OMRON

Machine Automation Controller

CJ-series

Serial Communications Units

Operation Manual for NJ-series CPU Unit

CJ1W-SCU22
CJ1W-SCU32
CJ1W-SCU42

Serial Communications Units

W494-E1-03

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Introduction

Thank you for purchasing an CJ-series CJ1W-SCU□2 Serial Communications Units.
This manual contains information that is necessary to use with the NJ-series CPU Unit. Please read this manual and make sure you understand the functionality and performance of the NJ-series CPU Unit before you attempt to use it in a control system.
Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

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

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

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B3503.

Applicable Products

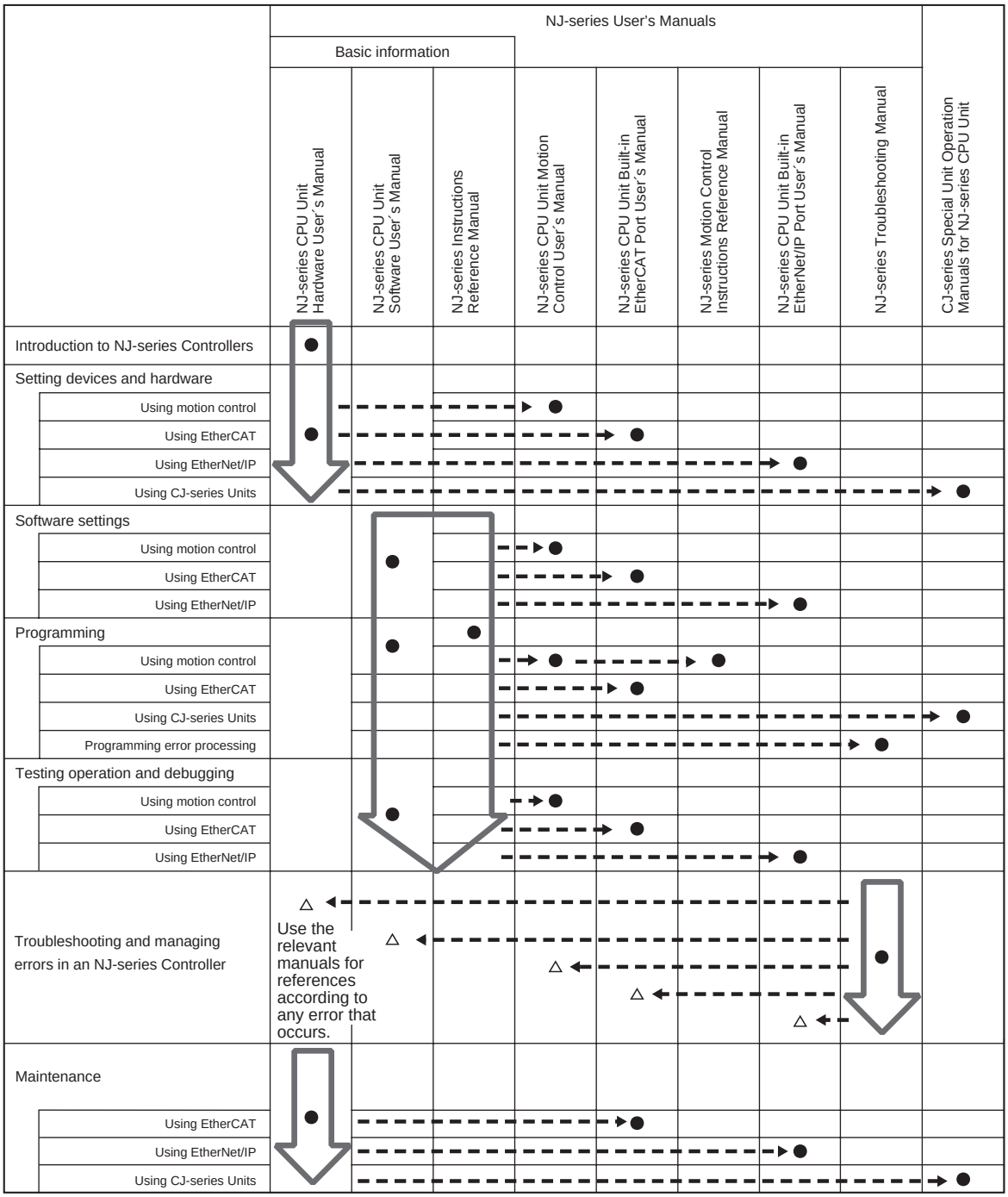
This manual covers the following products.

CJ-series Serial Communications Units

- CJ1W-SCU22
- CJ1W-SCU32
- CJ1W-SCU42

Relevant Manuals

There are three manuals that provide basic information on the NJ-series CPU Units: the *NJ-series CPU Unit Hardware User's Manual*, the *NJ-series CPU Unit Software User's Manual*, and the *NJ-series Instructions Reference Manual*.
Most operations are performed from the Sysmac Studio Automation Software. Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for information on the Sysmac Studio.
Other manuals are necessary for specific system configurations and applications.
Read all of the manuals that are relevant to your system configuration and application to make the most of the NJ-series CPU Unit.



Manual Configuration

NJ-series CPU Unit Hardware User's Manual (Cat. No. W500)

Section	Description
Section 1 Introduction	This section provides an introduction to the NJ-series Controllers and their features, and gives the NJ-series Controller specifications.
Section 2 System Configuration	This section describes the system configuration used for NJ-series Controllers.
Section 3 Configuration Units	This section describes the parts and functions of the configuration devices in the NJ-series Controller configuration, including the CPU Unit and Configuration Units.
Section 4 Installation and Wiring	This section describes where and how to install the CPU Unit and Configuration Units and how to wire them.
Section 5 Troubleshooting	This section describes the event codes, error confirmation methods, and corrections for errors that can occur.
Section 6 Inspection and Maintenance	This section describes the contents of periodic inspections, the service life of the Battery and Power Supply Units, and replacement methods for the Battery and Power Supply Units.
Appendices	The appendices provide the specifications of the Basic I/O Units, Unit dimensions, load short-circuit protection detection, line disconnection detection, and measures for EMC Directives.

NJ-series CPU Unit Software User's Manual (Cat. No. W501)

Section	Description
Section 1 Introduction	This section provides an introduction to the NJ-series Controllers and their features, and gives the NJ-series Controller specifications.
Section 2 CPU Unit Operation	This section provides information that is necessary to use the CPU Unit, including how the CPU Unit works and the operations that it performs depending on the status of the CPU Unit.
Section 3 I/O Ports, Slave Configuration, and Unit Configuration	This section describes how to use I/O ports, how to create the slave configuration and unit configuration and how to assign functions.
Section 4 Controller Setup	This section describes the initial settings of the function modules.
Section 5 Designing Tasks	This section describes the task system and types of tasks.
Section 6 Programming	This section describes programming, including the programming languages and the variables and instructions that are used in programming.
Section 7 Checking Operation and Actual Operation	This section describes the items and procedures for checking the operation of an NJ-series Controller, including offline debugging procedures.
Section 8 CPU Unit Functions	This section describes the functionality provided by the CPU Unit.
Section 9 Communications Setup	This section describes how to go online with the CPU Unit and how to connect to other devices.
Section 10 Example of Actual Application Procedures	This section describes the procedures that are used to actually operate an NJ-series Controller.
Section 11 Troubleshooting	This section describes the event codes, error confirmation methods, and corrections for errors that can occur.
Appendices	The appendices provide the CPU Unit specifications, task execution times, specifications of individual system-defined variables, data attribute lists, CJ-series Unit memory information, CJ-series Unit memory allocation methods, and version information.

Sysmac Studio Version 1 Operation Manual (Cat. No. W504)

Section	Description
Section 1 Introduction	This section provides an overview and lists the specifications of the Sysmac Studio and describes its features and components.
Section 2 Installation and Uninstallation	This section describes how to install and uninstall the Sysmac Studio.
Section 3 System Design	This section describes the basic concepts for designing an NJ-series System with the Sysmac Studio and the basic operating procedures.
Section 4 Programming	This section describes how to create programs with the Sysmac Studio.
Section 5 Online Connections to a Controller	This section describes how to go online with a Controller.
Section 6 Debugging	This section describes how to debug the programs online on the Controller or debug it offline with the Simulator.
Section 7 Other Functions	This section describes other functions that are supported by the Sysmac Studio, including security functions and troubleshooting functions.
Section 8 Reusing Programming	This section describes how to reuse the programs that you create with the Sysmac Studio.
Section 9 Support Software Provided with the Sysmac Studio	This section describes the Support Software that is provided with the Sysmac Studio.
Section 10 Troubleshooting	This section describes the error messages that are displayed when you check a program on the Sysmac Studio and how to correct those errors.
Appendices	The appendices describe the following: Driver Installation for Direct USB Cable Connection Specifying One of Multiple Ethernet Interface Cards Online Help Simulation Instructions

CJ-series Serial Communications Units Operation Manual for NJ-series CPU Unit (Cat. No. W494) (this manual)

Section	Description
Section 1 Introduction	This section provides an introduction to the Serial Communications Units and their features. It also describes the operating procedure and the specifications of the Serial Communications Units.
Section 2 Initial Settings and Allocations of Device Variables for CJ-series Unit	This section describes the data exchange between the CPU Unit and Serial Communications Unit and the definitions of the device variables for CJ-series Unit.
Section 3 Installation and Wiring	This section describes where and how to install the Serial Communications Unit, and how to connect and wire them.
Section 4 Using Protocol Macros	This section describes the protocol macro function provided by the Serial Communications Unit and the procedure for using the function.
Section 5 Serial Gateway	This section describes the Serial Gateway function provided by the Serial Communications Unit and the procedure for using the function.
Section 6 No-protocol Mode	This section describes the No-protocol Mode function provided by the Serial Communications Unit to send/receive data, and the procedure for using the function.
Section 7 Using Modbus-RTU Slave Mode	This section describes the Modbus-RTU Slave Mode function provided by the Serial Communications Unit, the procedure for using the function and the details of the command responses.
Section 8 Loopback Test	This section describes the loopback test function provided by the Serial Communications Unit and the procedure for using the function.
Section 9 Troubleshooting and Maintenance	This section describes the troubleshooting procedure, event logs and maintenance procedure for the Serial Communications Unit.
Reference	This section describes the details on the standard system protocols provided by the CX-Protocol and the Serial Communications Unit.
Appendix	---

SYSMAC CS/CJ Series Serial Communications Boards Serial Communications Units OPERATION MANUAL (Cat. No. W336)

Section	Description
Section 1 Introduction	This section introduces the features, specifications, and procedures of the Serial Communications Boards and the Serial Communications Units.
Section 2 Initial Settings and I/O Memory Allocations	This section describes the data exchange between the CPU Unit and the Serial Communications Boards/Serial Communications Units, and the I/O memory allocation.
Section 3 Installation and Wiring	This section describes how to mounting the Serial Communications Board and Serial Communications Units, and how to connect the ports to external devices.
Section 4 Using Host Link Communications	This section describes the procedure and other information required to use Host Link communications.
Section 5 Using Protocol Macros	This section describes the procedure and other information required to use the protocol macros.
Section 6 Serial Gateway	This section describes the procedure and other information required to use the Serial Gateway.
Section 7 No-protocol Mode	This section describes the procedure and other information required to use the no-protocol mode.
Section 8 Using 1:N NT Links	This section describes the procedure and other information required to use the 1:N NT Links to Programmable Terminals
Section 9 Using Modbus-RTU Slave Mode	This section describes the procedure and other information required to use the Modbus-RTU slave mode.
Section 10 Communications Performance	This section describes the communications performance of the Serial Communications Boards and the Serial Communications Units.
Section 11 Loopback Test	This section describes the procedure and other information required to conduct loopback test.
Section 12 Troubleshooting and Maintenance	This section describes the troubleshooting and maintenance procedures for the Serial Communications Boards and the Serial Communications Unit.
Appendices	---

CX-Protocol Ver.1.9 OPERATION MANUAL (Cat. No. W344)

Section	Description
Section 1 Introduction	This section introduces the Protocol Macro function, the features and specifications of the CX-Protocol, and outline of the standard system protocol.
Section 2 Installing/Uninstalling/Starting/ Ending	This section outlines the functions of the CX-Protocol and describes installation procedure, startup/shutdown, and the user interface for the CX-Protocol.
Section 3 Protocol Macro	This section describes details of the protocol macro functions.
Section 4 Using the Protocol Macro Function	This section describes the communications sequence and settings for the protocol macro function.
Section 5 Object Creation	This section describes how to create objects, such as projects, protocols, sequences, steps, messages, and matrices.
Section 6 Project and Protocol Editing	This section describes details of the editing of projects and protocols.
Section 7 Sequence Setting and Editing	This section describes details of the creating, setting and editing of sequences.
Section 8 Step Setting and Editing	This section describes details of the creating, setting and editing of steps.
Section 9 Setting and Editing Messages and Matrix Lists	This section describes details of the creating, setting and editing of messages and matrix lists.
Section 10 Communications PLC Setup and Online Connections	This section describes details of the communications settings and online connections.

Section	Description
Section 11 Protocol Data Transferring and Printing	This section describes details of the transferring, converting, and printing of protocol data.
Section 12 Tracing and Monitoring	This section describes details of PLC memory area monitoring and the transmission line tracing.
Section 13 Error and Error Log Display	This section describes details of the displaying of errors and the error log. This function cannot be used in NJ series.
Section 14 Troubleshooting	This section lists the error messages and describes their causes and remedies.
Section 15 Help	This section describes the online help services.
Appendices	---

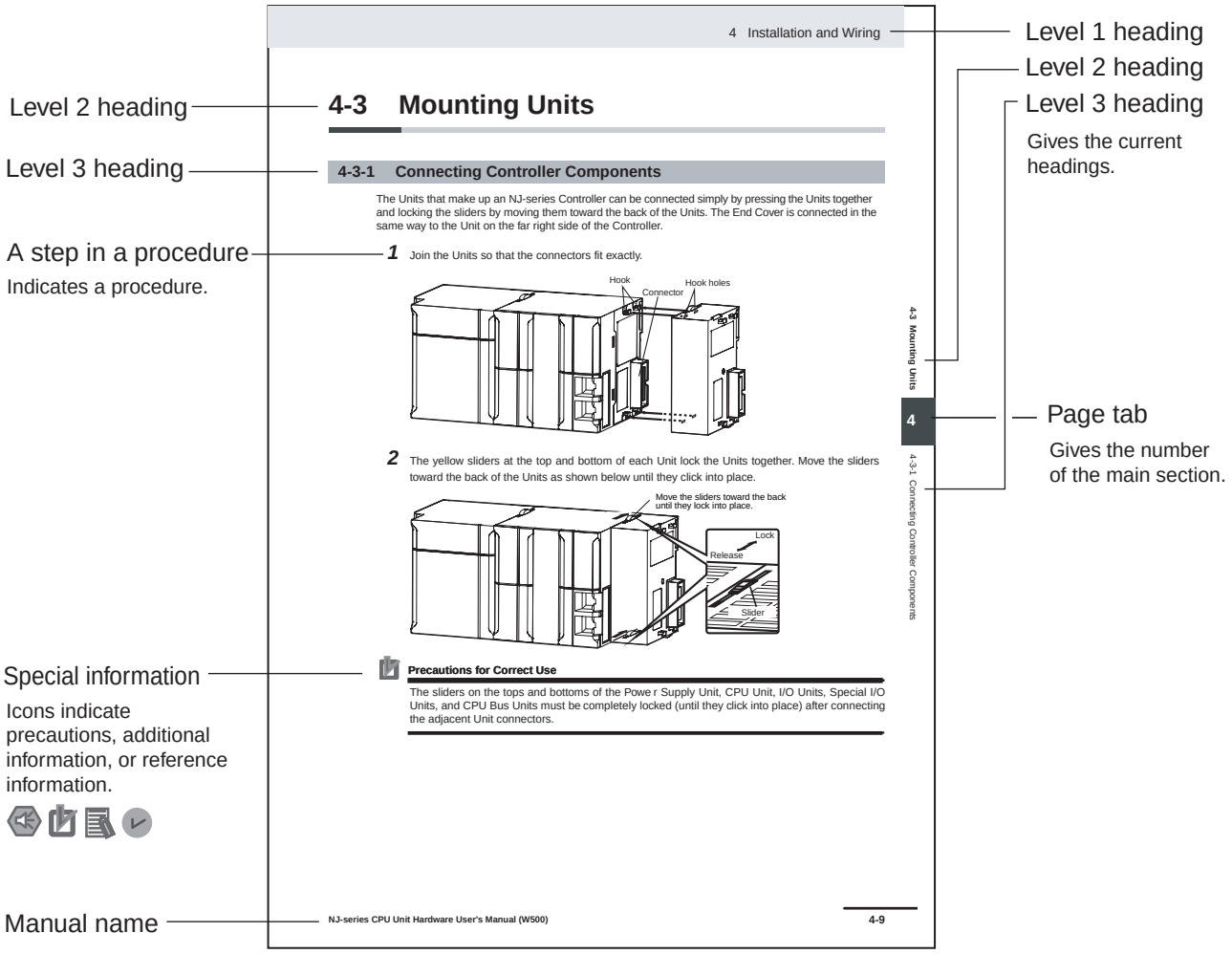
CX-Integrator Ver.2. Operation Manual (Cat. No. W464)

Section	Description
Section 1 Overview	This section provides an overview of the CX-Integrator and describes the CX-Integrator menus and connecitions.
Section 2 Basic Operations	This section describes the basic operations used for the CX-Integrator.
Section 3 Routing Tables	This section describes how to set the routing tables. For NJ-series, routing table is created by using Sysmac Studio instead of CX-Integrator.
Section 4 Data Links for Controller Link and SYSMAC LINK	This section describes how to set data links for Controller Link and SYSMAC LINK networks.
Section 5 Ethernet	This section describes the operations specific to Ethernet.
Section 6 DeviceNet	This section describes the settings and operations unithe to DeviceNet networks including registeing slaves in the master, I/O allocations, and devide monitoring.
Section 7 CompoNet	This section describes the basic usage of CompoNet networks and how to set CompoNet parameters.
Section 8 CompoWay/F	This section describes the settings and operations specific to the CompoWay/F system.
Section 9 NT Links	This section describes the settings and operations specific to the NT Link system.
Section 10 Network Testing	This section describes the operations of the network test tool.
Appendices	This section describes the CPS files for Ethernet, Controller Link, CompoWay/F and NT Link Networks, and EDS files for DeviceNet Networks.

Manual Structure

Page Structure

The following page structure is used in this manual.



This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

Version Information

Information on differences in specifications and functionality for CPU Units with different unit versions and for different versions of the Sysmac Studio is given.

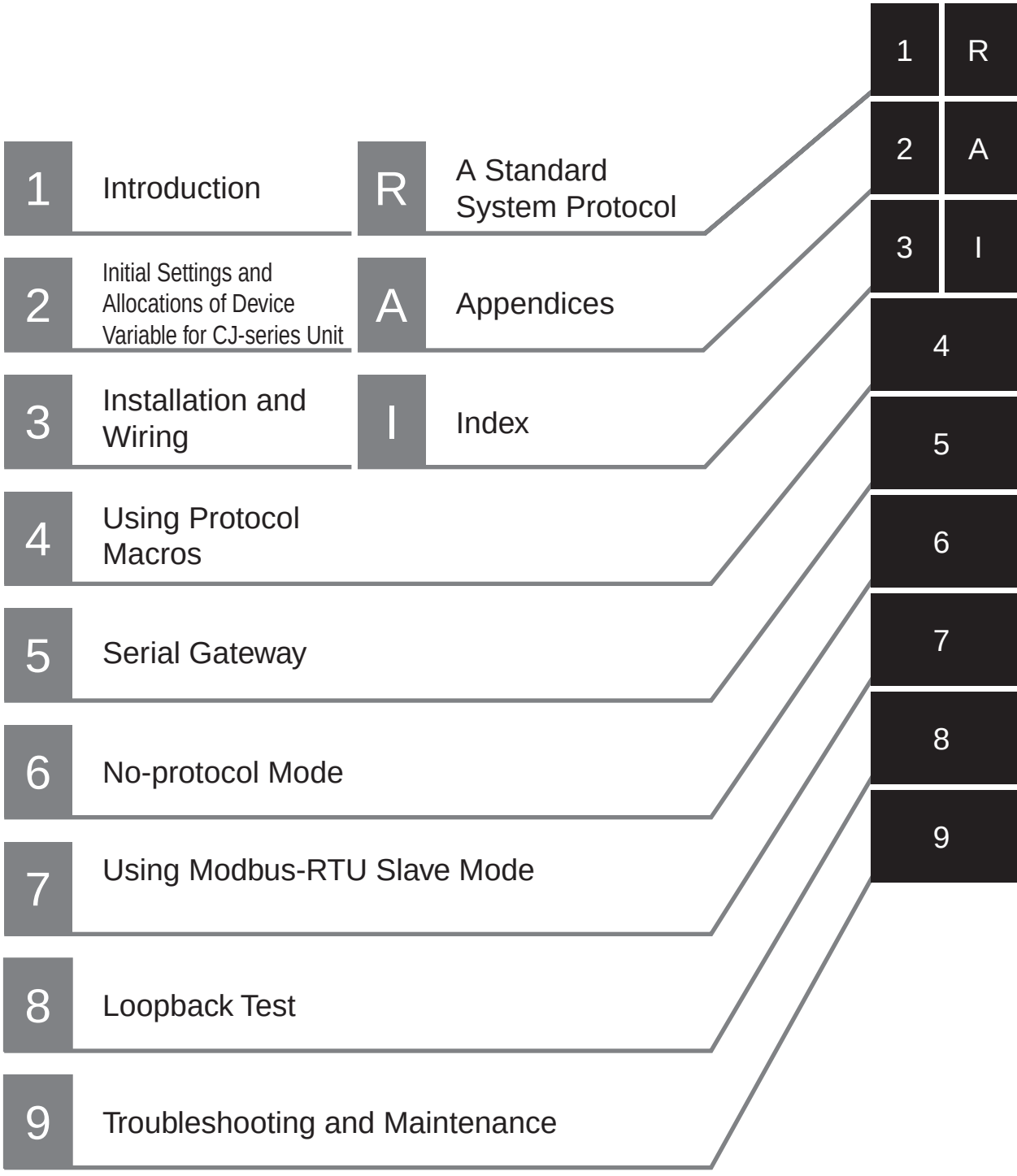
Note References are provided to more detailed or related information.

Precaution on Terminology

In this manual, "download" refers to transferring data from the Sysmac Studio to the physical Controller and "upload" refers to transferring data from the physical Controller to the Sysmac Studio.

For the Sysmac Studio, synchronization is used to both upload and download data. Here, "synchronize" means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.

Sections in this Manual



CONTENTS

Introduction 1
Relevant Manuals 2
Manual Configuration 3
Manual Structure 7
Sections in this Manual 9
CONTENTS 10
Read and Understand this Manual 15
Safety Precautions 18
Precautions for Safe Use 23
Precautions for Correct Use 29
Regulations and Standards 32
Unit Versions 35
Related Manuals 37
Revision History 38

Section 1 Introduction

1-1 Using this Manual 1-2
1-2 Overview 1-3
1-3 Protocol Overview 1-5
1-3-1 Protocol Macros 1-6
1-3-2 Loopback Test 1-6
1-3-3 Serial Gateway Mode 1-6
1-3-4 No-protocol Mode 1-7
1-3-5 Modbus-RTU Slave Mode 1-7
1-4 Features 1-8
1-4-1 Serial Communications Units 1-8
1-4-2 Protocols 1-8
1-5 System Configurations 1-10
1-5-1 Protocol Macro, Serial Gateway, No-protocol, or Modbus-RTU Slave 1-10
1-6 Specifications 1-14
1-6-1 Serial Communications Unit 1-14
1-6-2 General Specifications 1-15
1-7 Selecting the Serial Communications Mode 1-22
1-8 Basic Operating Procedure 1-23
1-8-1 Overview 1-23
1-8-2 Explanation of Procedure 1-24

Section 2 Initial Settings and Allocations of Device Variable for CJ-series Unit

2-1 Component Names and Functions 2-2

2-2 Data Exchange with the CPU Unit 2-8
2-2-1 Data Flow 2-8
2-2-2 How to Specify and Create Variables 2-12

2-3 Device Variable for CJ-series Unit 2-14
2-3-1 Allocations of Device Variable for CJ-series Unit 2-14
2-3-2 Device Variable for CJ-series Unit for System Settings 2-14
2-3-3 Device Variable for CJ-series Unit for Software Switches 2-23
2-3-4 Device Variable for CJ-series Unit for Status 2-24

2-4 System-defined Variable 2-34

Section 3 Installation and Wiring

3-1 Installing Serial Communications Units 3-2
3-1-1 System Configuration Precautions 3-2
3-1-2 Serial Communications Unit Installation Procedure 3-2
3-1-3 Unit Handling Precautions 3-3

3-2 Wiring 3-4
3-2-1 Wiring Precautions 3-4
3-2-2 Port Types 3-4
3-2-3 Communications Modes and Ports 3-4
3-2-4 Connector Pin Layout 3-5
3-2-5 Mounting Height and Connector Cover Dimensions 3-6
3-2-6 Reducing Electrical Noise for External Wiring 3-7
3-2-7 2-Wire and 4-Wire Connections 3-7
3-2-8 NT-AL001 Link Adapter Settings 3-8
3-2-9 Connections for Protocol Macro, Serial Gateway, No-protocol Mode, and Modbus-RTU Slave Mode 3-9
3-2-10 Connections in Loopback Test 3-18

3-3 RS-232C and RS-422A/485 Wiring 3-19
3-3-1 Recommended RS-232C Wiring Examples 3-19
3-3-2 Recommended RS-422A/485 Wiring Examples 3-20
3-3-3 Wiring RS-232C Connectors on the CJ1W-SCU22/42 3-22
3-3-4 Soldering 3-23
3-3-5 Assembling Connector Hood 3-24
3-3-6 Wiring RS-422A/485 Terminal-block Connectors on the CJ1W-SCU32/42 3-25
3-3-7 Connecting to Unit 3-26

Section 4 Using Protocol Macros

4-1 Overview of the Protocol Macro Function 4-2
4-1-1 Protocol Macros 4-2
4-1-2 Using the Protocol Macros 4-2
4-1-3 Protocol Structure 4-4
4-1-4 Data Exchange Method for Link Words 4-10

4-2 Device Variables for CJ-series Unit and System-defined Variables (Protocol Macro Mode) 4-13
4-2-1 Device Variable for CJ-series Unit for System Settings 4-13
4-2-2 Area Descriptions 4-15
4-2-3 System-defined Variable 4-21
4-2-4 Devices Variable for CJ-series Unit for Software Switches 4-22
4-2-5 Device Variables for CJ-series Unit for Status 4-24
4-2-6 Protocol Status 4-32

4-3 Using Protocol Macros 4-40
4-3-1 Executing Communications Sequences 4-40
4-3-2 User Program Example 4-42

Section 5 Serial Gateway

5-1 Serial Gateway Overview 5-2
5-1-1 Overview 5-2
5-1-2 Operating Conditions 5-2
5-1-3 Features 5-3
5-1-4 Serial Gateway Specifications 5-4

5-2 Device Variables for CJ-series Unit and System-defined Variables (During Serial Gateway Mode) 5-5
5-2-1 Device Variables for CJ-series Unit for System Settings 5-5
5-2-2 System-defined Variable 5-8
5-2-3 Device Variable for CJ-series Unit for Software Switches 5-9
5-2-4 Device Variable for CJ-series Unit for Status 5-9

5-3 Using the Serial Gateway 5-12
5-3-1 Setting Device Variable for CJ-series Unit for System Settings and Software Switches 5-12
5-3-2 Sending Messages Using the SendCmd Instruction 5-14
5-3-3 Using the Serial Gateway Function When Protocol Macros Are Executed 5-15

5-4 Protocol Conversion 5-22
5-4-1 Types of Protocol Conversion 5-22
5-4-2 Converting to CompoWay/F 5-23
5-4-3 CompoWay/F Connection Examples 5-25
5-4-4 Converting to Modbus-RTU 5-26
5-4-5 Converting to Modbus-ASCII 5-28

5-5 Serial Gateway 5-29
5-5-1 Serial Gateway Execution Timing for Protocol Macros 5-29
5-5-2 Serial Gateway Timeout Monitoring 5-31
5-5-3 Other Functions 5-32

5-6 Communications Frames 5-33
5-6-1 CompoWay/F 5-33
5-6-2 Modbus-RTU 5-34
5-6-3 Modbus-ASCII 5-36

Section 6 No-protocol Mode

6-1 Overview 6-2
6-1-1 Definition 6-2
6-1-2 Specifications 6-3
6-1-3 Connections for No-protocol Mode 6-4

6-2 Device Variables for CJ-series Unit and System-defined Variables (No-protocol Mode)6-5
6-2-1 Device Variables for CJ-Series Unit for System Settings 6-5
6-2-2 System-defined Variable 6-8
6-2-3 Device Variable for CJ-series Unit for Software Switches 6-8
6-2-4 Device Variable for CJ-series Unit for Status 6-8
6-2-5 Device Variable for CJ-series Unit for Status (When Sending/Receiving Data with SerialSend, SerialRcv, or SerialRcvNoClear Instruction) 6-11

6-3 Using Serial Port I/O Instructions 6-12
6-3-1 System Settings 6-12
6-3-2 Instruction Execution Methods 6-12

Section 7 Using Modbus-RTU Slave Mode

7-1 Modbus-RTU Slave System 7-2
7-1-1 Modbus-RTU Slave System 7-2
7-1-2 Modbus-RTU Specifications 7-2
7-1-3 Communicating with NJ-series CPU Units Using Modbus 7-3

7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode) 7-5
7-2-1 Device Variable for CJ-series Unit for System Settings 7-5
7-2-2 System-defined Variable 7-8
7-2-3 Device Variable for CJ-series Unit for Software Switches 7-8
7-2-4 Device Variable for CJ-series Unit 7-9

7-3 Command and Response Details 7-13
7-3-1 Supported Modbus-RTU Commands 7-13
7-3-2 Command and Response Details 7-14

Section 8 Loopback Test

8-1 Executing Loopback Tests 8-2
8-1-1 Overview 8-2
8-1-2 Connection Method 8-2
8-1-3 Procedure 8-2
8-1-4 Indicators Used for the Loopback Test 8-3

8-2 Device Variable for CJ-series Unit (Loopback Test) 8-4
8-2-1 Device Variables for CJ-Series Unit for System Settings 8-4
8-2-2 Device Variables for CJ-Series Unit for Status 8-5

Section 9 Troubleshooting and Maintenance

9-1 Indicator Error Displays 9-2

9-2 Communications Status Error Notification 9-3
9-2-1 Status Area Error Information 9-3

9-3 Troubleshooting 9-4
9-3-1 Serial Gateway (Serial Gateway or Protocol Macro Mode) 9-4
9-3-2 No-protocol Mode 9-10
9-3-3 Protocol Macros 9-16
9-3-4 Modbus-RTU Slave Mode 9-22

9-4 Error Logs 9-25
9-4-1 Error Log Data 9-25
9-4-2 Error Contents and Details 9-26
9-4-3 Error Codes and Troubleshooting 9-28

9-5 Event Logs 9-30
9-5-1 Overview of the Event Logs 9-30
9-5-2 Error Table 9-30
9-5-3 Error Descriptions 9-36

9-6 Cleaning and Inspection 9-53
9-6-1 Cleaning 9-53
9-6-2 Inspection 9-53

9-7 Replacement Precautions 9-55
9-7-1 Precautions when Replacing Unit 9-55
9-7-2 Settings after Replacing Unit 9-55
9-7-3 Replacing the Unit 9-56

A Standard System Protocol

R-1 Reading Reference Documents....R-3
R-1-1 Using Standard System Protocols R-3
R-1-2 Standard System Protocols.... R-6

R-2 CompoWay/F Master Protocol....R-7
R-2-1 CompoWay/F R-7
R-2-2 Communications Specifications R-8
R-2-3 Transmission Procedure.... R-8
R-2-4 Command and Response Formats R-8
R-2-5 CompoWay/F Master Protocol Sequences R-12
R-2-6 CompoWay/F Message Frames and PMCR(260) Operands R-12
R-2-7 Send/Receive with ASCII Conversion and with Response R-13
R-2-8 Structure of the Protocol R-13
R-2-9 Connections R-38

R-3 Mitsubishi Computer Link Master (A-compatible 1C Frame, Model 1)R-41
R-3-1 Communications Specifications R-41
R-3-2 Command/Response Formats R-42
R-3-3 Command Frame Contents.... R-43
R-3-4 Mitsubishi Computer Link Master Protocol Sequences.... R-43
R-3-5 Structure of the Protocol R-43

R-4 V500/V520 Bar Code Reader Protocol R-65
R-4-1 Connections R-65
R-4-2 System Setting R-66
R-4-3 Protocol Configuration.... R-67

R-5 3Z4L Laser Micrometer Protocol....R-78
R-5-1 Connections R-78
R-5-2 List of Operations with Laser Micrometer (5000/6000 Series).... R-81
R-5-3 Protocol Configuration.... R-83

R-6 Hayes Modem AT Command Protocol R-117
R-6-1 Protocol Configuration.... R-117
R-6-2 Connections R-119
R-6-3 Compatible Modems R-119
R-6-4 Modem Settings R-120
R-6-5 Communication Errors R-125

Appendices

A-1 Differences in Available Functions Depending on the CPU Unit (NJ or CJ Series) A-2
A-1-1 Functional Differences A-2
A-1-2 Differences in Methods for Access from a User Program A-3

A-2 Version Information....A-12

Index

Read and Understand this Manual

Please read and understand this manual before using the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of a CJ-series Serial Communications Unit. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.
The following notation is used.

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Precautions for Safe Use
Indicates precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use
Indicates precautions on what to do and what not to do to ensure proper operation and performance.

Symbols

The circle and slash symbol indicates operations that you must not do.
The specific operation is shown in the circle and explained in text.
This example indicates prohibiting disassembly.

The triangle symbol indicates precautions (including warnings).
The specific operation is shown in the triangle and explained in text.
This example indicates a precaution for electric shock.

