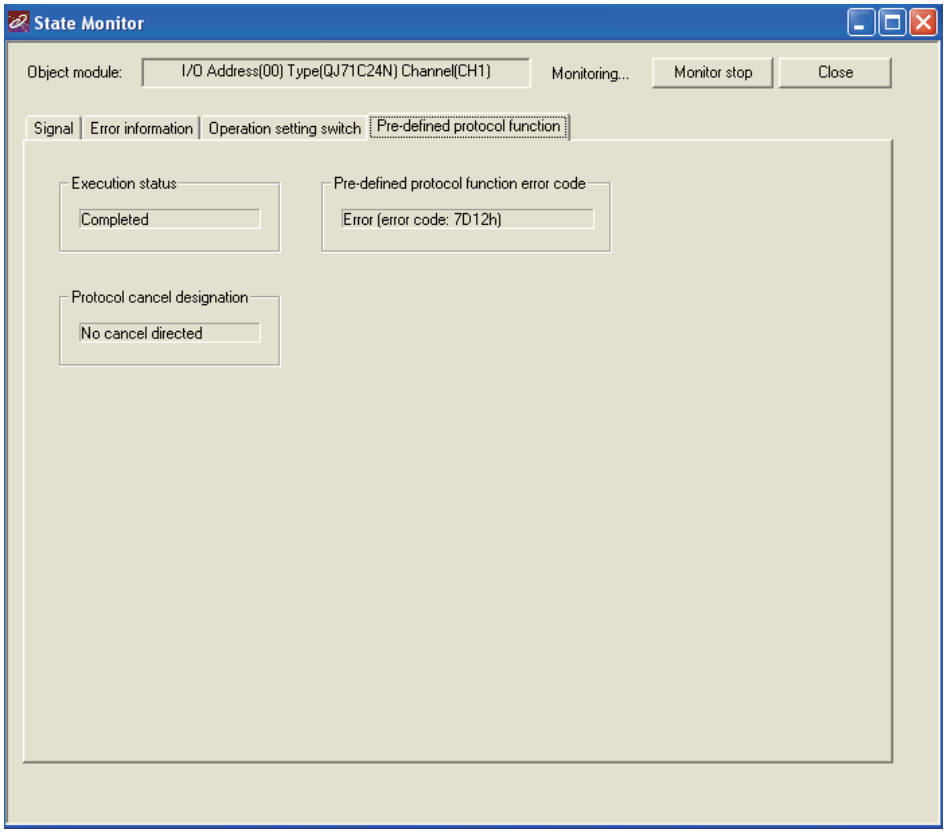
DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Switch setting status for the operation	Displays the operation switch setting status.
Mode switch	Displays the communication protocol setting.
Station switch	Displays the station number setting.

For details, refer to the user's manual of a target module.

(4) <<Pre-defined protocol function>> tab

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

Item	Display/Setting Details
Execution status	Displays the protocol execution status.
Protocol cancel designation	Displays the protocol cancel designation status.
Pre-defined protocol function error code	Displays the error code of the result from the error completion.

For details, refer to the user's manual of a target module.

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12 PRINT

12.1 Start

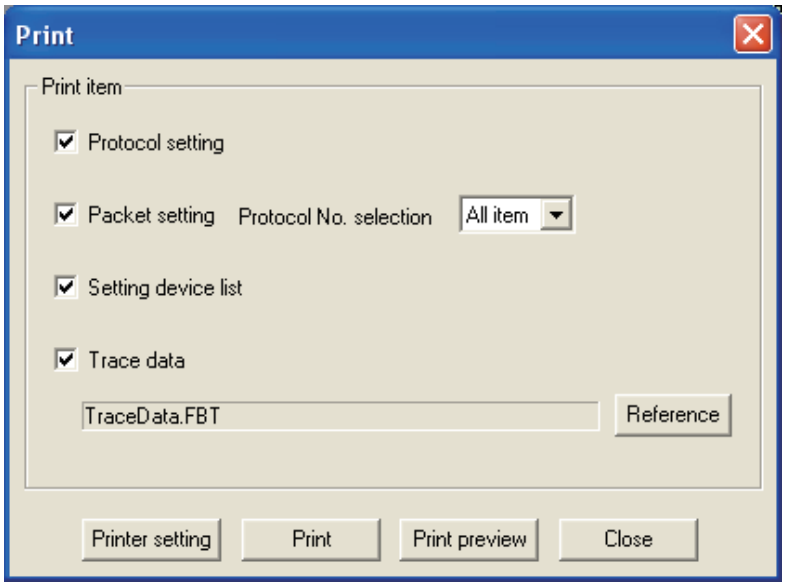
PURPOSE

To print protocol settings, packet settings, setting device list, and trace data.

BASIC OPERATION

Click the [File] → [Print] menu ( ).

DISPLAY/SETTING SCREEN

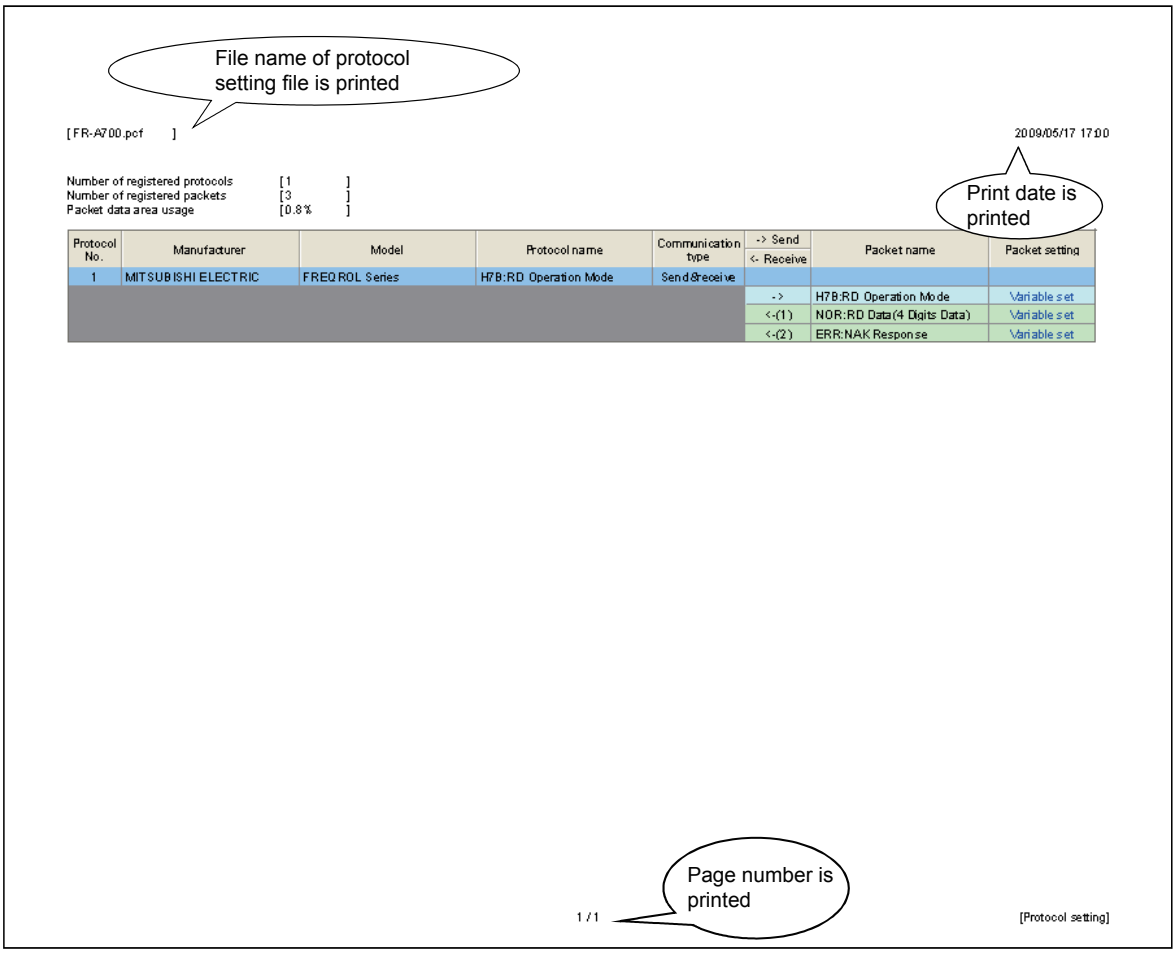


DISPLAY/SETTING DETAILS

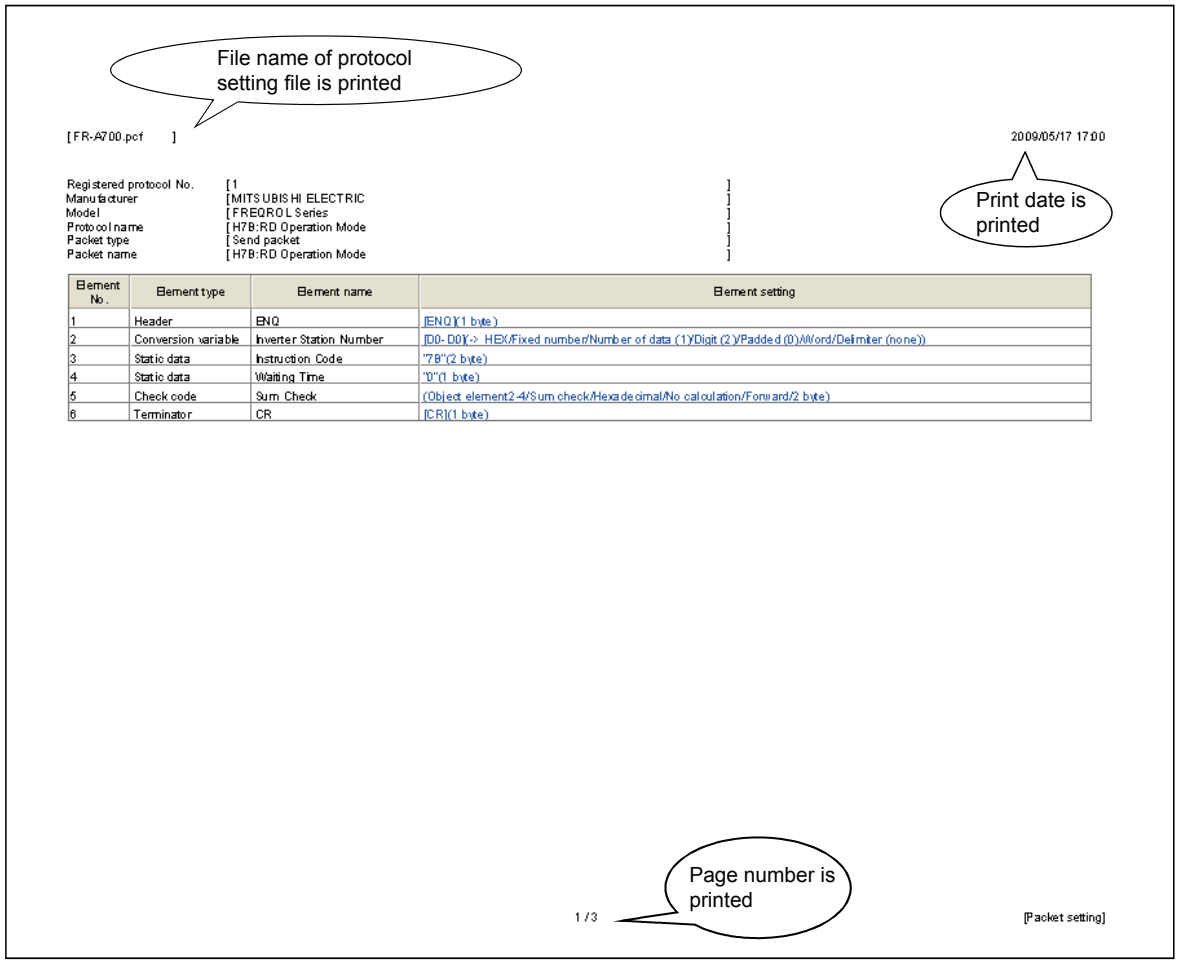
Item	Display/Setting Details
Print item	Select items to be printed.
Protocol setting	The data set in the protocol setting are printed.
Packet setting	Select a protocol number of a packet to be printed. "All item" and protocol numbers set on the Protocol setting screen are displayed in the combo box.
Setting device list	The list of set devices is printed.
Trace data	Specify the file name of the trace data to be printed. Click the Reference button and select the trace data file.
Printer setting button	Displays the printer setting screen.
Print button	Executes printing.
Print preview button	Displays the print preview.
Close button	Closes the Print screen.

12.2 Print Examples

(1) Protocol setting

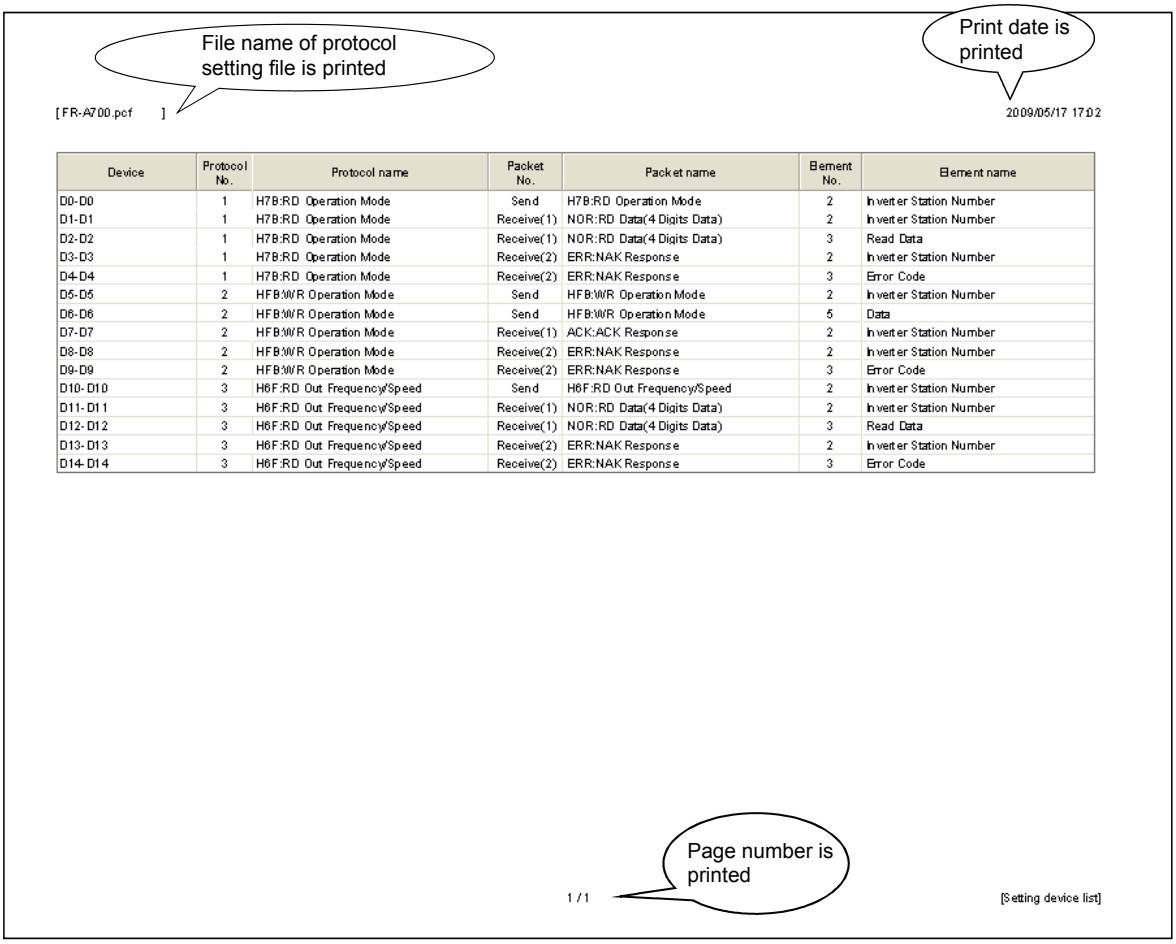


(2) Packet setting



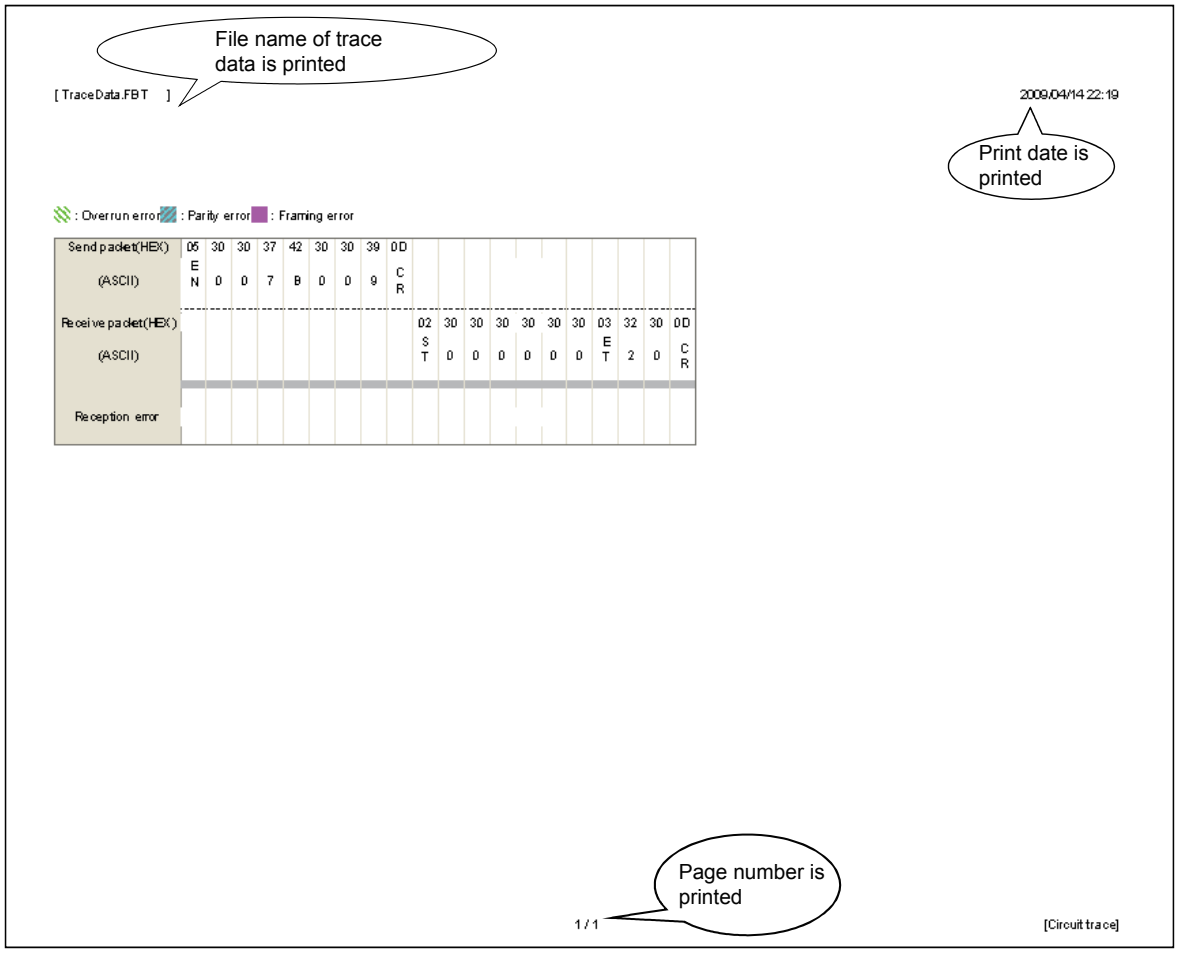
12 - 3

(3) Setting device list



Device	Protocol No.	Protocol name	Packet No.	Packet name	Element No.	Element name
D0-D0	1	H7B:RD Operation Mode	Send	H7B:RD Operation Mode	2	Inverter Station Number
D1-D1	1	H7B:RD Operation Mode	Receive(1)	NOR:RD Data(4 Digits Data)	2	Inverter Station Number
D2-D2	1	H7B:RD Operation Mode	Receive(1)	NOR:RD Data(4 Digits Data)	3	Read Data
D3-D3	1	H7B:RD Operation Mode	Receive(2)	ERR:NAK Response	2	Inverter Station Number
D4-D4	1	H7B:RD Operation Mode	Receive(2)	ERR:NAK Response	3	Error Code
D5-D5	2	HFB:WR Operation Mode	Send	HFB:WR Operation Mode	2	Inverter Station Number
D6-D6	2	HFB:WR Operation Mode	Send	HFB:WR Operation Mode	5	Data
D7-D7	2	HFB:WR Operation Mode	Receive(1)	ACK:ACK Response	2	Inverter Station Number
D8-D8	2	HFB:WR Operation Mode	Receive(2)	ERR:NAK Response	2	Inverter Station Number
D9-D9	2	HFB:WR Operation Mode	Receive(2)	ERR:NAK Response	3	Error Code
D10-D10	3	H6F:RD Out Frequency/Speed	Send	H6F:RD Out Frequency/Speed	2	Inverter Station Number
D11-D11	3	H6F:RD Out Frequency/Speed	Receive(1)	NOR:RD Data(4 Digits Data)	2	Inverter Station Number
D12-D12	3	H6F:RD Out Frequency/Speed	Receive(1)	NOR:RD Data(4 Digits Data)	3	Read Data
D13-D13	3	H6F:RD Out Frequency/Speed	Receive(2)	ERR:NAK Response	2	Inverter Station Number
D14-D14	3	H6F:RD Out Frequency/Speed	Receive(2)	ERR:NAK Response	3	Error Code