The triangle symbol indicates precautions (including warnings).
The specific operation is shown in the triangle and explained in text.
This example indicates a general precaution.

The filled circle symbol indicates operations that you must do.
The specific operation is shown in the circle and explained in text.
This example shows a general precaution for something that you must do.

⚠ WARNING

During Power Supply

Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

Do not attempt to take any Unit apart. In particular, high-voltage parts are present in the Power Supply Unit while power is supplied or immediately after power is turned OFF. Touching any of these parts may result in electric shock. There are sharp parts inside the Unit that may cause injury.

Fail-safe Measures

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, other Units, or slaves or due to other external factors affecting operation. Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

The Controller outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

The CPU Unit will turn OFF all outputs from Basic Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.

- If an error occurs in the power supply
- If the power supply connection becomes faulty
- If a CPU watchdog timer error or CPU reset occurs
- If a major fault level Controller error occurs
- While the CPU Unit is on standby until RUN mode is entered after the power is turned ON

External safety measures must be provided to ensure safe operation of the system in such cases.

If external power supplies for slaves or other devices are overloaded or short-circuited, the voltage will drop, outputs will turn OFF, and the system may be unable to read inputs. Provide external safety measures in controls with monitoring of external power supply voltage as required so that the system operates safely in such a case.

⚠ WARNING

Fail-safe Measures

Unintended outputs may occur when an error occurs in variable memory or in memory used for CJ-series Units. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

Provide measures in the communications system and user program to ensure safety in the overall system even if errors or malfunctions occur in data link communications or remote I/O communications.

If there is interference in remote I/O communications or if a major fault level error occurs, output status will depend on the products that are used. Confirm the operation that will occur when there is interference in communications or a major fault level error, and implement safety measures. Correctly set all of the EtherCAT slaves.

The NJ-series Controller continues normal operation for a certain period of time when a momentary power interruption occurs. This means that the NJ-series Controller may receive incorrect signals from external devices that are also affected by the power interruption. Accordingly, take suitable actions, such as external fail-safe measures and interlock conditions, to monitor the power supply voltage of the external device as required.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes. Not doing so may result in serious accidents due to incorrect operation.

Voltage and Current Inputs

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.
Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

Downloading

Always confirm safety at the destination before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio. The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.

⚠ Caution

Application

Do not touch any Unit when power is being supplied or immediately after the power supply is turned OFF. Doing so may result in burn injury.

Wiring

Be sure that all terminal screws and cable connector screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction.

Online Editing

Execute online editing only after confirming that no adverse effects will be caused by deviations in the timing of I/O. If you perform online editing, the task execution time may exceed the task period, I/O may not be refreshed with external devices, input signals may not be read, and output timing may change.

Precautions for Safe Use

Disassembly and Dropping

- Do not attempt to disassemble, repair, or modify any Units. Doing so may result in malfunction or fire.
- Do not drop any Unit or subject it to abnormal vibration or shock. Doing so may result in Unit malfunction or burning.

Mounting

- The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, and other Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.

Installation

- Always connect to a ground of 100 Ω or less when installing the Units. A ground of 100 Ω or less must be installed when shorting the GR and LG terminals on the Power Supply Unit.

Wiring

- Follow the instructions in this manual to correctly perform wiring.
  Double-check all wiring and switch settings before turning ON the power supply.
- Use crimp terminals for wiring.
  Do not connect bare stranded wires directly to terminals.
- Do not pull on the cables or bend the cables beyond their natural limit.
  Do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cables.
- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.
- Always remove any dustproof labels that are on the top of the Units when they are shipped before you turn ON the power supply. If the labels are not removed, heat will accumulate and malfunctions may occur.
- Before you connect a computer to the CPU Unit, disconnect the power supply plug of the computer from the AC outlet. Also, if the computer has an FG terminal, make the connections so that the FG terminal has the same electrical potential as the GR terminal on the Power Supply Unit. A difference in electric potential between the computer and Controller may cause failure or malfunction.
- If the external power supply to an Output Unit or slave has polarity, connect it with the correct polarity. If the polarity is reversed, current may flow in the reverse direction and damage the connected devices regardless of the operation of the Controller.

Power Supply Design

- Do not exceed the rated supply capacity of the Power Supply Units in the NJ-series Controller. The rated supply capacities are given in the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
  If the capacity is exceeded, operation may stop, malfunctions may occur, or data may not be backed up normally for power interruptions.
  Use NJ-series Power Supply Units for both the NJ-series CPU Rack and Expansion Racks.
  Operation is not possible if a CJ-series Power Supply Unit is used with an NJ-series CPU Unit or an NJ-series Power Supply Unit is used with a CJ-series CPU Unit.

- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum ratings.
- Surge current occurs when the power supply is turned ON. When selecting fuses or breakers for external circuits, consider the above precaution and allow sufficient margin in shut-off performance. Refer to the relevant manuals for surge current specifications. Refer to the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) for surge current specifications.
- If the full dielectric strength voltage is applied or turned OFF using the switch on the tester, the generated impulse voltage may damage the Power Supply Unit. Use the adjustment on the tester to gradually increase and decrease the voltage.
- Apply the voltage between the Power Supply Unit's L1 or L2 terminal and the GR terminal when testing insulation and dielectric strength.
- Do not supply AC power from an inverter or other device with a square-wave output. Internal temperature rise may result in smoking or burning. Always input a sinusoidal wave with the frequency that is given in the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
- Install external breakers and take other safety measures against short-circuiting in external wiring.

Turning ON the Power Supply

- It takes up to approximately 10 to 20 s to enter RUN mode after the power is turned ON. During that time, outputs will be OFF or will be the values specified in the Unit or slave settings, and external communications cannot be performed. Use the RUN output on the Power Supply Unit, for example, to implement fail-safe circuits so that external devices do not operate incorrectly.
- Configure the external circuits so that the power supply to the control system turns ON only after the power supply to the Controller has turned ON. If the power supply to the Controller is turned ON after the control power supply, temporary errors may result in incorrect control system signals because the output terminals on Output Units may momentarily turn ON when power supply is turned ON to the Controller.
- If you transfer data from a backup file on an SD Memory Card to the Controller when the power supply is turned ON, properly select the data groups to transfer. If the data for an unintended data group is transferred to the Controller, it may cause the equipment to operate unpredictably.

Actual Operation

- Check the user program, data, and parameter settings for proper execution before you use them for actual operation.

Turning OFF the Power Supply

- Never turn OFF the power supply to the Controller when the BUSY indicator is flashing. While the BUSY indicator is lit, the user program and settings in the CPU Unit are being backed up in the built-in non-volatile memory. This data will not be backed up correctly if the power supply is turned OFF. Also, a major fault level Controller error will occur the next time you start operation, and operation will stop.
- Do not turn OFF the power supply or remove the SD Memory Card while SD Memory Card access is in progress (i.e., while the SD BUSY indicator flashes). Data may become corrupted, and the Controller will not operate correctly if it uses corrupted data. To remove the SD Memory Card from the CPU Unit while the power supply is ON, press the SD Memory Card power supply switch and wait for the SD BUSY indicator to turn OFF before you remove the SD Memory Card.
- Do not disconnect the cable or turn OFF the power supply to the Controller when downloading data or the user program from Support Software.
- Always turn OFF the power supply to the Controller before you attempt any of the following.
  - Mounting or removing I/O Units or the CPU Unit
  - Assembling the Units
  - Setting DIP switches or rotary switches

- Connecting cables or wiring the system
- Connecting or disconnecting the connectors

The Power Supply Unit may continue to supply power to the rest of the Controller for a few seconds after the power supply turns OFF. The PWR indicator is lit during this time. Confirm that the PWR indicator is not lit before you perform any of the above.

Operation

- Confirm that no adverse effect will occur in the system before you attempt any of the following.
  - Changing the operating mode of the CPU Unit (including changing the setting of the Operating Mode at Startup)
  - Changing the user program or settings
  - Changing set values or present values
  - Forced refreshing
- Always sufficiently check the safety at the connected devices before you change the settings of an EtherCAT slave or Special Unit.
- If two different function modules are used together, such as when you use CJ-series Basic Output Units and EtherCAT slave outputs, take suitable measures in the user program and external controls to ensure that safety is maintained in the controlled system if one of the function modules stops. The relevant outputs will stop if a partial fault level error occurs in one of the function modules.
- Always confirm safety at the connected equipment before you reset Controller errors with an event level of partial fault or higher for the EtherCAT Master Function Module.
  When the error is reset, all slaves that were in any state other than Operational state due to a Controller error with an event level of partial fault or higher (in which outputs are disabled) will go to Operational state and the outputs will be enabled.
  Before you reset all errors, confirm that no Controller errors with an event level of partial fault have occurred for the EtherCAT Master Function Module.
- Always confirm safety at the connected equipment before you reset Controller errors for a CJ-series Special Unit. When a Controller error is reset, the Unit where the Controller error with an event level of observation or higher will be restarted.
  Before you reset all errors, confirm that no Controller errors with an event level of observation or higher have occurred for the CJ-series Special Unit. Observation level events do not appear on the Controller Error Tab Page, so it is possible that you may restart the CJ-series Special Unit without intending to do so.
  You can check the status of the *_CJB_UnitErrSta[0,0]* to *_CJB_UnitErrSta[3,9]* error status variables on a Watch Tab Page to see if an observation level Controller error has occurred.

Battery Backup

- The user program and initial values for the variables are stored in non-volatile memory in the CPU Unit. The present values of variables with the Retain attribute and the values of the Holding, DM, and EM Areas in the memory used for CJ-series Units are backed up by a Battery. If the Battery is not connected or the Battery is exhausted, the CPU Unit detects a Battery-backup Memory Check Error. If that error is detected, variables with a Retain attribute are set to their initial values and the Holding, DM, and EM Areas in memory used for CJ-series Units are cleared to all zeros. Perform thorough verifications and provide sufficient measures to ensure that the devices perform safe operation for the initial values of the variables with Retain attributes and the resulting operation.

Debugging

- Forced refreshing ignores the results of user program execution and refreshes I/O with the specified values. If forced refreshing is used for inputs for which I/O refreshing is not supported, the inputs will first take the specified values, but they will then be overwritten by the user program. This operation differs from the force-set/reset functionality of the CJ-series PLCs.

- You cannot upload or download information for forced refreshing with the Sysmac Studio.
  After downloading data that contains forced refreshing, change to RUN mode and then use the Sysmac Studio to perform the operation for forced refreshing.
  Depending on the difference in the forced status, the control system may operate unexpectedly.
- Do not specify the same address for the AT specification for more than one variable.
  Doing so would allow the same entity to be accessed with different variable names, which would make the user program more difficult to understand and possibly cause programming mistakes.

General Communications

- When you use data link communications, check the error information that is given in *ErrSta* (Controller Error Status) to make sure that no error has occurred in the source device. Write the user program to use the received data only if there is no error. If there is an error in the source device, the data for the data link may contain incorrect values.
- Unexpected operation may result if inappropriate data link tables are set. Even if appropriate data link tables have been set, confirm that the controlled system will not be adversely affected before you transfer the data link tables. The data links start automatically after the data link tables are transferred.
- All CPU Bus Units are restarted when routing tables are transferred from Support Software to the CPU Unit. Confirm that the system will not be adversely affected by restarting before you transfer the routing tables.
- Tag data links will stop between related nodes while tag data link parameters are transferred during Controller operation. Confirm that the system will not be adversely affected before you transfer the tag data link parameters.

EtherNet/IP Communications

- All related EtherNet/IP nodes are reset when you transfer settings for the built-in EtherNet/IP port (including IP addresses and tag data links settings). Confirm that the system will not be adversely affected by resetting nodes before you transfer the settings.
- If EtherNet/IP tag data links (cyclic communications) are used with a repeating hub, the communications load on the network will increase. This will increase collisions and may prevent stable communications. Do not use repeating hubs on networks where tag data links are used. Use an Ethernet switch instead.

EtherCAT Communications

- Make sure that the communications distance, number of nodes connected, and method of connection for EtherCAT are within specifications.
  Do not connect EtherCAT communications to EtherNet/IP, a standard in-house LAN, or other networks. An overload may cause the network to fail or malfunction.
- Malfunctions or unexpected operation may occur for some combinations of EtherCAT revisions of the master and slaves. If you disable the revision check in the network settings, use the Sysmac Studio to check the slave revision settings in the master and the actual slave revisions, and then make sure that functionality is compatible in the slave manuals or other references. You can check the actual slave revisions from the Sysmac Studio or on slave nameplates.
- After you transfer the user program, the CPU Unit is restarted and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration. If the EtherCAT network configuration contains only OMRON EtherCAT slaves, communications are cut off for a maximum of 45 seconds.
  Before you transfer the user program, confirm that the system will not be adversely affected.

- If the Fail-soft Operation parameter is set to stop operation, process data communications will stop for all slaves when an EtherCAT communications error is detected in a slave. For this reason, if Servo Drives are connected, the Servos for all axes will be turned OFF. Make sure that the Fail-soft Operation parameter setting results in safe operation when a device error occurs.
- EtherCAT communications are not always established immediately after the power supply is turned ON. Use the system-defined variables in the user program to confirm that communications are established before attempting control operations.
- If frames sent to EtherCAT slaves are lost due to noise or other causes, slave I/O data is not communicated, and the intended operation is sometimes not achieved. If noise countermeasures are required, use the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.
  The slave outputs behave according to the slave settings. Refer to the manuals for the slaves for details.
- When an EtherCAT slave is disconnected, communications will stop and control of the outputs will be lost not only for the disconnected slave, but for all slaves connected after it. Confirm that the system will not be adversely affected before you disconnect a slave.
- If you disconnect the cable from an EtherCAT slave to disconnect it from the network, any current communications frames may be lost. If frames are lost, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing for a slave that needs to be replaced.
  Program the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition.
  Set the Impermissible Number of Continuous Timeouts setting in the EtherCAT master to at least 2.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.

Motion Control

- Confirm the axis number carefully before you perform an MC Test Run.
- The motor is stopped if communications are interrupted between the Sysmac Studio and the CPU Unit during an MC Test Run. Connect the communications cable between the computer and CPU Unit securely and confirm that the system will not be adversely affected before you perform an MC Test Run.
- Always execute the Save Cam Table instruction if you change any of the cam data from the user program in the CPU Unit or from the Sysmac Studio. If the cam data is not saved, the previous condition will be restored when the power is turned ON again, possibly causing unexpected machine operation.
- The positive drive prohibit input (POT), negative drive prohibit input (NOT), and home proximity input (DEC) of the Servo Drive are used by the MC Function Module as the positive limit input, negative limit input, and home proximity input. Make sure that the signal widths for all of these input signals are longer than the control period of the MC Function Module. If the input signal widths are shorter than the control period, the MC Function Module may not be able to detect the input signals, resulting in incorrect operation.

Battery Replacement

- The Battery may leak, rupture, heat, or ignite. Never short-circuit, charge, disassemble, heat, or incinerate the Battery or subject it to strong shock.
- Dispose of any Battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.
- UL standards require that only an experienced engineer replace the Battery. Make sure that an experienced engineer is in charge of Battery replacement.
- Apply power for at least five minutes before changing the Battery. Install a new Battery within five minutes (at 25°C) of turning OFF the power supply. If power is not supplied for at least 5 minutes, the saved data may be lost.

Unit Replacement

- We recommend replacing the Battery with the power turned OFF to prevent the CPU Unit's sensitive internal components from being damaged by static electricity and to prevent malfunctions. The Battery can be replaced without turning OFF the power supply. To do so, always touch a grounded piece of metal to discharge static electricity from your body before you start the procedure.
  After you replace the Battery, connect the Sysmac Studio and clear the Low Battery Voltage error.
- Make sure that the required data, including the user program, configurations, settings, variables, and memory used for CJ-series Units, is transferred to a CPU Unit that was replaced and to externally connected devices before restarting operation.
  Be sure to include the routing tables, network parameters, and other CPU Bus Unit data, which are stored in the CPU Unit.

Disposal

- Dispose of the product and Batteries according to local ordinances as they apply.

- The following information must be displayed for all products that contain primary lithium batteries with a perchlorate content of 6 ppb or higher when shipped to or transported through the State of California, USA.
  Perchlorate Material - special handling may apply.
  See www.dtsc.ca.gov/hazardouswaste/perchlorate.
- The CPU Unit contains a primary lithium battery with a perchlorate content of 6 ppb or higher. Place the above information on the individual boxes and shipping boxes when shipping finished products that contain a CPU Unit to the State of California, USA.

Using Serial Communications Unit

- When connecting RS-422A/485, always check the polarity before you make connections. The signal names SDA/B and RDA/B do not always have the same polarity.
- Do not turn OFF the power supply while writing the protocol macro data.
- Do not connect the 5-V power supply on pin 6 of the RS-232C port on the Unit to any external device other than an NT-AL001 Link Adapter. Otherwise, the external device and the Serial Communications Unit may be damaged.
- Use the OMRON Cables specified in this manual or make your own cables. Do not use commercially available RS-232C cables sold for personal computers. Otherwise, the external device and the Serial Communications Unit may be damaged.
- When the Serial Gateway is executed during protocol macro execution, the communications sequence contents and the command reception timing may suspend step transition of the communications. Use the Serial Gateway send start timeout function to monitor at the command source whether step transition in the communications sequence was suspended due to execution of Serial Gateway. If sending of he command of each protocol does not start within the set time, either retry execution of the command or change the communications sequence.
- When you use 2-wire RS-422A/485 communications in Protocol Macro Mode, set only modem controls for the transmission control parameters, and do not use RS/CS flow controls.
- An instruction error will occur if you execute the SerialSend, SerialRcv, or SerialRcvNoClear instruction for a serial communications port that is in any mode other than No-protocol Mode.

Precautions for Correct Use

Storage, Mounting, and Wiring

- Do not operate or store the Controller in the following locations. Operation may stop or malfunctions may occur.
  - Locations subject to direct sunlight
  - Locations subject to temperatures or humidity outside the range specified in the specifications
  - Locations subject to condensation as the result of severe changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust (especially iron dust) or salts
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Take appropriate and sufficient countermeasures when installing the Controller in the following locations.
  - Locations subject to strong, high-frequency noise
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong electromagnetic fields
  - Locations subject to possible exposure to radioactivity
  - Locations close to power lines
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Install the Controller away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- An I/O bus check error will occur and the Controller will stop if an I/O Connecting Cable's connector is disconnected from the Rack. Be sure that the connectors are secure.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.
- Do not allow wire clippings, shavings, or other foreign material to enter any Unit. Otherwise, Unit burning, failure, or malfunction may occur. Cover the Units or take other suitable countermeasures, especially during wiring work.
- For EtherCAT and EtherNet/IP, use the connection methods and cables that are specified in the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) and the *NJ-series CPU Unit Built-in EtherNet/IP Port User's Manual* (Cat. No. W506). Otherwise, communications may be faulty.
- Use the rated power supply voltage for the Power Supply Units. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Make sure that the current capacity of the wire is sufficient. Otherwise, excessive heat may be generated. When cross-wiring terminals, the total current for all the terminals will flow in the wire. When wiring cross-overs, make sure that the current capacity of each of the wires is not exceeded.
- Do not touch the terminals on the Power Supply Unit immediately after turning OFF the power supply. Residual voltage may cause electrical shock.
- If you use reed switches for the input contacts for AC Input Units, use switches with a current capacity of 1 A or greater.
  If the capacity of the reed switches is too low, surge current may fuse the contacts.

Error Processing

- In applications that use the results of instructions that read the error status, consider the affect on the system when errors are detected and program error processing accordingly. For example, even the detection of a minor error, such as Battery replacement during operation, can affect the system depending on how the user program is written.
- If you change the event level of a Controller error, the output status when the error occurs may also change. Confirm safety before you change an event level.

Restoring and Automatically Transferring Data

- When you edit the restore command file or the automatic transfer command file, do not change anything in the file except for the “yes” and “no” specifications for the selectable data groups. If you change anything else in the file, the Controller may perform unexpected operation when you restore or automatically transfer the data.

Unit Replacement

- If you replace a CPU Bus Unit or Special I/O Unit, refer to operation manual for the Unit for information on the data required for individual Units and redo the necessary settings.
- The absolute encoder home offset is backed up with a Battery in the CPU Unit.
  When you change the combination of the CPU Unit and Servomotor, e.g., when you add or replace a Servomotor, define home again.
  To restore the information without changing the CPU Unit-Servomotor combination, remove the absolute encoder home offset from the data to restore.

Task Settings

- If a Task Period Exceeded error occurs, shorten the programs to fit in the task period or increase the setting of the task period.

Motion Control

- Use the system-defined variable in the user program to confirm that EtherCAT communications are established before you attempt to execute motion control instructions. Motion control instructions are not executed normally if EtherCAT communications are not established.
- Use the system-defined variables to monitor for errors in communications with the slaves that are controlled by the motion control function module. Motion control instructions are not executed normally if an error occur in slave communications.
- Before you start an MC Test Run, make sure that the operation parameters are set correctly.
- Do not download motion control settings during an MC Test Run.

EtherCAT Communications

- Do not disconnect the EtherCAT slave cables during operation. The outputs will become unstable.
- Set the Servo Drives to stop operation if an error occurs in EtherCAT communications between the Controller and a Servo Drive.
- Make sure that all of the slaves to be restored are participating in the network before you reset a Network Configuration Verification Error, Process Data Communications Error, or Link OFF Error in the EtherCAT Master Function Module. If any slave is not participating when any of these errors is reset, the EtherCAT Master Function Module may access slave with a different node address than the specified node address or the error may not be reset correctly.

Battery Replacement

- Be sure to install a replacement Battery within two years of the production date shown on the Battery label.
- Turn ON the power after replacing the Battery for a CPU Unit that has been unused for a long time. Leaving the CPU Unit unused again without turning ON the power even once after the Battery is replaced may result in a shorter Battery life.
- When you replace the Battery, use the CJ1W-BAT01 Battery Set.

SD Memory Cards

- Insert the SD Memory Card all the way.
- Do not turn OFF the power supply to the Controller during SD Memory Card access. The files may be corrupted.
  If there is a corrupted file in the SD Memory Card, the file is automatically deleted by the restoration function when the power supply is turned ON.

Regulations and Standards

Conformance to EC Directives

Applicable Directives

- EMC Directives
- Low Voltage Directive

Concepts

● EMC Directive

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*
Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

* Applicable EMC (Electromagnetic Compatibility) standards are as follows:
EMS (Electromagnetic Susceptibility): EN 61131-2 and EN 61000-6-2
EMI (Electromagnetic Interference): EN 61131-2 and EN 61000-6-4 (Radiated emission: 10-m regulations)

● Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61131-2.

● Conformance to EC Directives

The NJ-series Controllers comply with EC Directives. To ensure that the machine or device in which the NJ-series Controller is used complies with EC Directives, the Controller must be installed as follows:

- The NJ-series Controller must be installed within a control panel.
- You must use reinforced insulation or double insulation for the DC power supplies connected to DC Power Supply Units and I/O Units.
- NJ-series Controllers that comply with EC Directives also conform to the Common Emission Standard (EN 61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.
  You must therefore confirm that the overall machine or equipment complies with EC Directives.

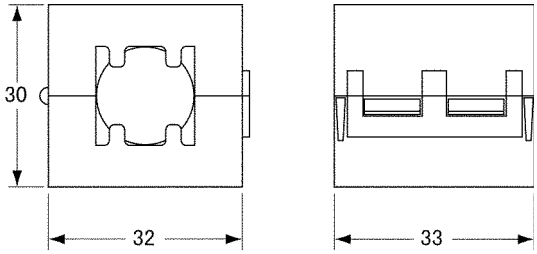
EMI Measures for Serial Communications Boards and Units

The CS/CJ-series PLCs conform to the Common Emission Standards (EN 61000-6-4 or EN 61131-2) of the EMC Directives. However, the noise generated from Serial Communications Board or Unit communications cables may not satisfy these standards. In such a case, commercially available ferrite cores must be placed on the communications cable or other appropriate countermeasures must be provided external to the PLC.

● Recommended Ferrite Cores

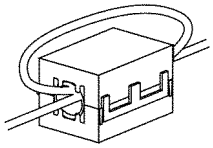
The following ferrite core (data line noise filter) is recommended:

0443-164151 by Fair-Rite Products Corp.
Low impedance, 25 MHz: 90 Ω, 100 MHz: 160 Ω

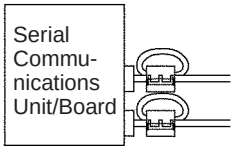


● Recommended Mounting Method

Mount the core on one turn of the communications cable, as shown in the following illustration.



Mount the cores as lost to the end of the communications cable as possible, as shown in the following illustration.



Conformance to Shipbuilding Standards

The NJ-series Controllers comply with the following shipbuilding standards. Applicability to the shipbuilding standards is based on certain usage conditions. It may not be possible to use the product in some locations. Contact your OMRON representative before attempting to use a Controller on a ship.

Usage Conditions for NK and LR Shipbuilding Standards

- The NJ-series Controller must be installed within a control panel.
- Gaps in the door to the control panel must be completely filled or covered with gaskets or other material.
- The following noise filter must be connected to the power supply line.

Noise Filter

Manufacturer	Model
Cosel Co., Ltd.	TAH-06-683

Trademarks

- Sysmac and SYSMAC are trademarks or registered trademarks of OMRON Corporation in Japan and other countries for OMRON factory automation products.
- Windows, Windows 98, Windows XP, Windows Vista, and Windows 7 are registered trademarks of Microsoft Corporation in the USA and other countries.
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- The SD logo is a trademark of SD-3C, LLC.

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Unit Versions

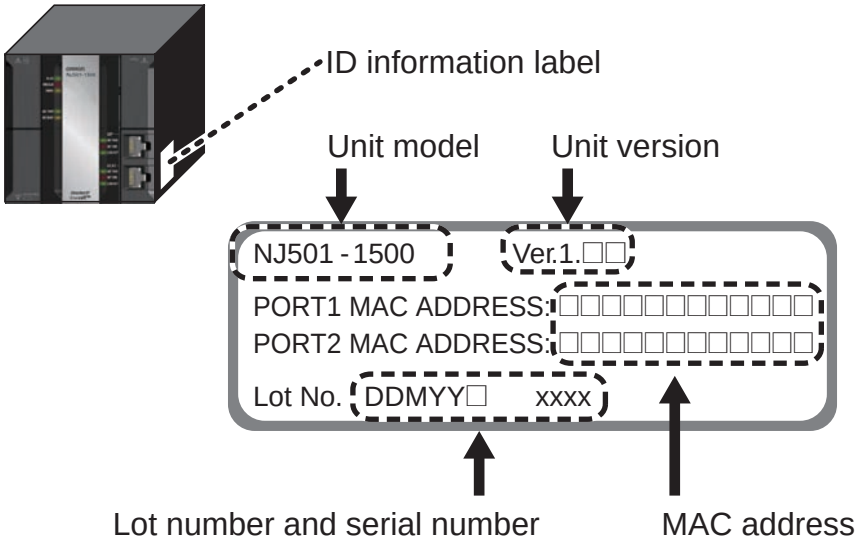
Unit Versions

A "unit version" has been introduced to manage CPU Units in the NJ Series according to differences in functionality accompanying Unit upgrades.

Notation of Unit Versions on Products

The unit version is given on the ID information label of the products for which unit versions are managed, as shown below.

Example for NJ-series NJ501-□□□□ CPU Unit:



The following information is provided on the ID information label.

Item	Description
Unit model	Gives the model of the Unit.
Unit version	Gives the unit version of the Unit.
Lot number and serial number	Gives the lot number and serial number of the Unit. DDMYY: Lot number, □: For use by OMRON, xxxx: Serial number "M" gives the month (1 to 9: January to September, X: October, Y: November, Z: December)
MAC address	Gives the MAC address of the built-in port on the Unit.

Confirming Unit Versions with Sysmac Studio

You can use the Unit Production Information on the Sysmac Studio to check the unit version of the CPU Unit, CJ-series Special I/O Units, CJ-series CPU Bus Units, and EtherCAT slaves. The unit versions of CJ-series Basic I/O Units cannot be checked from the Sysmac Studio.

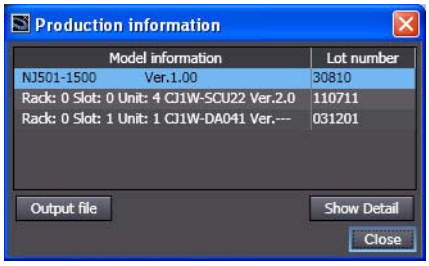
● CPU Unit and CJ-series Units

1 Double-click **CPU/Expansion Racks** under **Configurations and Setup** in the Multiview Explorer. Or, right-click **CPU/Expansion Racks** under **Configurations and Setup** and select ***Edit*** from the menu.

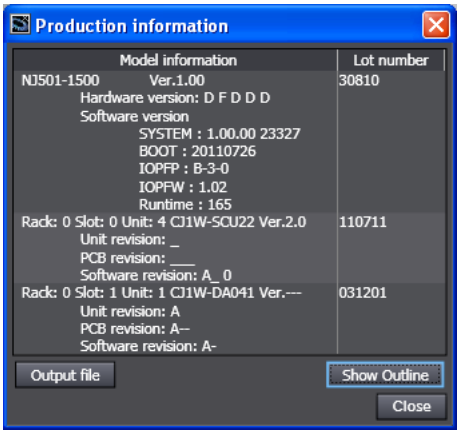
The Unit Editor is displayed for the Controller Configurations and Setup layer.

2 Right-click any open space in the Unit Editor and select ***Production Information***.

The Production Information Dialog Box is displayed.



Simple Display



Detailed Display

In this example, "Ver.1.00" is displayed next to the unit model.

The following items are displayed.

CPU Unit	CJ-series Units
Unit model	Unit model
Unit version	Unit version
Lot number	Lot number
	Rack number, slot number, and unit number

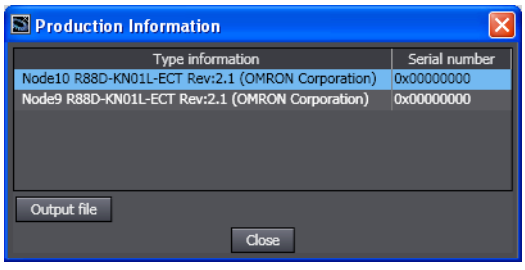
● EtherCAT Slaves

1 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer. Or, right-click **EtherCAT** under **Configurations and Setup** and select ***Edit*** from the menu.

The EtherCAT Configuration Tab Page is displayed for the Controller Configurations and Setup layer.

2 Right-click the master in the EtherCAT Configurations Editing Pane and select **Display Production Information**.

The Production Information Dialog Box is displayed.



The following items are displayed.
Node address
Type information*
Serial number

* If the model number cannot be determined (such as when there is no ESI file), the vendor ID, product code, and revision number are displayed.

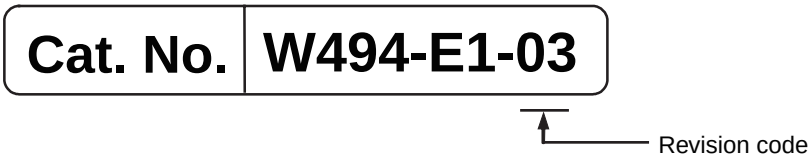
Related Manuals

The following manuals are related to the NJ-series Controllers. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection Use this manual together with the *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series CPU Unit Software User's Manual	W501	NJ501-□□□□ NJ301-□□□□	Learning how to program and set up an NJ-series CPU Unit. Mainly software information is provided.	The following information is provided on a Controller built with an NJ501 CPU Unit. • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.
CJ-series Serial Communications Units Operation Manual for NJ-series CPU Unit (this manual)	W494	CJ1W-SCU□2	Learning about the functions to use Serial Communications Unit and Boards with NJ series configuration (hardware and serial communications mode). Learning about the standard system protocol with OMRON components	Describes the use of Serial Communications Unit and Boards with NJ-series configuration (hardware and serial communications mode), including the usage of standard system protocols. Refer to the CX-Protocol Operation Manual (Cat. No. W344) for the details of functions of protocol macros made by users.
Serial Communications Boards and Serial Communications Units Operation Manual	W336	CS1W-SCB□1-V1 CS1W-SCU□1-V1 CJ1W-SCU□1-V1 CJ1W-SCU□2	Learning about the functions to use Serial Communications Unit and Boards (hardware and serial communications mode) . Learning about the standard system protocol with OMRON components	Describes the use of Serial Communications Unit and Boards with CJ-series configuration (hardware and serial communications mode), including the usage of standard system protocols. Refer to the CX-Protocol Operation Manual (Cat. No. W344) for the details of functions of protocol macros made by users.
CX-Protocol Version 1.9 Operation Manual	W344	---	Learning about the use of CX-Protocol, which enables protocol macro creation. Learning about the details of functions of protocol macros made by users.	Describes 1) the use of the CX-Protocol, and 2) details on protocol macros. Use this manual to create protocol macros for serial communications, or to customize the standard system protocol.
CX-Integrator CS/CJ/CP/NSJ-series Network Configuration Tool Operation Manual	W464		Learning how to configure networks (data links, routing tables, Communications Unit settings, etc.).	Describes operating procedures for the CX-Integrator.

Revision History

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



Revision code	Date	Revised content
01	July 2011	Original production
02	March 2012	Corrected errors.
03	August 2012	Made changes accompanying the upgrade to unit version 2.1.

1

Introduction

This section introduces the hardware and software functions of the Serial Communications Boards and the Serial Communications Units, including the communications modes, system configurations, and specifications.

1-1 Using this Manual 1-2

1-2 Overview 1-3

1-3 Protocol Overview 1-5

1-3-1 Protocol Macros 1-6

1-3-2 Loopback Test 1-6

1-3-3 Serial Gateway Mode 1-6

1-3-4 No-protocol Mode 1-7

1-3-5 Modbus-RTU Slave Mode 1-7

1-4 Features 1-8

1-4-1 Serial Communications Units 1-8

1-4-2 Protocols 1-8

1-5 System Configurations 1-10

1-5-1 Protocol Macro, Serial Gateway, No-protocol, or Modbus-RTU Slave 1-10

1-6 Specifications 1-14

1-6-1 Serial Communications Unit 1-14

1-6-2 General Specifications 1-15

1-7 Selecting the Serial Communications Mode 1-22

1-8 Basic Operating Procedure 1-23

1-8-1 Overview 1-23

1-8-2 Explanation of Procedure 1-24

1-1 Using this Manual

This manual provides information in the table below as would be required in actual applications. You should read *Section 1 Introduction* first. Then read information in the rest of the manual and related manuals as required by your specific application.