(4) Trace data


File name of trace data is printed
[TraceData.FBT]
2009/04/14 22:19
Print date is printed
: Overrun error : Parity error : Framing error
Send packet(HEX) 05 30 30 37 42 30 30 39 0D
(ASCII) EN 0 0 7 B 0 0 9 CR
Receive packet(HEX) 02 30 30 30 30 30 30 03 32 30 0D
(ASCII) ST 0 0 0 0 0 0 ET 2 0 CR
Reception error
Page number is printed
1 / 1
[Circuit trace]

13 SETTINGS FOR Q SERIES C24N / L SERIES C24 MODULE

This chapter explains the specification overview of Q series C24N / L series C24 modules required when using the pre-defined protocol function.
For the terms described in this chapter, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

13.1 I/O Signals of Programmable Controller CPU

This section explains the I/O signals of Q series C24N / L series C24 modules used for the pre-defined protocol.
For the I/O signals not used in the pre-defined protocol communication, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

13.2 Pre-defined Protocol Ready (X1D)

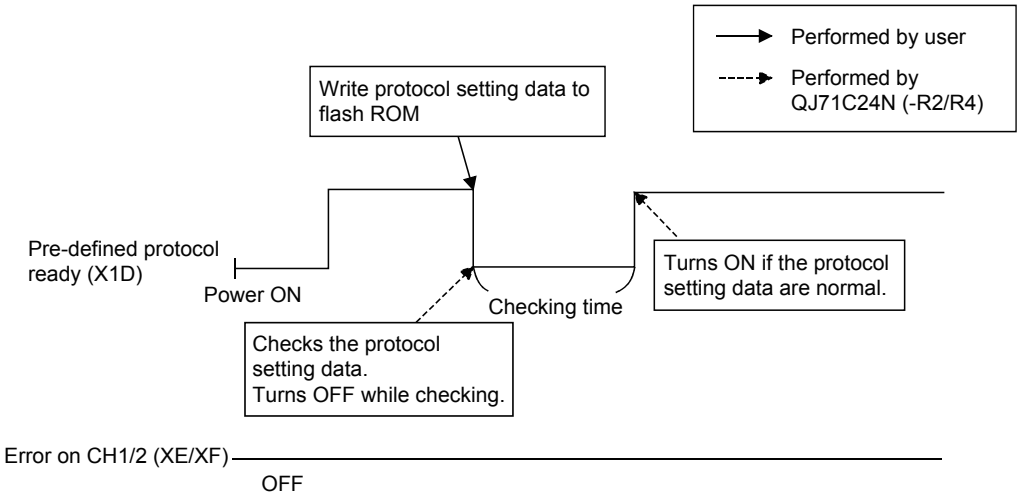
This is a signal that turns ON when the pre-defined protocol communication is ready to be executed.
The CPRTCL instruction can be executed when this signal is ON.
Use this signal as an interlock signal when executing the CPRTCL instruction in the sequence program.

This signal turns ON only when the communication protocol setting is set as pre-defined protocol.

(1) ON/OFF timing

X1D turns ON in the following conditions.

- The protocol setting data are not written in the flash ROM.[*1]
- The protocol setting data are written in the flash ROM.



X1D turns OFF in the following condition.

- A mode other than the pre-defined protocol is set for the communication protocol setting.

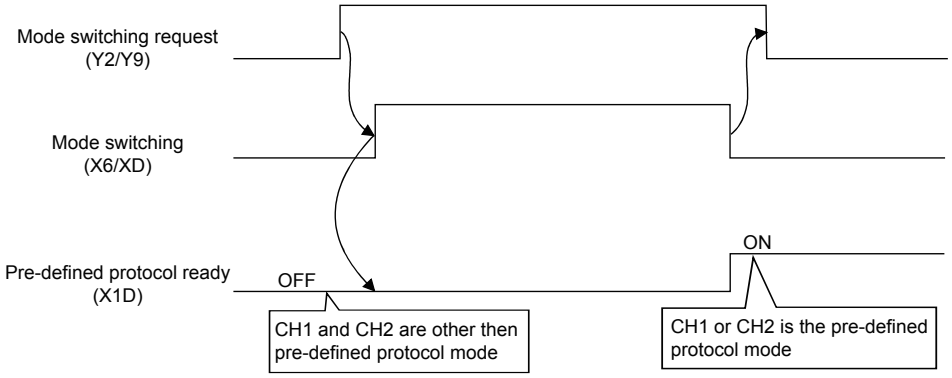
*1: Only functional protocols can be executed.
For details, refer to Section 13.4.3.

(2) Timing for executing the UINI instruction or mode switching request signal (Y2/Y9)[*1]

(a) Timing for executing mode switching request signal (Y2/Y9)

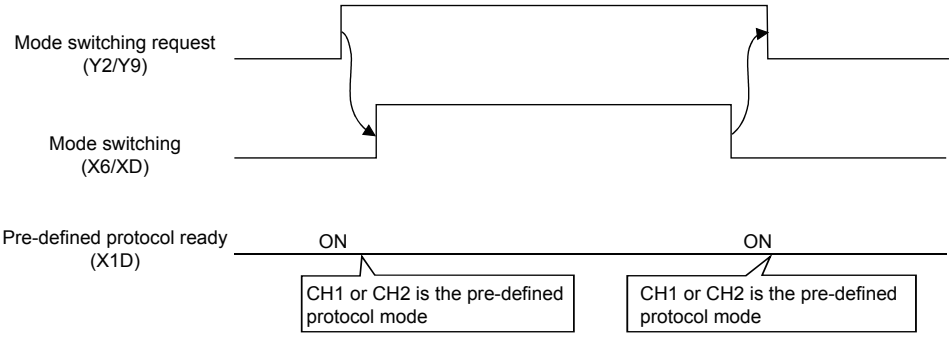
Communication protocol before change: CH1 and CH2 are other than the pre-defined protocol mode.

Communication protocol after change : CH1 or CH2 is the pre-defined protocol mode.

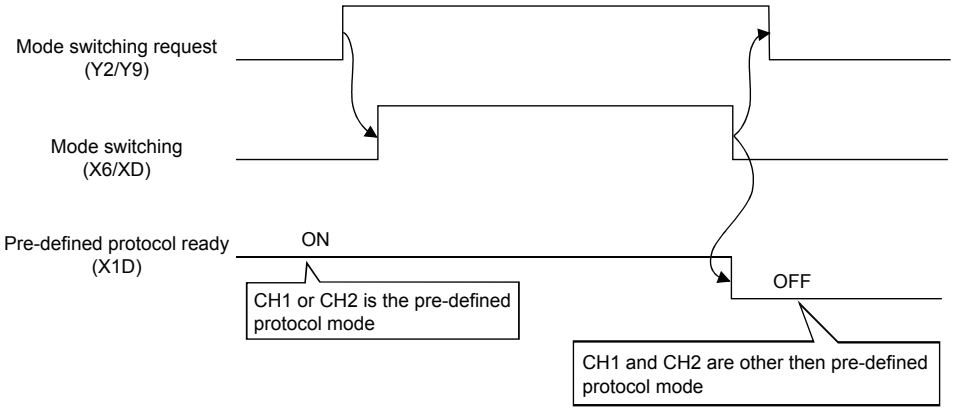


Communication protocol before change: CH1 or CH2 is the pre-defined protocol mode.

Communication protocol after change : CH1 or CH2 is the pre-defined protocol mode.



Communication protocol before change: CH1 or CH2 is the pre-defined protocol mode.
Communication protocol after change : CH1 and CH2 are other than the pre-defined protocol mode.

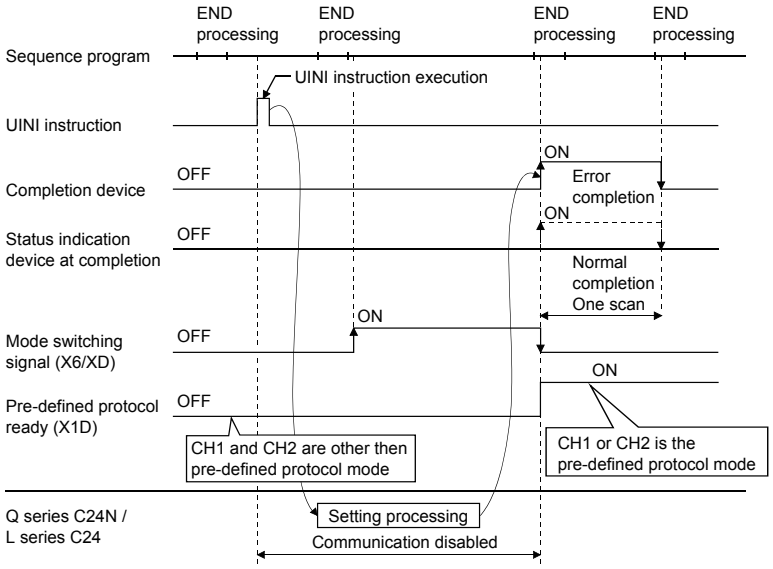


*1: Based on either following condition; the protocol setting data written to the flash ROM are normal, or the protocol setting data are not written to the flash ROM.

(b) Timing for executing the UINI instruction

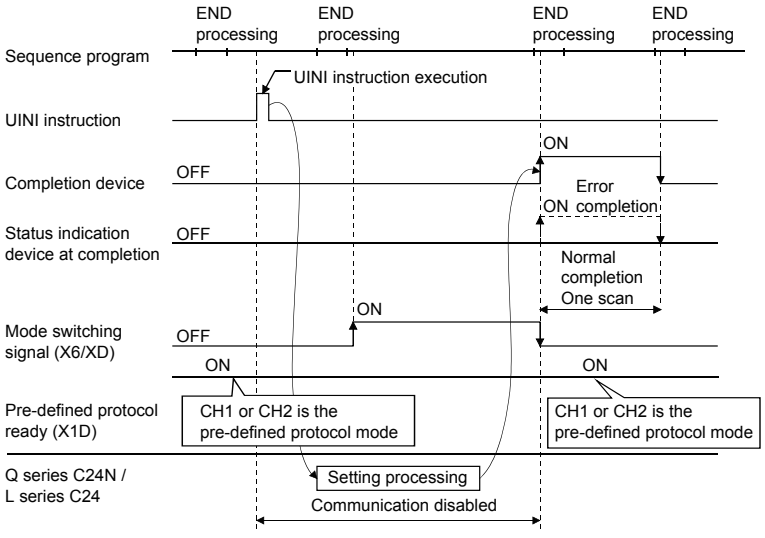
Communication protocol before change: CH1 and CH2 are other than the pre-defined protocol mode.

Communication protocol after change : CH1 or CH2 is the pre-defined protocol mode.

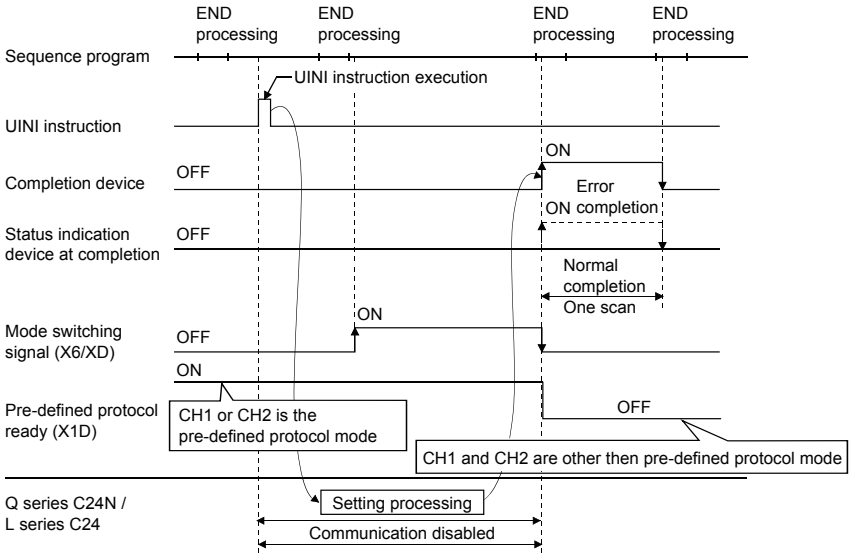


Communication protocol before change: CH1 or CH2 is the pre-defined protocol mode.

Communication protocol after change : CH1 or CH2 is the pre-defined protocol mode.



Communication protocol before change: CH1 or CH2 is the pre-defined protocol mode.
Communication protocol after change : CH1 and CH2 are other than the pre-defined protocol mode.



13.3 List of Applications and Assignments of Buffer Memory

This section explains the buffer memory (masked areas in the table) used for the pre-defined protocol function.
For the buffer memory that does not relate to the pre-defined protocol function, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

(1) Configuration of the buffer memory

A buffer memory consists of a user area and a system area as shown below.

(a) User area

1) This is the area where users write/read data.
2) The user area consists of areas for storing setting values for data communication, for actual data communication, and for storing communication status and communication error information.
3) Data read/write to the user area should be performed following the instructions in the corresponding detailed reference page.

(b) System area

This area is used by the Q series C24N / L series C24 module system.

(2) List of buffer memory assignments

A buffer memory is configured with 16 bits per address.
Name, initial value, etc. of each address of the buffer memory is shown in the lists on the following pages.

1) Abbreviations in the Applicable protocol column
   - MC : MC protocol
   - Non : Non procedure protocol
   - Bi : Bidirectional protocol
   - Pre : Pre-defined protocol
2) Meaning of symbols shown in the Applicable protocol column
   The following symbols are assigned to protocols related to the setting values of a corresponding area and to areas used for controlled with user settings, and indicate what kind of access is allowed to the area in question.
   - RW : Area where it is possible to read/write data from/to the programmable controller CPU and the other device.
   - R : Area where only reading is possible from the programmable controller CPU and the other device.
   - – : System area used by the system or area not used by the corresponding protocol.
3) Meaning of symbols shown in the Registration allowed/not allowed column
   Indicates whether or not it is possible to use a value in the corresponding area by registering it to the flash ROM of the Q series C24N / L series C24 module.
   - Allowed : Area that can be registered and used.
   - Not allowed : Area that cannot be registered.

IMPORTANT

Do not write data in the "System area" of the buffer memory.
If data are written to any of the system areas, the programmable controller system may malfunction.
Some of the user areas are partially system areas. Care must be taken when reading/writing data from/to the buffer memory.

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
0 (0H)	—	For LED and communication error clear	Communication error clear request for CH1 and to turn LED off 0: ON, No initialization request 1: OFF, Initialization requested SD WAIT (b0) C/N (b4) SIO (b1)) NAK (b5) PRO. (b2) ACK. (b6) P/S (b3) NEU. (b7) For system (b8) to (b15)	0	RW				Not allowed
—	1 (1H)		Communication error clear request for CH2 and to turn LED off 0: ON, No initialization request 1: OFF, Initialization requested SD WAIT (b0) NAK (b5) SIO (b1) ACK. (b6) PRO. (b2) NEU. (b7) P/S (b3) CH2 ERR. (b14) C/N (b4) CH1 ERR. (b15) For system (b8) to (b13)						
144 (90H)	304 (130H)	For designation of mode switching	Switching mode no. designation (0001H to 0007H, 00FFH) 0001H: MC protocol (format 1) 0006H: Non procedure protocol 0002H: MC protocol (format 2) 0007H: Bidirectional protocol 0003H: MC protocol (format 3) 0009H: Pre-defined protocol 0004H: MC protocol (format 4) 00FFH: GX Developer connection 0005H: MC protocol (format 5)	0	RW				Not allowed
145 (91H)	305 (131H)		Transmission specifications after switching designation Designates transmission specifications (below) after switching when b15 of this area is 1 (ON). Operation setting (b0) 0: Independent 1: Link Data bit (b1) 0: 7 bit 1: 8 bit Parity bit (b2) 0: No 1: Yes Odd/even parity (b3) 0: Odd 1: Even Stop bit (b4) 0: 1 bit 1: 2 bit Sum check code (b5) 0: No 1: Yes Write during RUN (b6) 0: Prohibited 1: Allowed Setting modification (b7) 0: Prohibited 1: Allowed Communication rate (b8 to b11) 50 bps to 230400 bps For system (b12 to b14) All 0 Transmission specifications after switching (b15) designation 0: Match settings in GX Developer 1: Match settings in this area						
146 (92H)	306 (132H)	Signal setting (*1)	RS and DTR signal status designation 0: Off 1: On RS signal (b0) DTR signal (b2) For system (b1), (b3) to (b15)	0005H					Allowed
147 (93H)	307 (133H)	For designation of transmission control	DTR/DSR(ER/DR), DC control designation • Transmission control (b0) 0: DTR/DSR control 1: DC code control • DC1/DC3 control (b8) 0: No control 1: Controlled • DC2/DC4 control (b9) 0: No control 1: Controlled	0					Allowed
148 (94H)	308 (134H)		DC1/DC3(Xon/Xoff) code designation • DC1 code (b0 to b7) 00H to FFH: DC1 code • DC3 code (b8 to b15) 00H to FFH: DC3 code	1311H					

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
149 (95H)	309 (135H)	For designation of transmission control	DC2/DC4 code designation • DC2 code (b0 to b7) 00H to FFH: DC2 code • DC4 code (b8 to b15) 00H to FFH: DC4 code	1412H	RW				Allowed
150 (96H)	310 (136H)	For designation of communication control	Word/byte units designation	0	RW			—	Allowed
151 (97H)	311 (137H)	For designation of communication control	CD terminal check designation (for RS-232) 0: Check 1: No check	1	RW				Allowed
152 (98H)	312 (138H)		Communication system designation (for RS-232) 0: Full duplex communication 1: Half-duplex communication	0					
153 (99H)	313 (139H)	For half- duplex communications control designation (RS-232)	Simultaneous transmission priority/non-priority designation 0: Priority Other than 0: Non-priority (transmission wait time, unit: 100 ms)						
154 (9AH)	314 (13AH)		Retransmission time transmission method designation 0: Do not resend. 1: Resend.						
155 (9BH)	315 (13BH)	For designation of communication control	Simultaneously transmission data valid/invalid designation	0	—		RW	—	Allowed
156 (9CH)	316 (13CH)	For designation of data communication time monitoring	No-reception monitoring time (timer 0) designation	0	RW			—	Allowed
157 (9DH)	317 (13DH)	For designation of data communication time monitoring	Response monitoring time (timer 1) designation 0H : Wait infinitely 1H to BB8H: Monitoring time (unit: 100 ms)	32H (5 s)	RW	—	RW		Allowed
158 (9EH)	318 (13EH)	For designation of data communication time monitoring	Transmission monitoring time (timer 2) designation	708H (3 min.)	RW				Allowed
290 (122H)	—	For designation of communication control	System area						
—	450 (1C2H)		RS-422/485 interface echo back allow/prohibit designation 0: Echo back allowed 1: Echo back prohibited	0	RW				Allowed
291 to 303 (123H to 12FH)	451 to 511 (1C3H to 1EFH)	Use prohibited	System area	—					
512 (200H)		For confirmation of station No. setting status	Station No. (switch setting)	Depends on parame-ter setting	R				Not allowed
513 (201H)		For confirmation of LED ON status and communication error status	LED ON status and communication error status on CH1 side 0: LED OFF, no error 1: LED ON, error SD WAIT (b0) C/N (b4) SIO (b1) NAK (b5) PRO. (b2) ACK. (b6) P/S (b3) NEU. (b7) For system (b8) to (b15)	Depends on module status					
514 (202H)			LED ON status and communication error status on CH2 side 0: LED OFF, no error 1: LED ON, error SD WAIT (b0) NAK (b5) SIO (b1) ACK. (b6) PRO. (b2) NEU. (b7) P/S (b3) CH2.ERR. (b14) C/N (b4) CH1 ERR. (b15) For system (b8) to (b13)						

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
515 (203H)		For confirmation of switch setting and mode switching	Switch setting error and mode switching error status 0: No error Other than 0: Switch setting error and mode switching error CH1 Communication protocol setting No. (b0) 0: Normal 1: Error CH1 Communication rate setting (b1) 0: Normal 1: Error CH1 Setting change prohibit time mode switching (b3) 0: Normal 1: Error CH2 Communication protocol setting No. (b4) 0: Normal 1: Error CH2 Communication rate setting (b5) 0: Normal 1: Error CH2 Setting change prohibit time mode switching (b7) 0: Normal 1: Error Setting station No. (b14) 0: Normal 1: Error Linked operation setting (b15) 0: Normal 1: Error	0	R				Not allowed
543 (21FH)		Use prohibited	System area	—					
544 (220H)		For confirmation of flash ROM write result	Flash ROM system parameters write result 0 : Normal completion Other than 1 (error code) : Abnormal completion	0	RW				Not allowed
591 (24FH)		For confirmation of station No. setting status (*2)	Station No. (instruction setting)	Depends on module status	R				Not allowed
592 (250H)	608 (260H)	For confirmation of transmission control status	Communication protocol status (switch setting) 0: GX Developer connection 5: MC protocol (format 5) 1: MC protocol (format 1) 6: Non procedure protocol 2: MC protocol (format 2) 7: Bidirectional protocol 3: MC protocol (format 3) 8: (For linked operation) 4: MC protocol (format 4) 9: Pre-defined protocol	Depends on parameter setting	R				Not allowed
593 (251H)	609 (261H)	For confirmation of transmission control status	Transmission setting status (switch setting) Operation setting (b0) 0: Independent 1: Link Data bit (b1) 0: 7 bit 1: 8 bit Parity bit (b2) 0: No 1: Yes Odd/even parity (b3) 0: Odd 1: Even Stop bit (b4) 0: 1 bit 1: 2 bit Sum check code (b5) 0: No 1: Yes Write during RUN (b6) 0: Prohibited 1: Allowed Setting modification (b7) 0: Prohibited 1: Allowed Communication rate (b8 to b11) 50 bps to 230400 bps For system (b12 to b15) All 0	Depends on parameter setting	R				Not allowed
594 (252H)	610 (262H)		Communication protocol status (current) 0: GX Developer connection 5: MC protocol (format 5) 1: MC protocol (format 1) 6: Non procedure protocol 2: MC protocol (format 2) 7: Bidirectional protocol 3: MC protocol (format 3) 8: (For linked operation) 4: MC protocol (format 4) 9: Pre-defined protocol	Depends on module status					
595 (253H)	611 (263H)		Transmission status (current) Operation setting (b0) 0: Independent 1: link Data bit (b1) 0: 7 bit 1: 8 bit Parity bit (b2) 0: No 1: Yes Odd/even parity (b3) 0: Odd 1: Even Stop bit (b4) 0: 1 bit 1: 2 bit Sum check code (b5) 0: No 1: Yes Write during RUN (b6) 0: Prohibited 1: Allowed Setting modification (b7) 0: Prohibited 1: Allowed Communication rate (b8 to b11) 50 bps to 230400 bps For system (b12 to b15) All 0						

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
596 (254H)	612 (264H)	Control signal status	RS-232 control signal status 0: OFF status 1: ON status RS (b0) DTR (b2) CS (b4) DSR (b1) CD (b3) RI (b5) Not used (b6 to b15) All 0	Depends on signal status	R				Not allowed
597 (255H)	613 (265H)	For confirmation of communication result	Transmission sequence status (For confirmation of MC protocol communication status)	0	R	—			
598 (256H)	614 (266H)		On-demand execution result		RW	—			
599 (257H)	615 (267H)	For confirmation of communication result	Data transmission result 0 : Normal completion 1 or more: Abnormal completion (error code)	0	RW				
600 (258H)	616 (268H)		Data reception result 0 : Normal completion 1 or more: Abnormal completion (error code)						
601 (259H)	617 (269H)		System area	—					
602 (25AH)	618 (26AH)		MC protocol transmission error code	0	RW	—			Not allowed
603 (25BH)	619 (26BH)		Receive user frame (nth)		—	R	—		
604 to 607 (25CH to 25FH)	620 to 1023 (26CH to 3FFH)	Use prohibited	System area	—					
1024 (400H)	2048 (800H)	Transmission/ receive area	Transmission data count designation 0: No designation 1 or more: Number of send data	0	RW (*3)				Not allowed
1025 to 1535 (401H to 5FFH)	2049 to 2559 (801H to 9FFH)		Transmission data designation Data to be sent to an external device						
1536 (600H)	2560 (A00H)		Receive data count (Number of data for which read is requested) 0: No receive data 1 or more: Number of receive data						
1537 to 2047 (601H to 7FFH)	2561 to 3071 (A01H to BFFH)		Receive data Data received from an external device						
3072 to 6911 (C00H to 1AFFH)		For user	User free area (3840 words) * Determined by the user.		RW				
8192 (2000H)		System designation	Flash ROM write allow/prohibit designation 0: Write prohibited 1: Write allowed	0	RW				Not allowed
8210 (2012H)	8466 (2112H)	For transmission control designation (*1)	Transmission control start free area designation 64 to 4,095: transmission control start free area	64	RW				Allowed
8211 (2013H)	8467 (2113H)		Transmission control end free area designation 263 to 4096: transmission control end free area	263					
8212 (2014H)	8468 (2114H)	For transmission control designation (*1)	Non procedure and non reception monitoring time format	0	—	RW	—		Allowed
8213 to 8215 (2015H to 2017H)	8469 to 8471 (2115H to 2117H)	Use prohibited	System area	—					
8216 (2018H)	8472 (2118H)	Communication data monitoring function (*1)	Communication data monitoring designation 0000H: No monitor/stopped monitor designation 0001H: Monitor start designation 0002H: Monitoring (Q series C24 is a set.) 1002H: Monitoring stopped (Q series C24 is set.) 100FH: Monitor setting error (Q series C24 is a set.)	0	RW				Allowed
8217 (2019H)	8473 (2119H)		Data optional designation 0: Off 1: On Full stop designation (b0) Timer 0 errors at occurrence stop designation (b2) For system (b1), (b3) to (b15)	0					
8218 (201AH)	8474 (211AH)		Monitor buffer head address designation (400H to 1AFDH,2600H to 3FFDH)	CH1: 2600H CH2: 3300H					
8219 (201BH)	8475 (211BH)		Monitor buffer size designation (0003H to 1A00H)	0D00H					
9216 (2400H)	Use prohibited	System area	—	9216 (2400H)					

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
9217 (2401H)		For flash ROM write count housing	Flash ROM write count 0 to 1000: Write count	0	R				Not allowed
9218 to 9727 (2402H to 25FFH)		Use prohibited	System area	—					
9728 to 16383 (2600H to 3FFFH)		For user (*1)	User free area 2 (6656 words) (Transmission/receiving data monitoring function default buffer) * Usage is determined by the user.	0	RW				Not allowed
16384 to 16415 (4000H to 401FH)	16416 to 16447 (4020H to 403FH)	Use prohibited	System area	—					
16448 (4040H) (*4)	16464 (4050H)	For designation of pre-defined protocol function control data	Protocol cancellation designation 0: No cancellation designation 1: Cancellation request (user designation) 2: Cancellation completion (QJ71C24N (-R2/R4) designation)	0	—			RW	Not allowed
16449 (4041H)	16465 (4051H)	For confirmation of pre-defined protocol function execution status	Protocol execution status 0: Not executed 1: Waiting for transmission 2: Sending 3: Waiting for reception 4: Receiving 5: Completion					R	
16450 (4042H)	16466 (4052H)		Pre-defined protocol function error code 0 : Normal Other than 0: Abnormal (error code)	0	—			R	
16451 (4043H)	16467 (4053H)		Number of protocol executions 0 : No history 1 to 65535: Number of executions	0	—			R	
16452 to 16463 (4044H to 404FH)	16468 to 16479 (4054H to 405FH)	Use prohibited	System area	—					
16480 to 16517 (4060H to 4085H)									
16518 (4086H)		For confirmation of protocol setting data	Protocol setting data error information: Protocol number 1 to 128 : Protocol number 65535 : Not otherwise identified	0	—			R	Not allowed
16519 (4087H)			Protocol setting data error information: Type 0 : Packet setting or element setting 1 : Protocol detailed setting 65535 : Not otherwise identified	0	—			R	
16520 (4088H)			Protocol setting data error information: Packet number 0 : Send packet 1 to 16 : Receive packet number 65535 : Not otherwise identified * Enabled only when Type is '0'.	0	—			R	
16521 (4089H)			Protocol setting data error information: Element number 1 to 32 : Element number 65535 : Not otherwise identified * Enabled only when Type is '0'.	0	—			R	
16522 to 16527 (408AH to 408FH)		Use prohibited	System area	—					

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name	Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
16528 (4090H)			Number of protocol registration 0 : No registration 1 to 128: Number of registered protocols	0	—			R	
16529 to 16536 (4091H to 4098H)		For confirmation of protocol execution data	Protocol registration 0: No 1: Yes * A bit corresponds to the protocol number turns ON/OFF. Each bit indicates a protocol number. b15 b14 b13 … b2 b1 b0 4091H 16 15 14 … 3 2 1 4092H 32 31 30 … 19 18 17 4093H 48 47 46 … 35 34 33 4094H 64 63 62 … 51 50 49 4095H 80 79 78 … 67 66 65 4096H 96 95 94 … 83 82 81 4097H 112 111 11… 100 99 98 97 4098H 128 127 126 … 115 114 113 0: Not registered 1: Registered	0	—			R	Not allowed
16537 to 16607 (4099H to 40DFH)		Use prohibited	System area	—					
16608 to16609 (40E0H to 40E1H)	16624 to 16625 (40F0H to 40F1H)	Use prohibited	System area	—					
16610 (40E2H)	16626 (40F2H)	For designation of protocol execution log	Execution log option designation 0: Only protocols with error completion are stored. 1: Execution status and execution log of all protocols are stored.	0	—			RW	Allowed
16611 to 16623 (40E3H to 40EFH)	16627 to 16639 (40F3H to 40FFH)	Use prohibited	System area	—					

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name		Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
16640 (4100H)	18432 (4800H)	For confirmation of protocol execution log	Number of stored protocol execution logs 0 : No log 1 to 32: Number of stored logs		0	—			R	Not allowed
16641 (4101H)	18433 (4801H)		Protocol execution log write pointer 0 : No history 1 to 32: Protocol execution log number of latest log		0	—			R	
16642 (4102H)	18434 (4802H)		Execution log 1	System area	—					
16643 (4103H)	18435 (4803H)			Protocol number 0 : No log 1 to 128 : Protocol number 201 to 207 : Functional protocol number	0	—			R	Not allowed
16643 to 16659 (4104H to 4113H)	18436 to 18451 (4804H to 4813H)			Type of external device 0 : Protocol not executed Other than 0 : Type of external device (Maximum of 32 bytes are stored in ASCII code)	0	—			R	
16660 to 16675 (4114H to 4123H)	18452 to 18467 (4814H to 4823H)			Protocol name 0 : Protocol not executed Other than 0 : Protocol name (Maximum of 32 bytes are stored in ASCII code)	0	—			R	
16676 (4124H)	18468 (4824H)			Communication type 0 : Protocol not executed 1 : Send only 2 : Receive only 3 : Send & receive 14: Functional protocol 15: Protocol not registered	0	—			R	
16677 (4125H)	18469 (4825H)			Protocol execution status 0 : Not executed 1 : Waiting for send 2 : Sending 3 : Waiting for receive 4 : Receiving 5 : Completion	0	—			R	
16678 (4126H)	18470 (4826H)			Execution result 0 : Normal completion Other than 0 (error code): Error completion	0	—			R	
16679 (4127H)	18471 (4827H)			Verification match receive packet number 0 : When error occurred, or the communication type of the executed protocol is “Send only”. 1 to 16: Matched receive packet number	0	—			R	
16680 (4128H)	18472 (4828H)			Number of send retries 0 : Retry not executed 1 to 10: Number of retries	0	—			R	
16681 (4129H)	18473 (4829H)			System area	—					

Address Decimal (Hex) CH1	Address Decimal (Hex) CH2	Application	Name			Initial value	Applicable protocol MC	Non	Bi	Pre	Registration allowed/not allowed
16682 (412AH)	18474 (482AH)	For confirmation of protocol execution log	Execution log 1	Execution start date	0: No log Upper 8 bits: Month Lower 8 bits: Last 2 digits of year b15 to b8 b7 to b0 Month (01H to 12H) | Year (00H to 99H) Last 2 digits	0	—			R	Not allowed
16683 (412BH)	18475 (482BH)				0: No log Upper 8 bits: Hour Lower 8 bits: Day b15 to b8 b7 to b0 Hour (00H to 23H) | Day (01H to 31H)	0	—			R	
16684 (412CH)	18476 (482CH)				0: No log Upper 8 bits: Second Lower 8 bits: Minute b15 to b8 b7 to b0 Second (00H to 59H) | Minute (00H to 59H)	0	—			R	
16685 (412DH)	18477 (482DH)				0: No log Upper 8 bits: First 2 digits of year Lower 8 bits: Day of week b15 to b8 b7 to b0 Year (00H to 99H) First 2 digits | Day of week (01H to 06H) 00H (Sunday) to 06H (Saturday)	0	—			R	
16686 (412EH)	18478 (482EH)			Execution completion date	0: No log Upper 8 bits: Month Lower 8 bits: Last 2 digits of year b15 to b8 b7 to b0 Month (01H to 12H) | Year (00H to 99H) Last 2 digits	0	—			R	
16687 (412FH)	18479 (482FH)				0: No log Upper 8 bits: Hour Lower 8 bits: Day b15 to b8 b7 to b0 Hour (00H to 23H) | Day (01H to 31H)	0	—			R	
16688 (4130H)	18480 (4830H)				0: No log Upper 8 bits: Second Lower 8 bits: Minute b15 to b8 b7 to b0 Second (00H to 59H) | Minute (00H to 59H)	0	—			R	
16689 (4131H)	18481 (4831H)				0: No log Upper 8 bits: First 2 digits of year Lower 8 bits: Day of week b15 to b8 b7 to b0 Year (00H to 99H) First 2 digits | Day of week (01H to 06H) 00H (Sunday) to 06H (Saturday)	0	—			R	
16690 to 18177 (4132H to 4701H)	18482 to 19969 (4832H to 4E01H)	For confirmation of protocol execution log	Execution log 2 to 32	Same as Execution log 1		0	—			R	
18178 to 18429 (4702H to 47FDH)	19970 to 20223 (4E02H to 4EFFH)	Use prohibited	System area			—					
20224 to 20479 (4F00H to 4FFFH)											
20480 to 24575 (5000H to 5FFFH)		Transmission area for pre-defined protocol function	Buffer for pre-defined protocol function			0	—			RW	Not allowed
24576 to 32767 (6000H to 7FFFH)		Use prohibited	System area			—					

*1: Only QJ71C24N (-R2/R4) can be used. (System area when using QJ71C24 (-R2))

*2: Only QJ71C24N (-R2/R4) whose first five digits of serial number are 06062 or higher can be used.

*3: It can be used as a user free area (send data storage area, receive data storage area) in the pre-defined protocol mode.

*4: Addresses 16448 (4040H) and later can only be used for QJ71C24N (-R2/R4) (function version B or later) whose first five digits of serial number are 10122 or higher. (System area for others not included in the description.)

13.4 Dedicated Instruction

This section explains the dedicated instructions used for pre-defined protocol communication.

13.4.1 Dedicated instructions and available devices

The following dedicated instruction is explained in this section.

Application	Dedicated instruction	Description of function
Pre-defined protocol communication	CPRTCL	Protocol setting data written to the flash ROM by GX Configurator-SC (pre-defined protocol support function) are executed.

Point

Do not change the buffer memory that is used for data (control data, setting data) specified by the dedicated instruction until the execution of that dedicated instruction completes or cancellation process completes.
The completion of the dedicated instruction can be checked by the SPBUSY instruction.
For details, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".
For details of control data and setting data, refer to Section 13.4.2.

(1) Available device

The following devices are available for the dedicated instruction.

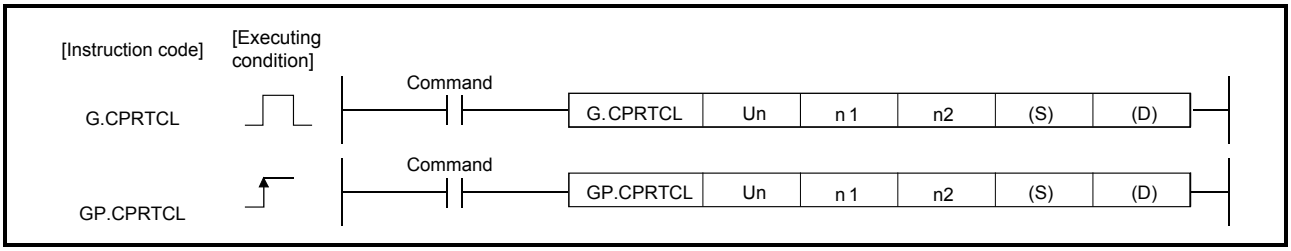
Internal device		File register	Constant*2
Bit*1	Word		
X, Y, M, L, F, V, B	T, ST, C, D, W	R, ZR	K, H

*1: Word device bit designation can be used as bit data.
Word device bit designation is done by designating Word device . Bit No..
(Bit numbers are designated in hexadecimal.)
For example, bit 10 of D0 is designated as D0.A.
However, bit designation cannot be used for timers (T), retentive timers (ST) and counters (C).
*2: Available devices are described in the Constant column.