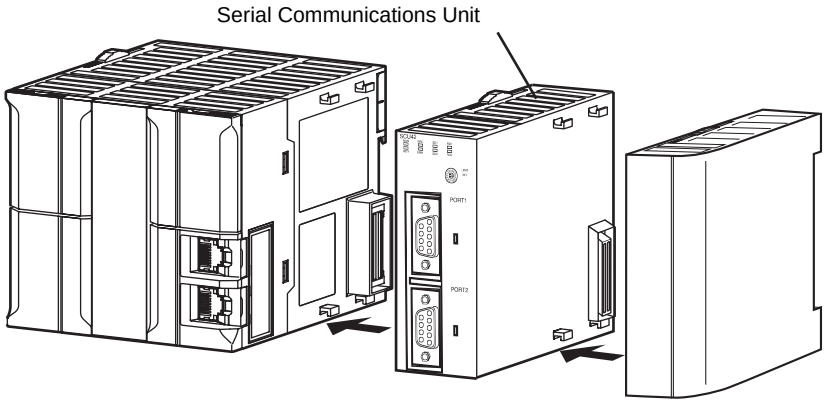
Information	Section	Item
Overview and appearance of the Unit	1 Introduction	*1-2 Overview* *2-1 Component Names and Functions*
Overview, features, and specifications of serial communications modes		*1-3 Protocol Overview* *1-4 Features* *1-6 Specifications*
Basic procedures and operations		*1-8 Basic Operating Procedure*
Selecting serial communications modes		*1-7 Selecting the Serial Communications Mode*
System configurations for serial communications modes		*1-5 System Configurations*
Allocations of device variables for CJ-series Units to the Unit and related system-defined variables	2 Initial Settings and Allocations of Device Variable for CJ-series Unit	*2-2 Data Exchange with the CPU Unit* *2-3 Device Variable for CJ-series Unit* *2-4 System-defined Variable*
Installing and wiring the Unit	3 Installation and Wiring	---
Allocations of device variables for CJ-series Units in each serial communications mode	4 Using Protocol Macros 5 Serial Gateway 6 No-protocol Mode 7 Using Modbus-RTU Slave Mode 8 Loopback Test	*4-2 Device Variables for CJ-series Unit and System-defined Variables (Protocol Macro Mode)* *5-2 Device Variables for CJ-series Unit and System-defined Variables (During Serial Gateway Mode)* *6-2 Device Variables for CJ-series Unit and System-defined Variables (No-protocol Mode)* *7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode)* *8-2 Device Variable for CJ-series Unit (Loopback Test)*
Ladder diagram programming in protocol macros	4 Using Protocol Macros	*4-3 Using Protocol Macros*
Loopback tests for communications ports	8 Loopback Test	
Troubleshooting and maintenance	9 Troubleshooting and Maintenance	---
The contents of standard system protocols and connection methods to OMRON components	Ref A Standard System Protocol	---
Details on the protocol macro function	*CX-Protocol Ver.1.9 OPERATION Manual* (Cat.No. W344)	

1-2 Overview

This section gives an overview of the Serial Communications Unit.

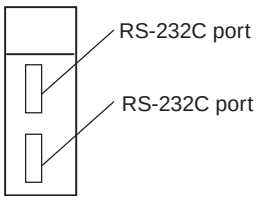
The Serial Communications Units are CJ-series CPU Bus Units. You can mount one or more Units to an NJ-series CPU Rack or an CJ-series Expansion Rack. You can control a total of up to 16 CPU Bus Units by one CPU Unit. (Serial Communications Units is abbreviated to Units in some sections of this manual.)

A Serial Communications Unit has two communications ports to connect with host computers, general-purpose external devices or support software. The Units allow easy expansion of ports for serial communications.

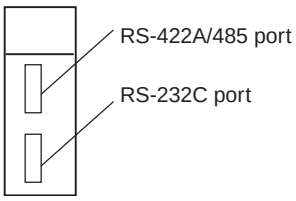


● Models

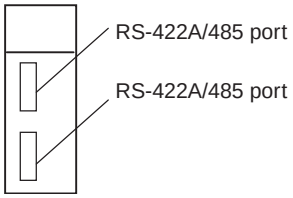
CJ1W-SCU22
(Two RS-232C ports)



CJ1W-SCU42
(One RS-232C and One RS-422A/485 Port)

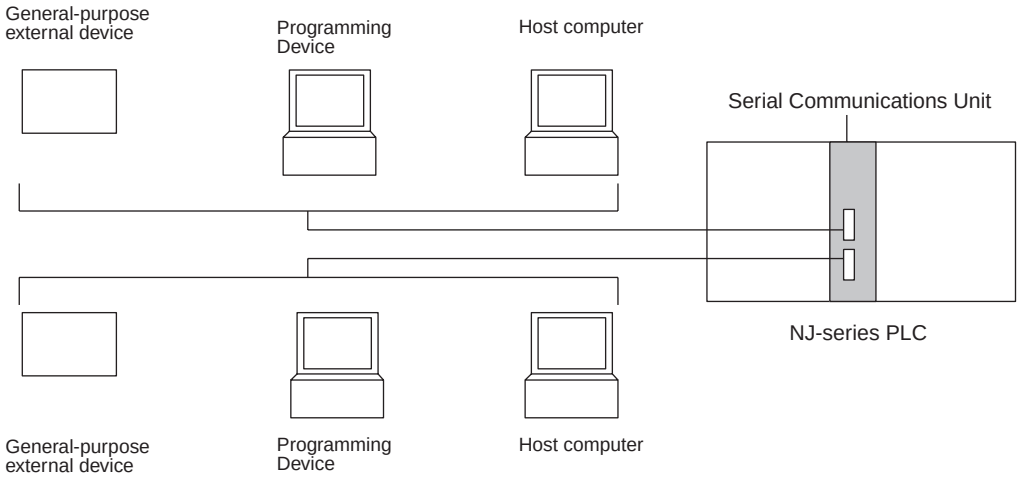


CJ1W-SCU32
(Two RS-422A/485 ports)

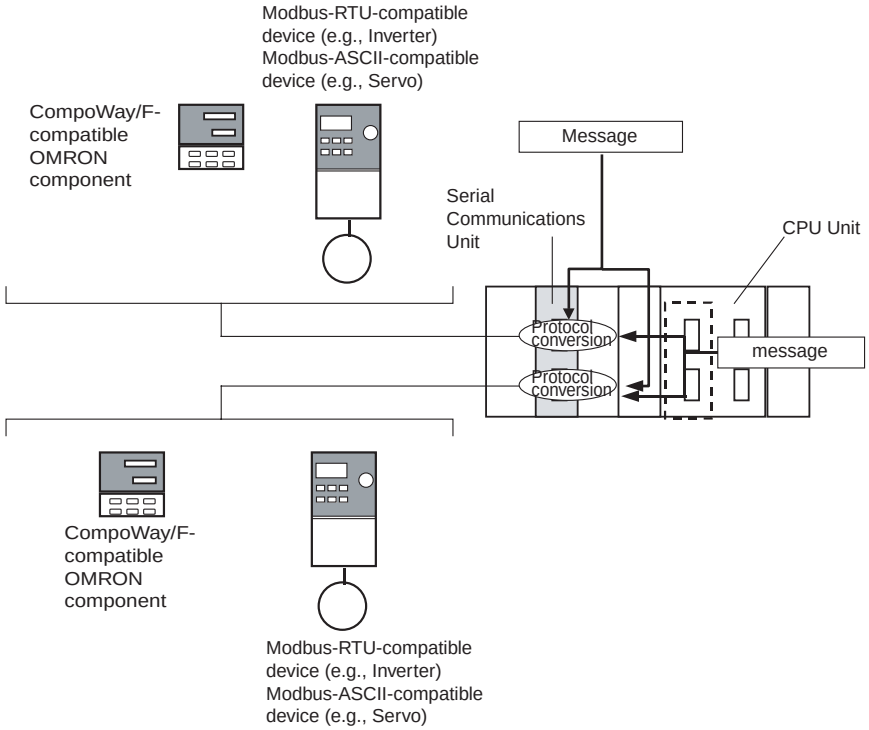


Connectable Devices

The following serial communications modes are supported by the Serial Communications Units: Protocol Macro, No-protocol, Modbus-RTU Slave, and Loopback Test Modes. You can also connect the devices shown in the following diagram.



There is another serial communications mode, Serial Gateway, which enables connection with the following devices.



1-3 Protocol Overview

A Serial Communications Unit is a CPU Bus Unit that provides RS-232C or RS-422A/485 serial communications ports. You can use the following five serial communications modes as required for each serial communications port.

- Protocol Macro: For communications between PLCs and general-purpose external devices
- Serial Gateway
- No-protocol
- Modbus-RTU Slave
- Loopback Test: For testing the communications ports

The Serial Gateway can also be executed in Protocol Macro Mode.

Modbus-ASCII Slave Mode is not supported.

Product	Model number	Serial ports	Serial communications mode					
			Protocol Macro	Loopback Test	Serial Gateway	Serial Gateway in Protocol Macro Mode	No-protocol	Modbus-RTU Slave
Serial Communications Unit	CJ1W-SCU22	RS-232C	OK	OK	OK	OK	OK	OK
		RS-232C	OK	OK	OK	OK	OK	OK
	CJ1W-SCU32	RS-422A/485	OK	OK	OK	OK	OK	OK
		RS-422A/485	OK	OK	OK	OK	OK	OK
	CJ1W-SCU42	RS-422A/485	OK	OK	OK	OK	OK	OK
		RS-232C	OK	OK	OK	OK	OK	OK
Device to be connected			General-purpose external device	None	Depends on the protocol used at the conversion destination		General-purpose external device	Host Link computer

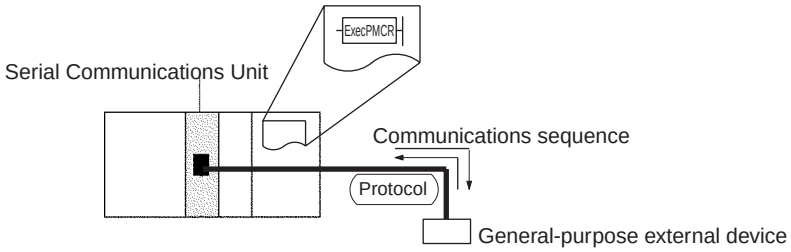
A connection example for each serial communications mode is shown in the following sections for a Serial Communications Unit.

1-3-1 Protocol Macros

In Protocol Macro Mode. the Serial Communications Unit uses the data transfer procedures (protocols) that are created by CX-Protocol to communicate with general-purpose external devices. The protocols can be created so as to match the communications specifications (half-duplex or full-duplex, and start-stop synchronization) of external devices.

These protocols are stored in the Serial Communications Unit, and enable data to be exchanged with general-purpose external devices simply through execution of the ExecPMCR instruction in the CPU Unit.

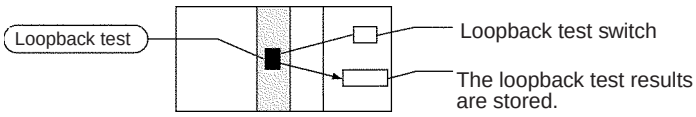
Standard system protocols to exchange data with OMRON devices (such as Temperature Controllers, Intelligent Signal Processors, Bar Code Readers, and Modems) are provided as a standard feature in the CX-Protocol and the Serial Communications Unit. You can also use CX-Protocol to change the standard system protocols according to user requirements.



1-3-2 Loopback Test

The loopback test is a testing function for communications circuits. The Serial Communications Unit compares transmitted data and loopback data. To perform loopback tests, connect a loopback wire connector to the port of the Serial Communications Unit.

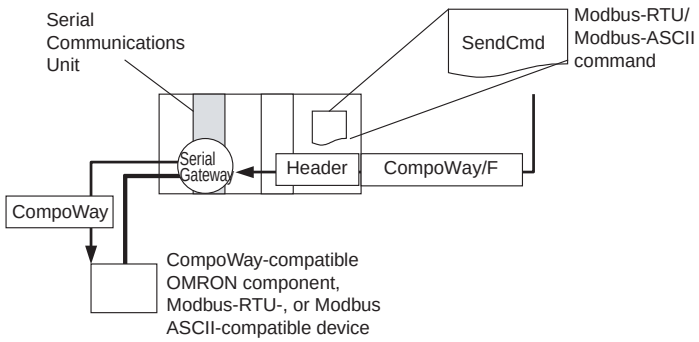
This loopback test is performed inside the specified serial communications port. It is not a loopback test using the RS-232C or RS-422A/485 communications path.



1-3-3 Serial Gateway Mode

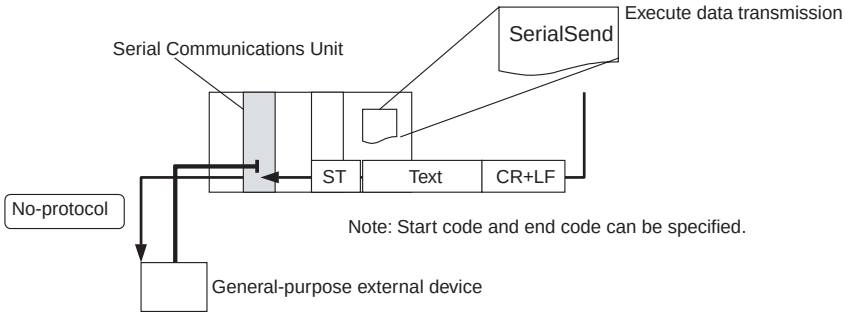
The received message is automatically converted to either CompoWay/F, Modbus-RTU, or Modbus-ASCII, depending on the type of message.

● CompoWay/F, Modbus-RTU, and Modbus-ASCII



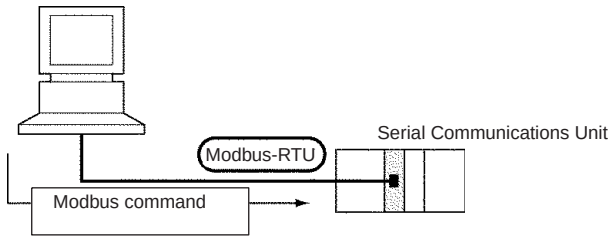
1-3-4 No-protocol Mode

No-protocol Mode enables you to receive or send data by using serial port output or input instructions. Data is sent and received by using the SerialSend, SerialRcv, and SerialRcvNoClear instructions. Use the No-protocol Mode when the data send and receive protocols are created by the user, or when a Serial Communications Unit is connected to devices that only receive or send data, such as bar code readers, or printers.



1-3-5 Modbus-RTU Slave Mode

Modbus-RTU Slave Mode enables you to send Modbus-RTU commands from the host computer to read and write PLC memory used for CJ-series Units.



1-4 Features

This section describes the features of the Serial Communications Unit and the protocols.

1-4-1 Serial Communications Units

A total of up to 16 CPU Bus Units can be mounted on the CPU Rack or an Expansion Rack. The total of 16 must include all Serial Communications Units and all other CPU Bus Units. The PLC can thus be expanded to provide additional serial ports as required by the system.

There are two types of serial communications ports: RS-232C × 2 ports and RS-232C + RS-422A/485 ports. If RS-422A/485 ports are used, general-purpose external devices are accessible via 1:N connection (protocol macros) without using any Link Adapter.

1-4-2 Protocols

Protocol Macros

The main features of the protocol macro functions are described below. For details, refer to the *CX-Protocol Ver.1.9 Operation Manual* (W344).

● Wide Range of Communications Protocols

Communications are possible with virtually any general-purpose external device, provided it has an RS-232C or RS-422A/485 port, supports half-duplex or full-duplex communications, and supports start-stop synchronization.

● Send Frames and Expected Receive Frames Matching Specifications

Send frames (command + data and other send frames) and expected receive frames (response and other frames) can be created and registered according to the communications frame specifications of the external device.

● Communications-related Functions

Error check code calculations, frame length calculations during sending, and ASCII⇔Hexadecimal conversion of numeric data are supported.

● Send/Receive Monitoring

Receive wait monitoring, receive completion monitoring, and send completion monitoring are supported. If monitoring times are exceeded, send/receive can either be terminated, or retry processing can be performed.

● Retry Processing

Send/receive retry processing can be automatically executed when an error occurs, simply by setting the number of retries.

● PLC Read/Write Variables in Send Frames and Expected Receive Frames

You can include variables for reading PLC memory used for CJ-series Units in the actual send frames. You can use these as destination addresses or data when you read PLC data during sending. You can also include variables for writing to PLC memory used for CJ-series Units in the actual receive frames. You can use these to write the contents of destination addresses or data to the PLC during reception.

● Switch 1:N Communications or the Data Write Destinations Using Repeat Processing

You can specify repeat processing (repeat counters) for send/receive processing in communications sequences. This enables the same data to be sent by switching destination addresses during 1:N communications (N = 32 max. due to restrictions in the physical layer) or to switch the PLC memory used for CJ-series Units write destination addresses during data reception.

● Next Process Switching According to Receive Data

The contents of up to 15 sets of expected receive data can be compared with the actual receive data to determine the next process.

● Step Wait for Sync Signal from the PLC

At any step of the communications sequence, the next process can be made to wait until a sync signal from the PLC (CPU Unit) is input. This enables processing, such as data manipulations, to be performed in the CPU Unit during the communications sequence.

● Half-duplex or Full-duplex Transmissions

The full-duplex transmissions enable all the data received in a sequence to be accessed. Data can also be received from a remote device while sending.

Full-duplex transmissions can be used with either RS-232C or RS-422A/485 as long as 1:1, 4-wire connections are used. Full-duplex transmissions cannot be used with 1:N connections or 2-wire connections.

● Clear Reception Buffer at Any Time

With Full-duplex Mode, the reception buffer is cleared only immediately before a communications sequence is executed. When a reception or other fault occurs, the receive data can be cleared at any time using the reception buffer clear (Flush) command.

● Control ER Signal at Any Time

With a connection to a modem, the ER signal is used to show the communications enabled status of a Serial Communications Unit (Data Terminal Equipment (DTE)).

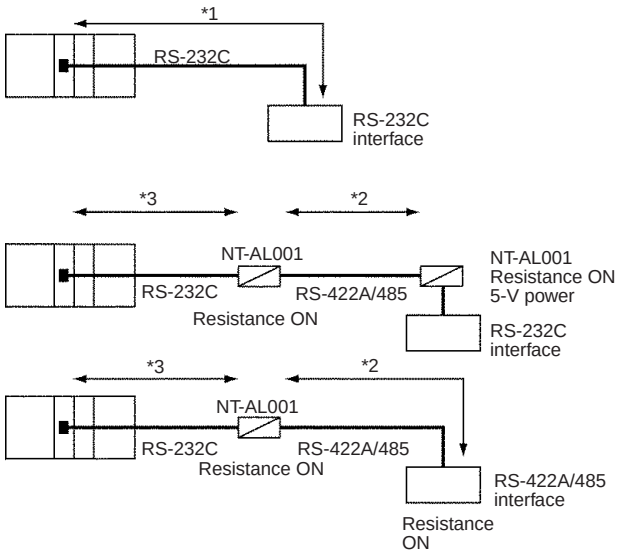
Improving this function has enabled the ER signal to be turned ON or OFF at any time during a communications sequence. This enables modem connections and disconnections to be performed by a protocol macro.

The ER signal can also be kept ON, even after a communications sequence has been completed. In this case, the ER signal remains ON, even after it has been switched to a different serial communications mode.

1-5 System Configurations

This section explains the system configuration supported by each serial communications mode.

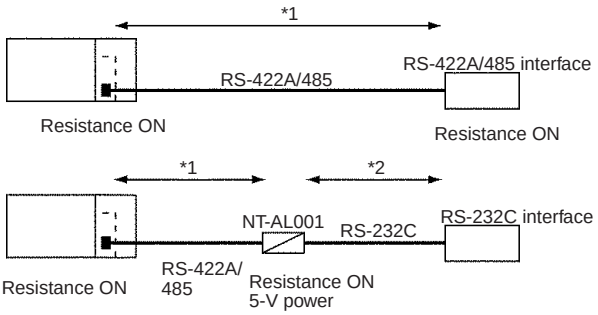
1-5-1 Protocol Macro, Serial Gateway, No-protocol, or Modbus-RTU Slave

PLC: General-purpose external device	Connection configuration	Required devices	Connected serial communications port/Remarks
1:1 Port: RS-232C	Connection of a Serial Communications Unit to a device with an RS-232C or RS-422A/485 port.  	CJ1W-SCU22	Port 1 or 2
		CJ1W-SCU44	Port 2
		NT-AL001 Converting Link Adapter	Converts between RS-232C and RS-422A/485
		5-V power supply	For NT-AL001 Link Adapter

*1 The maximum cable length for RS-232C is 15 m. The RS-232C specification does not define any use over 19.2 Kbps. Refer to the manual for the device being connected.

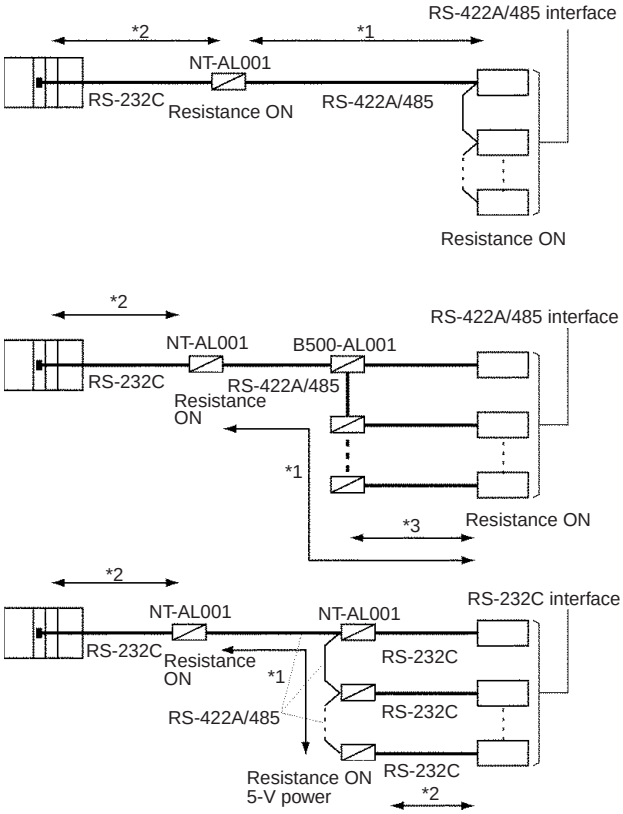
*2 The maximum total cable length for RS-422/485 is 500 m when an NT-AL001 Link Adapter is used. The length includes branch lines. Communications distance may vary by the device being connected. Refer to the manual for the device.

*3 The maximum length is restricted to 2 m when an NT-AL001 Link Adapter is connected.

PLC: General-purpose external device	Connection configuration	Required devices	Connected serial communications port/Remarks
1:1 Port: RS-422A/485	Connection of a Serial Communications Unit to a device with an RS-232C or RS-422A/485 port  	CJ1W-SCU32	Port 1 or 2
		CJ1W-SCU42	Port 1
		NT-AL001 Converting Link Adapter	Convert between RS-232C and RS-422A/485
		5-V power supply	For NT-AL001 Link Adapter

*1 With the CJ1W-SCU[]2, the maximum total cable length for RS-422/485 is 1200 m. The length when an NT-AL001 Link Adapter is used is 500 m. In both cases, the length includes branch lines. Communications distance may vary by the device being connected. Refer to the manual for the device.

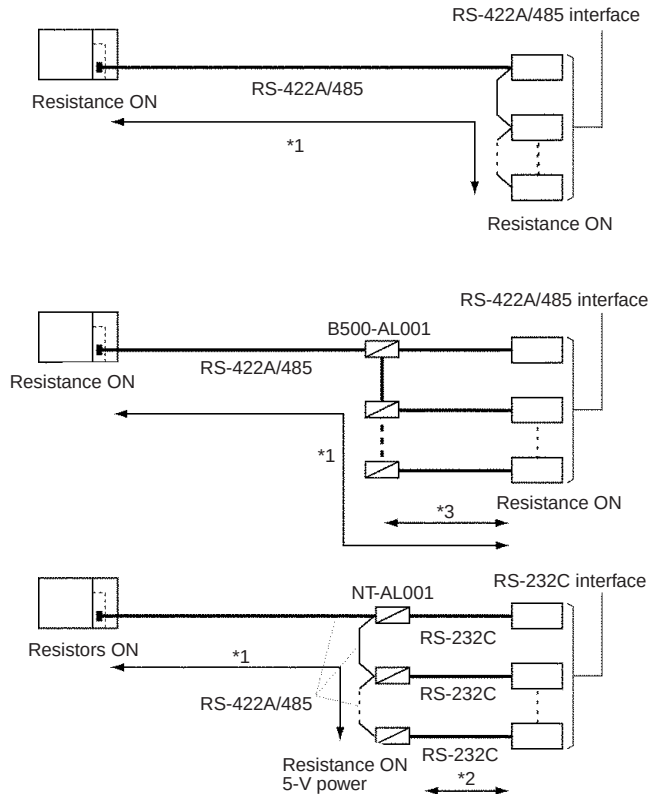
*2 The maximum length is restricted to 2 m when an NT-AL001 Link Adapter is connected.

PLC: General-purpose external device	Connection configuration	Required devices	Connected serial communications port/Remarks
1:N Port: RS-232C	Connection of a Serial Communications Unit to devices with RS-232C or RS-422A/485 ports. 	CJ1W-SCU22	Port 1 or 2
		CJ1W-SCU42	Port 2
		NT-AL001 Converting Link Adapter	Converts between RS-232C and RS-422A/485
		B500-AL001 Link Adapter	For RS-422A/485 branching
		5-V power supply	For NT-AL001 Link Adapter

*1 The maximum total cable length for RS-422/485 is 500 m when an NT-AL001 Link Adapter is used. The length includes branch lines. Communications distance may vary by the device being connected. Refer to the manual for the device.

*2 The maximum length is restricted to 2 m when an NT-AL001 Link Adapter is connected.

*3 The maximum branch line is 10 m.

PLC: General-purpose external device	Connection configuration	Required devices	Connected serial communications port/Remarks
1:N Port: RS-422A/485	Connection of a Serial Communications Unit to devices with RS-232C or RS422A/485 ports 	CJ1W-SCU32	Port 1 or 2
		CJ1W-SCU42	Port 1
		NT-AL001 Converting Link Adapter	Converts between RS-232C and RS-422A/485
		B500-AL001 Link Adapter	For RS-422A/485 branching
		5-V power supply	For NT-AL001 Link Adapter

*1 The maximum total cable length for RS-422/485 is 500 m when an NT-AL001 Link Adapter is used. The length includes branch lines. Communications distance may vary by the device being connected. Refer to the manual for the device.

*2 The maximum length is restricted to 2 m when an NT-AL001 Link Adapter is connected.

*3 The maximum branch line is 10 m.

1-6 Specifications

1-6-1 Serial Communications Unit

PLC Series		CJ-series		
Device name		Serial Communications Unit		
Classification		CPU Bus Unit		
Model number		CJ1W-SCU22	CJ1W-SCU32	CJ1W-SCU42
Serial communications ports	Port 1	RS-232C	RS-422A/485	RS-422A/485
	Port 2	RS-232C	RS-422A/485	RS-232C
Protocols	Port 1	You can select Protocol Macro, Serial Gateway (*1), No-protocol, Modbus-RTU Slave, or Loopback Test for each port.		
	Port 2			
Number of mountable Units	CPU Rack	A total of up to 16 Units, including all other CPU Bus Units. No restrictions on the mounting location.		
	Expansion Rack			
Data exchange with the CPU Unit	Ordinary refreshing of software switches and status	Data exchange with I/O port (constant data exchange with the CPU Unit)		
	Transfer the System Setting data from CPU Unit	Data exchange with I/O port Data is transferred from the CPU Unit at the following times: • When the Unit restarts or the Controller is reset, including when the power is turned ON • When the variable Settings Change (*_CJB_SCU□□P1ChgSta/_CJB_SCU□□P2ChgSta*) changes to TRUE. (□□ indicates Unit numbers.)		
Supporting CPU Units		NJ-series CPU Units		
Current consumption (*2)		280 mA + x	400 mA	360 mA + x
Weight		160 g max.	120 g max.	140 g max.

*1 The Serial Gateway can also be executed in Protocol Macro Mode.

*2 The current consumption is for one Serial Communications Unit.
When an NT-AL001 Link Adapter is connected to the Serial Communications Unit, power is supplied to the Link Adapter from the Unit.
Add a current consumption of 150 mA for each Link Adapter that is connected.
The current consumption value varies by unit. Take a note of this when you replace a Unit.
In the above specifications, the mark "x" indicates additional 150 mA per RS-232C port to which an NT-AL001 Link Adapter is connected. A 5-V power is supplied from the port to the Adabor.

1-6-2 General Specifications

The general specifications of the Serial Communications Units conform to those of the NJ-series CPU Unit.

● Protocol Macro Function Specifications

Item		Description	
Number of protocols	20 max.	Can be created and registered with the Protocol Support Tool (CX-Protocol).	
Number of sequences	1,000 max.		
Per protocol	Number of sequences	60 max.	
	Number of messages	300 max.	
	Number of receive matrixes	100 max.	
Sequence execution condition		Using the CPU Unit's ExecPMCR instruction (specifying the sequence number)	
Communications mode		Half-duplex or full-duplex	
Synchronous mode		Start-stop synchronization (asynchronous mode)	
Baud rate (*1)		RS-232C port and RS-422A/485 ports: 1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200/230,400 bps Default setting: 9,600 bps	
Communications distance (*1)		RS-232C port: 15 m max. RS-422A/485 port: 1,200 m max. (total cable length: 1,200 m max., Multidrop connections are possible. However, maximum cable length is 500 m if the NT-AL001 is used for RS-422A-485 connections.)	
Connection configuration		RS-232C port: 1:1 (1:N (N = 32 units max.) is possible using a Converting Link Adapter.) RS-422A/485 port: 1:N (N = 32 units max.)	
Maximum number of data exchange words between PLC and protocol macro function	Operand setting	250 words	Including the word that specifies the number of words (1 word)
	Link word setting	500 words	O1, O2, I1, and I2: 500 words total
	Direct setting	500 words	Maximum number of words per data attribute
Sequence contents (step common parameters)	Number of steps per sequence	16 max.	
	Transmission control parameters (*2)	X-on/X-off flow, RS/CS flow, delimiter control, contention control or modem control.	
	Response notification method (operand)	(Writes the receive data in the memory area used for CJ-series Units specified in DstDat of the ExecPMCR instruction) Writes the receive data to memory used for CJ-series Units during CPU Unit I/O refresh.	
	Monitoring time during send/receive processing	Receive wait, receive completion, or send completion can be monitored. Setting range: 0.01 to 0.99 s, 0.1 to 9.9 s, 1 to 99 s, or 1 to 99 minutes	
	Link word setting	Area in which data is exchanged between the CPU Unit and the Serial Communications Unit during Communications Unit refreshing. Two areas can be specified for each device: One for storing received data and the other for storing sent data.	

Item		Description	
Step contents	Commands	Send only (Send), receive only (Recv), send and receive (Send&Recv), wait (Wait), reception buffer clear (Flush), ER-ON (Open), or ER-OFF (Close)	
	Repeat counter	1 to 255 times	
	Retry count	0 to 9 (Only when the command is Send&Recv)	
	Send wait time	0.01 to 0.99 s, 0.1 to 9.9 s, 1 to 99 s, or 1 to 99 minutes (Only when the command is Send or Send&Recv)	
	With or without response write (operand)	Selectable either to store the received message when the receive process completes or not. (This option is used to store received data to the area specified by the DstDat of the ExecPMCR instruction.)	
	Next processing	Select a process following to a normal end of a step from End (sequnece completed), Next (proceed to the next step No.), Goto (go to the specified step No.), and Abort (interrupt the step and terminate the sequence.)	
	Error processing	Select a process following to an error end of a step from End, Next, Goto and Abort.	
	Send message	Data sent to the specified address when the command is Send or Send&Recv.	Consists of a header, address, length, data, error check code, and terminator. For details, see the message unit contents on the next page.
	Receive message	Data sent from the specified address when the command is Recv or Send&Recv.	
	Receive matrix	When the command is Recv or Send&Recv, sets the expected receive messages (15 max.), and switches the next processing according to the message received.	Specifies the receive messages and the next processing for each of cases No. 00 to No. 15. One of the maximum 16 cases must be set to "Other" in the receive messages (i.e., other than the set received messages).

Item			Description				
Message unit contents	Header and terminator data attributes	Constant	ASCII data, hexadecimal data, or control code				
	Data attributes of addresses and data in send/receive messages	Constant	ASCII data, hexadecimal data, or control code (For an address, control code is not possible)				
		Variable	No conversion, conversion to ASCII data, or conversion to hexadecimal data (the read/write direction can be specified)				
			Designation method	(X, Y) X: Effective address (Location to read data from or to write data into) Y: Data size (1 to 1,000) (*1)			
			X	Word designation	Read word (memory used for CJ-series Units to send data)	Specify by the input variable: *SrcData* of the SendPMR instruction.	Set leading address + n (The linear expression aN + b, including repeat counter N, is also possible for n.)
						Specify the area using a link word.	
						Directly specify the memory used for CJ-series Unit	
					Write word (receive data to memory used for CJ-series Units)	Specify by the in-out variable: *DstData* of the SendPMR instruction.	
						Specify the area by a link word.	
						Memory for CJ-series Unit direct designation	
				Wild card	*	Any data or address can be received (only in receive messages)	
				Repeat counter	N		

Item			Description				
Message unit contents	Data attributes of addresses and data in send/receive messages	Variables	Y	Linear expression including repeat counter	aN + b	a: 0 to 1000; b: 1 to 1000 N: Repeat counter value	
				Wild card	*	Can be received regardless of the length (only in receive messages)	
				Word designation	Read word (memory used for CJ-series Units to send data)	Specify by the input variable: *SrcData* of the SendPMR instruction.	Set leading address + n (The linear expression aN + b, including repeat counter N, is also possible for n.)
						Specify the area by a link word.	
						Directly specify the memory used for CJ-series Unit	
	Error check codes		LRC, LRC2, CRC-CCITT, CRC-16, SUM, SUM1, and SUM2 can be calculated.				
	Maximum length of send/receive messages		1,000 bytes. (A maximum length between 200 and 1,000 bytes can be set in the Setup Area.)				
	Maximum number of data attributes registered in one message		96 attributes (*4)				
	Maximum number of write data attributes registered in one message		30 attributes (*5)				
Trace function			A total of up to 1,700 bytes (characters) of time-series data can be traced in send and receive messages. Changes to the step No. and control signals such as RS and CS can also be traced.				