13.4.2 G(P). CPRTCL

This instruction executes the protocols and functional protocols written to the flash ROM by GX Configurator-SC (pre-defined protocol support function).
For details of functional protocols, refer to Section 13.4.3.

Setting data	Applicable device								
	Internal device (System, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
n1	—	○		—				○	—
n2	—	○		—				○	—
(S)	—	○		—				—	—
(D)	○	○		—				—	—



Setting data

Setting data	Description	Set by	Data type
Un	Start I/O signal of the module (00 to FE: Upper 2 digits when I/O signals are expressed in 3-digit.)	User	BIN16 bit
n1	Channel to communicate with other devices. 1: Channel 1 (CH1 side) 2: Channel 2 (CH2 side)	User	BIN16 bit Device name
n2	Number of consecutive protocol executions (1 to 8)	User	BIN16 bit Device name
(S)	Start number of the device in which control data are stored.	User, system	Device name
(D)	Bit device number to be turned ON at completion of execution.	System	Bit

The file register per local device and program cannot be used as the setting data.

Control data

Device	Item	Set data	Setting range	Set by [*1]
(S) + 0	Execution result	• The execution result of the G(P). CPRTCL instruction is stored. When executing multiple protocols, the execution result of the protocol executed at last is stored.[*2] 0: Normal Other than 0: Abnormal (error code)[*3]	—	System
(S) + 1	Number of executions	• The number of executions is stored. Protocols with errors are included in the count. When settings of the setting data and control data contain an error, "0" is stored.	1 to 8	System
(S) + 2 : : (S) + 9	Execution protocol number designation	• Set the first protocol number or functional protocol number to be executed.[*4] : : • Set the 8th protocol number or functional protocol number to be executed.[*4]	1 to128, 201 to 207	User
(S) + 10 : : (S) + 17	Verification match receive packet number	• When the communication type of the first protocol executed is "Receive only" or "Send & receive", the matched receive packet number is stored. When the communication type is "Send only", "0" is stored. If the error occurs to the first protocol executed, "0" is stored. When the functional protocol is executed, "0" is stored.[*4] : : • When the communication type of the 8th protocol executed is "Receive only" or "Send & receive", the matched receive packet number is stored. When the communication type is "Send only", "0" is stored. If the error occurs to the 8th protocol executed, "0" is stored. When the number of the executed protocols is less than 8, "0" is stored. When the functional protocol is executed, "0" is stored.[*4]	0, 1 to 16	System

*1: The followings are the descriptions of terms in the column.
- User : Data set by the user before executing the CPRTCL instructions.
- System: The programmable controller CPU stores the execution result of the CPRTCL instructions.

*2: When executing multiple protocols, if an error occurs to the nth protocol, the protocols after the nth protocol are not executed.

*3: For details of the error code at the error completion, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

*4: For details of functional protocols, refer to Section 13.4.3.

Function

(1) The protocol setting data written to the flash ROM are executed by the module designated in Un.
The protocol is executed according to the control data stored in the device designated in (S) and the following devices.

(2) Protocols are executed consecutively for the number of times designated in n2 (maximum: 8) in one instruction execution.

(3) Simultaneous execution of dedicated instructions
The following table shows the processing when executing another instruction during execution of the CPRTCL instruction or executing the CPRTCL instruction during execution of another instruction in the same channel.

Instruction*1	Availability of simultaneous execution	Processing of simultaneous execution
CPRTCL	×	• The next instruction will be ignored until the active instruction is completed. (However, simultaneous execution is available when channels to be used are not the same.)
PUTE GETE SPBUSY	○	—
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.

○: Available ×: Not available

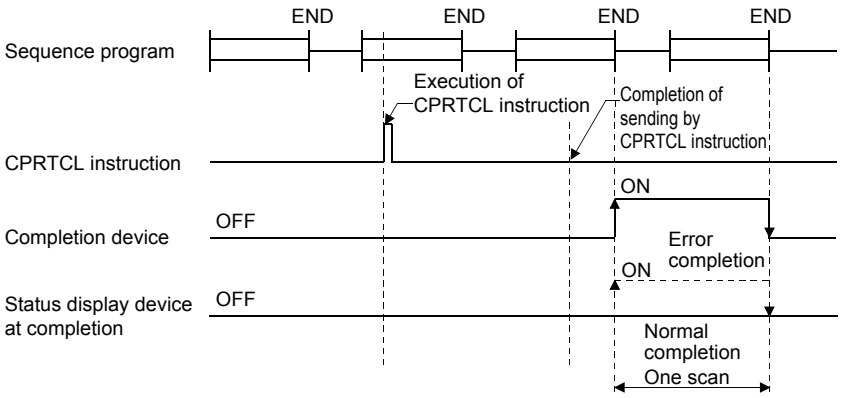
*1: Since the dedicated instructions shown below use a different communication protocol from that for the CPRTCL instruction, they are not used in the same channel.
• ONDEMAND, OUTPUT, PRR, BIDOUT, INPUT, BIDIN, BUFRCVS, CSET
If the dedicated instructions shown above are used in the same channel with the CPRTCL instruction, the communication protocol setting error (7FF2H) occurs. (Except for the BUFRCVS instruction)

(4) Whether a CPRTCL instruction was completed normally or abnormally can be checked by the completion device ((D)) or status display device at completion ((D)+1).

(a) Completion device : Turns ON at the END processing of the scan where the CPRTCL instruction is completed, and turns OFF at the next END processing.

(b) Status display device at completion : Turns ON and off depending on the completion status of the CPRTCL instruction.
- Normal completion : OFF with no change.
- Error completion : Turns ON at the END processing of the scan where the CPRTCL instruction is completed, and turns OFF at the next END processing.

[Operation during execution of the CPRTCL instruction]



Point

The following describes how to check the execution status of protocols.

(1) Checking with the buffer memory
Use the protocol execution status (address: 4041H/4051H).
For details, refer to Section 13.3.

(2) Checking with the intelligent function module utility
For details, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

Error

(1) When a dedicated instruction is completed abnormally, the status display device at completion ((D)+1) turns ON and the error code is stored in the execution result ((S)+0).

In case of operation errors, the error flag (SM0) turns ON and the error code is stored in the SD0.

Refer to the following manuals according to the error code, and check and correct the error.

<Error code>

4FFFH or less : QCPU (Q Mode) User's Manual
(Hardware Design, Maintenance and Inspection)
MELSEC-L CPU Module User's Manual
(Hardware Design, Maintenance and Inspection)

7000H or more : Q Corresponding Serial Communication Module User's Manual
(Basic)
MELSEC-L Serial Communication Module User's Manual
(Basic)

Program example

For the program example of the CPRTCL instruction, refer to Section 13.5.3.

Cancellation of protocol execution

A protocol can be cancelled during its execution.
This function is used to end the protocol execution forcibly when a communication error occurs with the other device.
This function is available for the pre-defined protocol mode only.

(1) Execution method for cancellation request

Execute a cancellation request from the sequence program.
The corresponding buffer memories are shown in the following table.

Address Decimal (Hex)		Name	Setting value
CH1	CH2		
16448 (4040H)	16464 (4050H)	Protocol cancellation specification	0: No cancellation specification 1: Cancellation request (Specified by User) 2: Cancellation completion (Specified by Q series C24N / L series C24 modules)

(2) Operation after execution of cancellation request

(a) Operation of dedicated instruction (CPRTCL instruction)

- The dedicated instruction (CPRTCL instruction) being executed is ended abnormally, and the error code is stored in the execution result ((S)+0).
- When executing multiple protocols consecutively, if the cancellation is requested to the nth protocol, the nth protocol is ended forcibly and the protocols after the nth protocol are not executed.

(b) Operation of Q series C24N / L series C24 modules

- If the cancellation is requested when protocols are not executed, the cancellation is completed in no-operation.
- If the cancellation is requested when the communication protocol setting is other than the pre-defined protocol mode, the value of the cancellation designation area is ignored.

Point

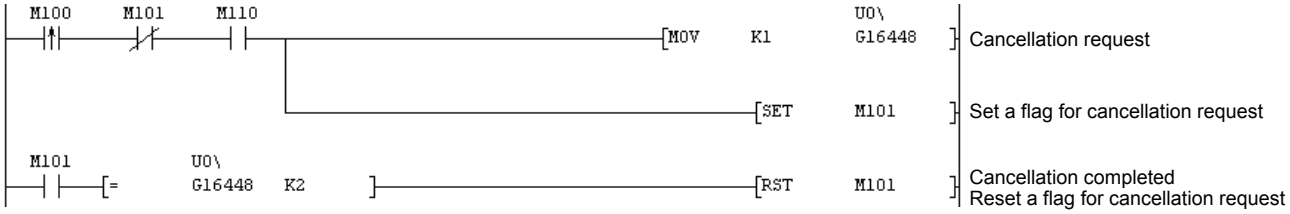
When the protocol with the communication type of "Send & receive" is cancelled, Execute the receive data clear after the cancellation.
When the response from the other device is slow, and data are received after the cancellation, the receive data remains in the OS area (receive data area).
For details of the receive data clear, refer to Section 13.4.3.

(3) Program example

The following is a program in which a cancellation is requested to the protocol being executed when the start I/O number of the Q series C24N / L series C24 module is 0000.

Devices used by user

Device	Purpose
M100	Cancellation request command flag
M101	Cancellation request flag
M110	Turns ON during execution of the CPRTCL instruction.
U0\G16448	Cancellation designation area



13.4.3 Functional protocol

The following functions are available by executing functional protocols with the CPRTCL instruction.

- Receive data clear
- Send/receive data monitoring start/stop
- RS/DTR signal condition designation

(1) Setting

Specify the functional protocol number of the function to be executed in the control data ((S)+2 to (S)+9) of the CPRTCL instruction.
For details of the CPRTCL instruction, refer to Section 13.4.2.

(2) List of functional protocols

The following table shows the list of functional protocols described in this section.

Protocol number	Protocol type	Keyword*1	Reference
201	Receive data clear	Receive Data Clear	(a) in this section
202	Send/Receive data monitoring start	Send/Recv Monitor Start	(b) in this section
203	Send/Receive data monitoring stop	Send/Recv Monitor Stop	
204	Turns DTR (ER) signal ON	DTR ON	(c) in this section
205	Turns DTR (ER) signal OFF	DTR OFF	
206	Turns RS signal ON	RS ON	
207	Turns RS signal OFF	RS OFF	

*1: Character strings that are stored to the protocol name of the protocol execution log when functional protocols are executed.

(a) Receive data clear

Receive data in the OS area are cleared.

(b) Send/Receive data monitoring start/stop

Start or stop of send/receive data monitoring is specified.
When the functional protocol (202, 203) is specified, a monitoring start command (0001_H) or monitoring stop command (0000_H) is set for send/receive data monitoring specification (address: 2018_H/2118_H) in the Q series C24N / L series C24 module.
For details of send/receive monitoring, refer to the "MELSEC-Q/L Serial Communication Module User's Manual (Application)".

(c) RS/DTR signal status specification

ON/OFF status of the RS/DTR signal is specified.

When the functional protocol (204 to 207) is executed, corresponding bits of the RS/DTR signal status specification (address: 92_H/132_H) are turned ON/OFF in the Q series C24N / L series C24 module.

For details of RS/DTR signal status specification, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)" or "MELSEC-L Serial Communication Module User's Manual (Basic)".

13.5 Programming example

This section explains the programming examples and setting examples of the pre-defined protocol function.
GX Developer and pre-defined protocol support function of GX Configurator-SC are used for settings. Serial communication module QJ71C24N and Mitsubishi inverter (FREQROL-A700, described as inverter or FR-A700 hereafter) as a connection target device are used in this setting example.

13.5.1 System configuration/wiring example

The system configuration and wiring example are as follows.

(1) System configuration example.

QJ71C24N is mounted at the slot 0 on the base unit, and connected 1:1 with the other device through the RS-422/485 line using CH2.
For details of system configuration, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)".

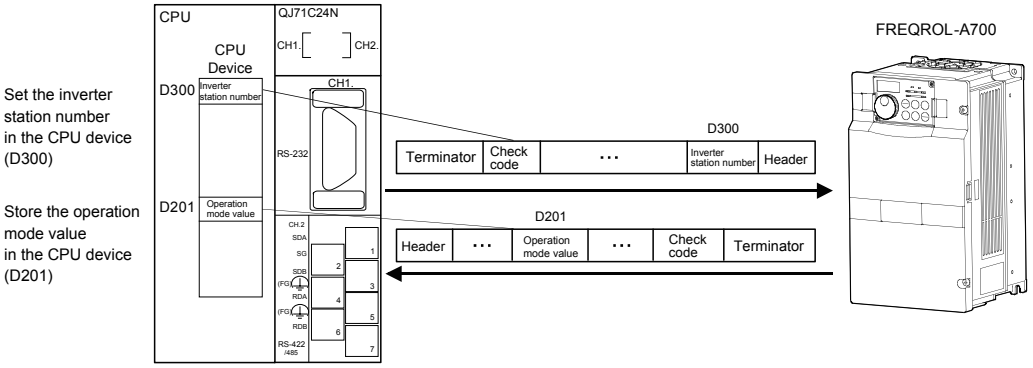
13.5.2 Communication data

In the program example, the pre-defined protocol communication described below is executed between QJ71C24N and the other device.

(1) Other device and protocols

Connect Q71C24N and the inverter and read out the operation mode values of the inverter.

Set the inverter station number in the CPU device (D300) and send it, and store the operation mode value in the CPU device (D201).



Manufacturer	Mitsubishi Electric
Device name	FR-A700
Protocol name	H7B: RD Operation Mode

(2) Storage devices for send/receive data, buffer memory assignment

Specify CPU devices and buffer memories in the data storage area as shown in the table below, and send/receive data.

Packet name	Element name	Packet type	Data storage area specification
H7B:RD Operation Mode	Inverter Station Number	Send packet	D300
NOR:RD Data (4 Digits Data)	Inverter Station Number	Receive packet	D200
	Read Data		D201
ERR:NAK Response	Inverter Station Number	Receive packet	D202
	Error Code		D203

13.5.3 Communication settings

(1) Settings on the GX Developer

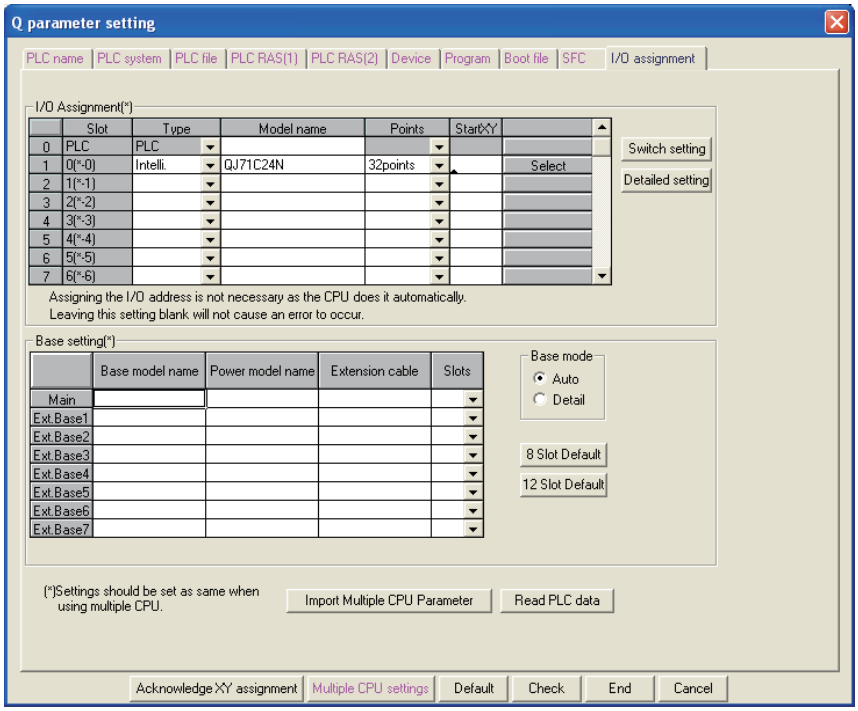
This section explains the settings required for executing the pre-defined protocol communication on GX Developer.
For details, refer to the "GX Developer Version 8 Operating Manual".

(a) I/O assignment setting

Type and I/O signal range of each module mounted on the base unit are set in the I/O assignment setting.

1. Double click "PLC parameter" in the project window of GX Developer.
2. Click the <<I/O assignment>> tab.
3. Set the following items to the slot on which QJ71C24N is mounted.

DISPLAY/SETTING SCREEN



DISPLAY/SETTING DETAILS

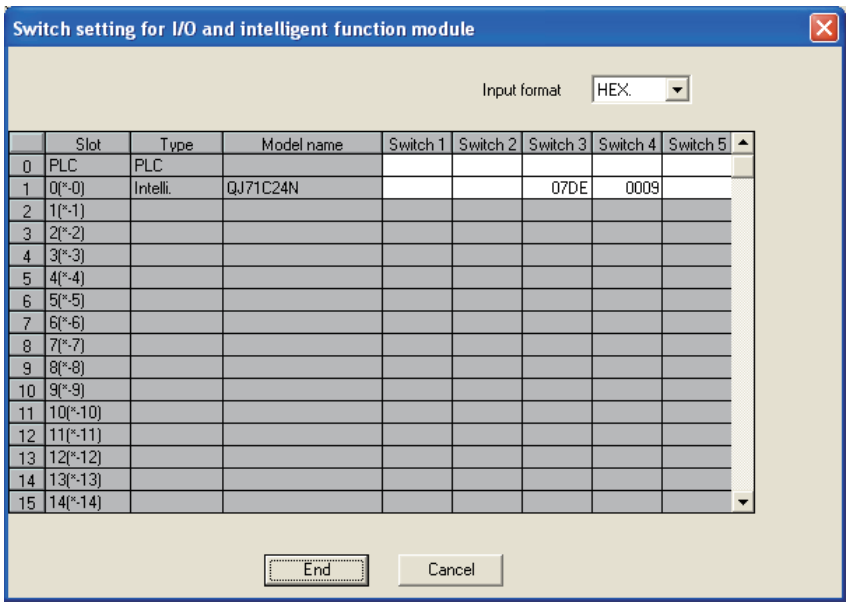
Item	Display/Setting Details
Type	Set "Intelli.".
Module name	Set QJ71C24N.
Points	Set 32 points.
Start XY	Set 0000.

4. Clicking the Switch setting button in the <<I/O assignment>> tab displays a screen described in (b).

(b) Switch setting for intelligent function module

Transmission specifications and communication protocols to communicate with the other device are set.