*1 The baud rate and the communications distance sometimes depend on the remote device. Confirm them in the operation manuals for the connected devices.

*2 When you use 2-wire RS-422A/485 communications in Protocol Macro Mode, set only modem controls for the transmission control parameters, and do not use RS/CS flow controls.

*3 The data size is the number of bytes on the transmission path.

*4 The CX-Protocol can be used to register up to 96 attributes per message.

*5 A macro syntax error will occur when the protocol macro is executed if more than 31 write attributes are registered in one message.

Serial Gateway Specifications

Item	Description
Conversion source	Commands (received through network or CPU bus)
Conversion functions	The received command is sent to the Unit's serial port and is converted to the command code as follows: 2803 hex: Header removed and converted to CompoWay/F command. 2804 hex: Header removed and converted to Modbus-RTU command. 2805 hex: Header removed and converted to Modbus-ASCII command.
Converted format	• CompoWay/F commands • Modbus-RTU commands • Modbus-ASCII commands
Enabled serial communications mode	Serial Gateway Mode or Protocol Macro Mode
Queuing functions	Up to five commands can be converted and then queued for processing.
Protocol macro execution processing	When a command is received during protocol macro execution, the Serial Gateway is executed using an interrupt between steps in the communications sequence. If the next step is a Receive command, the Serial Gateway will not be executed until the next step. For other conditions, the interrupt is executed immediately. (*1)
Response timeout monitoring	The time is monitored from when the message converted into the specified protocol using the Serial Gateway is sent until the response is received (in Serial Gateway Mode or Protocol Macro Mode). (*2) Default: 5 s (setting range: 0.1 to 25.5 s)
Send start timeout monitoring	The time is monitored from when the command is received until it is converted into the specified protocol and starts to be sent (in Protocol Macro Mode only). (*3) Default: 5 s (setting range: 0.1 to 25.5 s)
Send delay	The time can be set from when the message is converted into another protocol using Serial Gateway conversion until the data is actually sent. (Serial Gateway or Protocol Macro Mode) Default: 0 s (setting range: 0.01 to 300.00 s)

*1 The reception buffer is cleared during Serial Gateway execution.
You can prohibit the Serial Gateway in Protocol Macro Mode by changing the Serial Gateway Prohibit Switch (*_P#_SgwDsblCmd*) to TRUE.

*2 When a timeout occurs, a command end code (0205 hex (Response Timeout)) is returned to the command source.

*3 When a timeout occurs, a command end code (0204 hex (Destination Busy)) is returned to the command source. At this time, the received command is discarded without execution of send processing.

● No-protocol Specifications

Item	Description	
Communications mode	Full-duplex	
Baud rate (*)	RS-232C port and RS-422A/485 ports: 1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200/230,400 bps Default setting: 9,600 bps	
Communications distance (*)	RS-232C port: 15 m max. RS-422A/485 port: 1,200 m max. (total cable length: 1,200 m max., Multidrop connections are possible. However, maximum cable length is 500 m if the NT-AL001 is used for RS-422A-485 connections.)	
Messages (communications frame structure)	Set either of the following six types in the Sysmac Studio or device variable for CJ-series Unit. 1. Data only (without start code or end code) 2. Start code + data 3. Data + end code 4. Start code + data + end code 5. Data + CR + LF 6. Start code + data +CR + LF You can make the following setting with the Sysmac Studio or device variable for CJ-series Unit: Select to have the start code or not, select to have the end code or not, select the start code from 00 to FF hex when you set to have one, select the end code from 00 to FF hex when you set to have one, and set the number of receive data bytes when you set not to have the end code.	
	Start code	None or 00 to FF hex
	End code	None, 00 to FF hex, or CR + LF
	Number of receive data bytes during reception	Set the number of receive data bytes between 1 and 256 bytes (according to the settings in Sysmac Studio or device variable for CJ-series Unit.) when frame structure 1 or 2 above is used.
Sending messages	SerialSend instruction	
Receiving messages	SerialRcv or SerialRcvNoClear instruction	
Maximum message length	Sending and receiving: Up to 259 bytes including the start code and end code (up to 256 bytes excluding start/end codes)	
Data conversion	No conversion	
Communications protocol	None	
Message delay time	When the SerialSend instruction is executed, after the send delay time, the data is sent from the port. 0 to 300 s (0 to 300,000 ms) (Can be set in 10-ms units: Set in System Studio or by using a device variable for CJ-series Unit.)	
Receive counter	The number of data bytes (0 to 256) received at the port can be counted.	
Reception buffer clear timing	SerialRcv instruction: After reading the receive data SerialRcvNoClear instruction: When the receive data size variable (*Size*) is set to 0	

* The baud rate and the communications distance sometimes depend on the remote device.

● Modbus-RTU Specifications

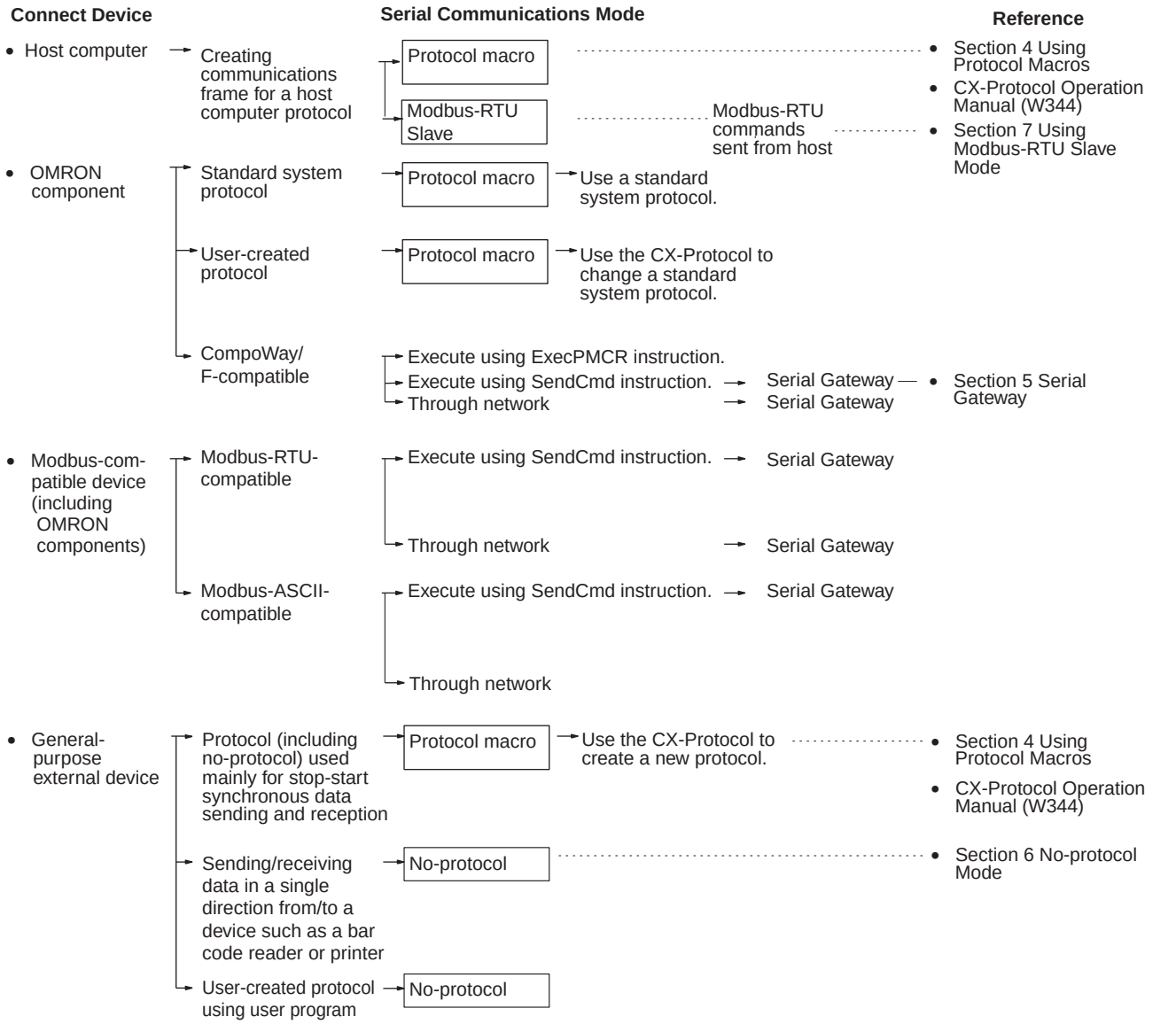
Item	Description
Mode	Modbus-RTU Slave Mode (*)
Baud rate	1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200/230,400 bps Default: 19,200 bps
Data length	8 bits
Parity	Odd, even, or none Default: Even
Stop bits	Odd or even parity:1 bit No parity: 2 bits
Address setting range	1 to 247 (broadcasting: 0)
Frame format	Slave address: 1 byte Function code: 1 byte Data: 0 to 252 bytes CRC code: 2 bytes

* Modbus-ASCII Slave Mode is not supported.

● Supported Commands

Function code (hexa-decimal)	Function	Modbus name
01	Reads multiple bits from the CIO, Work, Holding, or Auxiliary Area of memory used for CJ-series Units.	Read Coils
02	Reads multiple bits from the CIO Area of memory used for CJ-series Units.	Read Discrete Inputs
03	Reads multiple words from the DM or EM Area of memory used for CJ-series Units.	Read Holding Registers
04	Reads multiple words from the CIO, Work, Holding, or Auxiliary Area of memory used for CJ-series Units.	Read Input Registers
05	Writes a bit in memory used for CJ-series Units.	Write Single Coil
06	Writes a word in the DM or EM Area of memory used for CJ-series Units.	Write Single Register
08	Executes an echoback test.	Diagnostic
0F	Writes multiple bits in memory used for CJ-series Units.	Write Multiple Coils
10	Writes multiple words in the DM or EM Area of memory used for CJ-series Units.	Write Multiple Registers

1-7 Selecting the Serial Communications Mode



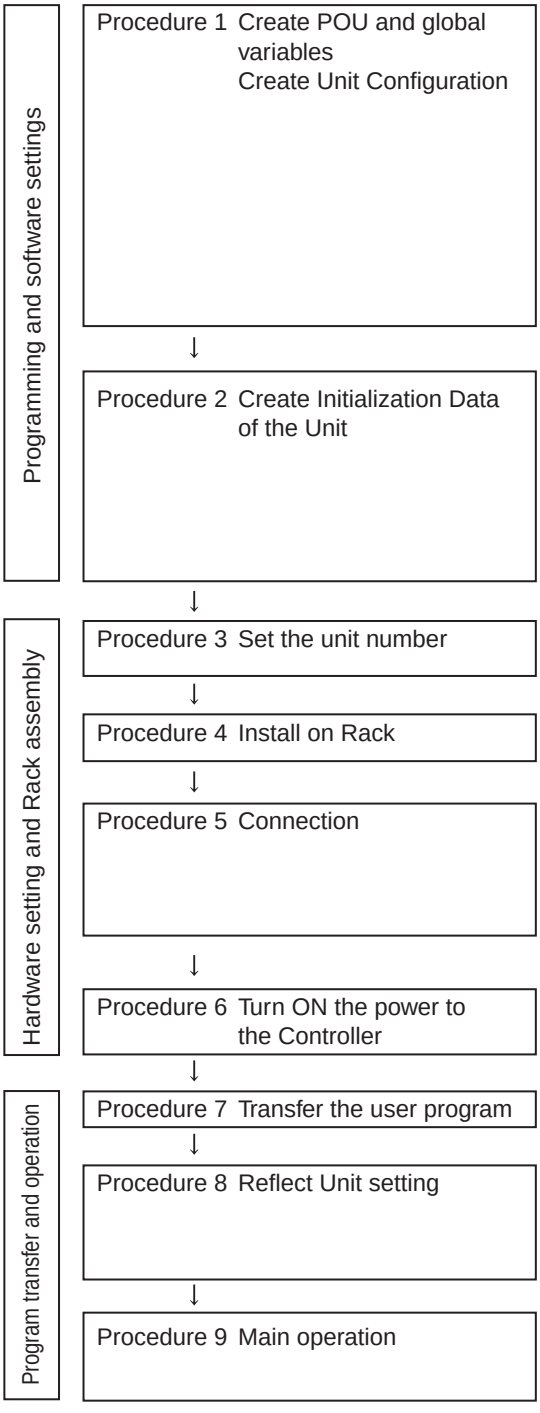
1-8 Basic Operating Procedure

1-8-1 Overview

An overview of the basic operating procedures for the Serial Communications Unit is provided here. There is no restriction regarding the sequence of "Programs and software settings" and "Hardware setting and rack assembly." These tasks may be carried out concurrently or in the reverse order.

Use Sysmac Studio to create and set programs.

For details on operations of Sysmac Studio, refer to the *Sysmac Studio NJ-One Version 1.0 Operation Manual* (Cat. No. W504).



- Create and register global variables and each POU.
- Create algorithm of each POU and register local variables of each POU.
- Register the Unit in the Unit Configuration on the CPU/Expansion Racks screen in Configuration and Setup.
  - At this time, set both the device name and the unit number of the unit to be registered.
- Allocate device variables for CJ-series Units to I/O ports.
  Allocate on the I/O Map View window.
  You can use one of the following three methods to allocate.
  1. Select and allocate existing variables.
  2. Input a new variable name.
  3. Automatically create with "Create Device Variable."
- Create the Unit settings by using the Edit Special Unit Settings.
  - Serial communications mode
  - Baud rate
  - Make the settings for the Transmission Mode for Protocol Macro Mode (half-duplex or full-duplex), the maximum length of send/receive data, etc.
    (When the program is transferred, items set here will be reflected in the device variable for CJ-series Unit (for initial setting).)
- Use the rotary switch on the front panel of the Unit to set the unit number.
  - Set the same unit number as in the Unit Configuration settings.
- Connect the Unit and external device(s), and the CPU Unit and Sysmac Studio.
  When an RS-422A/485 port is used, the following setting is required.
  - TERM: Terminating resistance ON/OFF switch
  - WIRE: 2-wire or 4-wire selector switch
- Reflect the settings for the switches on the front panel of the Unit, in the Unit.
- Transfer user programs, Unit Configuration and Setup, and variable information to the CPU Unit.
- Reflect the setting when one of the following events occurs.
  - Controller reset
  - At Unit restart
  - Restart of communications port
- Use the software switches and various flags of the Unit to perform serial communications. The user program controls the Unit via I/O ports by using device variables for CJ-series Unit.

1-8-2 Explanation of Procedure

Procedure 1. Create POU, Global Variables and Unit Configuration

1. Create and register global variables and each POU.

2. Create algorithm for each POU and register local variables for each POU.

3. Register the Unit in the Unit Configuration on the CPU/Expansion Racks screen in Configuration and Setup.
   Once this Unit is registered in the Unit Configuration, I/O ports are created automatically according to this Unit. Also set both the device name and the unit number of the unit to be registered.

4. Allocate device variables for CJ-series Unit to I/O ports.
   Allocate on the I/O Map View window.
   You can use one of the following three methods to allocate the device variables for CJ-series Unit.

- Select and allocate existing variables.
- Input a new variable name.
- Automatically create with "Create Device Variable."

Procedure 2. Create Initialization Data of the Unit

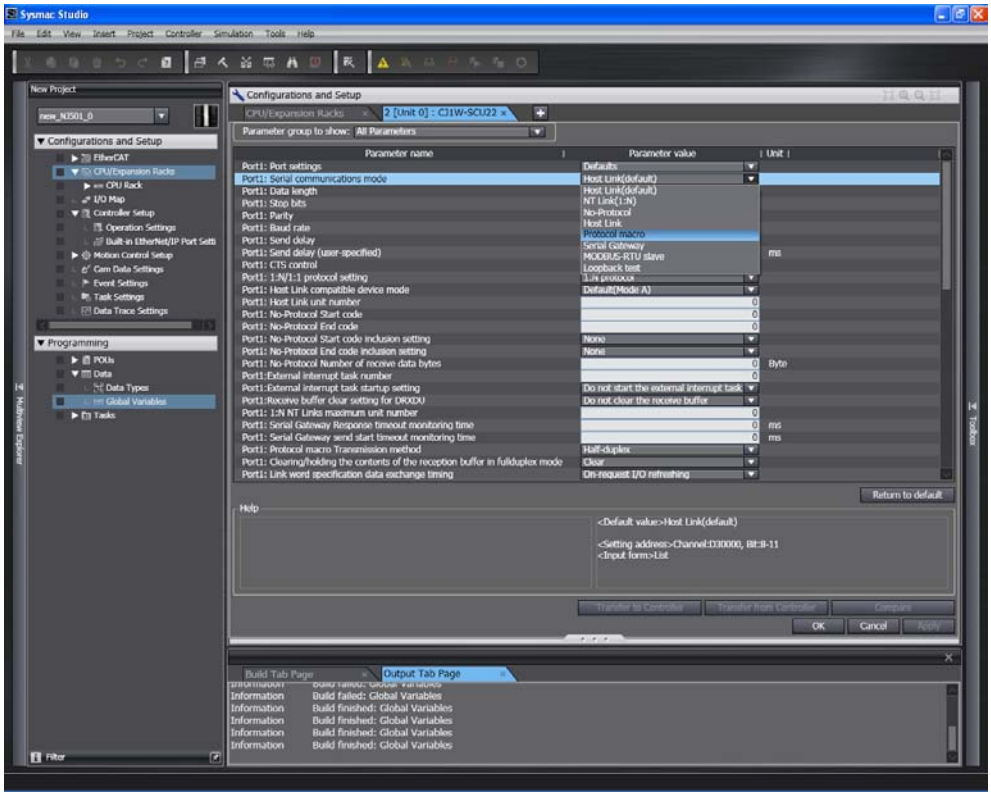
Set the Initialization Data of the Unit, such as the Serial Communications Mode and communications specifications.

Set the initial settings on the Edit Special Unit Settings of Sysmac Studio.

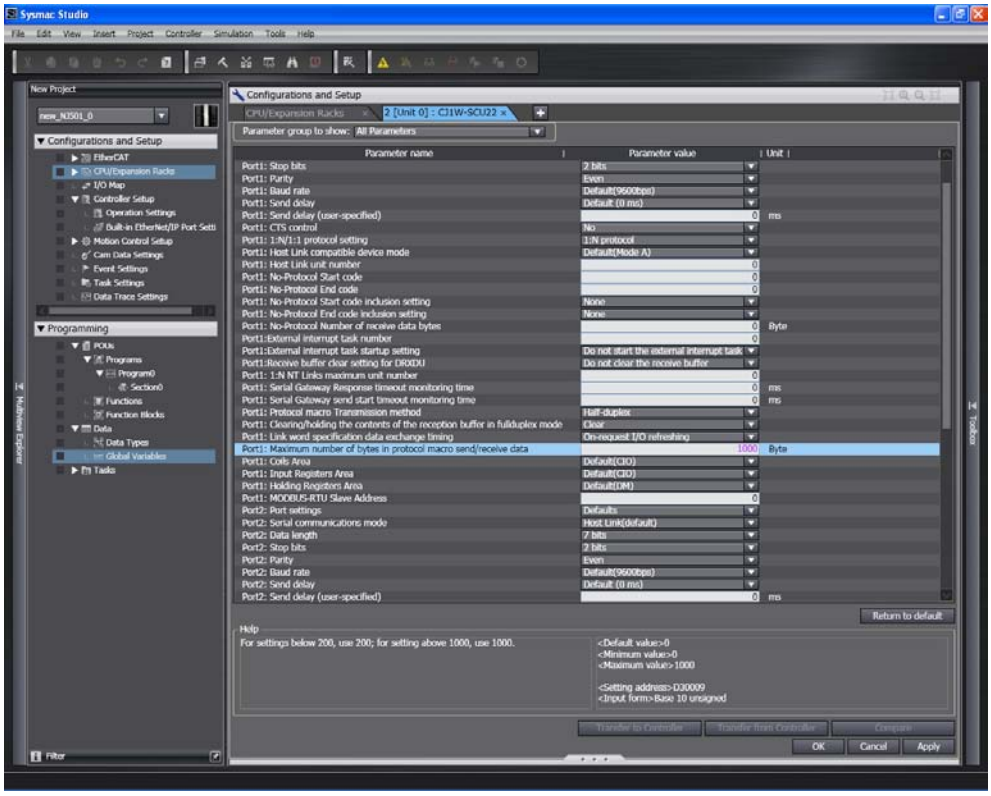
Setting Example for Protocol Macro Mode

Example) Set the default (standard) communications conditions

Set "Serial Communications Mode" to the Protocol Macro Mode.



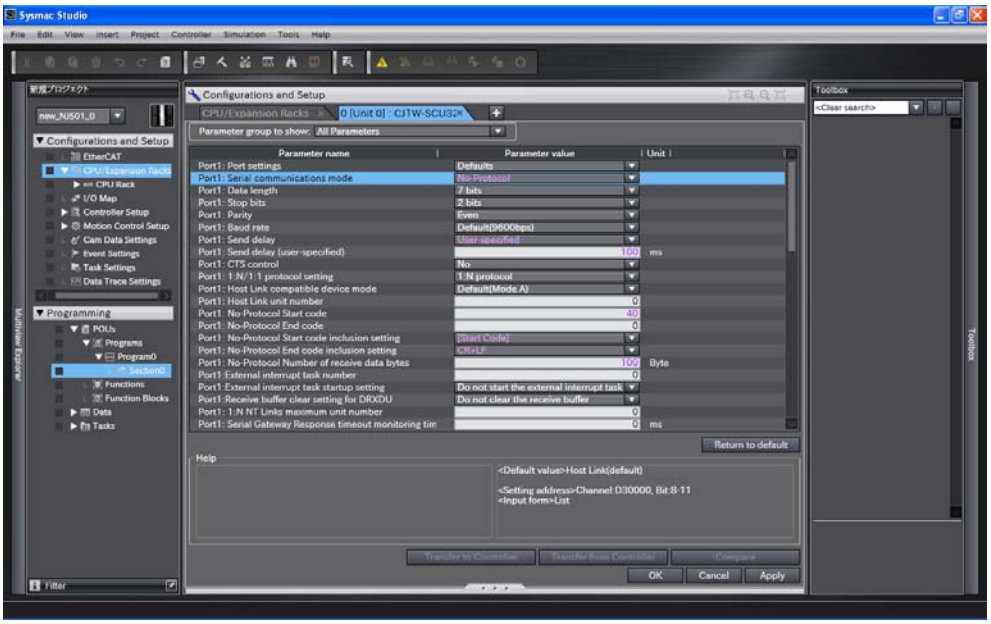
Set "Maximum Number of Bytes in Protocol Macro Send/Receive Data" to 1000 bytes.



Setting Example for No-protocol Mode

Example) Set the default (standard) communications conditions

Send delay is set to 100 ms, start code is included (e.g., @), end code is included (CR + LF), and number of receive bytes is set to 100 bytes.



Additional Information

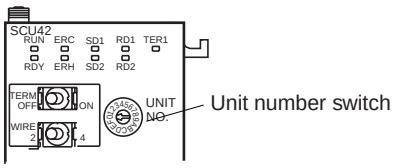
The Settings specified in the Special Unit Setup Editing screen support all the functions of this Unit. However, when used with NJ Series, some functions of this Unit become unavailable. Please do not select functions that cannot be used. Errors will not be detected even if these functions are selected or set.

For functions that you cannot use with NJ series, refer to *A-1 Differences in Available Functions Depending on the CPU Unit (NJ or CJ Series)*.

Procedure 3. Set the Unit Number

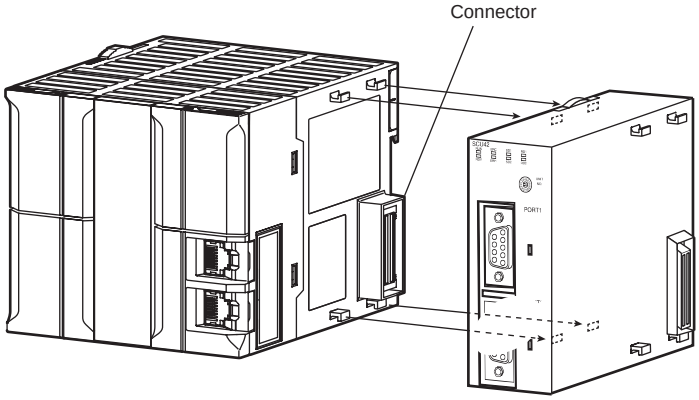
Set the Unit number specific for each CPU Bus Unit mounted in a CPU Rack or Expansion Rack. The Unit number must be the one registered in Unit Configurations. Set the unit number switch at the top of the front panel to between 0 and F. Turn OFF the Controller before changing the unit number setting.

CJ-series Units

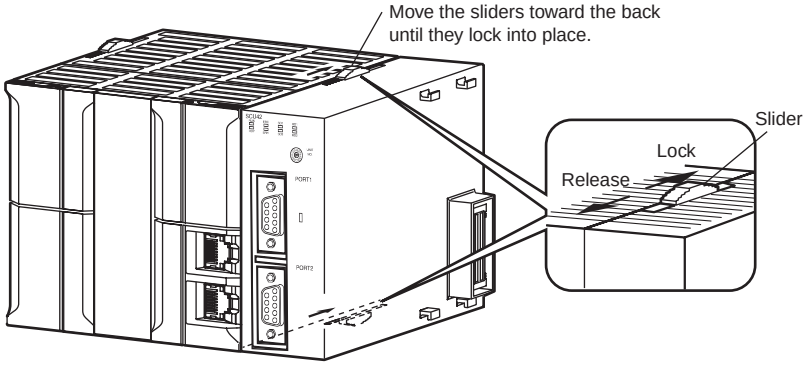


Procedure 4. Install on Rack

1 Align the connectors properly and then press in on the Unit to connect it.



2 Slide the sliders on the top and bottom of the Unit until they lock the Units together.



Precautions for Safe Use

If the sliders are not locked properly, the Serial Communications Units may not function correctly.

Procedure 5. Connection

Connect this Unit and the external devices using RS-232C or RS-422A/485 cables. Also, connect the CPU Unit and Sysmac Studio. For details on the connector pin layout and the connection methods, refer to *Section 3 Installation and Wiring*, and refer to the relevant manuals for the external devices to be connected.

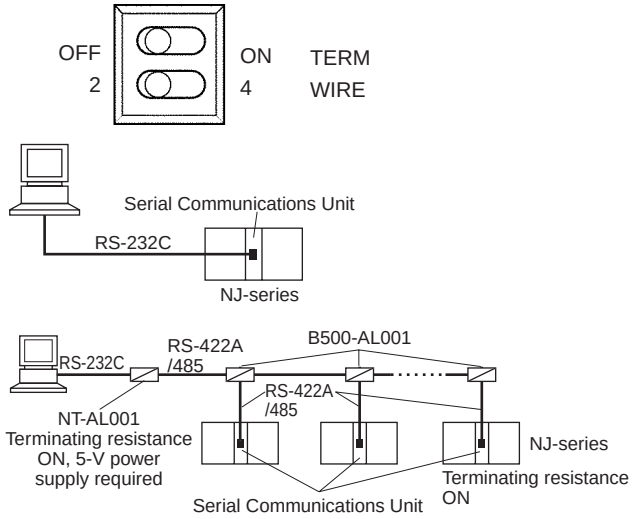
● Types of Port for Different Models

The types of port for the different models of Serial Communication Units are shown in the following table.

Model	Port 1	Port 2
CJ1W-SCU22	RS-232C	RS-232C
CJ1W-SCU32	RS-422A/485	RS-422A/485
CJ1W-SCU42	RS-422A/485	RS-232C

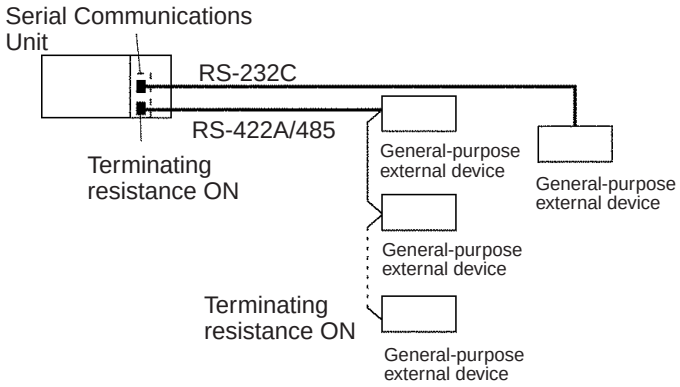
When an RS-422A/485 port is used in the Serial Communications Unit, the following setting is required.

- TERM: Terminating resistance ON/OFF switch
  OFF: Terminating resistance OFF
  ON: Terminating resistance ON
- WIRE: 2-wire or 4-wire selector switch
  2: 2-wire; 4: 4-wire



Also perform other required processing, such as setting switches on the external device(s).

● Connection Example for Protocol Macro, Serial Gateway, No-protocol Mode, and Modbus-RTU Slave Mode



Also perform other required processing, such as setting switches on the external device(s).

Procedure 6. Turn ON the Power Supply of Controller

Turn on the power supply of the Controller.

An I/O Setting Check Error occurs when there is a Unit Configuration in the CPU Unit which does not match the actual Unit Configuration. In this case, restart the Controller in Procedure 8 to cancel the error.

Procedure 7. Transfer the User Program

Transfer user programs, Unit Configuration and Setup, and variable information from Sysmac Studio to the CPU Unit.
At this time, special function setting data is not yet transferred in this Unit.

Procedure 8. Reflect Unit Settings

● Controller Reset

Reset the Controller. The System Settings specified in the Edit Special Unit Setting will be transferred from the CPU Unit to the Unit.

● Restarting

Restart the Unit by turning the restart bit in the system-defined variable, from FALSE to TRUE. Or restart the communications port by turning either Port 1 or 2 Setting Changing Flag to TRUE. Then the System Settings are transferred.

- Restart Bits (** indicates unit numbers.)

System-defined variable	Type	R/W	Name	Function
_CJB_CBU**Restart	BOOL	RW	CPU Bus Unit Restart Bits	TRUE: CPU Bus Units are restarted. FALSE: CPU Bus Units are not restarted. Default: FALSE

- Port 1/2 Settings Changing Flag (** indicates unit numbers.)

System-defined variable	Type	R/W	Name	Function
_CJB_SCU**P1ChgSta	BOOL	RW	Serial Communications Unit ** Port 1 Settings Changing Flag	TRUE: Port 1 Serial Communications Port Settings will change or are changing. FALSE: All other statuses Default: FALSE
_CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit ** Port 2 Settings Changing Flag	TRUE: Port 2 Serial Communications Port Settings will change or are changing. FALSE: All other statuses Default: FALSE

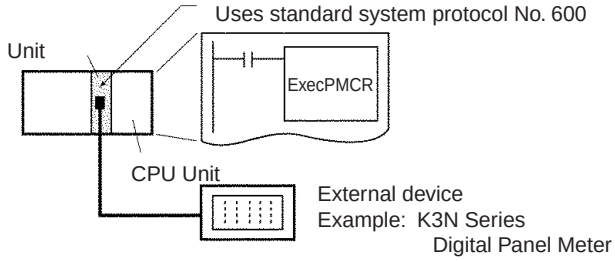
Procedure 9. Main operation

Execute the communications in Serial Communications Mode as set. The user program controls the Unit by using the device variables for CJ-series Unit allocated to the I/O ports corresponding to software switches and various flags.

Protocol Macros

When a standard system protocol (provided in the Serial Communications Unit, and CX-Protocol) is executed

Using Standard System Protocols



1 Creating the User-defined Variable to Store Send/Receive Data

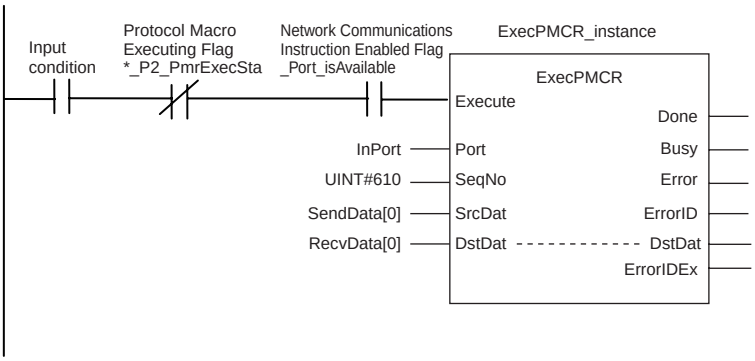
Create a word-type array variable to be set as the input parameter in input variable *SrcDat*, and in-out variable *DstDat*, of the ExecPMCR instruction. Reserve the number of array elements (size) that are required.

2 Setting the Send Data

Refer to *Send Data Allocation* in *R-1-1 Using Standard System Protocols* and set the number of send data words to the starting element of *SrcDat* and the send data to the second and subsequent elements.

3 Coding ExecPMCR Instruction

Example) The following example shows how to use a Serial Communications Unit to read and store the present values of E5□N Temperature Controller by using the CompoWay/F Master standard system protocol sequence No. 610: Variable Area Read.



If the Input condition is TRUE when the Protocol Macro Executing Flag (*_P2_PmrExecSta*) is FALSE and the Network Communications Instruction Enabled Flag (*_Port_isAvailable*) is TRUE, communications sequence No. 610 of the standard system protocol in the Serial Communications Unit is called, and data is sent and received via port 2 of the Serial Communications Unit. For the details of the above example, refer to Section *4-3-2 User Program Example*.