1. Set the following items and click the End button.



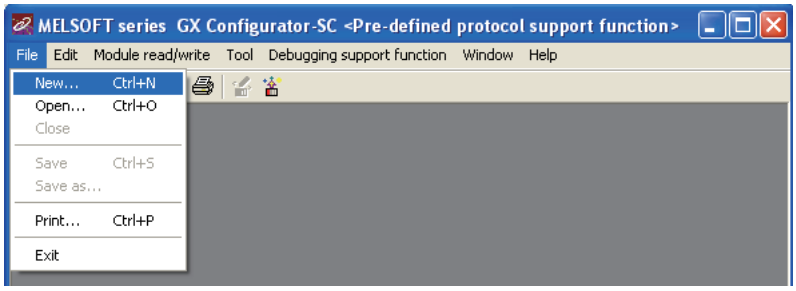
DISPLAY/SETTING DETAILS

Item	Setting value	Display/Setting Details	
Input format	Hexadecimal	Set "HEX." for the input format	
Switch 1	—	—	
Switch 2	—	—	
Switch 3	07DE	CH2 communication speed setting: 19200bps	
		CH2 transmission setting	Operation setting: Independent setting
			Data bit: 8
			Parity bit: Yes
			Odd/even parity: Even
			Stop bit: 2
			Sum check code: No
			Online change: Enable
			Setting change: Enable
Switch 4	0009	CH2 communication protocol setting: Pre-defined protocol	
Switch 5	—	—	

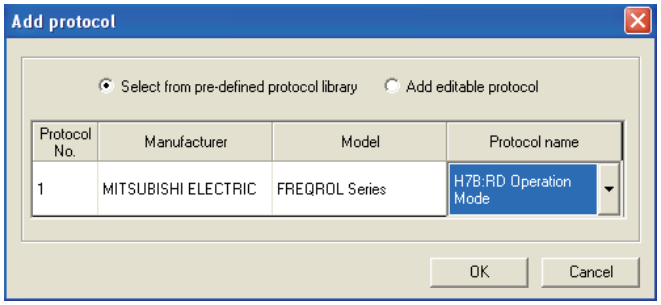
(2) Settings on GX Configurator-SC

Protocols described in Section 13.5.2 are set.

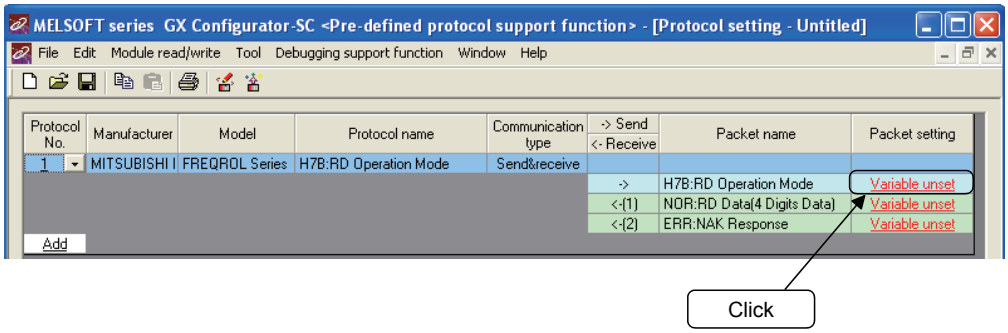
1. Click the [File] → [New] menu.



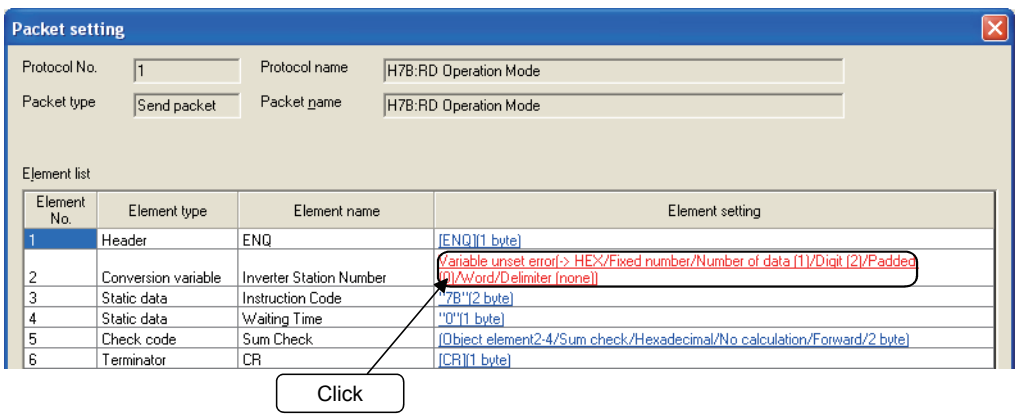
2. The Add protocol screen is displayed.
   Select the following protocol and click the OK button.



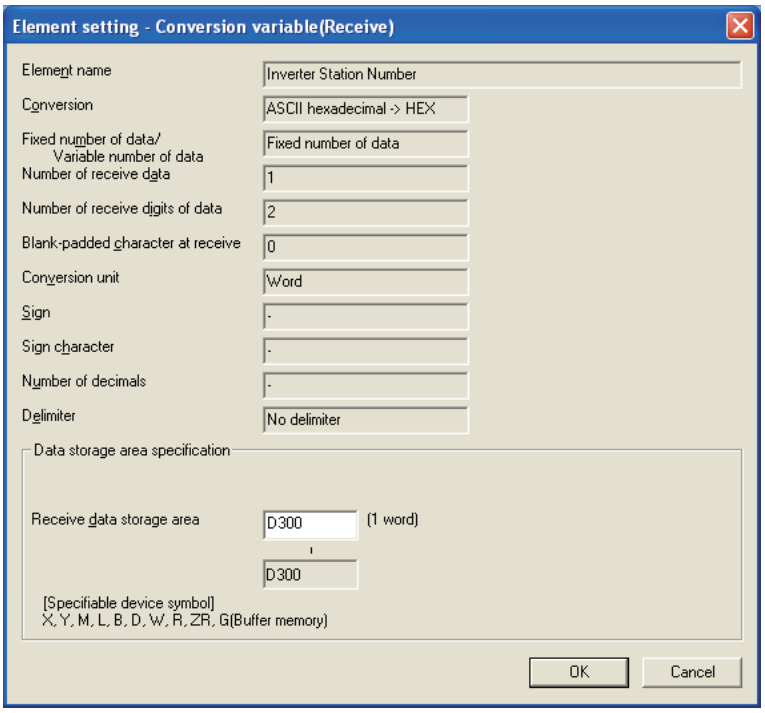
3. The Protocol setting screen is displayed.
   Click the "Packet setting" cell (displayed in red) of "Packet name" H7B:RD Operation Mode.



4. The Packet setting screen is displayed.
   Click the "Element setting" cell (displayed in red) of "Element number" 2.

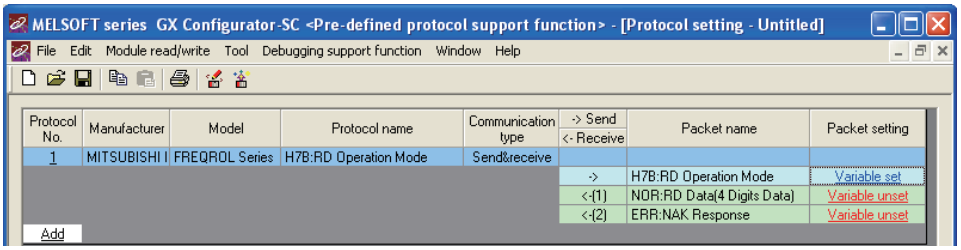


5. The Element setting (Conversion variable) screen is displayed.
   Set D300 to "Send data storage area", and click the OK button.



6. The Packet setting screen is displayed.
   The packet setting for "Packet name" H7B:RD Operation Mode is completed.
   Click the Close button.

7. The Protocol setting screen is displayed.
   Set the packet settings for "Packet name" NOR:RD Data (4 Digits Data) and ERR:NAK Response by the same procedure as 3 to 6.

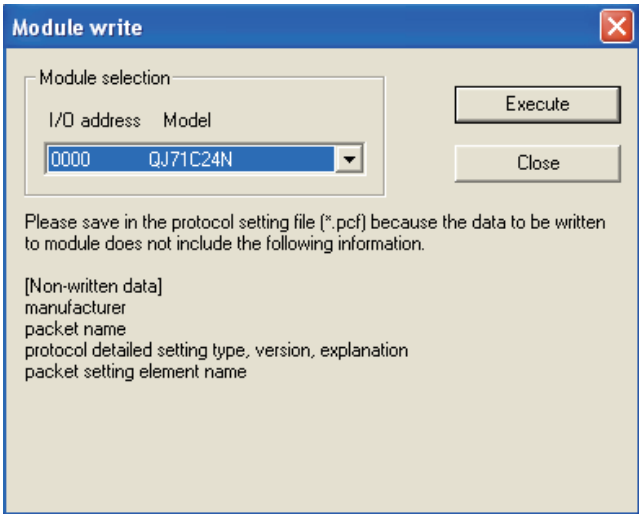


Set the following values for the data storage area.

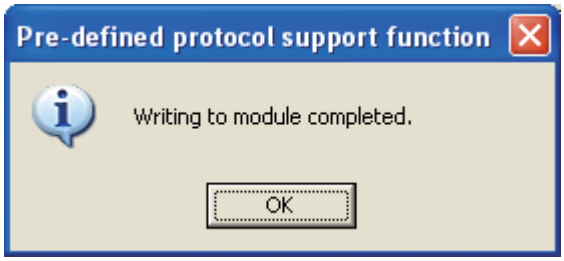
Packet name	Element number	Element name	Data storage area specification
NOR:RD Data (4 Digits Data)	2	Inverter Station Number	D200
	3	Read Data	D201
ERR:NAK Response	2	Inverter Station Number	D202
	3	Error Code	D203

(3) Writing data to module

1. Click the [Module read/write] → [Write to module] menu.
   Select the following module and click the Execute button.



2. The following confirmation message is displayed when writing the protocol setting data to the module is completed.



(4) Executing the protocols (program example)

Create a program with the dedicated instruction (CPRTCL instruction) using GX Developer.

Switch the CPU to RUN, and execute the registered protocol by the dedicated instruction (CPRTCL instruction).

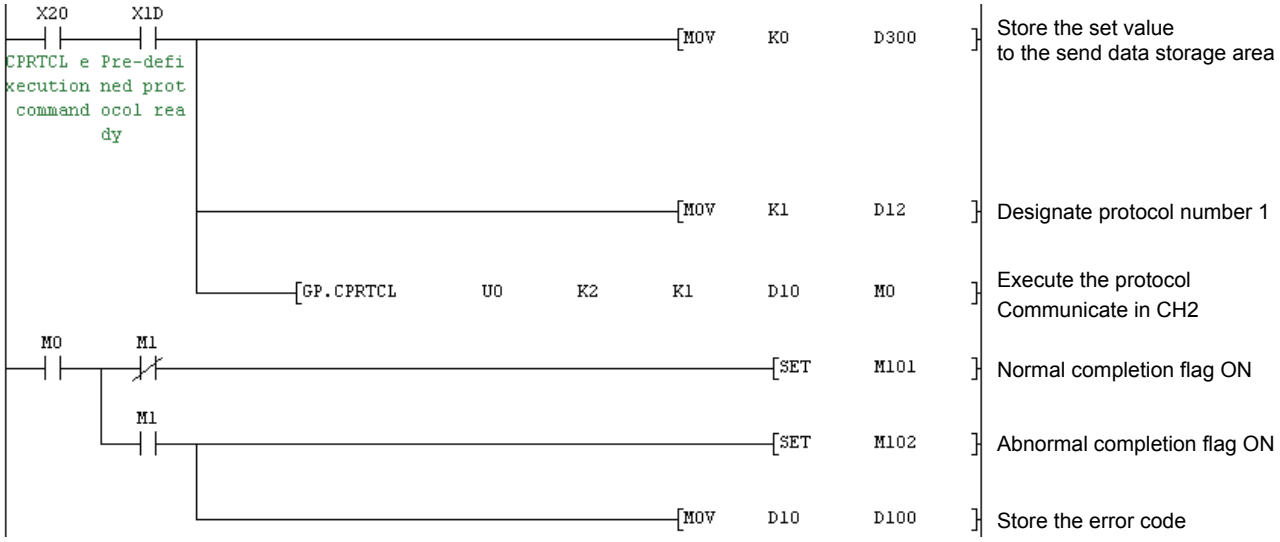
The following table shows the devices to be used.

(a) I/O signal of QJ71C24N

Pre-defined protocol ready: X1D

(b) Devices used by user

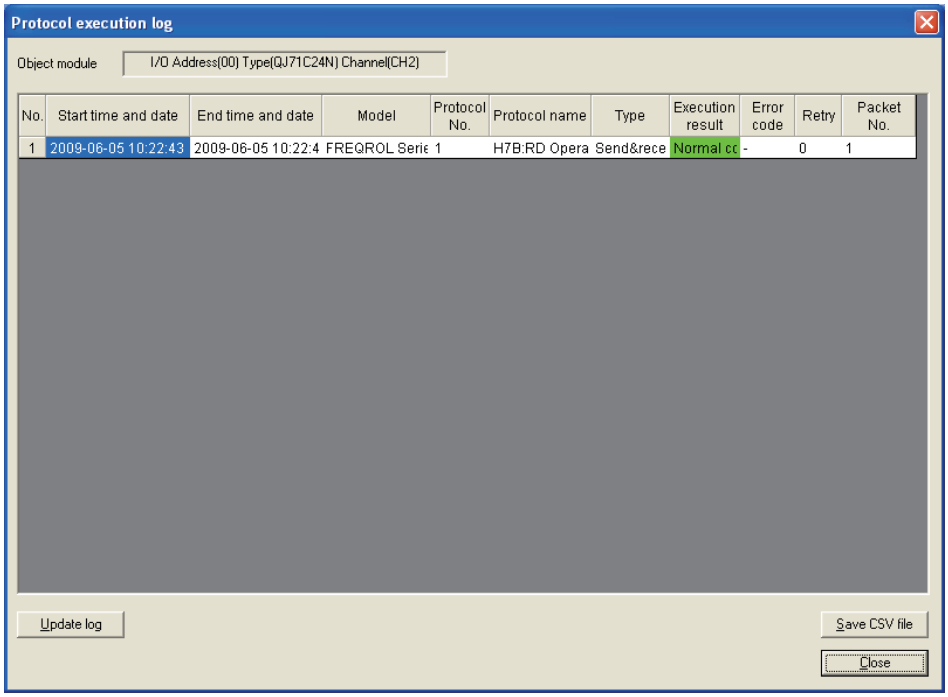
Device	Purpose	Device	Purpose
X20	CPRTCL instruction execution command	M1	Status display device at completion
D300	Inverter Station Number designation device	M101	Normal completion flag
D10	Execution result storing device for the CPRTCL instruction	M102	Error completion flag
D12	Execution protocol number designation device	D100	Error code storing device
M0	Completion device	—	—



Receive data are stored to the receive data storage area that is set to the receive packet.

(5) Checking protocol execution result

1. Select the [Debugging support function] → [Protocol execution log] menu. The protocol execution result can be checked on the Protocol execution log screen.



Point

The registration condition of log can be specified by the execution log option specification for buffer memory (buffer memory address: $40E2_H$, $40F2_H$) and intelligent function module utility.

The followings are the registration conditions.

Bit 0 is OFF (0): Stores the execution log for the protocols with the abnormal completion only.

Bit 0 is ON (1) : Stores the execution logs and the execution condition of all protocols.

Note that, only the logs of error protocols are displayed at the default setting. To display all logs of protocols, set the condition in the intelligent function module utility.

For details, refer to the "Q Corresponding Serial Communication Module User's Manual (Basic)".

MEMO

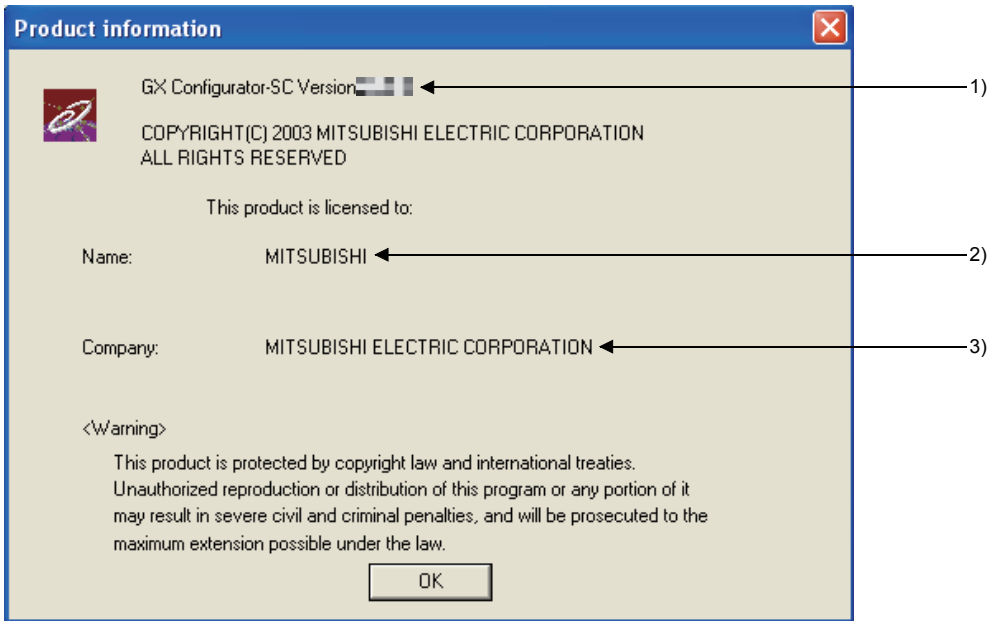
APPENDIX

Appendix 1 Help Function

The help function displays the product information.

BASIC OPERATION

Select the [Help] → [Product information] menu.



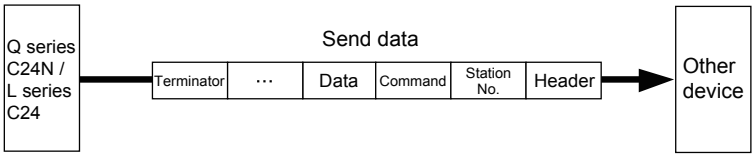
No.	Name	Description
1)	Version	Displays the version of the GX Configurator-SC function.
2)	Name	Displays the name set at the time of installation.
3)	Company name	Displays the company name set at the time of installation.

Appendix 2 Operation Image of Each Communication Type of Protocol

In the pre-defined protocol function, communication with other devices is performed through the communication type 'Send only', 'Receive only', or 'Send & receive'. This section describes the respective operation images.

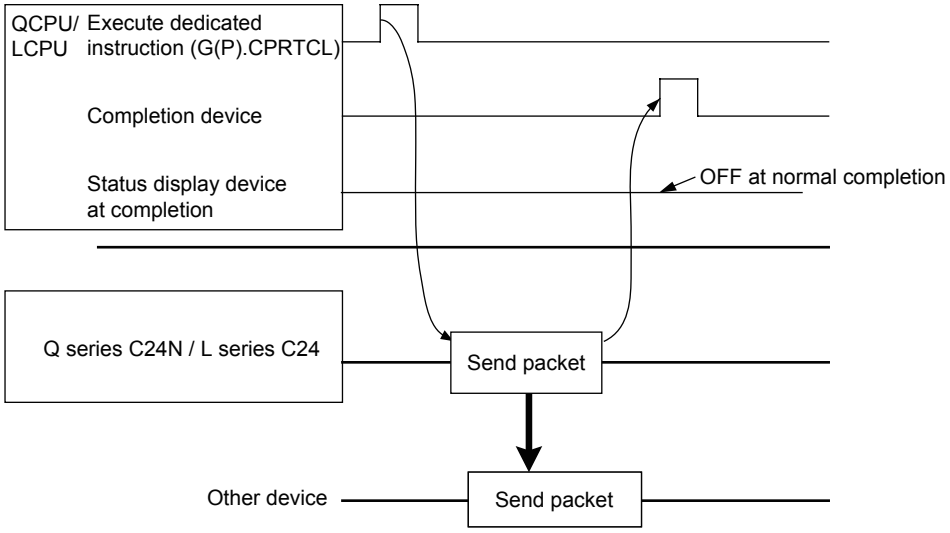
Appendix 2.1 In case where communication type is 'Send only'

A module sends the specified packet once.