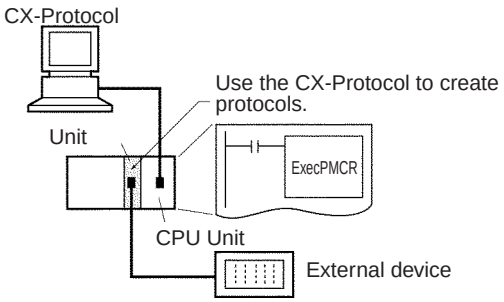
4 Executing the ExecPMCR Instruction

5 Confirming Operation

Refer to *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

- Transmission Line Tracing
  The data in the send/receive messages flowing over the transmission line (RS-232C or RS-422A/485) and the control codes are traced.
- I/O Memory Monitoring
  Monitors send/receive data and the status of the various flags.

Executing User-defined Protocols



1 Designing Protocols

Refer to Section 4 and Section 5 in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344) for details.

a. Create a communications sequence status transition chart.

b. From the status transition chart, divide the processing contents into a sequence and steps.

c. Determine the communications sequence message contents.

2 Creating and Transferring the Project (protocol data) on CX-Protocol.

Refer to Section 1-10 of *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344) for the outline of the flow.

a. Creating a new project:
Refer to *6-1 Creating a New Project and Protocol* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

b. Creating a new communications sequence:
Refer to *7-1 Creating a New Sequence* and *7-2 Setting a Sequence* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

c. Creating steps:
Refer to *8-1 Creating a New Step* and *8-2 Setting a Step* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

d. Creating messages:
Refer to *9-2 Setting a Message* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

e. Transferring the created project to a Unit:
Refer to *11-1 Transferring and Reading Protocol Data between the Personal Computers and Serial Communications Board and Unit* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).
After creating messages, steps can also be created by specifying message names.

3 Creating the User Program.

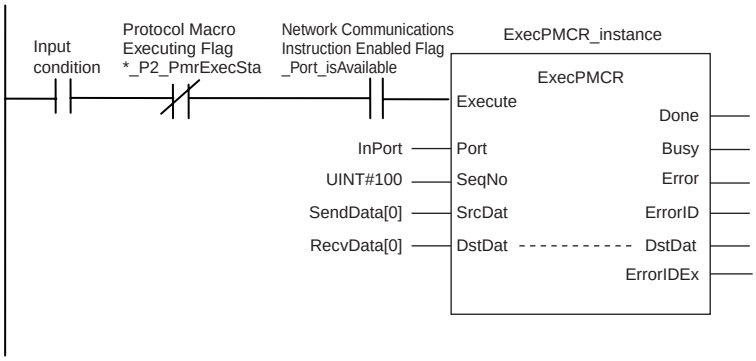
a. Creating User-defined Variables for Send/Receive Data Area

Create a word-type array variable to be set as the input parameter in input variable *SrcDat* (Send Data Area) and in-out variable *DstDat* (Receive Data Area) of the ExecPMCR instruction. Reserve the number of array elements (size) that are required.

b. Setting Send Data

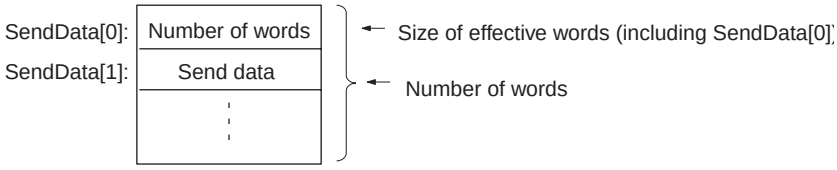
- Specifying Operands
  Set the send data to the second and subsequent elements of user-defined variable *SendData* of the input parameter set up in input variable of the ExecPMCR instruction, *SrcDat*. Set the number of send data words to the starting element of *SendData*.
- Direct Designations
  Set the send data in the memory used for CJ-series Units specified by the read variables in the send message.
- Specifying Link Words
  Set the send data in the O1 or O2 area of the Link Word Area.

c. Coding ExecPMCR Instruction

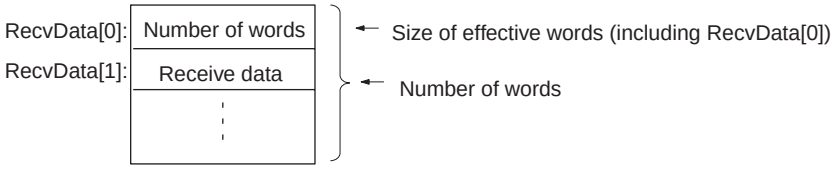


If the Input condition is TRUE when the Protocol Macro Executing Flag (*_P2_PmrExecSta for port 2) is FALSE and the Network Communications Instruction Enabled Flag (_Port_isAvailable) is TRUE, communications sequence No. 100 registered in the Serial Communications Unit is called, and data is sent and received via port 2 of the Serial Communications Unit.

Send data is sent starting from the second element of the *SendData* and its size (number of words) is specified by the first element of "SendData".



The receive data is stored in consecutive words beginning with input parameter "RecvData[1]", and the number of words actually stored in the input parameter is stored in "RecvData[0]".



d. Executing the ExecPMCR Instruction

4 Confirming operation. Refer to *Section 12 Tracing and I/O Memory Monitoring* in the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

- Transmission Line Tracing
  The data in the send/receive messages flowing over the transmission line (RS-232C or RS-422A/485) and the control codes are traced.
- I/O Memory Monitoring
  Monitors send/receive data and the status of the various flags.

● Serial Gateway Mode

- Sending commands from the Controller
  Send commands by using the SendCmd instruction. For details, refer to *5-6 Communications Frames.*
- Sending commands from the PT
  Execute the PT's SAP (Smart Active Parts).

No-protocol Mode

Creating the User Program

Execute the SerialSend instruction to send the program to the external device from the Controller.

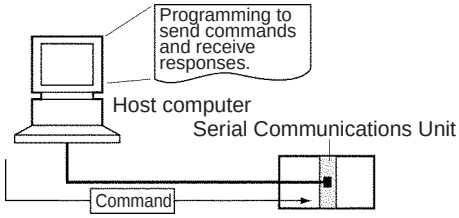
For the SerialSend instruction, include an N.O. of the Network Communications Instruction Enabled Flag (_Port_isAvailable) and an N.C. of the SerialSend Executing Flag (*_P1_NopSerialSendExecSta/*_P2_NopSerialSendExecSta) in an AND condition as the input condition.

Execute the SerialRcv or SerialRcvNoClear instruction to receive data at the Controller from the external device.

Include an N.O. input for the Reception Completed Flag (*_P1_NopRcvCompleteSta or *_P2_NopRcvCompleteSta) and an N.O. input of the Network Communications Instruction Enabled Flag (_Port_isAvailable) in an AND condition as the input condition to the SerialRcv or SerialRcvNoClear instruction.

Modbus-RTU Slave Mode

Modbus-RTU commands are sent from the host computer to the controller.



The host computer must be programmed to send the Modbus-RTU commands and receive responses.

2

Initial Settings and Allocations of Device Variable for CJ-series Unit

This section describes the components of the Serial Communications Boards and the Serial Communications Units, the settings required for operation, and the memory allocated in the I/O memory of the CPU Unit to control and monitor communications.

2-1 Component Names and Functions 2-2

2-2 Data Exchange with the CPU Unit 2-8

2-2-1 Data Flow 2-8

2-2-2 How to Specify and Create Variables 2-12

2-3 Device Variable for CJ-series Unit 2-14

2-3-1 Allocations of Device Variable for CJ-series Unit 2-14

2-3-2 Device Variable for CJ-series Unit for System Settings 2-14

2-3-3 Device Variable for CJ-series Unit for Software Switches 2-23

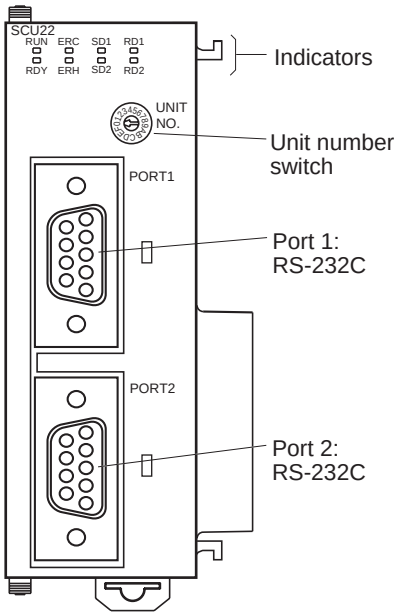
2-3-4 Device Variable for CJ-series Unit for Status 2-24

2-4 System-defined Variable 2-34

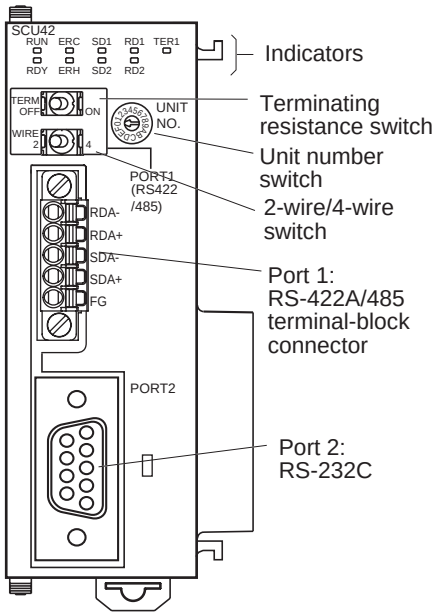
2-1 Component Names and Functions

CJ-series Serial Communications Unit

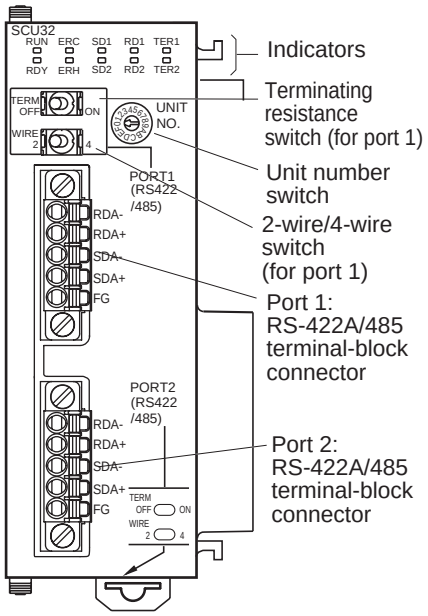
CJ1W-SCU22



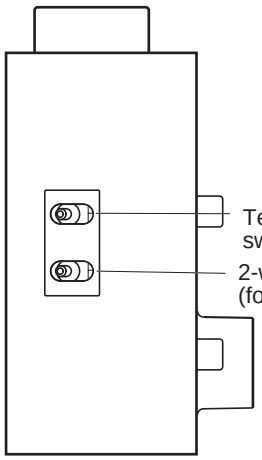
CJ1W-SCU42



CJ1W-SCU32



Bottom view



● Indicators

Indicator	Color	Status	Meaning
RUN	Green	Lit	Operating normally.
		Not lit	Unit hardware error.
RDY	Green	Lit	Protocol macro preparations are complete.
		Flashing	Protocol macros are being prepared. (*1)
		Not lit	Hardware error in Serial Communications Unit.
ERH	Red	Lit	CPU Unit error or this Unit was not registered in the Unit Configuration. Routing tables incorrectly registered in the Unit.
		Flashing	System Setup Error. (*2).
		Not lit	CPU Unit is operating normally and the system settings are normal.
ERC	Red	Lit	Unit Hardware Error.
		Flashing	Protocol data syntax error or protocol data error (SUM error).
		Not lit	Unit is operating normally.
SD1	Yellow	Lit	Communications port 1 is being used for sending.
		Not lit	Communications port 1 is not being used for sending.
RD1	Yellow	Lit	Communications port 1 is being used for receiving.
		Not lit	Communications port 1 is not being used for receiving.
TER1 (*3)	Yellow	Lit	Terminating resistance is connected internally for communications port 1.
		Not lit	Terminating resistance is not connected internally for communications port 1.
SD2	Yellow	Lit	Communications port 2 is being used for sending.
		Not lit	Communications port 2 is not being used for sending.
RD2	Yellow	Lit	Communications port 2 is being used for receiving.
		Not lit	Communications port 2 is not being used for receiving.
TER2 (*4)	Yellow	Lit	Terminating resistance switch for Port 2 is ON.
		Not lit	Terminating resistance for Port 2 is OFF.

*1 Depending on the interval of flashing, the meaning is as follows:
Protocol data being initialized: 0.3 s
Protocol data initialized, or being overwritten: 1.0 s
Protocol data error: 1.0 s and CPU Unit ERC indicator is flashing

*2 System settings use the device variables for CJ-series Unit determined by the unit number setting. For details, refer to *2-3-2 Device Variable for CJ-series Unit for System Settings*.

*3 Only the CJ1W-SCU32/SCU42 are equipped with a TER1 indicator.

*4 Only the CJ1W-SCU32 is equipped with a TER2 indicator.

For actions required when an error occurs, refer to *Section 9 Troubleshooting and Maintenance*.

● Unit No. Switch [UNIT No.]

Set the CPU Bus Unit unit number for the Unit. Set the Unit number specific for each CPU Bus Unit mounted in a CPU Rack or Expansion Rack. The Unit number must be the one registered in Unit Configurations. Set the unit number between 0 and F.
The factory setting is for unit number 0. Turn OFF the Controller before changing the unit number setting.

● RS-232C Ports

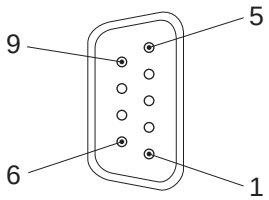
Protocol	Protocol macro
Communications method	Full-duplex or half-duplex
Synchronization	Start-stop synchronization (asynchronous)
Baud rate	1200/2400/4800/9600/19200/38400/57600/ 115200/230400 bps
Connections	1:1 (1:N is possible with Link Adapters)
Transmission distance	15 m max. (*)
Interface	Complies with EIA RS-232C

Protocol	No-protocol	Serial Gateway	Modbus-RTU
Communications method	Full-duplex	---	---
Synchronous mode	---	---	---
Baud rate	1200/2400/4800/9600/19200/38400/57600/115200/230400 bps		
Connection configuration	1:1 (1:N is possible with Link Adapters)		
Communications distance	15 m max. (*)		
Interface	Complies with EIA RS-232C		

* The maximum cable length for RS-232C is 15 m. The RS-232C standard, however, does not cover baud rates above 19.2 Kbps. Refer to the manual for the device to be connected to confirm support.

Connector Pin Layout

Pin No.	Abbreviation	Signal name	I/O
1 (*1)	FG	Shield	---
2	SD	Send data	Output
3	RD	Receive data	Input
4 (*2)	RS	Request to send	Output
5 (*2)	CS	Clear to send	Input
6 (*3)	5V	Power supply	---
7 (*2)	DR	Data set ready (*4)	Input
8 (*2)	ER	Data terminal ready	Output
9	SG	Signal ground	---
Shell (*1)	FG	Shield	---



*1 Pin No. 1 and the shell are connected to the ground terminal (GR) of the Power Supply Unit inside of the Serial Communications Unit. Therefore, ground the GR of the Power Supply Unit to ground the cable shield.

*2 You can monitor the status of the RS, CS, DR, and ER signals by using the device variables for CJ-series Unit. For details, refer to *2-3-4 Device Variable for CJ-series Unit for Status*. You can use the DR signal for any purpose specified by the user since it does not affect the system operations.

*3 Pin 6 (5 V) is required when the NT-AL001 Link Adapter is connected. For details on connection methods, refer to *3-2 Wiring*.

*4 The DR signal is used to monitor the signal cable. You can also use it as a CD (carrier detection) signal.

Precautions for Safe Use

Do not connect the Pin 6 (+5-V power supply) of the RS-232C port on the Unit to any external device other than an NT-AL001 Link Adapter. Otherwise, the external device and the Serial Communications Unit may be damaged.
Use the OMRON Cables specified in this manual or make your own cables. Do not use commercially available RS-232C cables sold for personal computers. Otherwise, the external device and the Serial Communications Unit may be damaged.

The following cables are provided for connection to NT-AL001 Link Adapters. We recommend that you use these cables.

NT-AL001 connecting cables:

XW2Z-070T-1 (0.7 m)

XW2Z-200T-1 (2 m)

Applicable Connectors

Plug: XM2A-0901 (manufactured by OMRON) or equivalent
Hood: XM2S-0911-E (manufactured by OMRON) or equivalent
One plug and one hood are provided for each port.

Recommended Cables

UL2464 AWG28 × 5P IFS-RVV-SB
AWG28 × 5P IFVV-SB

UL2464-SB (MA) 5P × 28AWG (7/0.127)
CO-MA-VV-SB 5P × 28AWG (7/0.127)
Cable length: 15 m max.

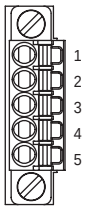
● RS-422A/485 Port

Protocol	Protocol macro
Communications method	Full-duplex or half-duplex
Synchronous mode	Start-stop synchronization (asynchronous mode)
Baud rate	1200/2400/4800/9600/ 19200/38400/57600/115200/230400 bps
Connection configuration	1:N (N: 32 Units max.)
Communications distance	500 m max. (The total combined cable length is 500m max. T-branch lines must be a maximum of 10m long.)
Interface	Complies with EIA RS-485

Protocol	No-protocol	Serial Gateway	Modbus-RTU
Communications method	Full-duplex	---	---
Synchronous mode	---	---	---
Baud rate	1200/2400/4800/9600/19200/38400/57600/115200/230400 bps		
Connection configuration	1:N (N: 32 Units max.)		
Communications distance	500 m max. (The total combined cable length is 500m max. T-branch lines must be a maximum of 10m long.)		
Interface	Complies with EIA RS-485		

Connector Pin Layout

Pin No.	Abbreviation	Signal name	I/O
1 (*1)	RDA	Receive data -	Input
2 (*1)	RDB	Receive data +	Input
3 (*1)	SDA	Send data -	Output
4 (*1)	SDB	Send data +	Output
5 (*2)	FG	Shield	---



*1 For 2-wire connections, use either pins 1 and 2 or pins 3 and 4.

*2 Pin 5 (the shield) is connected to the GR terminal on the Power Supply Unit though the Serial Communications Unit. The Cable Shield can thus be grounded if you ground the GR terminal of the Power Supply Unit.

Precautions for Safe Use

The signal names SDA/B and RDA/B do not always have the same polarity as that shown above. Check the polarity of the external device before you make connections.

Applicable Connectors

Plug:FMC 1.5/5-STF-3.5AU (screwless model by Phoenix Contact) or equivalent
MC1.5/5-STF-3.5AU (model with screw terminals by Phoenix Contact) or equivalent

Recommended Cables

CO-HC-ESV-3P × 7/0.2 (by Hirakawa Hewtech Corp.)
Cable length: 1,200 m max. (multidrop connections)

● Terminating Resistance Switch [TERM]

When an RS-422/485 port is used, set the switch to ON if the Serial Communications Unit is on the end of the transmission line. Refer to *Section 3 Installation and Wiring* for the ON/OFF settings.

Label	Name	Settings	Factory setting
TERM	Terminating resistance switch	ON: Terminating resistance ON OFF: Terminating resistance OFF	OFF: Terminating resistance OFF

Note You can monitor the status of the terminating resistance setting with the device variables for CJ-series Unit. For details, refer to *2-3-4 Device Variable for CJ-series Unit for Status*.

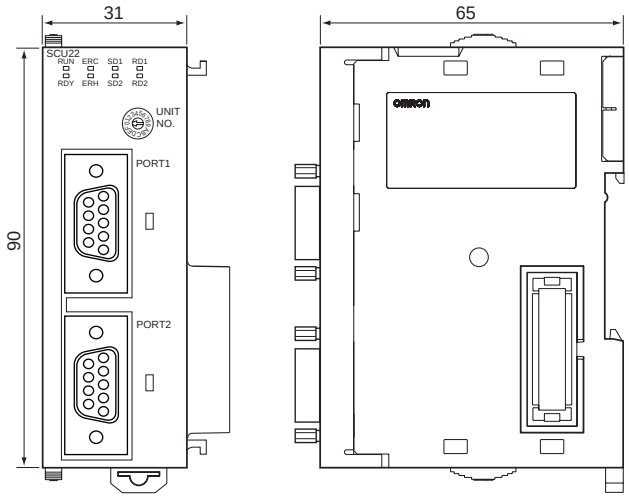
● 2-wire or 4-wire Switch [WIRE]

When an RS-422A/485 port is used, set the switch to "2" when 2-wire connections are used, and set the switch to "4" when 4-wire connections are used.
For details, refer to *Section 3 Installation and Wiring*.

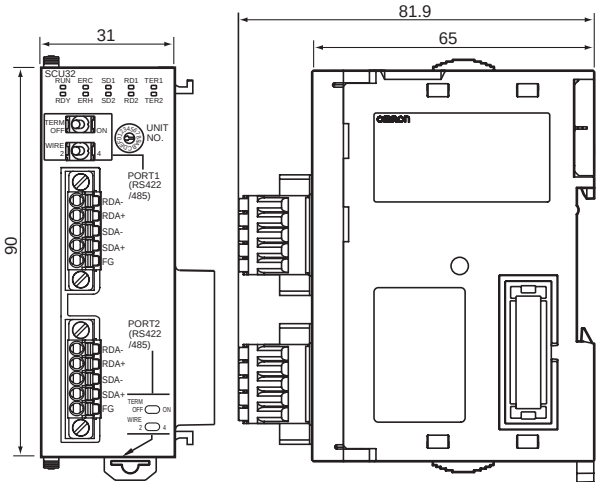
Label	Name	Settings	Factory setting
WIRE	2-wire or 4-wire switch	2: 2-wire 4: 4-wire	2: 2-wire

Dimensions (Unit: mm)

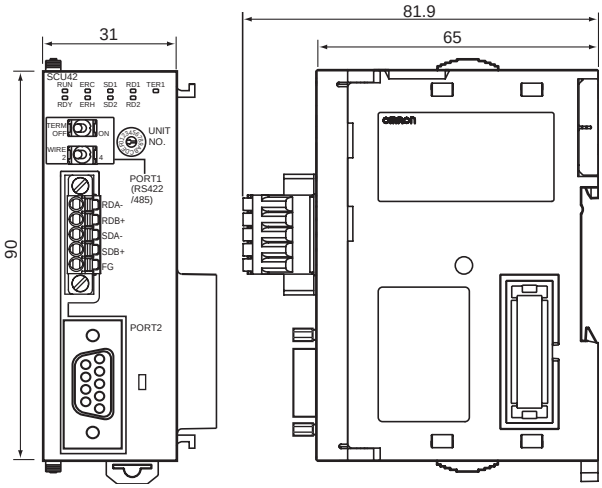
CJ1W-SCU22



CJ1W-SCU32



CJ1W-SCU42



2-2 Data Exchange with the CPU Unit

Data exchange between this Unit and the CPU Units uses the I/O port allocated to the Serial Communications Unit or memory used for CJ-series Unit, if necessary.

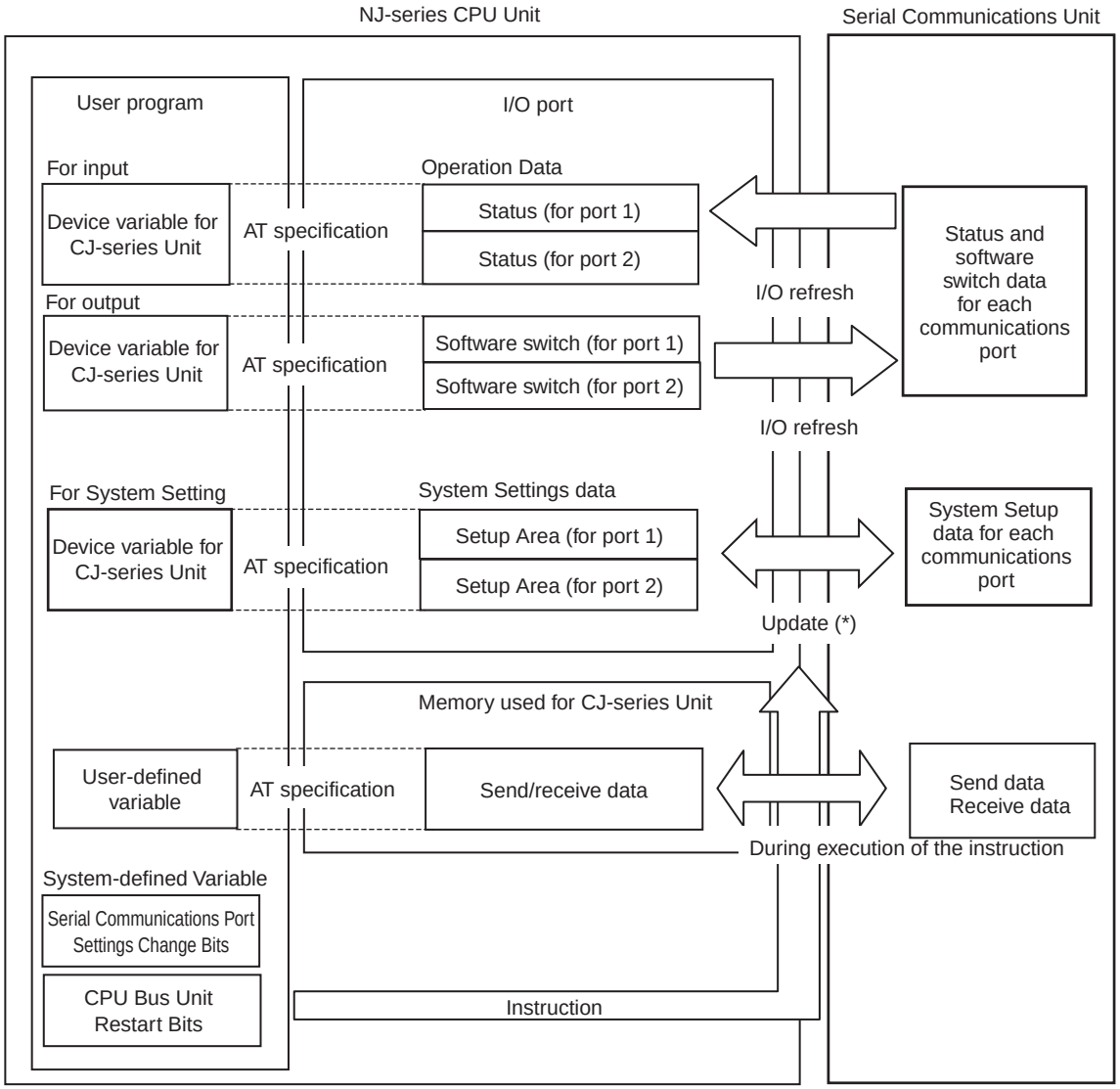
For details on I/O ports, refer to *2-3 Device Variable for CJ-series Unit*.

2-2-1 Data Flow

The CPU Unit and Serial Communications Unit exchange data as shown in the table and figure below.

Data exchange type

Access methods from the user program	AT specification destination	Data exchange timing	Unit data type
Device variable for CJ-series Unit	I/O port (for Operation Data)	During I/O refresh	Software switch
			Status
	I/O port (for System Settings data)	When the power is turned ON, the serial communications port setting is changed, or the Unit is restarted	System Settings data
User-defined variable	Memory used for CJ-series Unit	During I/O refresh	Data in holding registers and other allocation areas in the Modbus-RTU Slave Mode
		At I/O refresh immediately after instruction execution	Send/receive data of Serial Communications instructions, etc.
System-defined variable	---	During I/O refresh	Send/receive data of Serial Port I/O instructions, etc.



* This is executed when the Controller is reset, the serial communications port setting is changed, or the Unit is restarted.

Device variable for CJ-series Unit

Device variables for CJ-series Units are variables for which AT is specified for the I/O port explained below.

The user program uses device variables for CJ-series Unit to access the Configuration Unit such as Serial Communications Unit.

For allocation of the device variables for CJ-series Unit to the I/O port, refer to *How to Create User-defined Variables* (P. 2-13).

● I/O port

An "I/O port" is a logical interface for data exchange by a CPU Unit with a Serial Communications Unit or other Configuration Unit.

An I/O port has a unique pre-defined name for each unit model and function.

An I/O port is automatically created by preparing the Unit Configuration with Sysmac Studio.

For the details of I/O ports defined for the Serial Communications Unit, refer to *2-3 Device Variable for CJ-series Unit*.

There are two types of I/O ports for the Serial Communications Unit: those for Operation Data and those for System Settings data.

● Operation Data

- Software Switch for Each Communications Port
  Software switch data to be output (from CPU Unit to this Unit) exists for each communications port.
  Software switch data is stored at the I/O ports for Operation Data allocated for the Serial Communications Unit.
  The user program references data and operates switches via the device variable for CJ-series Unit.
  Data is updated during I/O refreshing.
- Status of Each Communications Port
  Status data to be input (from this Unit to CPU Unit) exists for each communications port. Status data is stored at the I/O ports for Operation Data allocated for the Serial Communications Unit.
  The user program references data via the device variable for CJ-series Unit.
  Data is updated during I/O refreshing.

● System Settings data

- System Settings Data for Each Communications Port
  System Settings data exists for each communications port.
  Configure the System Settings data using the Edit Special Unit Settings view of Sysmac Studio. You can also configure System Settings by using the device variables for CJ-series Unit (for system setting) that are AT specified to the applicable I/O ports from the user program.
  System Settings data is stored at the I/O ports for System Settings data allocated for the Serial Communications Unit. System Settings data will be retained by the battery even during power interruptions.
  The data is transferred to the Serial Communications Unit and updated when the Controller is reset, the serial communications port setting is changed, or the Unit is restarted.

User-defined variable

The user program uses user-defined variables to access the storage area for the send/receive data, or holding resisters and other allocation areas in the Modbus-RTU Slave Mode, with a communications instruction.

For allocation of user-defined variables, refer to *How to Create User-defined Variables* (P. 2-13).

System-defined variable

These variables are allocated with specific functions pre-defined by the system.

Some are set automatically by the system and others are set and manipulated with the user program.

The Serial Communications Unit uses them to restart the Unit, change the communications setting, or restart a serial communications port.

For details, refer to *2-4 System-defined Variable*.

How to Access from User Program

The CPU Unit and the Serial Communications Unit exchange data via the memory within the CPU Unit used for the CJ-series Unit.

For details of the memory used for CJ-series Unit, refer to NJ-series CPU Unit Software User's Manual (W501).

The user program exchanges data using the following.

Data type	Access method
Software switch	Device variable for CJ-series Unit
Status data	
System Settings data	
Send/receive data of Serial Port I/O instructions in No-protocol Mode	User-defined variable
Send/receive data with Protocol Macro instruction in Protocol Macro Mode	
Data in allocation area in Modbus-RTU Slave Mode	
Serial Communications Port Settings Change Bits, Unit Restart Bits, Network Communications Instruction Enabled Flag	System-defined variable

2-2-2 How to Specify and Create Variables

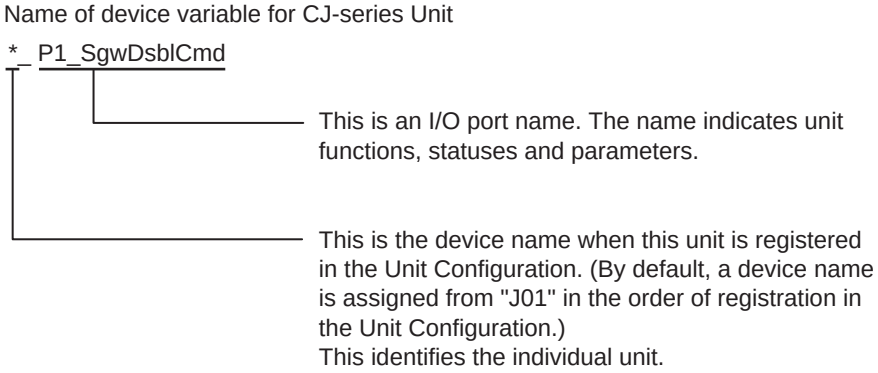
How to Specify Device Variable for CJ-series Unit

Allocate device variables for CJ-series Unit to I/O ports on the I/O Map View of Sysmac Studio.

Specify the variable name to be allocated by one of the following methods:

- Select and allocate an existing variables.
- Input a new variable name.
- Automatically create with "Create Device Variable."

The following is the configuration of variable names created with the last method: Automatic creation.



For details of the device variable for CJ-series Unit, refer to *2-3 Device Variable for CJ-series Unit*.

In the explanations from here on, the device name automatically created is used as the device variable name for CJ-series Unit, for example **_P1_SgwDsblCmd*.

How to Create User-defined Variables

User-defined variables are required in the following situations.

- To specify the send/receive data of Serial Port I/O instructions in No-protocol Mode
- To specify the send/receive data with a Protocol Macro instruction in Protocol Macro Mode
- To specify the allocation area in Modbus-RTU Slave Mode

In general, user-defined variables create array variables.

An example of allocation to a user-defined variable is explained below.

Example) The Holding Registers allocation area is set in DM within the memory area for the CJ-series Unit in the Modbus-RTU Slave Mode, and allocated to the array variable, RegData, to update the 10 words, DM1000 to DM1009. Each of these 10 words can be updated separately. The user can use any desired name for the array variable names.

Set the starting address to D1000

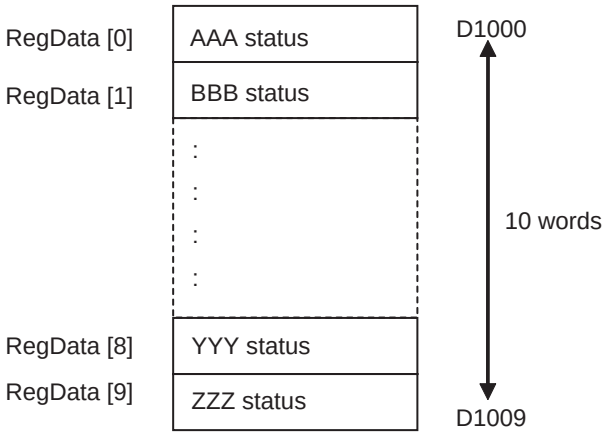
Word address	15 bits 0 bit
+0	RegData [0]
+1	RegData [1]
+2	RegData [2]
:	:
+9	RegData [9]

For 10 words

Set the array data type to WORD as it is set for each word.