The operation image of 'Send only' is as follows.

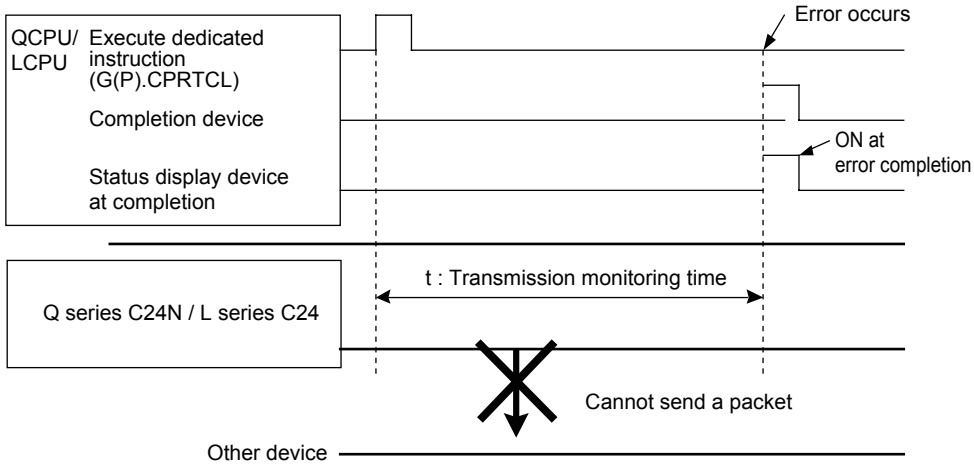
(1) Normal completion



(2) Error completion (transmission monitoring timeout error)

Example of setting)

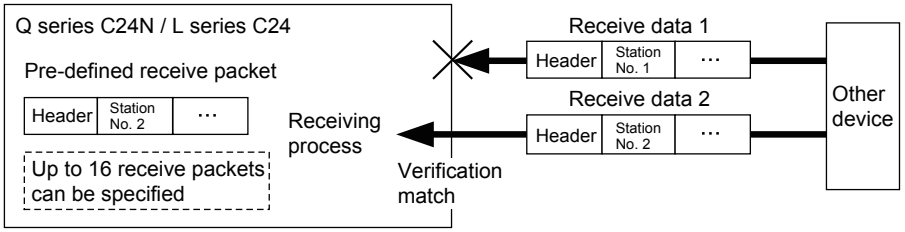
Standby time: 0, Retry interval: 0, Monitoring time: other than 0



App

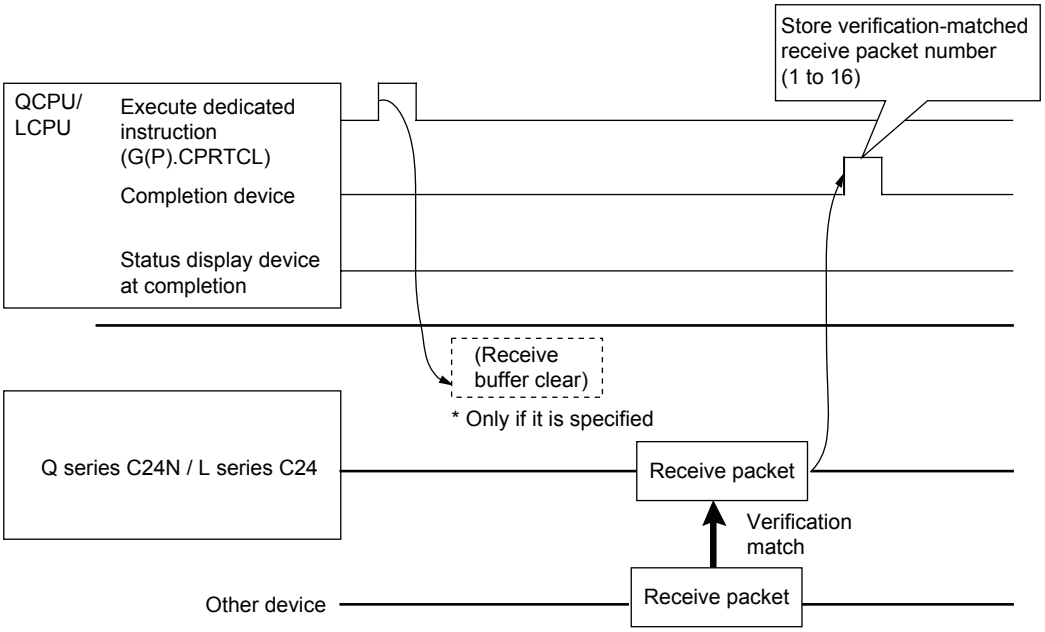
Appendix 2.2 In case where communication type is 'Receive only'

When a module receives data from other devices, the process completes when the receive data matches the receive packet and the receiving process is performed.



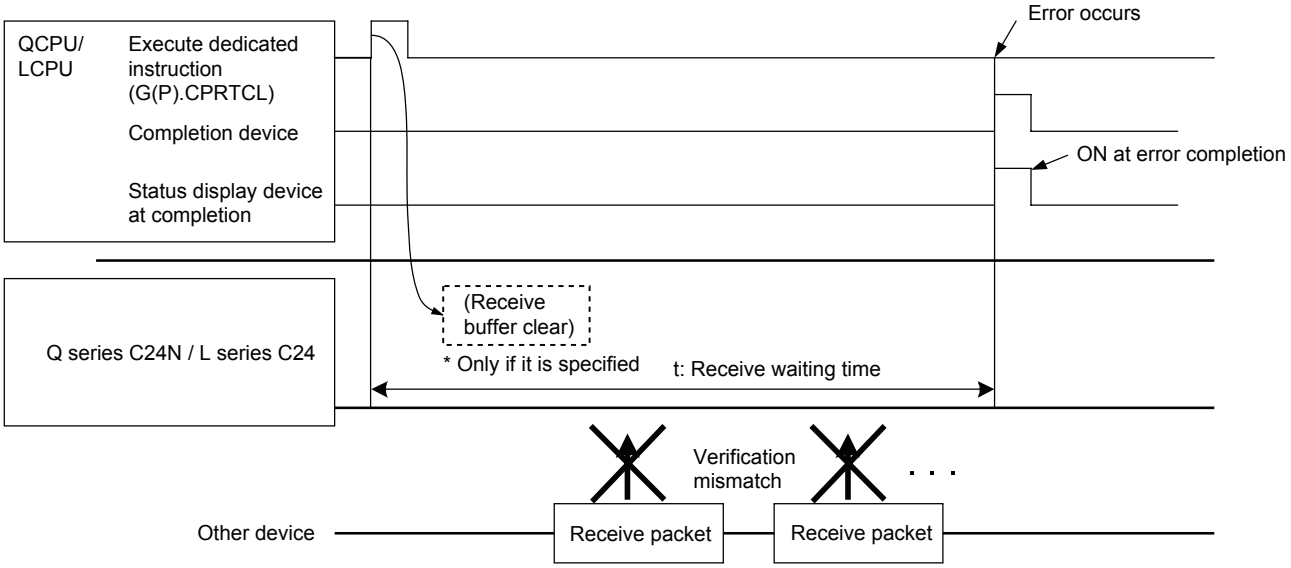
The operation image of 'Receive only' is as follows.

(1) Normal completion



App - 3

(2) Error completion (receive wait timeout error)



Point

- When variables are included in receive packet elements, variable parts are not verified.
- With multiple receive packet specifications, receive data are verified with registered receive packet information starting from information of the first registered packet, in the registration order. Once the receive data match one of them, the receiving process is performed and the following verification is cancelled.
- The number of a receive packet which is matched in the verification is stored in the control data of the dedicated instruction (CPRTCL instruction).

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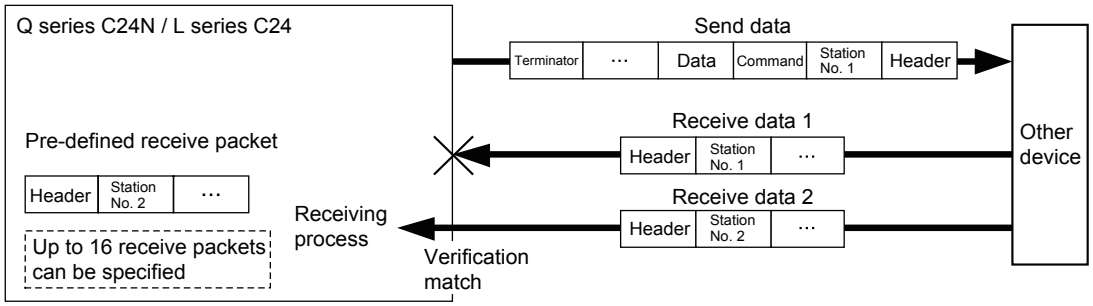
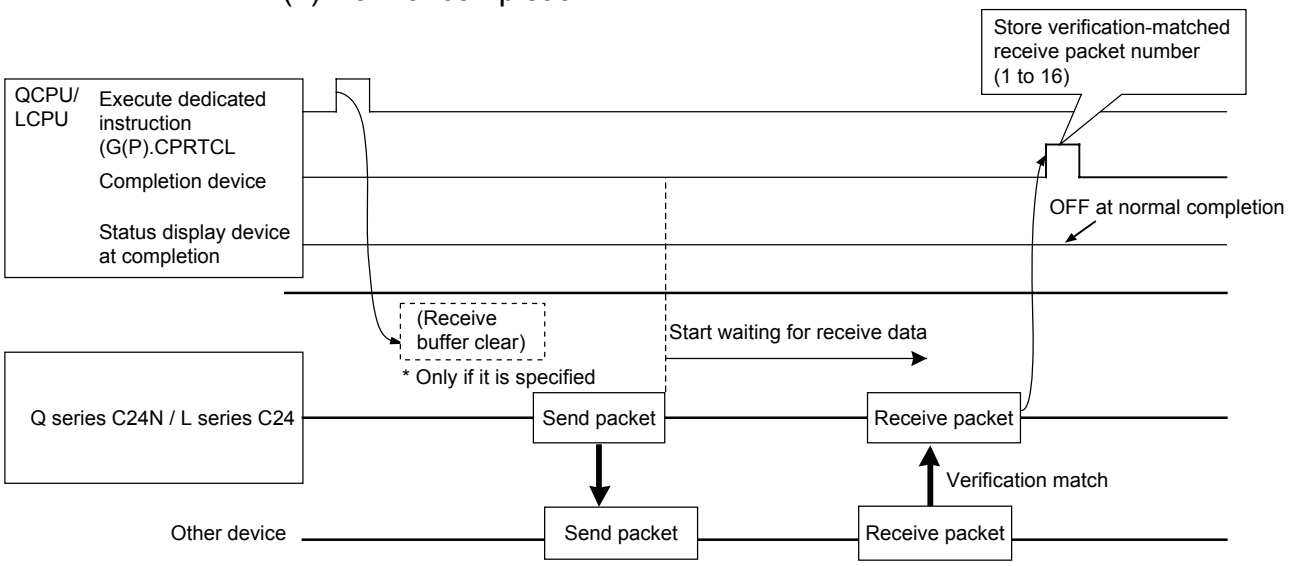
Appendix 2.3 In case where communication type is 'Send & receive'

A module sends the specified packet once, and the execution status changes to Waiting for receive data status after the sending process completes normally. Then the module receives data from other devices, and the process completes when the receive data matches the receive packet and the receiving process is performed.

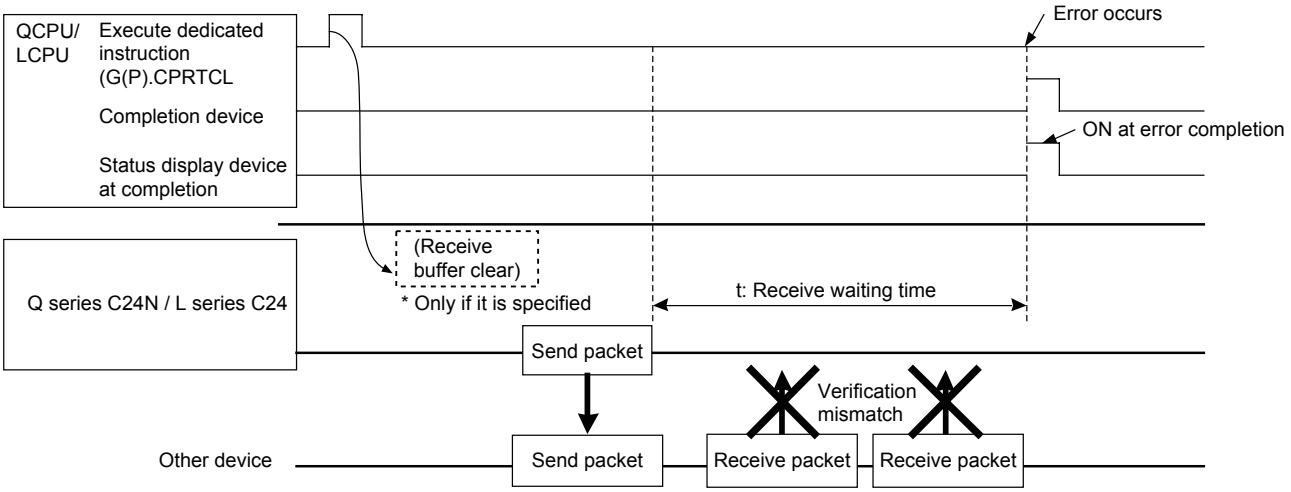


The operation image of 'Send & receive' is as follows.

(1) Normal completion



(2) Error completion (receive wait timeout error)



Point

- When variables are included in receive packet elements, variable parts are not verified.
- With multiple receive packet specifications, receive data are verified with registered receive packet information starting from information of the first registered packet, in the registration order. Once the receive data match one of them, the receiving process is performed and the following verification is cancelled.
- The number of a receive packet that is matched in the verification is stored in the control data of the dedicated instruction (CPRTCL instruction).

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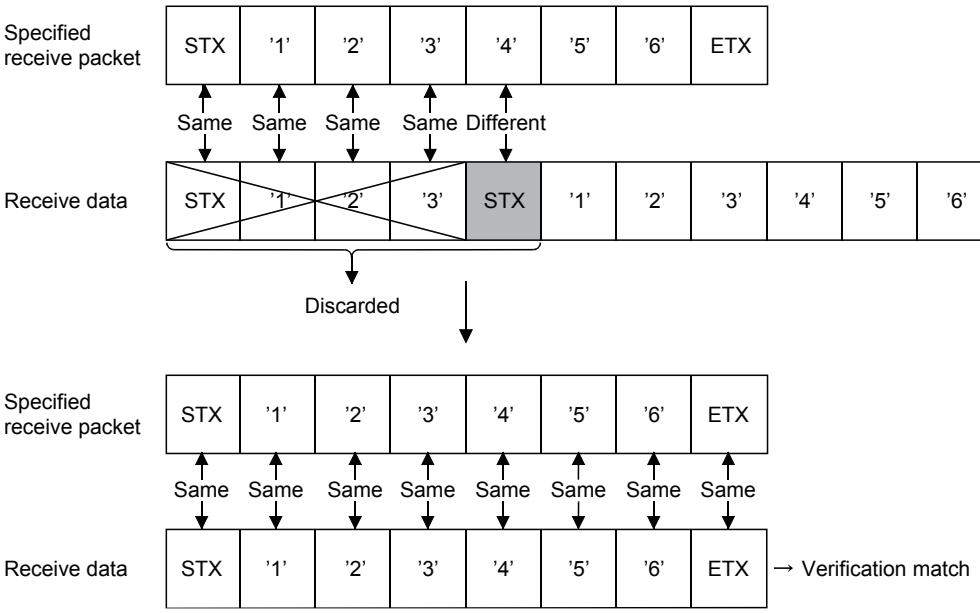
Appendix 3 Verification Operation of Receive Packet

The following shows the Q series C24N / L series C24 module operation when data that are different from the specified receive packet are received.

Receive data prior to the different data are discarded. Data are compared again from the start of the receive packet, and once the data are matched with the receive packet, the data receiving operation is processed.



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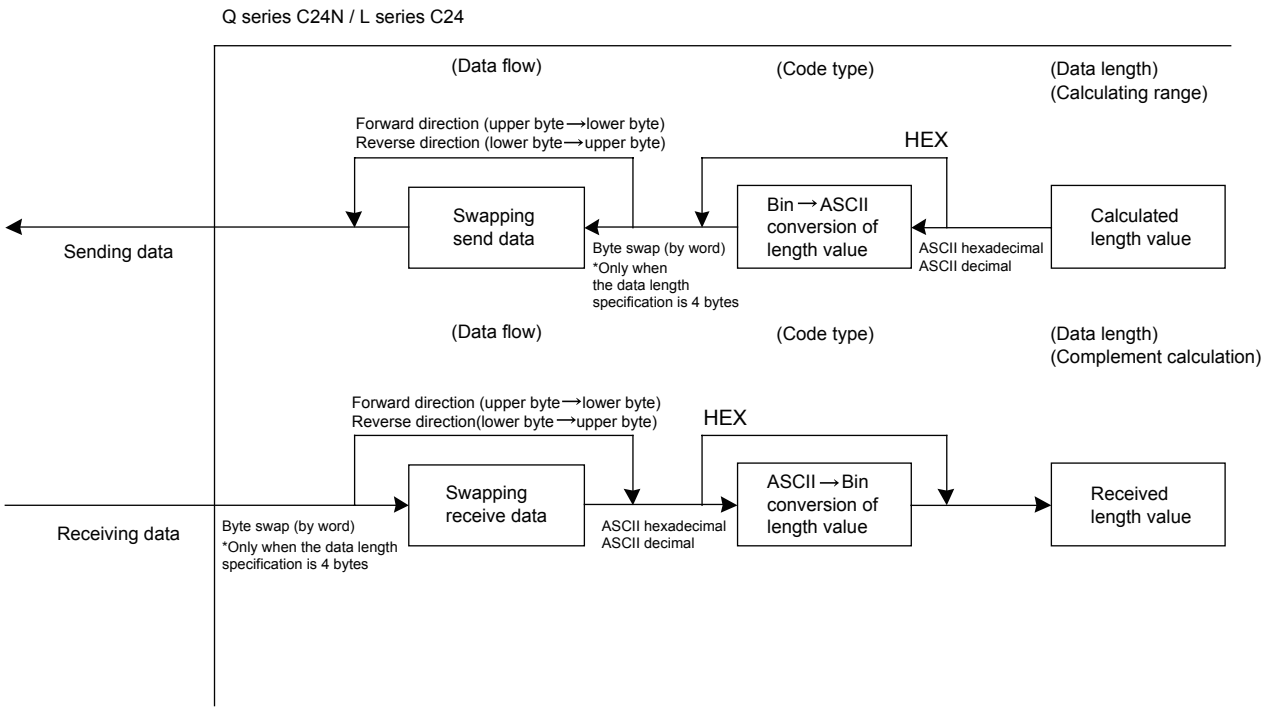
Appendix 4 Data Examples of Packet Elements

This section describes the processing procedures and practical data examples of elements that can be placed in a packet.