Array elements are required for 10 words. Therefore, the array variable will be WORD RegData [10].

Allocate this array to the area starting from D1000 by using Sysmac Studio.



How to Specify System-defined Variables

Use the variables that are pre-defined.

For details, refer to *2-4 System-defined Variable*.

2-3 Device Variable for CJ-series Unit

The function of each device variable for CJ-series Unit is explained in this section.

The following explanations use variables names automatically created on the I/O Map View of Sysmac Studio.

2-3-1 Allocations of Device Variable for CJ-series Unit

With the NJ series, the following three types of data in the Operation Data and System Settings data of the Serial Communications Unit are pre-defined as the I/O ports.

Allocate device variables for CJ-series Unit to I/O ports to use.

- System Settings (to set the modes, communications specifications, and other settings for the Serial Communications Unit.)
- Software switch (for the CPU Unit to instruct the Serial Communications Unit to execute various functions)
- Status (to indicate the status of the Serial Communications Unit or error information)

The following subsections explain each type of data for the device variables for CJ-series Unit for Serial Comunications Unit.

For the device variable names for CJ-series Unit and the addresses of the Operation Data and the System Settings data, refer to *A-1-2 Differences in Methods for Access from a User Program*.

2-3-2 Device Variable for CJ-series Unit for System Settings

These device variables for CJ-series Unit are used for System Settings. They are used to set the modes, communications specifications, and other settings for the Serial Communications Unit. The data is transferred from the CPU Unit to the Serial Communications Unit when the Controller is reset, the serial communications port setting is changed, or the Unit is restarted.

Precautions for Safe Use

Before restarting the Serial Communications Unit after any of the System Settings are changed, thoroughly confirm the safety of the target device for connection.

System Setting Procedure

You can use the following methods to set the Unit settings.

1 Use CX-Protocol or Special Unit Setup Editing screen of Sysmac Studio.

2 Use a user program.

If it is necessary to change the System Settings while the user program is executed, use the user program to change the System Settings.

Correct the settings, and make the new setting valid.

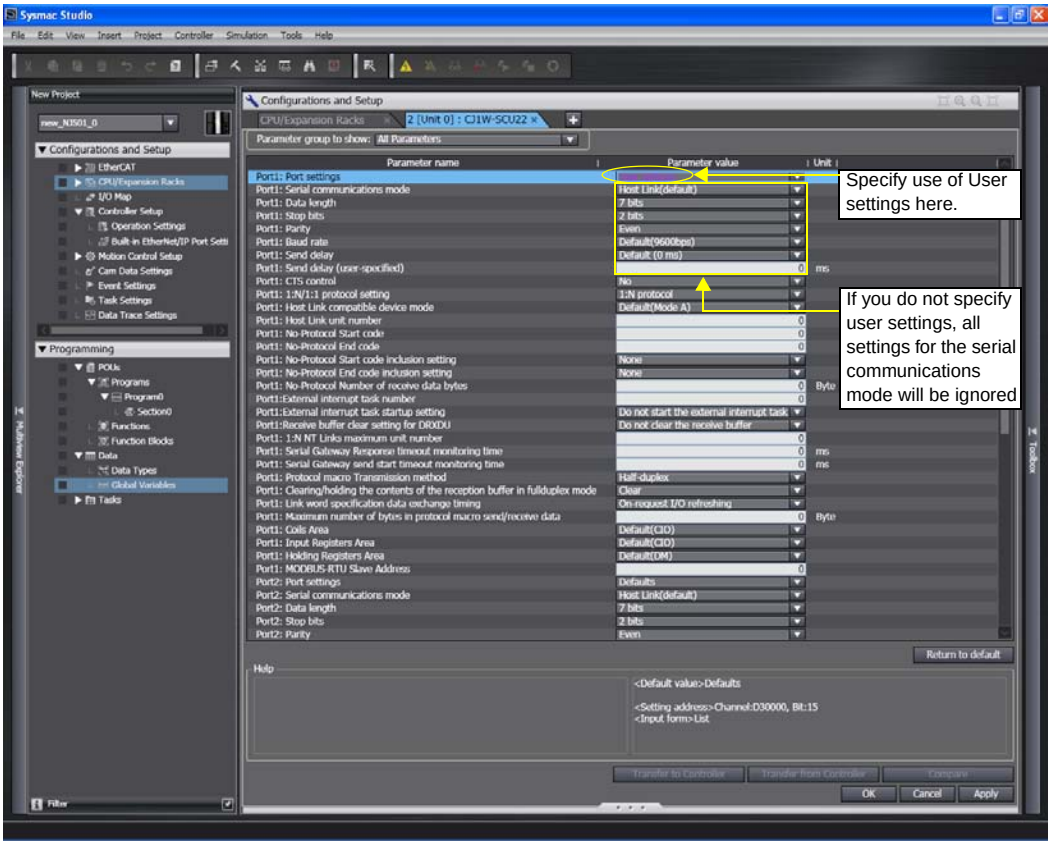
Restart the Unit, or change the Port 1/2 Settings Change Flag to TRUE, to make the new setting valid. For the system-defined variable for each flag, refer to *2-4 System-defined Variable*.

The usage of the System Settings differs according to the serial communications mode. For details, refer to the sections that explain the application when used in each serial communication mode.

Protocol Macro Mode:	→ Section 4
Serial Gateway:	→ Section 5
No-protocol Mode:	→ Section 6
Modbus-RTU Mode:	→ Section 7
Loopback Test:	→ Section 8

Precautions for Correct Use

When you make Unit settings using Edit Special Unit Settings view of the Unit Configuration on System Studio, always enable *User settings* whenever the default settings for port communications conditions are not used. Otherwise, any changes on the communications setting such as baud rate will be invalid.



List of Device Variable for CJ-series Unit for System Settings

*_ in a device variable name for CJ-series Unit corresponds to the device name of this Unit.

By default, a device name is assigned from "J01" in the order of registration in the Unit Configuration.

This identifies the individual unit.

● All Serial Communications Modes

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Bit 15: User-specified Setting Inclusion (*1) Bits 08 to 11: Serial Communications Mode Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P1_PortCfg.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P2_PortCfg.	Bit string	RW	Serial Communications Mode	Serial Communications Mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
*_P1_StartBitCfg	*_P2_StartBitCfg	BOOL	RW	Start Bits	1 start bit is always used regardless of whether the setting is FALSE/TRUE. FALSE: 1 bit TRUE: 1 bit Default: FALSE
*_P1_DatBitCfg	*_P2_DatBitCfg	BOOL	RW	Data Length	FALSE: 7 bits TRUE: 8 bits Default: FALSE
*_P1_StopBitCfg	*_P2_StopBitCfg	BOOL	RW	Stop Bits	FALSE: 2 bits TRUE: 1 bit Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity Even/Odd	FALSE: Even TRUE: Odd Default: FALSE
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps) (*2)	0: 9,600 3: 1,200 4: 2,400 5: 4,800 6: 9,600 7: 19,200 8: 38,400 9: 57,600 10: 115,200 11: 230,400 Default: 0

*1 When the default settings are used, the Baud Rate, Start Bits, Data Length, Stop Bits, Parity Yes/No, and Parity Even/Odd settings are disabled. To set these items to values other than the default, apply user settings.
The default settings used for No-protocol Mode, Protocol macro, Serial Gateway Mode and Loopback Test Mode are as follows: Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even, and Stop Bits: 2 bits (when the serial communications mode is either Host Link, Protocol macro, Serial Gateway, or Loopback Test).
The default settings used for Modbus-RTU Slave Mode are as follows: Baud Rate: 19,200 bps, Data Length: 8 bits, Parity: Even, and Stop Bits: 1 bit.

*2 Do not set undefined settings and baud rates that are not supported by the Serial Communications Mode. A System Setup error will occur. Settings of 1 and 2 are reserved for the system and should not be used.

● Protocol Macro Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	Bit 15: Send delay time Bits 00 to 14: Send delay time (user-specified)
*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	BOOL	RW	Send Delay Time	FALSE: Default (0 ms) TRUE: User settings
There is no specific device variable for CJ-series Unit to set the send delay setting range. When you reference this setting, set to bits 00 to 14 of *_P1_SendDelayCfg.	There is no specific device variable for CJ-series Unit to set the send delay setting range. When you reference this setting, set to bits 00 to 14 of *_P2_SendDelayCfg.	Bit string	RW	Send Delay Time (user-specified)	0 to 300 s (0 to 300,000 ms) (0000 to 7530 hex; 0 to 30,000 decimal) [Unit: 10 ms]
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control (*1)	FALSE: No TRUE: Yes Default: FALSE
*_P1_PmrSgwTimeoutCfg	*_P2_PmrSgwTimeoutCfg	WORD	RW	Serial Gateway Timeout Monitoring Time Setting	08 to 15: Serial Gateway response timeout monitoring time 00 to 07: Serial Gateway send start timeout monitoring time
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	USINT	RW	Serial Gateway Send Start Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrTransCfg	*_P2_PmrTransCfg	WORD	RW	Protocol macro Transmission Settings	Bit 15: Protocol macro transmission method Bit 03: Clearing/holding the contents of the reception buffer in full-duplex mode Bit 02: Link word specification data exchange method
*_P1_PmrTransTypCfg	*_P2_PmrTransTypCfg	BOOL	RW	Protocol macro Transmission method	FALSE: Half-duplex (default) TRUE: Full-duplex

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrRBufClrCfg	*_P2_PmrRBufClrCfg	BOOL	RW	Clearing/Holding the Contents of the Reception Buffer in Full-duplex Mode	FALSE: Clear (default) TRUE: Hold
*_P1_PmrLkChAccessCfg	*_P2_PmrLkChAccessCfg	BOOL	RW	Link Word specification Data Exchange Method	FALSE: On-request I/O refreshing (default) TRUE: Continuous I/O refreshing
*_P1_PmrMaxDatSzCfg	*_P2_PmrMaxDatSzCfg	USINT	RW	Maximum Number of Bytes in Protocol Macro Send/Receive Data	Range 200 to 1,000 bytes (*2)

*1 When CTS control is enabled, the request to send signal (RTS) turns ON and the transmission starts after the clear to send signal (CTS) turns ON. When CTS control is disabled, the request to send signal (RTS) turns ON and the transmission starts without checking whether the clear to send signal (CTS) is ON.

*2 Set to 200 when value of 200 or below is specified, or 1,000 when value of 1,000 or above is specified.

● Serial Gateway Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	Bits serve the functions described below. Bit 15: Send delay time Bits 00 to 14: Send delay Time (user-specified)
*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	BOOL	RW	Send Delay Time	FALSE: Default (0 ms) TRUE: User settings
There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_P1_SendDelayCfg.	There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_P2_SendDelayCfg.	Bit string	RW	Send Delay Time (User-specified)	0 to 300 s (0 to 300,000 ms) (0000 to 7530 hex; 0 to 30,000 decimal) [Unit: 10 ms]
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control (*)	FALSE: No TRUE: Yes
*_P1_PmrSgwTimeoutCfg	*_P2_PmrSgwTimeoutCfg	WORD	RW	Serial Gateway Timeout Monitoring Time Setting	Bits serve the functions described below. 08 to 15: Serial Gateway response timeout monitoring time 00 to 07: Serial Gateway send start timeout monitoring time
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Data range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	USINT	RW	Serial Gateway Send Start Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]

* When CTS control is enabled, the request to send signal (RTS) turns ON and the transmission starts after the clear to send signal (CTS) turns ON. When CTS control is disabled, the request to send signal (RTS) turns ON and the transmission starts without checking whether the clear to send signal (CTS) is ON.

● No-protocol Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	Bits serve the functions described below. Bit 15: Send delay timer Bits 00 to 14: Send delay Time (user-specified)
*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	BOOL	RW	Send Delay Time	0: Default (0 ms) 1: User settings
There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_P1_SendDelayCfg.	There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_P2_SendDelayCfg.	Bit string	RW	Send Delay Time (User-specified)	0 to 300 s (0 to 300,000 ms) (0000 to 7530 hex; 0 to 30,000 decimal) [Unit: 10 ms]
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control (*)	FALSE: No TRUE: Yes
*_P1_NopCfg	*_P2_NopCfg	WORD	RW	No-Protocol Settings	Bit 12: No-protocol start code inclusion setting Bit 09: No-protocol CR + LF specification setting Bit 08: No-protocol end code inclusion setting Bits 00 to 07: Number of receive data bytes in no-protocol mode
*_P1_NopStartCodeYNCfg	*_P2_NopStartCodeYNCfg	BOOL	RW	No-Protocol Start Code Inclusion Setting	TRUE: Yes FALSE: No (default)
*_P1_NopCRLFCfg	*_P2_NopCRLFCfg	BOOL	RW	No-Protocol CR + LF Specification Setting	End code P□_NopCRLFCfg/ P□_NopEndCodeYNCfg:
*_P1_NopEndCodeYNCfg	*_P2_NopEndCodeYNCfg	BOOL	RW	No-Protocol End Code Inclusion Setting	00: No (specify number of receive data bytes) 01: Yes 10: CR + LF specified 11: Prohibited
*_P1_NopRcvDatSzCfg	*_P2_NopRcvDatSzCfg	USINT	RW	Number of Receive Data Bytes in No-protocol Mode	0 (default): 256 bytes Range: 1 to 255 bytes
*_P1_NopStartCodeCfg	*_P2_NopStartCodeCfg	USINT	RW	No-protocol Start Code	Range: 0 to 255
*_P1_NopEndCodeCfg	*_P2_NopEndCodeCfg	USINT	RW	No-protocol End Code	Range: 0 to 255

* When CTS control is enabled, the request to send signal (RTS) turns ON and the transmission starts after the clear to send signal (CTS) turns ON. When CTS control is disabled, the request to send signal (RTS) turns ON and the transmission starts without checking whether the clear to send signal (CTS) is ON.

● Modbus-RTU Slave Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_MbsSlavAdrCfg	*_P2_MbsSlavAdrCfg	USINT	RW	Modbus-RTU Slave Address	Range: 1 to 247 Default: 0
*_P1_MbsCoilsAreaCfg	*_P2_MbsCoilsAreaCfg	BYTE	RW	Coils Allocation Area	16#00: CIO (default) 16#B0: CIO 16#B1: WR 16#B2: HR 16#B3: AR
*_P1_MbsRegAreaCfg	*_P2_MbsRegAreaCfg	WORD	RW	Modbus-RTU Settings	Bits 08 to 15 Input Registers Area allocation area Bits 00 to 07 Holding Registers Area allocation area
*_P1_MbsInRegAreaCfg	*_P2_MbsInRegAreaCfg	BYTE	RW	Input Registers Allocation Area	16#00: CIO (default) 16#B0: CIO 16#B1: WR 16#B2: HR 16#B3: AR
*_P1_MbsHdRegAreaCfg	*_P2_MbsHdRegAreaCfg	BYTE	RW	Holding Registers Allocation Area	16#00: DM (default) 16#82: DM 16#50 to 5C: EM bank 0 to bank C 16#A0 to AC: EM bank 0 to bank C

2-3-3 Device Variable for CJ-series Unit for Software Switches

(Output from the CPU Unit to Serial Communications Unit)

The software switches are used for loopback tests, aborts in Protocol Macro Mode, releasing wait status, etc. For the details on the software switch functions, refer to *Section 5 Serial Gateway* and *Section 8 Loopback Test*.

List of Device Variables for CJ-series Unit for Software Switches

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SoftSw	*_P2_SoftSw	BYTE	RW	Soft Switches	Bit 06: Loopback test switch Bit 04: Serial gateway prohibit switch Bit 03: Abort switch Bit 02: One-shot trace switch Bit 01: Continuous trace switch Bit 00: Wait release switch
*_P1_LbtTestTrigCmd	*_P2_LbtTestTrigCmd	BOOL	RW	Loopback Test Switch (Loopback Tests)	TRUE: Start FALSE: Stop
*_P1_SgwDsblCmd	*_P2_SgwDsblCmd	BOOL	RW	Serial Gateway Prohibit Switch (Protocol Macros)	TRUE→FALSE: Permitted FALSE→TRUE: Prohibited
*_P1_PmrAbtCmd	*_P2_PmrAbtCmd	BOOL	RW	Abort Switch (Protocol Macros)	TRUE: Abort FALSE: Aborted
*_P1_Pmr1ShotTraceCmd	*_P2_Pmr1ShotTraceCmd	BOOL	RW	One-shot Trace Switch (*) (Protocol Macros)	TRUE: Start FALSE: Stop
*_P1_PmrContTraceCmd	*_P2_PmrContTraceCmd	BOOL	RW	Continuous Trace Switch (*) (Protocol Macros)	TRUE: Start FALSE: Stop
*_P1_PmrWaitRlsCmd	*_P2_PmrWaitRlsCmd	BOOL	RW	Wait Release Switch (Protocol Macros)	TRUE: Release wait FALSE: Wait released

* The One-shot Trace Switch and Continuous Trace Switch are used for the Serial Communications Unit only when you execute traces from the CX-Protocol in Protocol Macro Mode. Do not manipulate these switches from a user program.

2-3-4 Device Variable for CJ-series Unit for Status

These variables are used for data input from the Serial Communications Unit to the CPU Unit.

With statuses, you can read the setting status, communications status, transmission control signal status, and transmission error status of each Serial Communications Unit port common to each Communications Mode, and you can read the protocol status unique to each Communications Mode.

List of Device Variables for CJ-series Unit for Statuses Common to All Communications Modes

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_Com_UnitSta		WORD	R	Serial Communication Unit Status	Bit 01: Error log EEPROM error Bit 00: Protocol data error
*_Com_UnitLogMemErr		BOOL	R	Error Log EEPROM Error	TRUE: Error log EEPROM error FALSE: Error log EEPROM normal
*_Com_UnitPmrDatErr		BOOL	R	Protocol Data Error	TRUE: Protocol data error FALSE: Protocol data normal
*_P1_SysSetSta	*_P2_SysSetSta	WORD	R	System Settings (*1)	Bits 12 to 15: Serial Communications Mode Bits 8 to 11: Baud rate Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P2_SysSetSta*.	Bit string	R	Serial Communications Mode	Serial Communications Mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P2_SysSetSta*.	Bit string	R	Baud Rate	0: 9,600 3: 1,200 4: 2,400 5: 4,800 6: 9,600 7: 19,200 8: 38,400 9: 57,600 10: 115,200 11: 230,400 Default: 0

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_StartBitSta	*_P2_StartBitSta	BOOL	R	Start Bits (Always 1 bit)	FALSE: 1 bit TRUE: 1 bit (1 bit for both FALSE and TRUE)
*_P1_DatBitSta	*_P2_DatBitSta	BOOL	R	Data Length (7 bits/8 bits)	FALSE: 7 bits TRUE: 8 bits
*_P1_StopBitSta	*_P2_StopBitSta	BOOL	R	Stop Bits (2 bits/1 bit)	FALSE: 2 bits TRUE: 1 bit
*_P1_ParityYNSta	*_P2_ParityYNSta	BOOL	R	Parity (Yes/No)	FALSE: Yes TRUE: No
*_P1_ParityBitSta	*_P2_ParityBitSta	BOOL	R	Parity (Even/Odd)	FALSE: Even TRUE: Odd
*_P1_HwSetSta	*_P2_HwSetSta	WORD	R	Hardware Settings	Bit 15: RS-422/485 setting status Bit 14: RS-232C setting status Bit 13: Terminating resistance setting status Bit 01: System Setup error Bit 00: Port operating status
*_P1_Ser485Sta	*_P2_Ser485Sta	BOOL	R	RS-422/485 setting Status	Port types of each port *_P□_Ser485Sta/ *_P□_Ser232Sta:* 00: No port 01: RS232C 10: RS422A/485 11: This status does not exist.
*_P1_Ser232Sta	*_P2_Ser232Sta	BOOL	R	RS-232C setting Status	
*_P1_TermSta	*_P2_TermSta	BOOL	R	Terminating Resistance Setting Status	TRUE: Terminating resistance ON FALSE: Terminating resistance OFF
*_P1_SysSetupErr	*_P2_SysSetupErr	BOOL	R	System Setup Error	TRUE: System Setup error FALSE: System Setup normal
*_P1_OperatingSta	*_P2_OperatingSta	BOOL	R	Port Operating Status	TRUE: Port operating FALSE: Port stopped
*_P1_TransCtlSta	*_P2_TransCtlSta	WORD	R	Communications Status	Bit 10: Remote Unit busy Bit 08: Local Unit busy Bit 07: DTR (ER) signal Bit 06: DSR (DR) signal Bit 04: CTS (CS) signal Bit 03: RTS (RS) signal
*_P1_RmtBusySta	*_P2_RmtBusySta	BOOL	R	Remote Unit Busy	TRUE: Remote Unit busy (Flow control) FALSE: Remote Unit ready to receive

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_LclBusySta	*_P2_LclBusySta	BOOL	R	Local Unit Busy	TRUE: Local Unit busy (Flow control) FALSE: Local Unit ready to receive
*_P1_SigERSta	*_P2_SigERSta	BOOL	R	ER signal	TRUE: High FALSE: Low
*_P1_SigDRSta	*_P2_SigDRSta	BOOL	R	DR signal	TRUE: High FALSE: Low
*_P1_SigCSSta	*_P2_SigCSSta	BOOL	R	CS signal	TRUE: High FALSE: Low
*_P1_SigRSSta	*_P2_SigRSSta	BOOL	R	RS signal	TRUE: High FALSE: Low
*_P1_TransErrSta	*_P2_TransErrSta	WORD	R	Transmission Error Status	Bit 15: Transmission error (*2) Bit 14: Tfs (send finished monitoring time) exceeded (*3) Bit 13: Tfr (receive finished monitoring time) exceeded (*3) Bit 12: Tr (receive wait monitoring time) exceeded (*3) Bits 08 to 11: Number of retries (*3) Bit 07: FCS check error Bit 06: Command error (*3) Bit 05: Timeout error Bit 04: Overrun error Bit 03: Framing error Bit 02: Parity error
*_P1_TransErr	*_P2_TransErr	BOOL	R	Transmission error (*2)	TRUE: Transmission error FALSE: No transmission error
*_P1_TfsErr	*_P2_TfsErr	BOOL	R	Tfs (Send Finished Monitoring Time) Exceeded (*3)	TRUE: Tfr (send finished monitoring time) exceeded FALSE: Normal
*_P1_TfrErr	*_P2_TfrErr	BOOL	R	Tfr (Receive Finished Monitoring Time) Exceeded (*3)	TRUE: Tfr (receive finished monitoring time) exceeded FALSE: Normal
*_P1_TrErr	*_P2_TrErr	BOOL	R	Tr (Receive Wait Monitoring Time) Exceeded (*3)	TRUE: Tr (receive wait monitoring time) exceeded FALSE: Normal

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
There is no specific device variable for CJ-series Unit to reference the number of retries. When you reference the number of retries, refer to bits 08 to 11 of *_P1_TransErrSta*.	There is no specific device variable for CJ-series Unit to reference the number of retries. When you reference the number of retries, refer to bits 08 to 11 of *_P2_TransErrSta*.	Bit string	R	Number of Retries (*3)	Range: 0 to 9
*_P1_FCSErr	*_P2_FCSErr	BOOL	R	FCS Check Error (*4)	TRUE: FCS check error FALSE: FCS check normal
*_P1_CmdErr	*_P2_CmdErr	BOOL	R	Command Error (*3)	TRUE: Command error FALSE: No command error
*_P1_TimeoutErr	*_P2_TimeoutErr	BOOL	R	Timeout Error (*5)	TRUE: Timeout (protocol macros: Tfs, Tfr, or Tr) error or Serial Gateway send/response timeout FALSE: Normal
*_P1_OverRunErr	*_P2_OverRunErr	BOOL	R	Overrun Error (*6)	TRUE: Overrun error FALSE: Normal
*_P1_FramingErr	*_P2_FramingErr	BOOL	R	Framing Error (*7)	TRUE: Framing error FALSE: Normal
*_P1_ParityErr	*_P2_ParityErr	BOOL	R	Parity Error (*7)	TRUE: Parity error FALSE: Normal

*1 The current settings for the port are read. For details on the contents that are read, refer to *List of Device Variable for CJ-series Unit for System Settings* on page 2-16. If a System Settings error occurs, the default settings will be read.

*2 If any of the error bits 00 to 14 becomes TRUE in the Protocol Macro Mode but then communications are recovered within the specified number of retries, the bit will be changed to FALSE. The bit will remain TRUE if recovery is not possible within the specified number of retries.

*3 Used only with protocol macros. Not used with any other serial communications mode.

*4 Used with Protocol Macro or Serial Gateway Mode.
This bit is changed to TRUE if an error occurs in the transmission path with the Serial Gateway.
With Modbus-RTU Slave Mode, this bit is changed to TRUE if there is a CRC check error.

*5 Used with Protocol Macro or Serial Gateway Mode.
This bit is changed to TRUE if a send start timeout or response timeout occurs with the Serial Gateway.

*6 Not used with Loopback Test Mode. This bit also changes to TRUE if more than 259 bytes of unread data is stored in the reception buffer during No-protocol Mode.

*7 Not used with Loopback Test Mode.

List of Device Variables for CJ-series Unit for Statuses Specific to Each Communications Mode (Protocol Statuses)

● Protocol Macro Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrSta	*_P2_PmrSta	WORD	R	Protocol Macro Operating Status	Bit 15: Protocol macro executing flag Bit 14: Step end error Bit 13: Abort flag Bit 12: Tracing flag Bit 11: Sequence end completion flag Bit 10: Sequence abort completion flag Bit 09: Sequence wait flag Bit 08: Serial Gateway prohibited flag (protocol macros) Bits 00 to 03: Protocol macro error code
*_P1_PmrExecSta	*_P2_PmrExecSta	BOOL	R	Protocol Macro Executing Flag	This flag is changed to TRUE when a ExecPMCR instruction (sequence) is executed. The flag remains FALSE when execution fails. When the sequence is completed and receive data is written, the flag is changed to FALSE after all the receive data has been written to I/O memory. This flag is changed to FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort).
*_P1_PmrStepErr	*_P2_PmrStepErr	BOOL	R	Step End Error	This flag is changed to TRUE when a step ends abnormally. It remains FALSE if the step ends normally as a result of a retry. TRUE: Step ended abnormally FALSE: Step ended normally

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrAbtSta	*_P2_PmrAbtSta	BOOL	R	Abort Flag	This flag is changed to TRUE when processing is ended by using the abort switch from the user program. When the abort switch is turned ON at the end of a sequence, the sequence may end with either End or Abort status.
*_P1_PmrTracingSta	*_P2_PmrTracingSta	BOOL	R	Tracing Flag	This flag is changed to TRUE while time series data for send and receive messages is traced with an instruction from the CX-Protocol.
*_P1_PmrSeqEndSta	*_P2_PmrSeqEndSta	BOOL	R	Sequence End Completion Flag	This flag is changed to TRUE when a sequence is completed for the next process or for an error process with an End command. **Note** When a sequence has ended normally, setting End (Abort when the sequence has ended abnormally) enables this flag to determine whether or not the sequence execution has ended normally. TRUE: Sequence ended FALSE: Sequence not ended
*_P1_PmrSeqAbtSta	*_P2_PmrSeqAbtSta	BOOL	R	Sequence Abort Completion Flag	This flag is changed to TRUE when a sequence is ended for the next process or for an error processing with an Abort command. TRUE: Sequence aborted FALSE: Sequence not aborted
*_P1_PmrSeqWaitSta	*_P2_PmrSeqWaitSta	BOOL	R	Sequence Wait Flag	This flag is changed to TRUE when a sequence is in the waiting state due to the WAIT command. Waiting is released when the Wait Release Switch is changed to TRUE in the user program, and the sequence will move to the next step.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrSgwProhSta	*_P2_PmrSgwProhSta	BOOL	R	Serial Gateway Prohibited Flag (Protocol Macros)	This flag is changed to TRUE when the Serial Gateway function (mode) is prohibited due to the status of the Serial Gateway Prohibit Switch in the user program. This flag is changed to FALSE when the Serial Gateway is permitted.
There is no specific device variable for CJ-series Unit to reference the Protocol Macro Error Code. When you reference the code, refer to bits 00 to 03 of *_P1_PmrSta.	There is no specific device variable for CJ-series Unit to reference the Protocol Macro Error Code. When you reference the code, refer to bits 00 to 03 of *_P2_PmrSta.	Bit string	R	Protocol Macro Error Code	0: No error 2: Sequence No. error 3: Data read/write area exceeded error 4: Protocol data syntax error
*_P1_PmrCommSeqNoSta	*_P2_PmrCommSeqNoSta	UINT	R	Communications Sequence No.	Range: 0 to 999
*_P1_PmrExecNoSta	*_P2_PmrExecNoSta	WORD	R	Executed Step and Case No.	Bits 08 to 11: Executed Step No. (code) Bits 00 to 03: Executed Reception Case No. (code)
*_P1_PmrStepNoCodeSta	*_P2_PmrStepNoCodeSta	USINT	R	Executed Step No. (Code)	Range: 0 to 15
*_P1_PmrRcvCaseNoCodeSta	*_P2_PmrRcvCaseNoCodeSta	USINT	R	Executed Reception Case No. (Code)	Range: 0 to 15
*_P1_PmrRcvCaseNoFlgSta[0-15]	*_P2_PmrRcvCaseNoFlgSta[0-15]	BOOL	R	Executed Reception Case No. Storage Flag	0 to 15: Correspond to bits 00 to 15
*_P1_PmrStepNoFlgSta[0-15]	*_P2_PmrStepNoFlgSta[0-15]	BOOL	R	Executed Step No. Storage Flag	0 to 15: Correspond to bits 00 to 15
*_P1_PmrRepCntSta	*_P2_PmrRepCntSta	WORD	R	Repeat Counter	Bits 08 to 15: Repeat Counter Setting Value Bits 00 to 07: Repeat Counter Present Value
*_P1_PmrSetRepCntSta	*_P2_PmrSetRepCntSta	USINT	R	Repeat Counter Setting Value	The number of times a step is repeated is set in these bits. Range: 0 to 255
*_P1_PmrCurRepCntSta	*_P2_PmrCurRepCntSta	USINT	R	Repeat Counter Present Value	The Repeat Counter Variable N is set. The value is cleared when the sequence execution starts, when the STUP instruction is executed, or at restarts. Range: 0 to 255

● Loopback Tests

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_LbtSta	*_P2_LbtSta	WORD	R	Loopback Test Status	Bit 15: Error Bit 08: DTR check error Bit 07: CTS check error Bit 05: Timeout error Bit 04: Parity error Bit 03: Overrun error Bit 02: Framing error Bit 00: Comparison error
*_P1_LbtErrSta	*_P2_LbtErrSta	BOOL	R	Error	TRUE: Error FALSE: Normal
*_P1_LbtDRErr	*_P2_LbtDRErr	BOOL	R	DTR Check Error	TRUE: DSR (DR) signal check error FALSE: Normal
*_P1_LbtCSErr	*_P2_LbtCSErr	BOOL	R	CTS Check Error	TRUE: CTS (CS) signal check error FALSE: Normal
*_P1_LbtTimeoutErr	*_P2_LbtTimeoutErr	BOOL	R	Timeout Error	TRUE: Timeout error FALSE: Normal
*_P1_LbtParityErr	*_P2_LbtParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal
*_P1_LbtOverRunErr	*_P2_LbtOverRunErr	BOOL	R	Overrun Error	TRUE: Overrun error FALSE: Normal
*_P1_LbtFramingErr	*_P2_LbtFramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal
*_P1_LbtCmpErr	*_P2_LbtCmpErr	BOOL	R	Comparison Error	TRUE: Comparison error FALSE: Normal
*_P1_LbtTestCntSta	*_P2_LbtTestCntSta	UINT	R	Test Execution Count	The test execution count is cleared at startup. If the number of tests is counted to 65,535, the value of the count will remain at 65,535, but testing will continue.
*_P1_LbtTestErrCntSta	*_P2_LbtTestErrCntSta	UINT	R	Test Error Count	The test execution count is cleared at startup. If the number of tests is counted to 65,535, the value of the count will remain at 65,535, but testing will continue.

● No-protocol Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_NopSta	*_P2_NopSta	WORD	R	No-protocol Mode Status	Bit 07: Reception Overflow Flag Bit 06: Reception Completed Flag Bit 05: SerialSend Executing Flag
*_P1_NopRcvOvfSta	*_P2_NopRcvOvfSta	BOOL	R	Reception Overflow Flag	TRUE: Unit received more than the specified number of bytes FALSE: Unit did not receive more than the specified number of bytes
*_P1_NopRcvCompleteSta	*_P2_NopRcvCompleteSta	BOOL	R	Reception Completed Flag	TRUE: Reception completed FALSE: No reception or reception in progress
*_P1_NopSerialSendExecSta	*_P2_NopSerialSendExecSta	BOOL	R	SerialSend Executing Flag	TRUE: Executing FALSE: Not executing
*_P1_NopRcvCntSta	*_P2_NopRcvCntSta	UINT	R	Reception Counter (Number of Receive Data Bytes)	Counts the number of received data bytes that have not been read from 0 to 256 (0 to 256 bytes). If an end code is present, counts the number of unread data bytes up to the end code.

● Modbus-RTU Slave Mode

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_MbsCmdRxCntSta	*_P2_MbsCmdRxCntSta	UINT	R	Number of Normally Received Commands	The number of normal Modbus-RTU commands received from the communications port is stored.
*_P1_MbsRespTxCntSta	*_P2_MbsRespTxCntSta	UINT	R	Number of Normally Sent Responses	The number of normal Modbus-RTU responses sent to the communications port is stored.
*_P1_MbsTxErrCnt	*_P2_MbsTxErrCnt	UINT	R	Number of Overrun Errors, Framing Errors, and Parity Errors (Transmission errors)	The number of overrun errors, framing errors, and parity errors that occur is stored.
*_P1_MbsCRCErrCnt	*_P2_MbsCRCErrCnt	UINT	R	Number of CRC Errors (Transmission errors)	The number of CRC errors that occur is stored.
*_P1_MbsCmdErrCnt	*_P2_MbsCmdErrCnt	UINT	R	Number of Command Format Errors (Illegal Function Codes and Illegal Addresses)	The number of illegal function codes and illegal addresses/data in received Modbus- RTU commands is stored.

2-4 System-defined Variable

Serial Communications Unit Port 1/2 Settings Changing Flag and Restart Bits are allocated to the following system-defined variables.

● Port 1 and Port 2 Settings Changing Flag

You can use an Out instruction or another instruction from the program to change these flags to TRUE to change communications settings and restart the Serial Communications Unit ports. After you change the settings and restart the communications port, the flag will automatically be changed to FALSE.

These flags are used both to change the communications port settings and to restart the communications port at the same time. Accordingly, in cases where these flags are changed to TRUE only to restart a communications port by using an Out instruction or another instruction, you can change these flags to TRUE without changing the port system settings.

List of System-defined Variables (corresponds to the unit number.)**

System-defined variable	Type	R/W	Name	Function
_CJB_SCU**P1ChgSta	BOOL	RW	Serial Communications Unit **, Port 1 Settings Changing Flag	TRUE: Port 1 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE
_CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit **, Port 2 Settings Changing Flag	TRUE: Port 2 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE

● Restart

You can restart the Serial Communications Unit by one of the following methods.

- Issue a ResetUnit instruction to restart from the program.
- Restart from a system-defined variable.
  Change the following bits to TRUE and then back to FALSE.

List of System-defined Variables (corresponds to the unit number.)**

System-defined variable	Type	R/W	Name	Function
_CJB_CBU**Restart	BOOL	RW	CPU Bus Unit Restart Bits	TRUE: CPU Bus Units are restarted. FALSE: CPU Bus Units are not restarted. Default: FALSE

● Variables Related to the SerialSend, SerialRcv, and SerialRcvNoClear Instructions in No-protocol Mode

System-defined variable	Description
_Port_isAvailable	Network Communications Instruction Enabled Flag TRUE when execution of SerialSend, SerialRcv, SerialRcvNoClear, and other network communications instructions (such as SendCmd and ExecPMCR) is enabled.

3

Installation and Wiring

This section describes how to mount Serial Communications Units, and how to connect the ports to external devices.

3-1 Installing Serial Communications Units 3-2
- 3-1-1 System Configuration Precautions 3-2
- 3-1-2 Serial Communications Unit Installation Procedure 3-2
- 3-1-3 Unit Handling Precautions 3-3

3-2 Wiring 3-4
- 3-2-1 Wiring Precautions 3-4
- 3-2-2 Port Types 3-4
- 3-2-3 Communications Modes and Ports 3-4
- 3-2-4 Connector Pin Layout 3-5
- 3-2-5 Mounting Height and Connector Cover Dimensions 3-6
- 3-2-6 Reducing Electrical Noise for External Wiring 3-7
- 3-2-7 2-Wire and 4-Wire Connections 3-7
- 3-2-8 NT-AL001 Link Adapter Settings 3-8
- 3-2-9 Connections for Protocol Macro, Serial Gateway, No-protocol Mode, and Modbus-RTU Slave Mode 3-9
- 3-2-10 Connections in Loopback Test 3-18

3-3 RS-232C and RS-422A/485 Wiring 3-19
- 3-3-1 Recommended RS-232C Wiring Examples 3-19
- 3-3-2 Recommended RS-422A/485 Wiring Examples 3-20
- 3-3-3 Wiring RS-232C Connectors on the CJ1W-SCU22/42 3-22
- 3-3-4 Soldering 3-23
- 3-3-5 Assembling Connector Hood 3-24
- 3-3-6 Wiring RS-422A/485 Terminal-block Connectors on the CJ1W-SCU32/42 3-25
- 3-3-7 Connecting to Unit 3-26

3-1 Installing Serial Communications Units

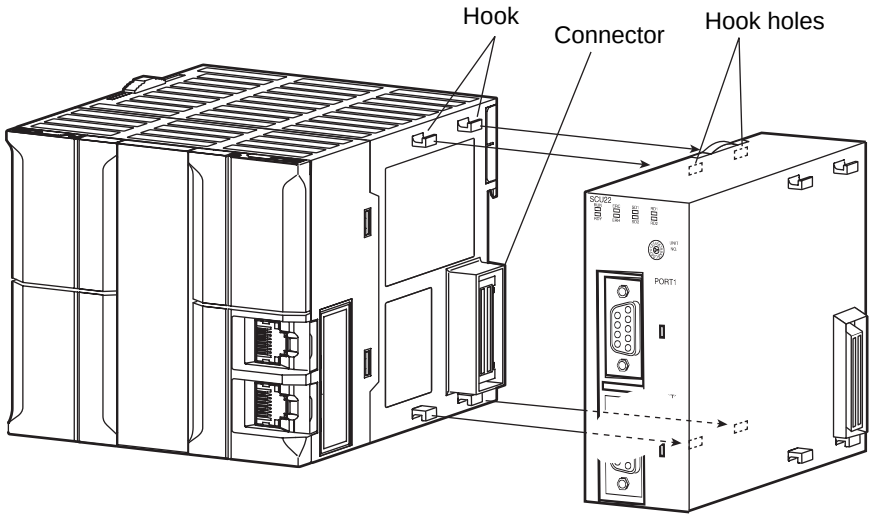
3-1-1 System Configuration Precautions

- Set a unique Unit number for each CPU Bus Unit to be installed in the CPU Rack or Expansion Rack. Set the unit number switch at the top of the front panel to between 0 and F. Turn OFF the Controller before setting the unit number.
- A maximum of 10 Serial Communications Units can be conntected to a CPU Rack or Expansion Rack. In total 16 Units can be mounted to a CPU Unit as long as no other CPU Bus Unit is mounted.

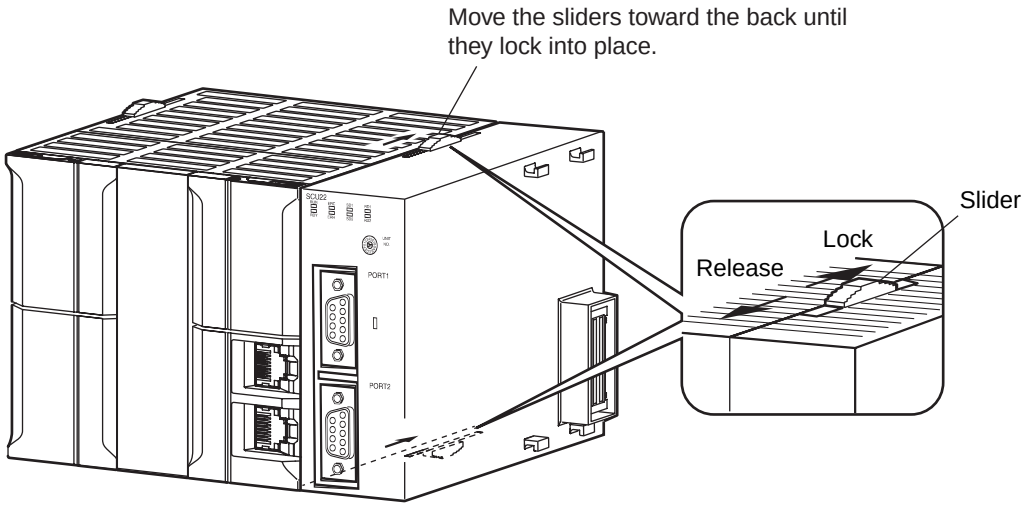
3-1-2 Serial Communications Unit Installation Procedure

Use the following steps to mount or remove Serial Communications Units.

1 Align the connectors properly and then press in on the Unit to connect it.



2 Slide the sliders on the top and bottom of the Unit until they lock the Units together.



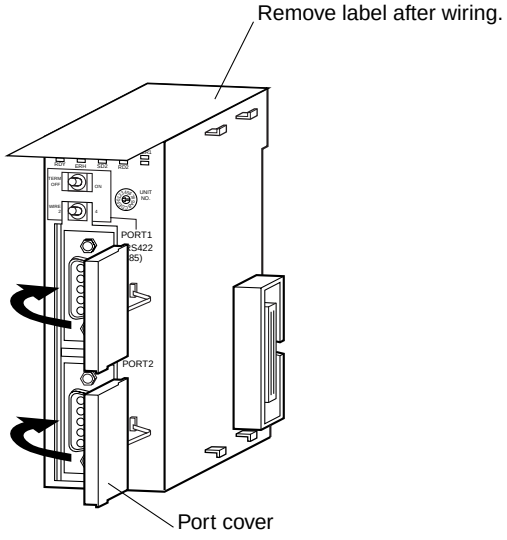
Precautions for Safe Use

If the sliders are not locked properly, the Serial Communications Units may not function correctly.

To remove the Unit, move the sliders to the release position and then pull the Units gently apart.

3-1-3 Unit Handling Precautions

- Always turn OFF the NJ-series before you mount or remove a Serial Communications Unit or you connect or disconnect cables to/from the Serial Communications Unit.
- Place the port connecting cables in a different duct from those for high-voltage lines or power lines to prevent the effects of electrical noise from these lines.
- Prevent wire clippings, cutting chips or other materials from getting inside the Unit. They could cause scorching, failure, and malfunction. Pay particular attention to this during installation and take measures such as covering with a cover.
- If the Unit was shipped from the factory with the dust protection label on top of the unit, be sure to remove that label before switching ON the power. The label prevents heat dissipation and could cause a malfunction.
- If a serial port is not used, leave the port cover on the port to prevent the entrance of dust.



3-2 Wiring

3-2-1 Wiring Precautions

- Before you connect or disconnect the communications cables, always make sure that the Controller power is turned OFF.
- Tighten the communications connector screws firmly with your fingers.
- You can connect Serial Communications Units to various devices. For compatibility, refer to the operation manuals for the devices to be connected.

3-2-2 Port Types

The following port types are provided on the Serial Communications Units.

Model	Port 1	Port 2
CJ1W-SCU22	RS-232C	RS-232C
CJ1W-SCU32	RS-422A/485	RS-422A/485
CJ1W-SCU42	RS-422A/485	RS-232C

The following sections describe the connection methods used for each serial communications mode and Serial Communications Unit port.

3-2-3 Communications Modes and Ports

The following table shows the relationship between the communications ports and the communications modes for the Serial Communications Unit.

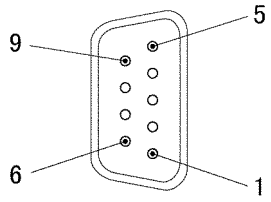
Communications mode	RS-232C		RS-422A/485			
	1:1	1:N (*)	1:1 4-wire	1:N 4-wire	1:1 2-wire	1:N 2-wire
Protocol Macros	Yes	Yes	Yes	Yes	Yes	Yes
Serial Gateway	Yes	Yes	Yes	Yes	Yes	Yes
No-protocol	Yes	Yes	Yes	Yes	No	No
Modbus-RTU Slave	Yes	Yes	Yes	Yes	Yes	Yes

* You can be use the NT-AL001 Link Adapter to convert RS-232C to RS-422A/485 and vice versa to enable 1:N communications.

3-2-4 Connector Pin Layout

● RS-232C Ports

This layout applies to the following ports: ports 1 and 2 of the CJ1W-SCU22 and port 2 of the CJ1W-SCU42.



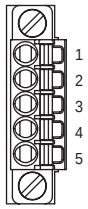
Pin	Abbreviation	Signal name	I/O
1	FG	Shield	---
2	SD	Send data	Output
3	RD	Receive data	Input
4	RS	Request to send	Output
5	CS	Clear to send	Input
6	5V	Power supply	---
7	DR	Data set ready	Input
8	ER	Data terminal ready	Output
9	SG	Signal ground	---
Shell	FG	Shield	---

Refer to *2-1 Component Names and Functions*.

● RS-422A/485 Port: Ports 1 and 2 on CJ1W-SCU32, or Port 1 on CJ1W-SCU42

Connector Pin Layout

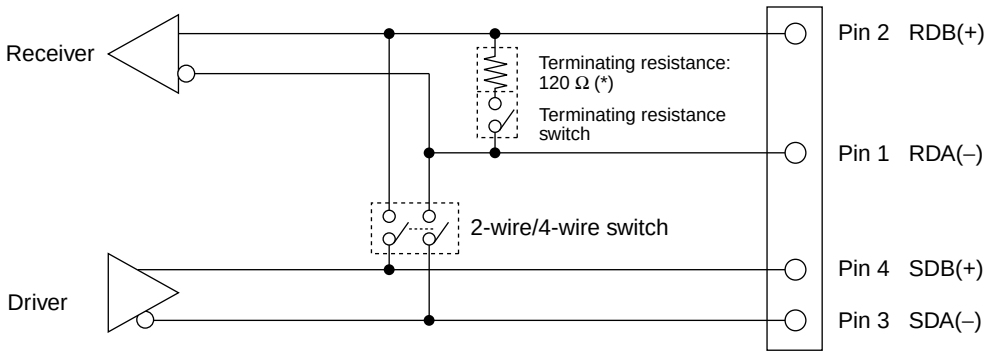
Pin No.	Symbol	Signal name	I/O
1	RDA	Receive data –	Input
2	RDB	Receive data +	Input
3	SDA	Send data –	Output
4	SDB	Send data +	Output
5	FG	Shield	---



Note When the 2-wire connections are used, use either pins 1 and 2, or pins 6 and 8.

Refer to *2-1 Component Names and Functions*.

The internal circuits are shown below.



* Terminating Resistance
Turn OFF the terminating resistance switch or externally attach terminating resistance as required by the specifications of the remote device.

Precautions for Safe Use

The signal names SDA/B and RDA/B do not always have the same polarity as that shown above. Check the polarity of the external device before you make connections.

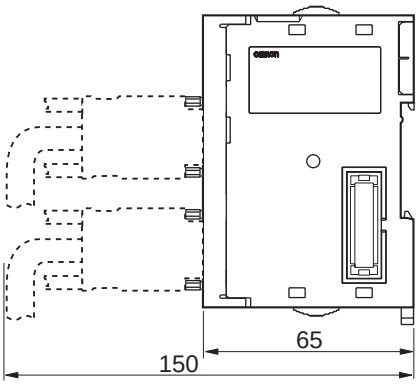
Additional Information

The RS-422A/485 port on the CJ1W-SCU32/42 has a failsafe function built into the receiver to prevent reading incorrect signals when the RDA and RDB pins are open or shorted.

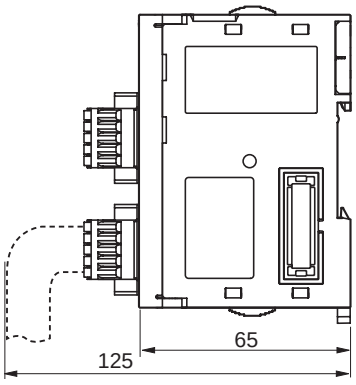
3-2-5 Mounting Height and Connector Cover Dimensions

When you mount the Serial Communications Unit, make sure to provide space for the mounting height and connector cover dimensions shown below.

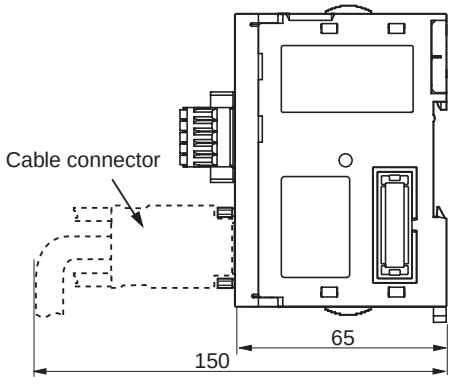
Serial Communications Unit
CJ1W-SCU22



CJ1W-SCU32
Serial Communications Unit



CJ1W-SCU42
Serial Communications Unit

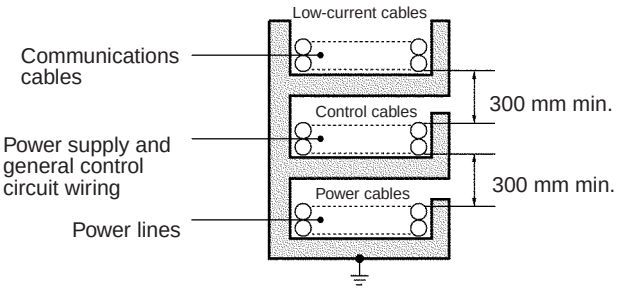


Note The mounting heights shown above are applicable when the attached connectors, connector covers, and recommended cables are used. The mounting height may differ when other connectors, connector covers, and cables are used. Take into account the connectors, connector covers, and the minimum bending radius of the cables to determine the mounting height.

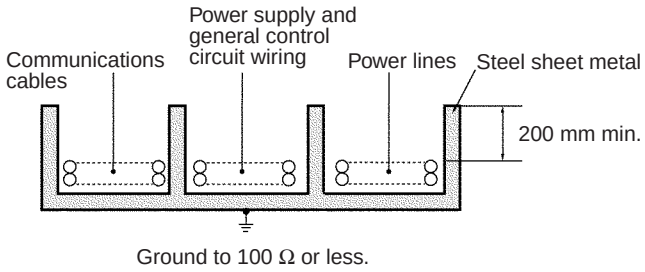
3-2-6 Reducing Electrical Noise for External Wiring

Observe the following precautions for external wiring.

- When multi-conductor signal cable is used, avoid use of I/O wires and other control wires in the same cable.
- If wiring racks are running in parallel, allow at least 300 mm between the racks.

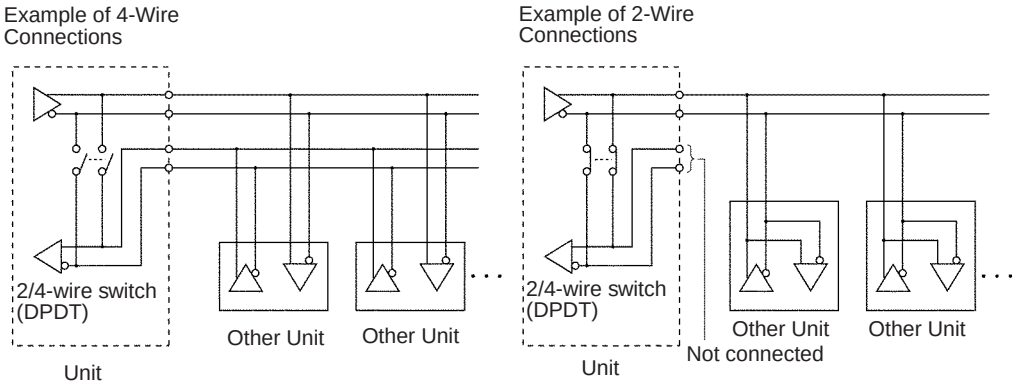


- If you place the I/O wiring and power cables in the same duct, shield them from each other with grounded steel sheet metal.



3-2-7 2-Wire and 4-Wire Connections

The transmission circuits for 2-wire and 4-wire connections are different, as shown in the following diagram.



Precautions for Correct Use

- Use the same transmission circuit (2-wire or 4-wire) for all nodes.
- Do not use 4-wire connections when the 2/4-wire switch on the Unit is set to 2-wire.
- In Protocol Macro Mode, do not use full-duplex transmissions when the 2/4-wire switch on the Unit is set to 2-wire. Otherwise, the data sent from the Serial Communications Unit will be directly returned as receive data. In this case, the Unit cannot determine whether the data in the reception buffer is its own send data or the data received from a remote node, and thus cannot perform receive processing properly. To avoid this problem, always use half-duplex transmissions with a 2-wire setting. You can use either half-duplex or full-duplex transmissions with a 4-wire setting.

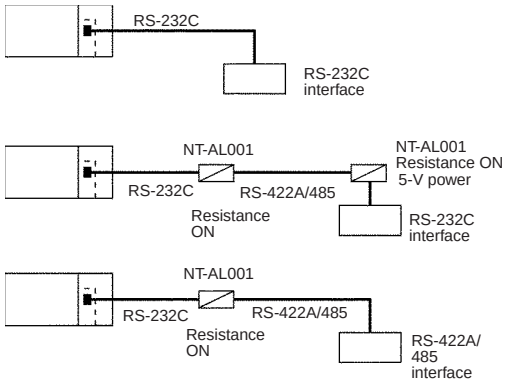
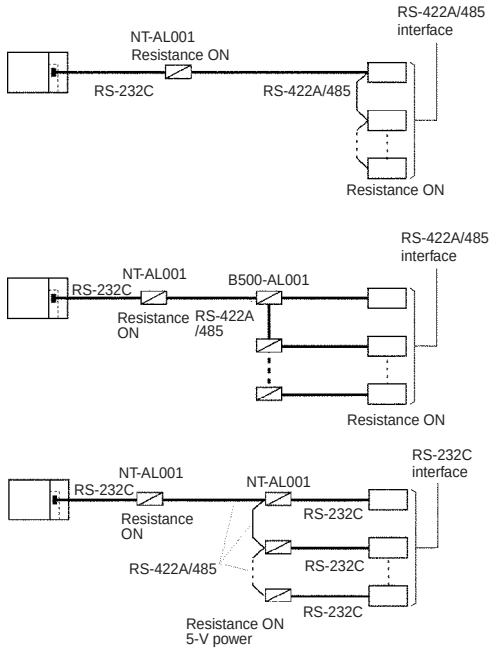
3-2-8 NT-AL001 Link Adapter Settings

The NT-AL001 Link Adapter has a DIP switch to set RS-422A/485 communications conditions. When you connect the Unit in any serial communications modes, refer to the DIP switch settings shown in the following table.

Pin	Function	Factory setting
1	Not used. Always set this pin to ON.	ON
2	Built-in terminating resistance setting ON: Connects terminating resistance. OFF: Disconnects terminating resistance.	ON
3	2/4-wire setting 2-wire: Set both pins to ON. 4-wire: Set both pins to OFF.	OFF
4		OFF
5	Transmission mode (setting) Constant transmission: Set both pins to OFF. Transmission performed when CS signal in RS-232C interface is at high level: Set pin 5 to OFF and pin 6 to ON. Transmission performed when CS signal in RS-232C interface is at low level: Set pin 5 to ON and pin 6 to OFF.	ON
6		OFF

3-2-9 Connections for Protocol Macro, Serial Gateway, No-protocol Mode, and Modbus-RTU Slave Mode

This section describes the connections for Protocol Macro, Serial Gateway, and No-protocol Mode. Up to 32 Boards or Units can be used for 1:N connections.

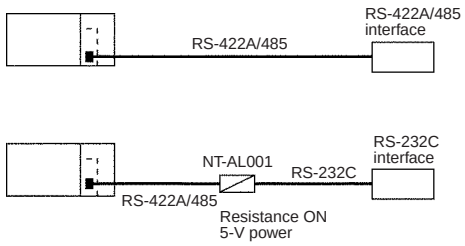
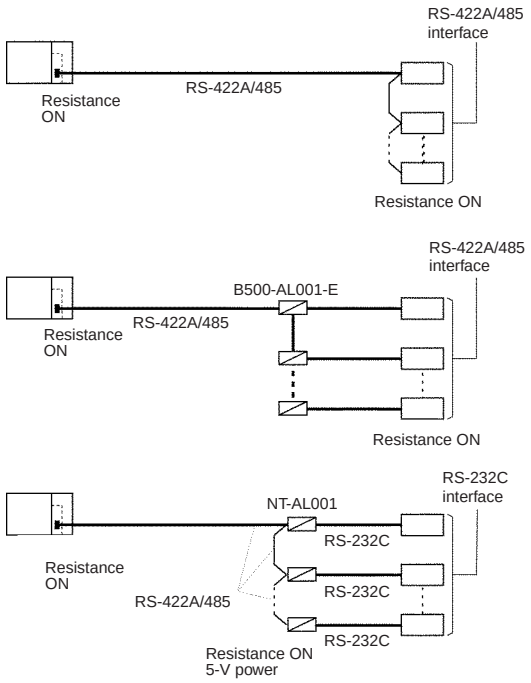
Port	Config-uration	Schematic diagram
RS-232C	1:1	
RS-232C	1:N	

Note **1** The maximum cable length for RS-232C is 15 m. The RS-232C standard, however, does not cover baud rates above 19.2 kbps. Refer to the manual for the device to be connected to confirm support.

2 The total cable length for RS-422A/485 systems, including branch cables, is 500 m max. when NT-AL001 Link Adapters are used. The baud rate and the communications distance sometimes depend on the remote device. Confirm the baud rates and communications distance supported by connected devices.

3 Here, the maximum cable length is limited to 2 m when an NT-AL001 Link Adapter is connected.

4 Branch lines must be a maximum of 10 m long.

Port	Config-uration	Schematic diagram
RS-422A/485	1:1	
RS-422A/485	1:N	

Note **1** The maximum cable length for RS-232C is 15 m. The RS-232C standard, however, does not cover baud rates above 19.2 Kbps. Refer to the manual for the device connected to confirm support.

2 The total cable length for RS-422A/485 systems, including branch cables, is 1,200 m max. The total cable length for RS-422A/485 systems, including branch cables, is 500 m max. when NT-AL001 Link Adapters are used. The baud rate and the communications distance sometimes depend on the remote device. Confirm the baud rates and communications distance supported by connected devices.

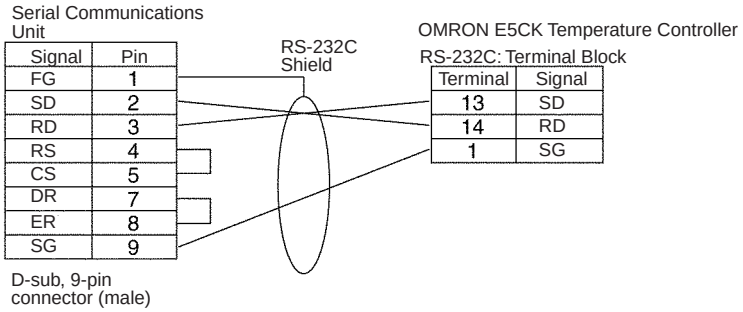
3 Here, the maximum cable length is limited to 2 m when an NT-Link Adapter is connected.

4 Branch lines must be a maximum of 10 m long.

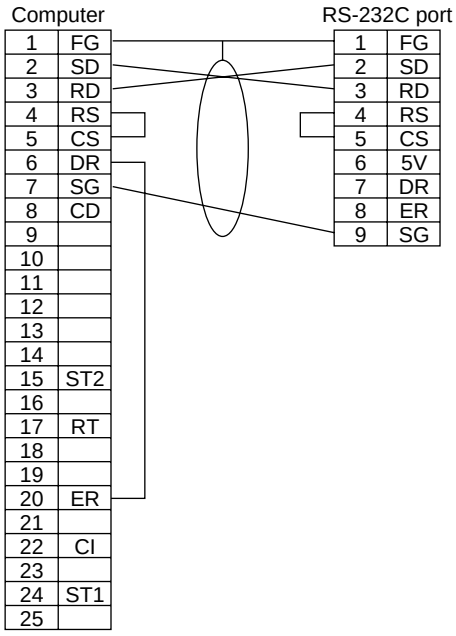
Connection diagrams are provided in the following subsections. OMRON recommends the use of shielded, twisted-pair cables for actual wiring to enhance noise resistance. For details on wiring methods, refer to *3-3 RS-232C and RS-422A/485 Wiring*.

Connecting RS-232C Ports 1:1

● Connections to E5CK Temperature Controller

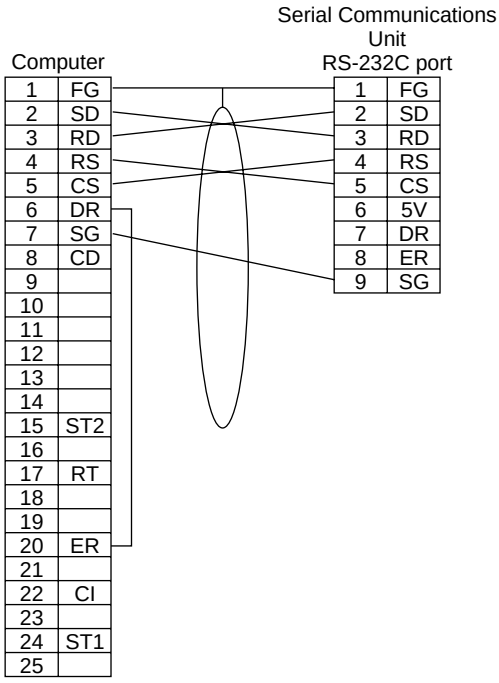


● Connections to Personal Computer

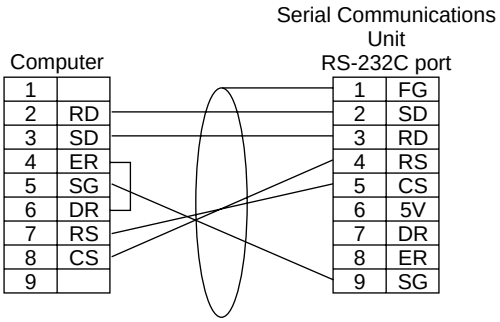


● Connections to Personal Computer with RS-CS Flow Control

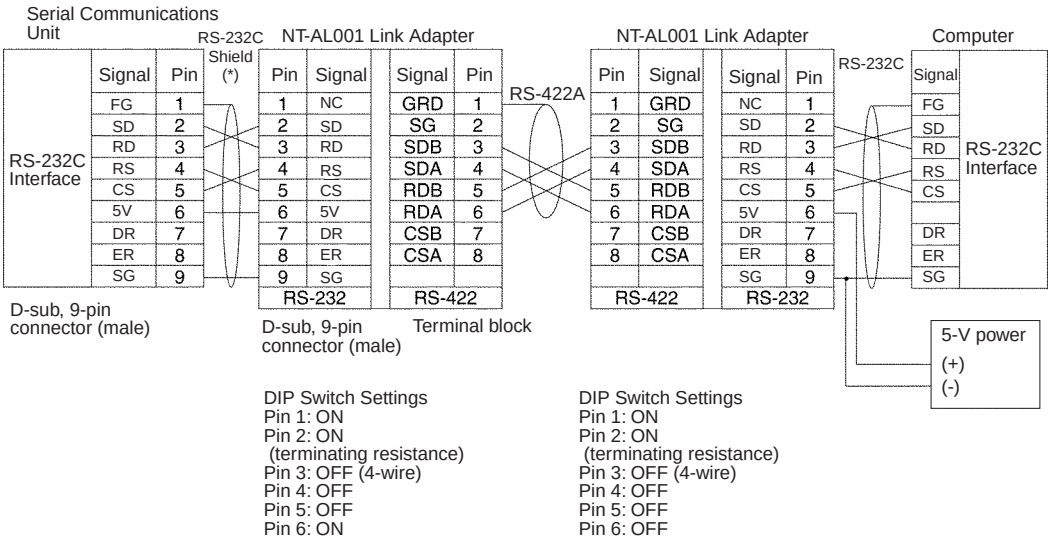
- IBM PC/AT or Compatible Computers



- DOS/V or Compatible Computers



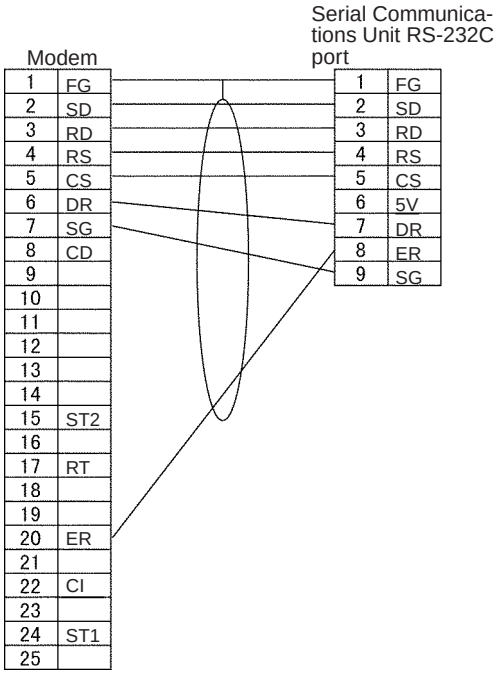
● Using NT-AL001 Link Adapters



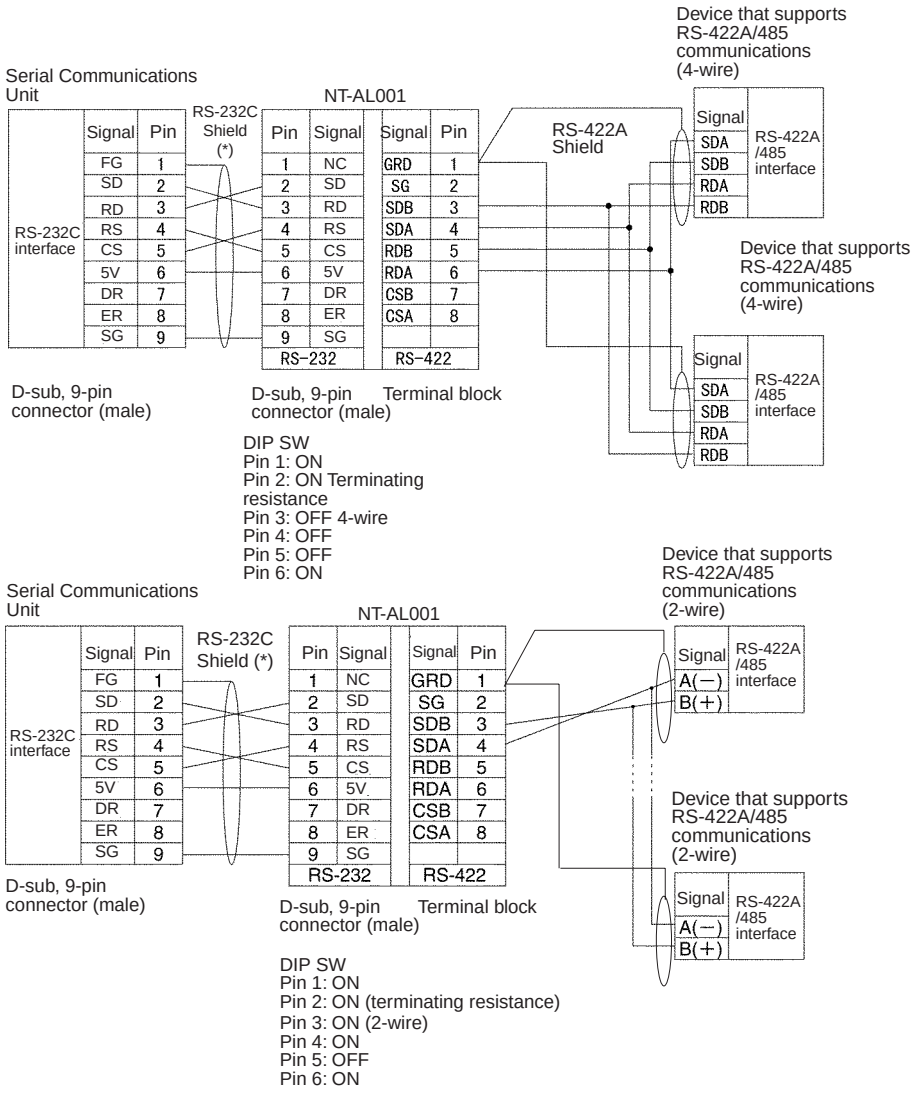
* We recommend you use the following NT-AL001 Link Adapter Connecting Cables to connect to NT-AL001 Link Adapters.