Appendix 4.1 Length

(1) Processing procedure

The Q series C24N / L series C24 module processes Length according to the following procedure.



(2) Data example

The followings shows examples in the case where the calculated value of length is 258 bytes in decimal (258 is 102_H).

(a) Data flow is 'Forward direction'

Data length / Code type	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"2" (32_H)	"02" (30_H 32_H)	"102" (31_H 30_H 32_H)	"0102" (30_H 31_H 30_H 32_H)
ASCII decimal	"8" (38_H)	"58" (35_H 38_H)	"258" (32_H 35_H 38_H)	"0258" (30_H 32_H 35_H 38_H)
HEX	02_H	0102_H	000102_H	00000102_H

(b) Data flow is 'Reverse direction'

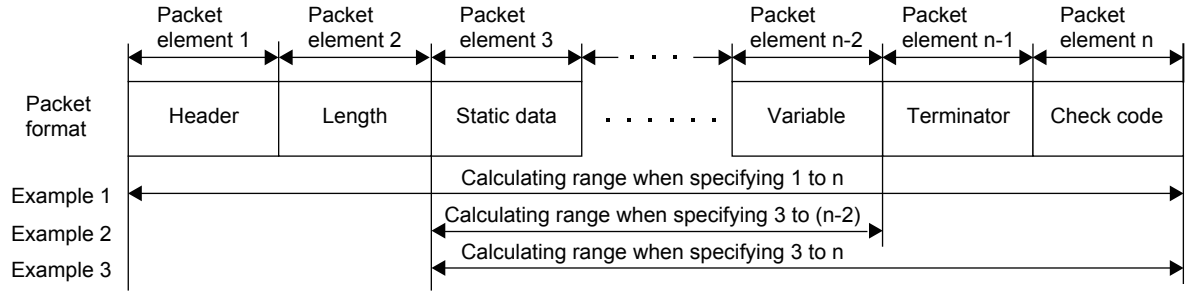
Data length / Code type	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"20" (32_H 30_H)	"201" (32_H 30_H 31_H)	"2010" (32_H 30_H 31_H 30_H)
ASCII decimal		"85" (38_H 35_H)	"852" (38_H 35_H 32_H)	"8520" (38_H 35_H 32_H 30_H)
HEX		0201_H	020100_H	02010000_H

(c) Data flow is 'Byte swap'

Data length / Code type	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"1020" (31_H 30_H 32_H 30_H)
ASCII decimal				"2085" (32_H 30_H 38_H 35_H)
HEX				00000201_H

(3) Calculating range

The following shows specification examples of the calculating range of Length.



Example 1: Calculating range when its start is 1 and end is n.
Example 2: Calculating range when its start is 3 and end is n-2.
Example 3: Calculating range when its start is 3 and end is n.

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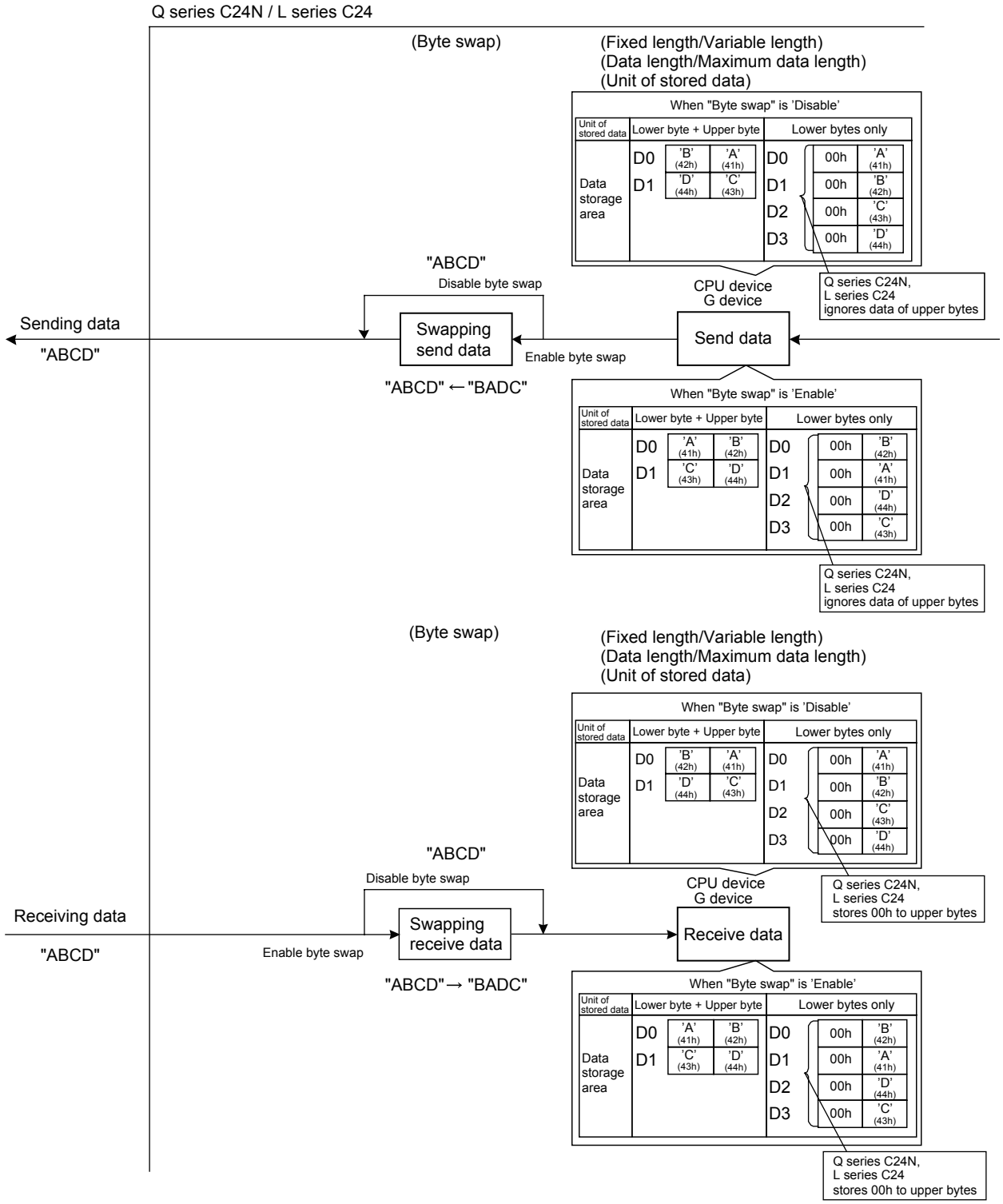
Appendix 4.2 Non-conversion variable

(1) Processing procedure

The Q series C24N / L series C24 module processes Non-conversion variable according to the following procedure.



(2) Data example

(a) The following table shows data to be stored in the data storage area in case where the string of send data is 'ABCD'
(Reference: A=41H, B=42H, C=43H, and D=44H in ASCII code)

Item	Description			
Fixed length/Variable length	Fixed length			
Data length	4 bytes			
Start address of data storage area	D0			
Unit of stored data	Lower byte + Upper byte		Lower bytes only	
Byte swap	Disable	Enable	Disable	Enable
Data to be stored in data storage area	D0 = 4241H D1 = 4443H	D0 = 4142H D1 = 4344H	D0 = 0041H D1 = 0042H D2 = 0043H D3 = 0044H	D0 = 0042H D1 = 0041H D2 = 0044H D3 = 0043H

(b) The following table shows data to be stored in the data storage area in case where the string of send data is 'EFG'
(Reference: E=45H, F=46H, and G=47H in ASCII code)

Item	Description			
Fixed length/Variable length	Fixed length			
Data length	3 bytes			
Start address of data storage area	D0			
Unit of stored data	Lower byte + Upper byte		Lower bytes only	
Byte swap	Disable	Enable	Disable	Enable
Data to be stored in data storage area	D0 = 4645H D1 = 0047H	D0 = 4546H D1 = 4700H	D0 = 0045H D1 = 0046H D2 = 0047H D3 = (Any data)	D0 = 0046H D1 = 0045H D2 = 0047H D3 = (Any data)

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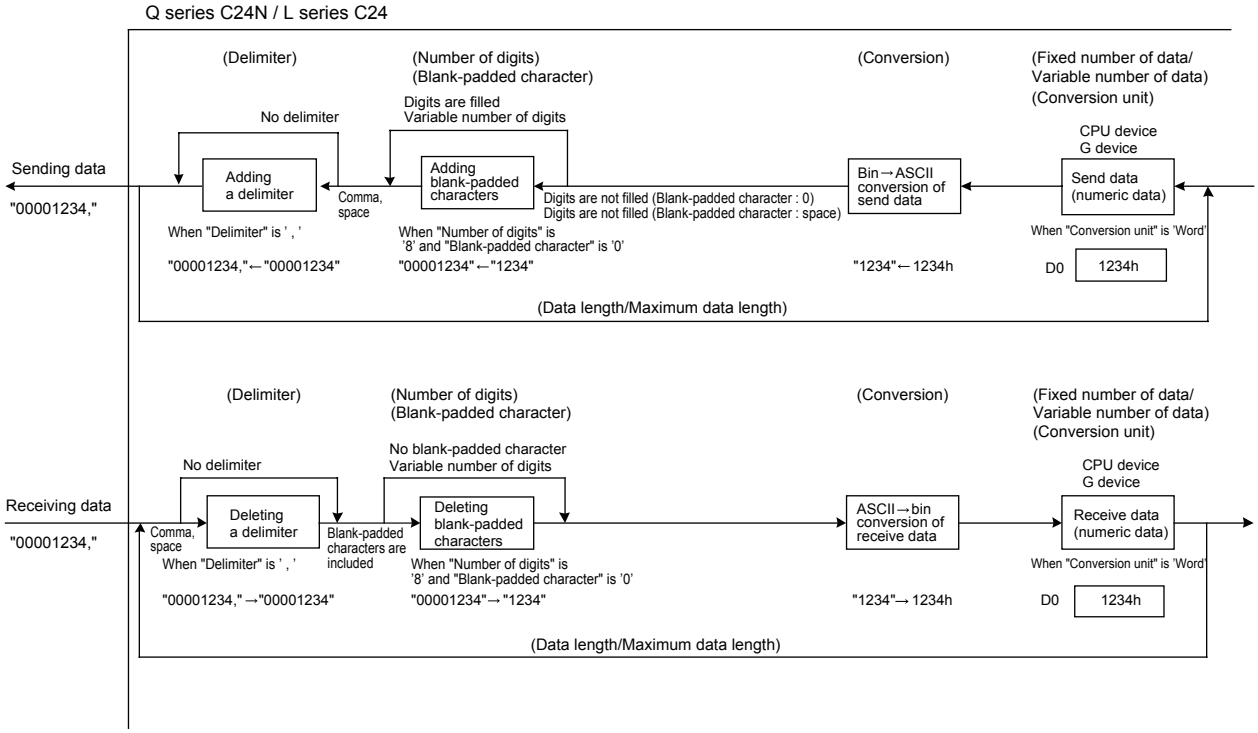
Appendix 4.3 Conversion variable

(1) Processing procedure

The Q series C24N / L series C24 module processes Conversion variable according to the following procedure.

(a) In case where “Conversion” is ‘HEX -> ASCII hexadecimal’ or ‘ASCII hexadecimal -> HEX’



* Blank-padded characters

At data sending, upper digits are filled with data specified in “Blank-padded character” when the number of digits is less than that specified in “Number of send digits of data”.

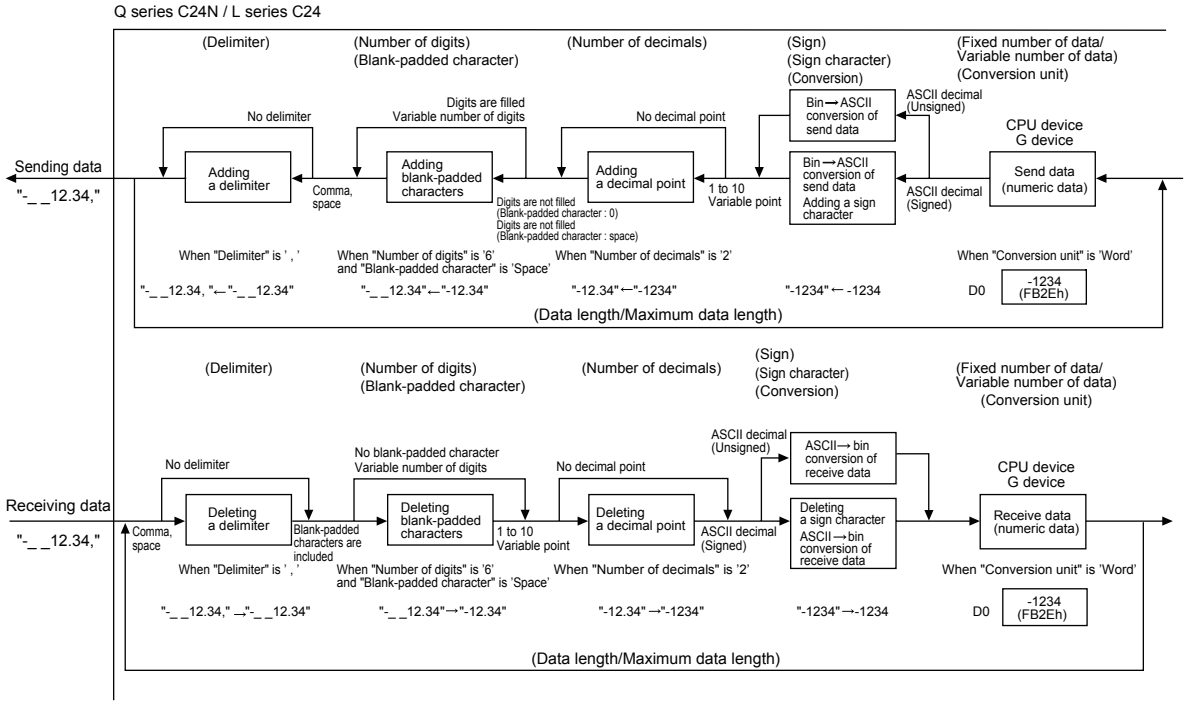
At data receiving, either of ‘0’ or ‘_ (space)’ is processed as a blank-padded character, regardless of the setting of “Blank-padded character”.

(Example) Setting of “Number of receive digits of data” is ‘6’

(‘_’ indicates a space character in the table)

No.	Receive data	Operation of Q series C24N / L series C24 modules
1	000120	Considers its starting 3 digits as blank-padded characters.
2	_ _ 0120	Considers its starting 3 digits as blank-padded characters.
3	0 _ 0120	Considers its starting 3 digits as blank-padded characters.
4	_ _ _ 120	Considers its starting 3 digits as blank-padded characters.
5	00012 _	Considers it to be an ASCII -> bin conversion error (7F20H).
6	_ _ _ 12 _	Considers it to be an ASCII -> bin conversion error (7F20H).
7	0001 _ 0	Considers it to be an ASCII -> bin conversion error (7F20H).

(b) In case where “Conversion” is ‘HEX -> ASCII decimal’ or ‘ASCII decimal -> HEX



(2) Data example

The following table shows send data in case where a packet consists of Header Conversion variable Terminator and data stored in the data storage area is D0=837 (0345_H), D1=18 (0012_H).
(Reference: 120345_H=1180485 in decimal form)

Item	Setting Details		
Fixed number of data/Variable number of data	Fixed number of data	Fixed number of data	Fixed number of data
Number of data	1	1	1
Start address of data storage area	D0	D0	D0
Conversion unit	Word	Word	Word
Conversion	HEX→ASCII decimal	HEX→ASCII decimal	HEX→ASCII decimal
Number of digits	5	5	Variable number of digits
Blank-padded character	0	Space	- (Not settable)
Sign	Unsigned	Signed	Signed
Sign character	- (Not settable)	+	+
Number of decimals	No decimal point	2	No decimal point
Delimiter	No delimiter	Comma	Comma
Send data[*1]	Header 00837 Terminator	Header +_ _ 8.37, Terminator	Header +837, Terminator

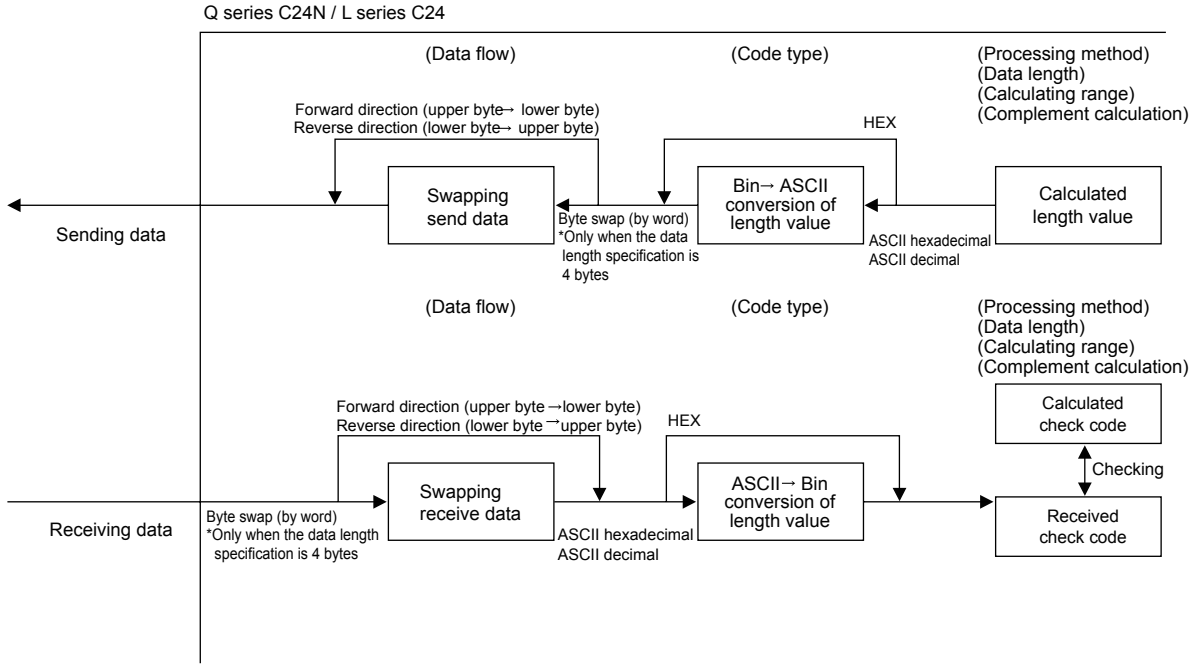
Item	Setting Details		
Fixed number of data/Variable number of data	Fixed number of data	Fixed number of data	Fixed number of data
Number of data	1	2	2
Start address of data storage area	D0	D0	D0
Conversion unit	Double word	Word	Word
Conversion	HEX→ASCII decimal	HEX→ASCII decimal	HEX→ASCII decimal
Number of digits	10	5	5
Blank-padded character	0	Space	0
Sign	Signed	Unsigned	Signed
Sign character	+	- (Not settable)	+
Number of decimals	8	No decimal point	2
Delimiter	No delimiter	No delimiter	Comma
Send data[*1]	Header +00.01180485 Terminator	Header _ _ 837 _ _ _18 Terminator	Header +008.37, +000.18 Terminator

Appendix 4.4 Check code

(1) Processing procedure

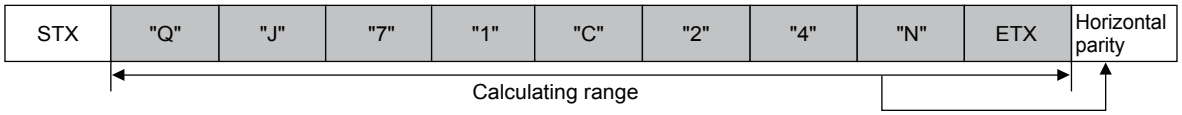
Q series C24N / L series C24 modules process Check code according to the following procedure.

1) Calculates value according to the selection of “Processing method”.
2) When “Complement calculation” is ‘One’s complement’ or ‘Two's complement’, performs a 2-word-wise complement operation on the value calculated in 1).
3) When “Code type” is ‘ASCII decimal’, extracts the lowest one word from the value calculated in 2) and performs the hexadecimal→decimal conversion.



(2) Procedure for calculating horizontal parity

The followings show procedures for calculating horizontal parities using the following sample data.



(For the data shown above)

```
"Q"   (51H)  0101 0001
                XOR
"J"   (4AH)  0100 1010 =  0001 1011
                           XOR
"7"   (37H)               0011 0111 =  0010 1100
                                        XOR
"1"   (31H)                            0011 0001 =  0001 1101
                                                     XOR
"C"   (43H)                                         0100 0011 =  0101 1110
                                                                  XOR
"2"   (32H)                                                      0011 0010 =  0110 1100
                                                                              XOR
"4"   (34H)                                                                  0011 0100 =  0101 1000
                                                                                          XOR
"N"   (4EH)                                                                              0100 1110     0001 0110
                                                                                                       XOR
ETX   (03H)                                                                                           0000 0011 =  0001  0101  (Binary)

                                                                                      Horizontal parity =  1     5     (Hexadecimal)
```

(a) Data flow : Forward direction

1) "Complement calculation" is 'No complement calculation'
(15_H in hexadecimal is 21 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"5" (35_H)	"15" (31_H 35_H)	"015" (30_H 31_H 35_H)	"0015" (30_H 30_H 31_H 35_H)
ASCII decimal	"1" (31_H)	"21" (32_H 31_H)	"021" (30_H 32_H 31_H)	"0021" (30_H 30_H 32_H 31_H)
HEX	15_H	0015_H	000015_H	00000015_H

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 0015_H is FFFF $FFEA_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEA_H$ in hexadecimal is 65514 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"A" (41_H)	"EA" (45_H 41_H)	"FEA" (46_H 45_H 41_H)	"FFEA" (46_H 46_H 45_H 41_H)
ASCII decimal	"4" (34_H)	"14" (31_H 34_H)	"514" (35_H 31_H 34_H)	"5514" (35_H 35_H 31_H 34_H)
HEX	EA_H	$FFEA_H$	$FFFFEA_H$	$FFFFFFEA_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 0015_H is FFFF $FFEB_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEB_H$ in hexadecimal is 65515 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"B" (42_H)	"EB" (45_H 42_H)	"FEB" (46_H 45_H 42_H)	"FFEB" (46_H 46_H 45_H 42_H)
ASCII decimal	"5" (35_H)	"15" (31_H 35_H)	"515" (35_H 31_H 35_H)	"5515" (35_H 35_H 31_H 35_H)
HEX	EB_H	$FFEB_H$	$FFFFEB_H$	$FFFFFFEB_H$

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(b) Data flow : Reverse direction

1) "Complement calculation" is 'No complement calculation'
(15H in hexadecimal is 21 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"51" (35_H 31_H)	"510" (35_H 31_H 30_H)	"5100" (35_H 31_H 30_H 30_H)
ASCII decimal		"12" (31_H 32_H)	"120" (31_H 32_H 30_H)	"1200" (31_H 32_H 30_H 30_H)
HEX		1500_H	150000_H	15000000_H

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 0015_H is FFFF $FFEA_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEA_H$ in hexadecimal is 65514 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"AE" (41_H 45_H)	"AEF" (41_H 45_H 46_H)	"AEFF" (41_H 45_H 46_H 46_H)
ASCII decimal		"41" (34_H 31_H)	"415" (34_H 31_H 35_H)	"4155" (35_H 35_H 31_H 34_H)
HEX		$EAFF_H$	$EAFFFF_H$	$EAFFFFFF_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 0015_H is FFFF $FFEB_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEB_H$ in hexadecimal is 65515 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"BE" (42_H 45_H)	"BEF" (42_H 45_H 46_H)	"BEFF" (42_H 45_H 46_H 46_H)
ASCII decimal		"51" (35_H 31_H)	"515" (35_H 31_H 35_H)	"5155" (35_H 31_H 35_H 35_H)
HEX		$EBFF_H$	$EBFFFF_H$	$EBFFFFFF_H$

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(c) Data flow : Byte swap

1) "Complement calculation" is 'No complement calculation'
(15_H in hexadecimal is 21 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"0051" (30_H 30_H 35_H 31_H)
ASCII decimal				"0012" (30_H 30_H 31_H 32_H)
HEX				00001500_H

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 0015_H is FFFF $FFEA_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEA_H$ in hexadecimal is 65514 in decimal)

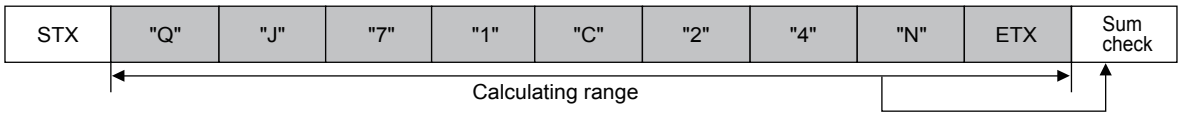
Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"FFAE" (46_H 46_H 41_H 45_H)
ASCII decimal				"5541" (35_H 35_H 34_H 31_H)
HEX				$FFFFEAFF_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 0015_H is FFFF $FFEB_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FFEB_H$ in hexadecimal is 65515 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"FFBE" (46_H 46_H 42_H 45_H)
ASCII decimal				"5551" (35_H 35_H 35_H 31_H)
HEX				$FFFFEBFF_H$

(3) Procedure for calculating sum check

The followings show procedures for calculating sum check codes using the following sample data.



(For the data shown above)

Sum check = $51_H + 4A_H + 37_H + 31_H + 43_H + 32_H + 34_H + 4E_H + 03_H = 1FD_H$

(a) Data flow : Forward direction

1) "Complement calculation" is 'No complement calculation'
($1FD_H$ in hexadecimal is 509 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"D" (44_H)	"FD" (46_H 44_H)	"1FD" (31_H 46_H 44_H)	"01FD" (30_H 31_H 46_H 44_H)
ASCII decimal	"9" (39_H)	"09" (30_H 39_H)	"509" (35_H 30_H 39_H)	"0509" (30_H 35_H 30_H 39_H)
HEX	FD_H	$01FD_H$	$0001FD_H$	$000001FD_H$

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 $01FD_H$ is FFFF $FE02_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FF02_H$ in hexadecimal is 65026 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"2" (32_H)	"02" (30_H 32_H)	"E02" (45_H 30_H 32_H)	"FE02" (46_H 45_H 30_H 32_H)
ASCII decimal	"6" (36_H)	"26" (32_H 36_H)	"026" (30_H 32_H 36_H)	"5026" (35_H 30_H 32_H 36_H)
HEX	02_H	$FE02_H$	$FFFE02_H$	$FFFFFE02_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 $01FD_H$ is FFFF $FE03_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
($FE03_H$ in hexadecimal is 65027 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal	"3" (33_H)	"03" (30_H 33_H)	"E03" (45_H 30_H 33_H)	"FE03" (46_H 45_H 30_H 33_H)
ASCII decimal	"7" (37_H)	"27" (32_H 37_H)	"027" (30_H 32_H 37_H)	"5027" (35_H 30_H 32_H 37_H)
HEX	03_H	$FE03_H$	$FFFE03_H$	$FFFFFE03_H$

(b) Data flow : Reverse direction

1) "Complement calculation" is 'No complement calculation'
(1FD$_H$ in hexadecimal is 509 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"DF" (44_H 46_H)	"DF1" (44_H 46_H 31_H)	"DF10" (44_H 46_H 31_H 30_H)
ASCII decimal		"90" (39_H 30_H)	"905" (39_H 30_H 35_H)	"9050" (39_H 30_H 35_H 30_H)
HEX		$FD01_H$	$FD0100_H$	$FD010000_H$

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 01FD$_H$ is FFFF FE02$_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
(FF02$_H$ in hexadecimal is 65026 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"20" (32_H 30_H)	"20E" (32_H 30_H 45_H)	"20EF" (32_H 30_H 45_H 46_H)
ASCII decimal		"62" (36_H 32_H)	"620" (36_H 32_H 30_H)	"6205" (36_H 32_H 30_H 35_H)
HEX		$02FE_H$	$02FEFF_H$	$02FEFFFF_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 01FD$_H$ is FFFF FE03$_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
(FE03$_H$ in hexadecimal is 65027 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal		"30" (30_H 33_H)	"30E" (33_H 30_H 45_H)	"30EF" (33_H 30_H 45_H 46_H)
ASCII decimal		"72" (37_H 32_H)	"720" (37_H 32_H 30_H)	"7205" (37_H 32_H 30_H 35_H)
HEX		$03FE_H$	$03FEFF_H$	$03FEFFFF_H$

(c) Data flow : Byte swap

1) "Complement calculation" is 'No complement calculation'
(1FD$_H$ in hexadecimal is 509 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"10DF" (31_H 30_H 44_H 46_H)
ASCII decimal				"5090" (35_H 30_H 39_H 30_H)
HEX				$0000FD01_H$

2) "Complement calculation" is 'One's complement'
(One's complement of 0000 01FD$_H$ is FFFF FE02$_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
(FF02$_H$ in hexadecimal is 65026 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"EF20" (45_H 46_H 32_H 30_H)
ASCII decimal				"0562" (30_H 35_H 36_H 32_H)
HEX				$FFFF02FE_H$

3) "Complement calculation" is 'Two's complement'
(Two's complement of 0000 01FD$_H$ is FFFF FE03$_H$)
When "Code type" is 'ASCII decimal', the last one word is extracted and converted from hexadecimal to decimal.
(FE03$_H$ in hexadecimal is 65027 in decimal)

Code type	Data length			
	1 byte	2 bytes	3 bytes	4 bytes
ASCII hexadecimal				"EF30" (45_H 46_H 33_H 30_H)
ASCII decimal				"0572" (30_H 35_H 37_H 32_H)
HEX				$FFFF03FE_H$

(4) Procedure for calculating 16-bit CRC (for MODBUS)

This is a check system that is used only when data are sent/received in the RTU mode of the MODBUS protocol. The data length of CRC is fixed to 2 bytes (16 bits), and the CRC is calculated every 1 byte (8 bits) from the start of the calculating range according to the following procedure.

1) Load a 16-bit register whose bits are all '1'.
2) Exclusive OR (XOR) the first 1 byte (8 bits) of the calculating range with 8 bits in above 1).
3) Shift the result of 2) one bit right.
4) If the latest significant bit in above 2) is '1', exclusive OR (XOR) the result of 3) with the generator polynomial ($A001_H$). If the last bit is '0', shift the result of 2) one bit right (operation described in 3)) without the exclusive OR (XOR) operation.
5) Repeat steps 3) and 4) until 8 shifts have been performed.
6) Exclusive OR (XOR) the result of 5) with the next 1 byte (8 bits).
7) Repeat step 2) through 6) until all bytes have been processed.
   The final result is CRC value.
8) When the CRC value is placed in a packet, the lower 8 bits are set first, and then the upper 8 bits are set.

For the specific example of calculation, refer to the table on the next page.

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The followings show the example of 16-bit CRC (for MODBUS) calculation.
Packet example:

Station No.	Function code	16-bit CRC	
02_H	07_H	41_H	12_H

Procedure example of 16-bit CRC (for MODBUS) of a packet example above:

CRC error checking procedure	16-bit register (MSB)				Flag	Calculating procedure
(Load a 16-bit register whose bits are all '1')	1111	1111	1111	1111		
02_H(Station number)			0000	0010		1) to 2)
Exclusive OR (XOR)	1111	1111	1111	1101		
Shift 1	0111	1111	1111	1110	1	
Generator polynomial	1010	0000	0000	0001		3) to 4)
Exclusive OR (XOR)	1101	1111	1111	1111		
Shift 2	0110	1111	1111	1111	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1100	1111	1111	1110		
Shift 3	0110	0111	1111	1111	0	
Shift 4	0011	0011	1111	1111	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1001	0011	1111	1110		
Shift 5	0100	1001	1111	1111	0	5)
Shift 6	0010	0100	1111	1111	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1000	0100	1111	1110		
Shift 7	0100	0010	0111	1111	0	
Shift 8	0010	0001	0011	1111	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1000	0001	0011	1110		
07_H(Function code)			0000	0111		6)
Exclusive OR (XOR)	1000	0001	0011	1001		
Shift 1	0100	0000	1001	1100	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1110	0000	1001	1101		
Shift 2	0111	0000	0100	1110	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1101	0000	0100	1111		
Shift 3	0110	1000	0010	0111	1	
Generator polynomial	1010	0000	0000	0001		7)
Exclusive OR (XOR)	1100	1000	0010	0110		
Shift 4	0110	0100	0001	0011	0	
Shift 5	0011	0010	0000	1001	1	
Generator polynomial	1010	0000	0000	0001		
Exclusive OR (XOR)	1001	0010	0000	1000		
Shift 6	0100	1001	0000	0100	0	
Shift 7	0010	0100	1000	0010	0	
Shift 8	0001	0010	0100	0001	0	
CRC value	12_H		41_H			8)

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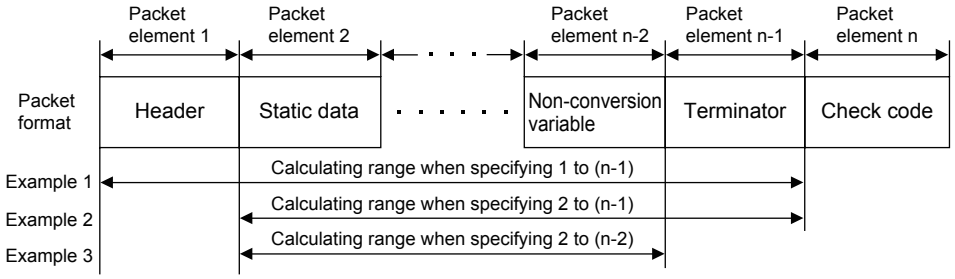
(5) Calculating range of Check code

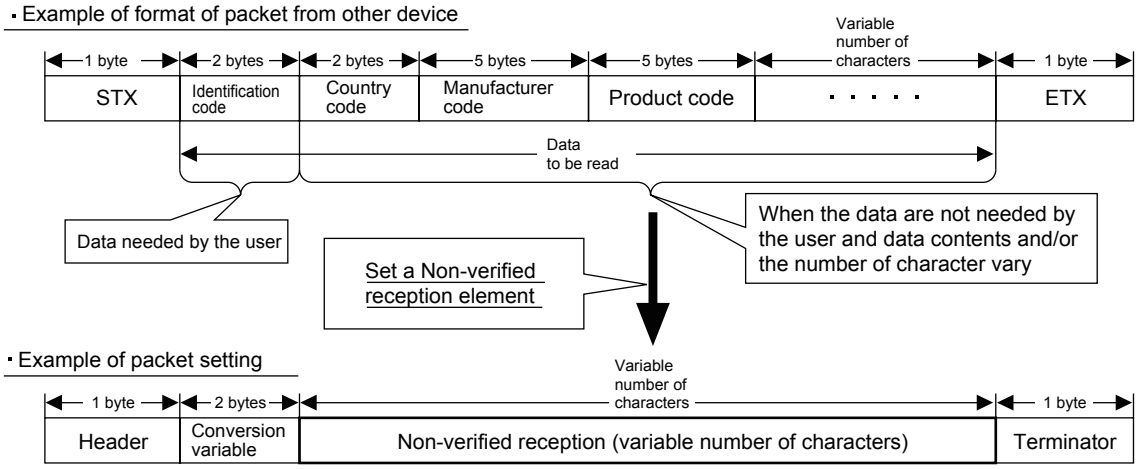
The following shows specification examples of the calculating range of Check code.



Example 1: Calculating range when its start is 1 and end is n-1.
Example 2: Calculating range when its start is 2 and end is n-1.
Example 3: Calculating range when its start is 2 and end is n-2.

Appendix 4.5 Non-verified reception

The following shows a usage example of Non-verified reception.



Using a Non-verified reception element has the following advantages in case of the packet format shown above.

- Necessary data can only be stored in a CPU device and buffer memory.
- A single protocol (packet) can handle receive packets that includes data whose contents vary each time.

Appendix 5 Functions Modified from the Previous Version

(1) Functions modified from the previous version

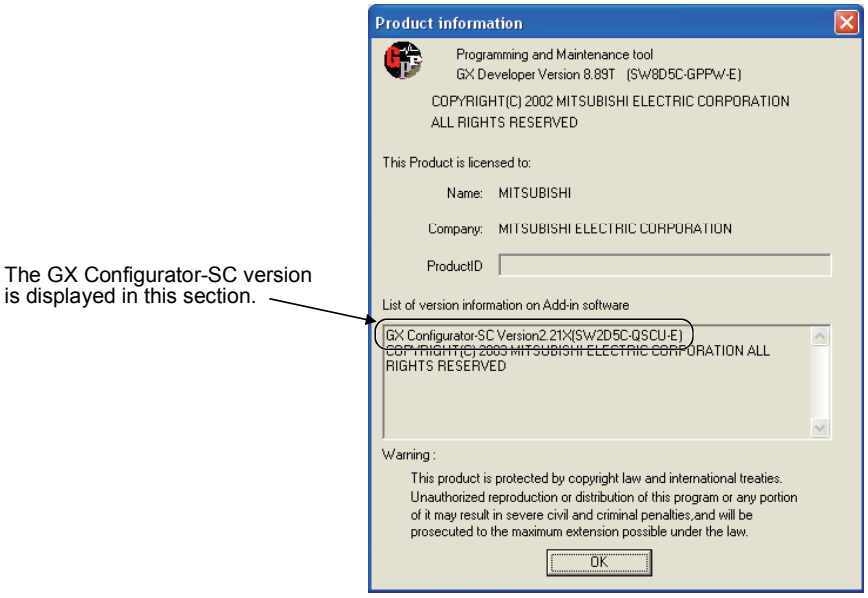
(a) Functions modified in Version 2.21X

With upgrade from Version 2.20W (SW2D5C-QSCU) to Version 2.21X (SW2D5C-QSCU), the following are the main functions/setting items that are added to GX Configurator-SC.

Function/Setting item	Description	Reference
Addition of applicable CPU	Now compatible with L02CPU and L26CPU-BT.	Section 3.2
Addition of target modules	Now compatible with LJ71C24 and LJ71C24-R2.	

(2) Checking the GX Configurator-SC software version

Check the version within the GX Developer product information.
([Help] → [Product information])



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SH (NA)-080850ENG-C

SH(NA)-080850ENG-C(1009)MEE
MODEL: GXCON-SC-O-PP-E
MODEL CODE: 13JU66

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