XW2Z-070T-1: 0.7 m
XW2Z-200T-1: 2 m

● Connections to a Modem



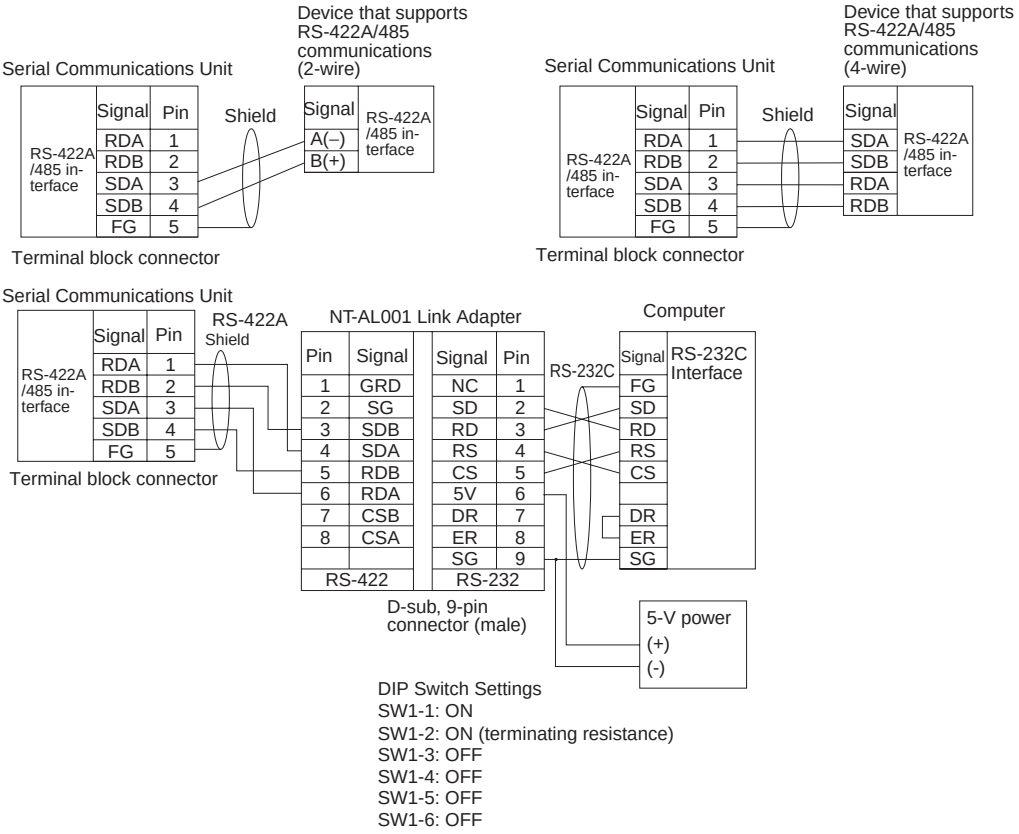
1:N Connections Using RS-232C Ports



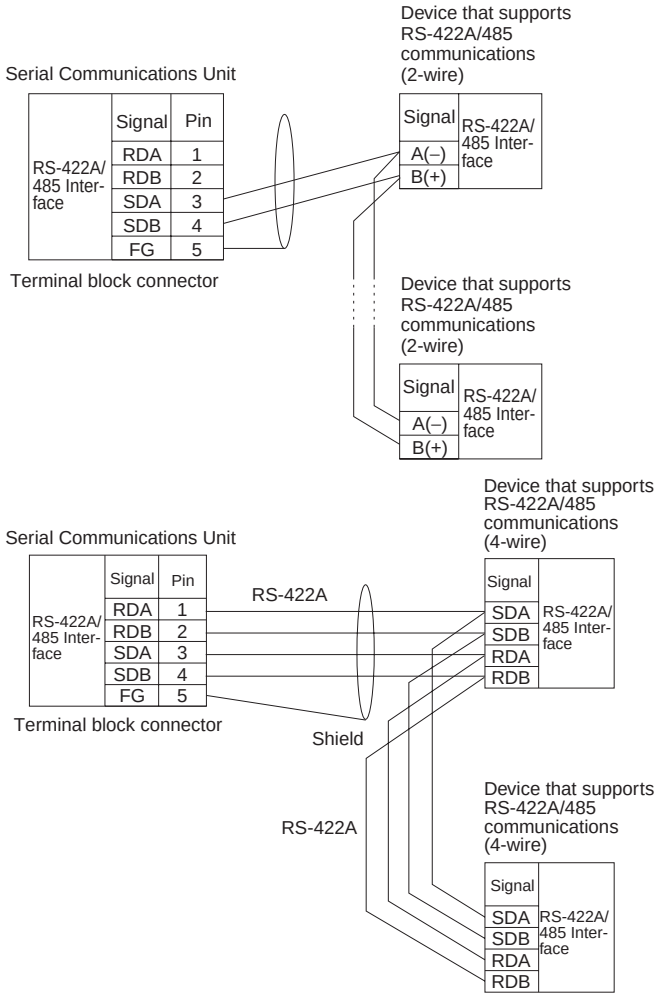
* We recommend you use the following NT-AL001 Link Adapter Connecting Cables to connect to NT-AL001 Link Adapters.

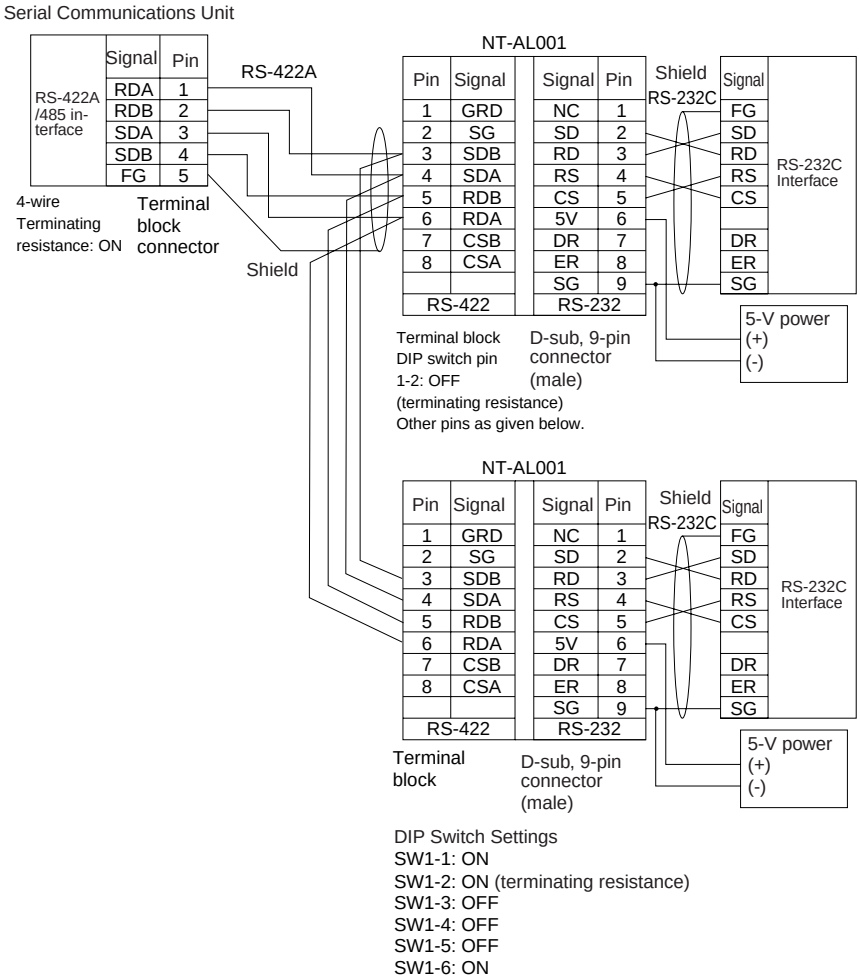
XW2Z-070T-1: 0.7 m
XW2Z-200T-1: 2 m

1:1 Connections Using RS-422A/485 Ports



1:N Connections Using RS-422A/485 Ports




Serial Communications Unit
Signal
Pin
RS-422A /485 interface
RDA 1
RDB 2
SDA 3
SDB 4
FG 5
4-wire
Terminating resistance: ON
Terminal block connector
RS-422A
Shield
NT-AL001
Pin Signal Signal Pin
1 GRD NC 1
2 SG SD 2
3 SDB RD 3
4 SDA RS 4
5 RDB CS 5
6 RDA 5V 6
7 CSB DR 7
8 CSA ER 8
SG 9
RS-422
RS-232
Shield
RS-232C
Signal
FG
SD
RD
RS
CS
DR
ER
SG
RS-232C Interface
5-V power
(+)
(-)
Terminal block
DIP switch pin
1-2: OFF
(terminating resistance)
Other pins as given below.
D-sub, 9-pin connector (male)
NT-AL001
Terminal block
D-sub, 9-pin connector (male)
DIP Switch Settings
SW1-1: ON
SW1-2: ON (terminating resistance)
SW1-3: OFF
SW1-4: OFF
SW1-5: OFF
SW1-6: ON

3-2-10 Connections in Loopback Test

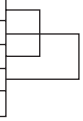
Connect the communications ports as shown below.

RS-232C port

Pin	Signal
2	SD
3	RD
4	RS
5	CS
1	FG
8	DR
7	ER

RS-422A/485 port

Pin	Signal
1	RDA
2	RDB
3	SDA
4	SDB
5	FG



3-3 RS-232C and RS-422A/485 Wiring

3-3-1 Recommended RS-232C Wiring Examples

It is recommended that RS-232C cables be connected as described below especially when the Serial Communications Unit is used in an environment where it is likely to be subject to electrical noise.

1 Always use shielded twisted-pair cables as communications cables.

Recommended cable model	Manufacturer
UL2464 AWG28x5P IFS-RVV-SB (UL-approved) AWG28x5P IFVV-SB (Not UL-approved)	Fujikura Ltd.
UL2464-SB (MA) 5Px28AWG (7/0.127) (UL-approved) CO-MA-VV-SB 5Px28AWG (7/0.127) (Not UL-approved)	Hitachi Cable, Ltd.

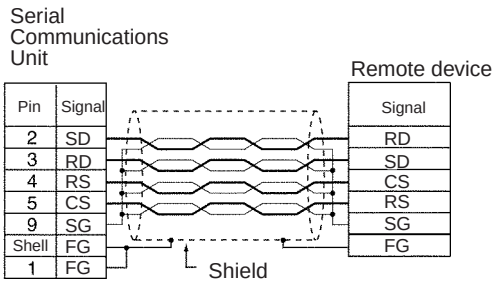
2 Combine signal wires and SG (signal ground) wires in a twisted-pair cable. At the same time, bundle the SG wires to each of the connectors on the Serial Communications Unit and the remote device.

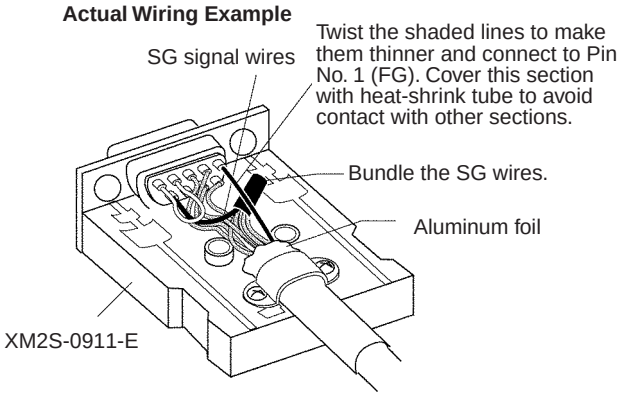
3 Connect the shield of the communications cable to the Shell (FG) terminal of the RS-232C connector on the Serial Communications Unit. At the same time, ground the ground (GR) terminal of the Power Supply Unit on the CPU Rack or Expansion Rack to 100 Ω or less.

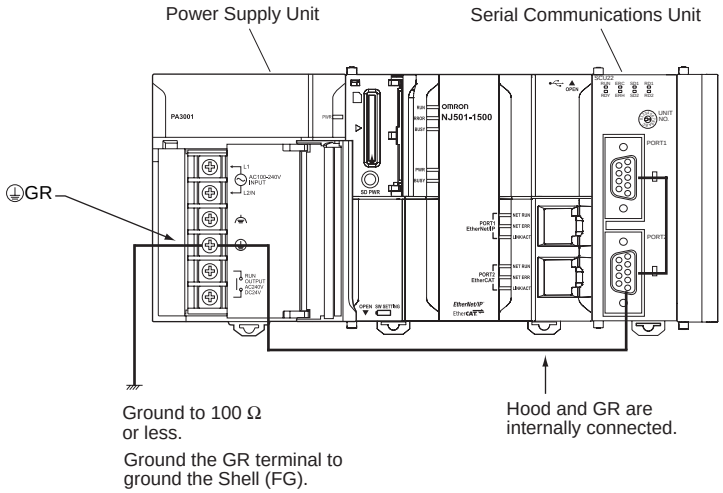
The Shell (FG) is internally connected to the ground terminal (GR) on the Power Supply Unit via the CPU Rack or Expansion Rack. Therefore, ground the ground terminal (GR) on the Power Supply Unit to ground the FG. There is conductivity between the Shell (FG) and Pin 1 (FG). To minimize contact resistance between the Shield and the FGs and improve noise resisance, connect the two FGs, i.e., Shell and Pin 1, to Shield.

A connection example is shown below.

Example:Twisted-pair Cable Connecting SD-SG, RD-SG, RTS-SG, and CTS-SG Terminals







3-3-2 Recommended RS-422A/485 Wiring Examples

● Recommended RS-422A/485 Cable

We recommend the following wiring method to ensure transmission quality.

1 Always use shielded twisted-pair cables as communications cables.

Model	Manufacturer
CO-HC-ESV-3Px7/0.2	Hirakawa Hewtech Corp.

2 Connect the shield of the communications cable to the Shell (FG) of the RS-422A/485 connector on the Serial Communications Unit. At the same time, ground the ground (GR) terminal of the Power Supply Unit on the CPU Rack or Expansion Rack to 100 Ω or less.

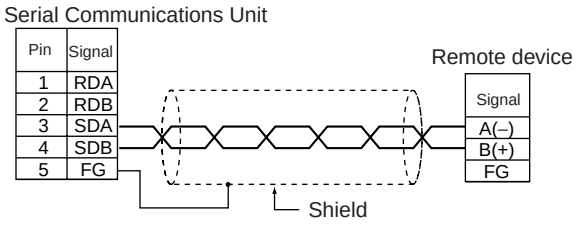
3 Always turn ON the terminating resistance at the end node of the RS-422A/485 line.

Precautions for Correct Use

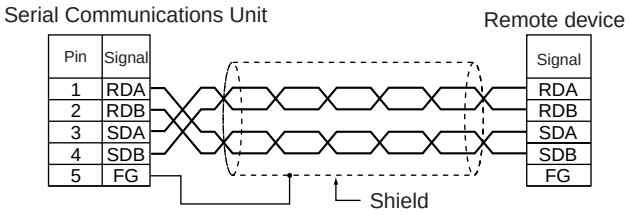
Always ground the shield only at the Unit end. You may damage the device if you ground both ends of the shield due to the potential difference between the ground terminals.

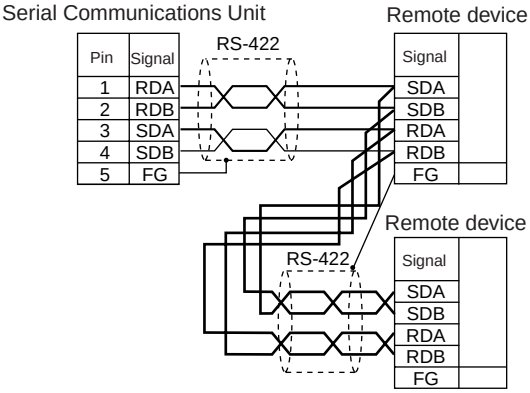
Connection examples are shown with the following diagrams.

2-wire Connections

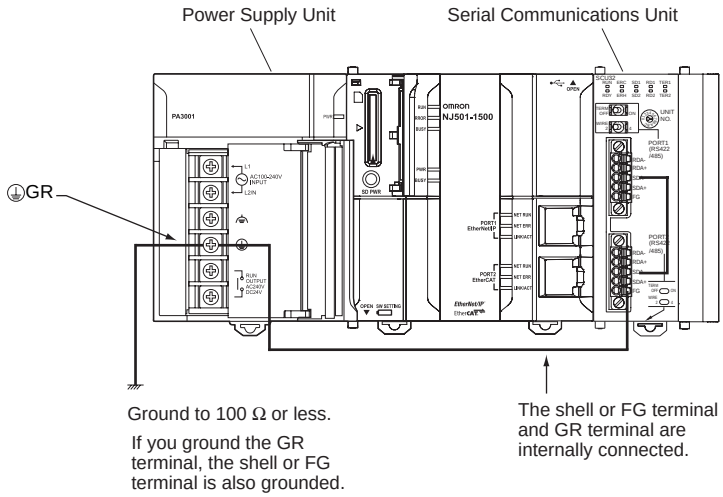


4-wire Connections





Note The FG terminal on the Serial Communications Unit is internally connected to the ground terminal (GR) on the Power Supply Unit via the CPU Rack or Expansion Rack. Therefore, ground the ground terminal (GR) on the Power Supply Unit to ground the FG.



3-3-3 Wiring RS-232C Connectors on the CJ1W-SCU22/42

Use the following steps to wire connectors.

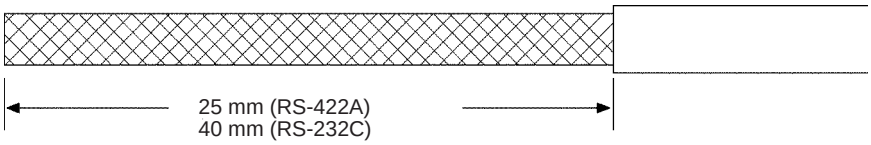
Cable Preparation

See the following diagrams for the length of the cable portion to be cut in each step.

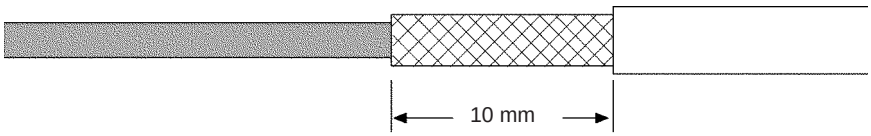
- **Shield Connected to Shell (FG)**

1 Cut the cable to the required length.

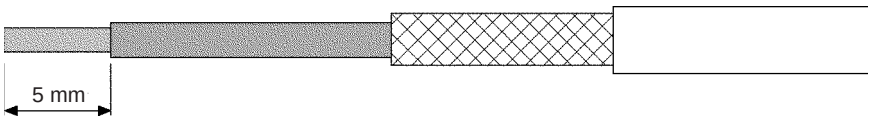
2 Remove the specified length of the sheath from the cable by using a knife. Be careful not to scratch the braided shield.



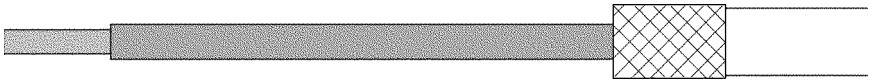
3 Trim off the braided shield by using scissors so that the remaining shield length is 10 mm.



4 Remove the insulation from each conductor by using a stripper so that the exposed conductor length is 5 mm.



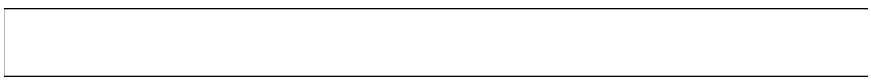
5 Fold back the braided shield.



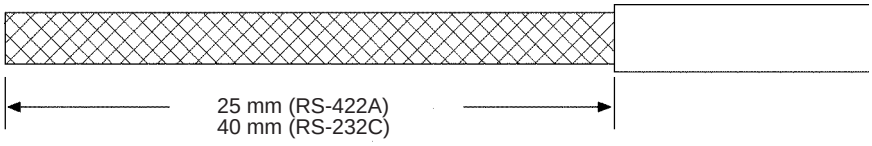
6 Wrap aluminum foil tape around the folded shield.

- **Shield Not Connected to Shell (FG)**

1 Cut the cable to the required length.



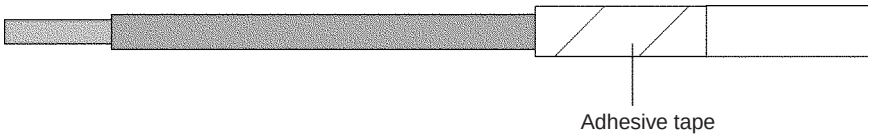
2 Remove the specified length of the sheath from the cable by using a knife. Be careful not to scratch the braided shield.



3 Trim off all the braided shield by using scissors.

4 Remove the insulation from each conductor by using a stripper so that the exposed conductor length is 5 mm.

5 Wrap adhesive tape around the conductor from which the braided shield was removed.

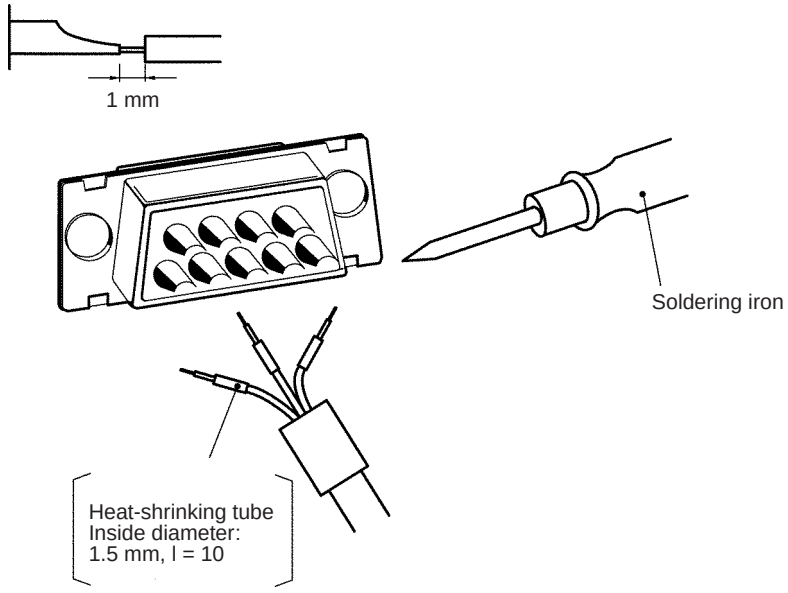


3-3-4 Soldering

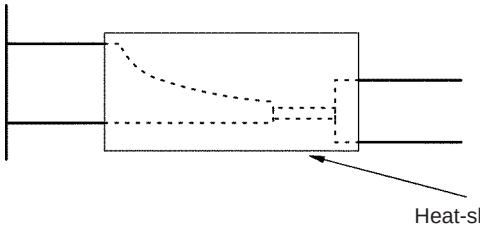
1 Place heat-shrinking tubes over all wires.

2 Temporarily solder each conductor to the corresponding connector terminals.

3 Completely solder each conductor.

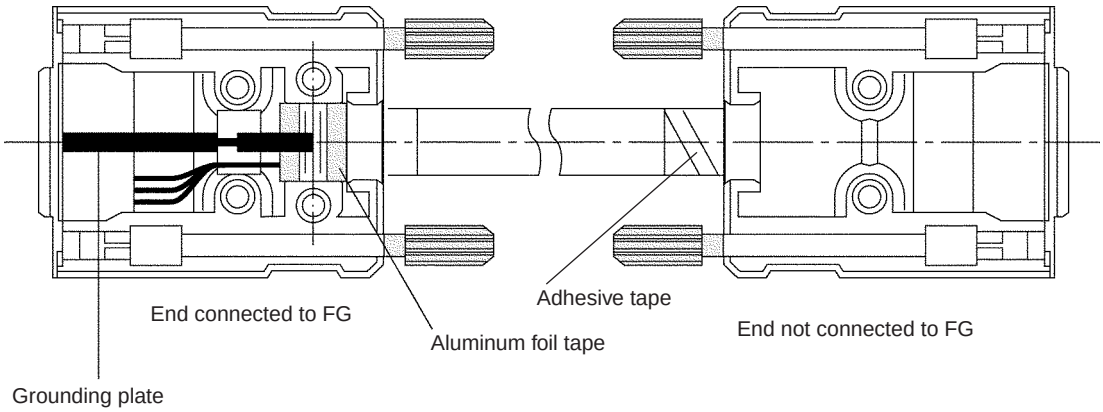


4 Return the heat-shrinking tube to the soldered portion, then heat the tube to shrink it in place.



3-3-5 Assembling Connector Hood

Assemble the connector hood as shown below.



3-3-6 Wiring RS-422A/485 Terminal-block Connectors on the CJ1W-SCU32/42

● Applicable Connectors

Use one of the following connectors.

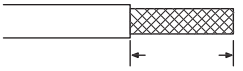
Manufacturer and model	Comments
Phoenix Contact FMC1.5/5-STF-3.5AU	Screwless terminals (provided with Unit)
Phoenix Contact MC1.5/5-STF-3.5AU	Screw terminals Purchase separately from the manufacturer.

Note To connect two wires to one terminal, use the terminal-block connector with screw terminals and connect the two wires to one terminal with or without ferrules designed for two wires.

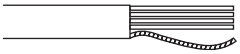
● Wiring Procedure for Screwless Terminals

Use the following wiring procedure for terminal-block connectors with screwless terminals.

1 Remove 30 to 50 mm of the sheath from the cable. Be careful not to damage the braided shield.



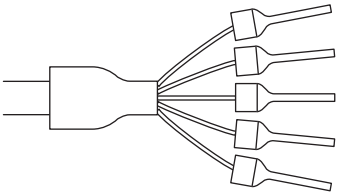
2 Carefully remove the shield and twist it.



Carefully trim away any unnecessary cable packing and conductors.

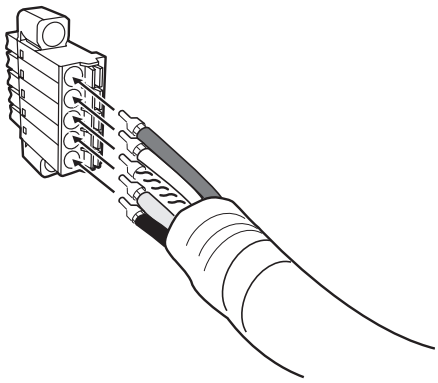
3 Strip the signal lines to the correct length for the ferrules.
Cover the exposed signal wires with electrician's tape or a heat-shrinking tube.

4 Connect the ferrules to the ends of the signal lines and shields, and crimp them with a crimping tool.



- Recommended Ferrules
  AI Series made by Phoenix Contact
  Signal wires: AI0.25-8BU (product number 3201364)
  FG wire: AI0.75-10GY (product number 3201288)
- CRIMPFOX Crimping Pliers
  XUD6 made by Phoenix Contact (product number 1204436)

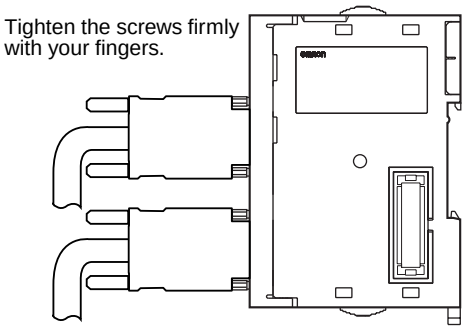
5 Connect the signal lines and shield to the terminal block on the RS-422A/485. Press each line all the way to the back of its hole as shown below. When you insert wires without ferrules, hold down the orange knob with a small flat-blade screw driver or similar object.



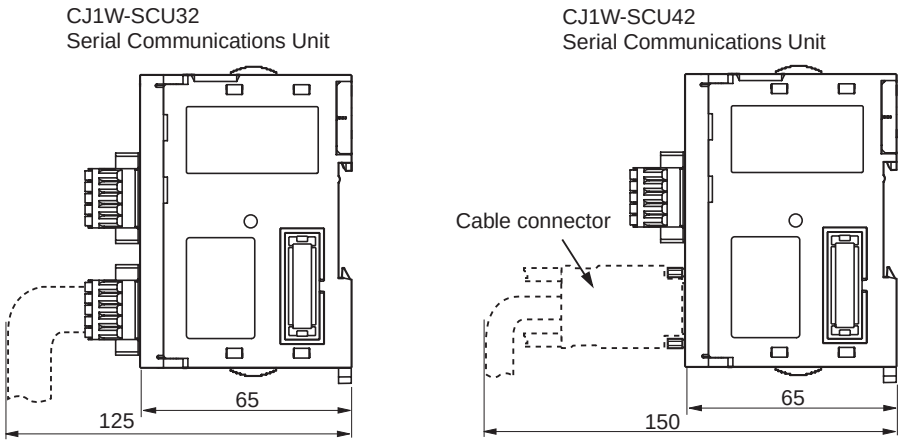
6 Connect the connector with the communications cable attached to it to the connector on the Unit. Then tighten the screws to secure the connector to the Unit.
Recommended tightening torque: 0.2 to 0.3 N·m

3-3-7 Connecting to Unit

CJ1W-SCU22



CJ1W-SCU32/42



4

Using Protocol Macros

This section describes the procedure and other information required to use protocol macros.

4-1 Overview of the Protocol Macro Function 4-2
4-1-1 Protocol Macros 4-2
4-1-2 Using the Protocol Macros 4-2
4-1-3 Protocol Structure 4-4
4-1-4 Data Exchange Method for Link Words 4-10
4-2 Device Variables for CJ-series Unit and System-defined Variables (Protocol Macro Mode) 4-13
4-2-1 Device Variable for CJ-series Unit for System Settings 4-13
4-2-2 Area Descriptions 4-15
4-2-3 System-defined Variable 4-21
4-2-4 Devices Variable for CJ-series Unit for Software Switches 4-22
4-2-5 Device Variables for CJ-series Unit for Status 4-24
4-2-6 Protocol Status 4-32
4-3 Using Protocol Macros 4-40
4-3-1 Executing Communications Sequences 4-40
4-3-2 User Program Example 4-42

4-1 Overview of the Protocol Macro Function

4-1-1 Protocol Macros

The Protocol Macro Function can control the various devices that have communications interfaces and are connected via a RS-232C or RS-422A/485. It executes data communications sequences (protocols) set for each device and specified by ExecPMCR instructions in the user program.

Standard system protocols to control OMRON devices (such as Digital Controllers and Temperature Controllers) are provided in the Serial Communications Unit.

By using the Protocol Support Tool called the CX-Protocol, you can create new protocols for commercially available measuring instruments and devices, and modify the standard system protocols. The standard system protocols are also provided with the CX-Protocol.

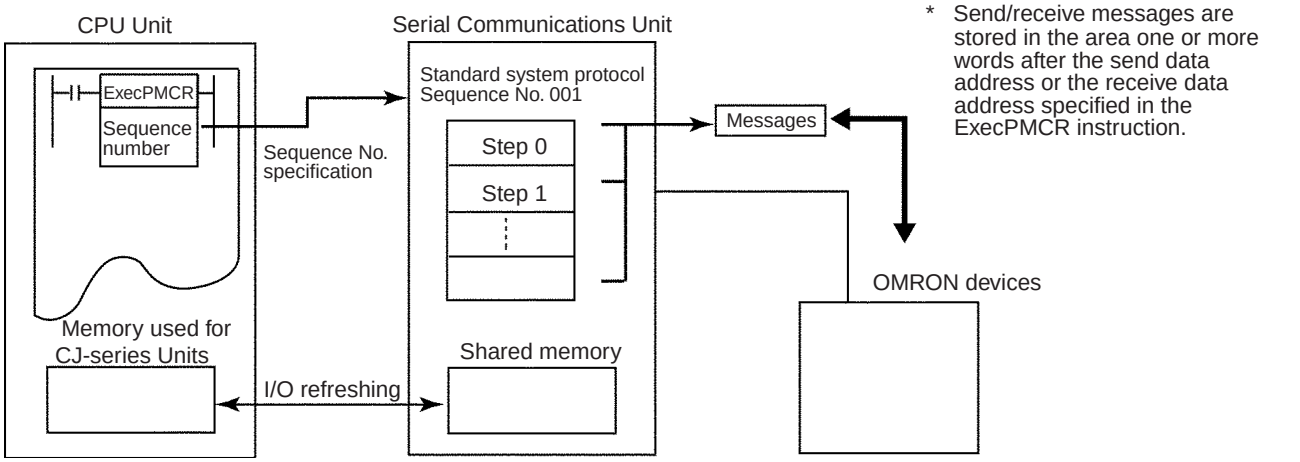
For details on the use of the CX-Protocol and the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

4-1-2 Using the Protocol Macros

The following three methods are available to use the protocol macros.

● Using the Standard System Protocols

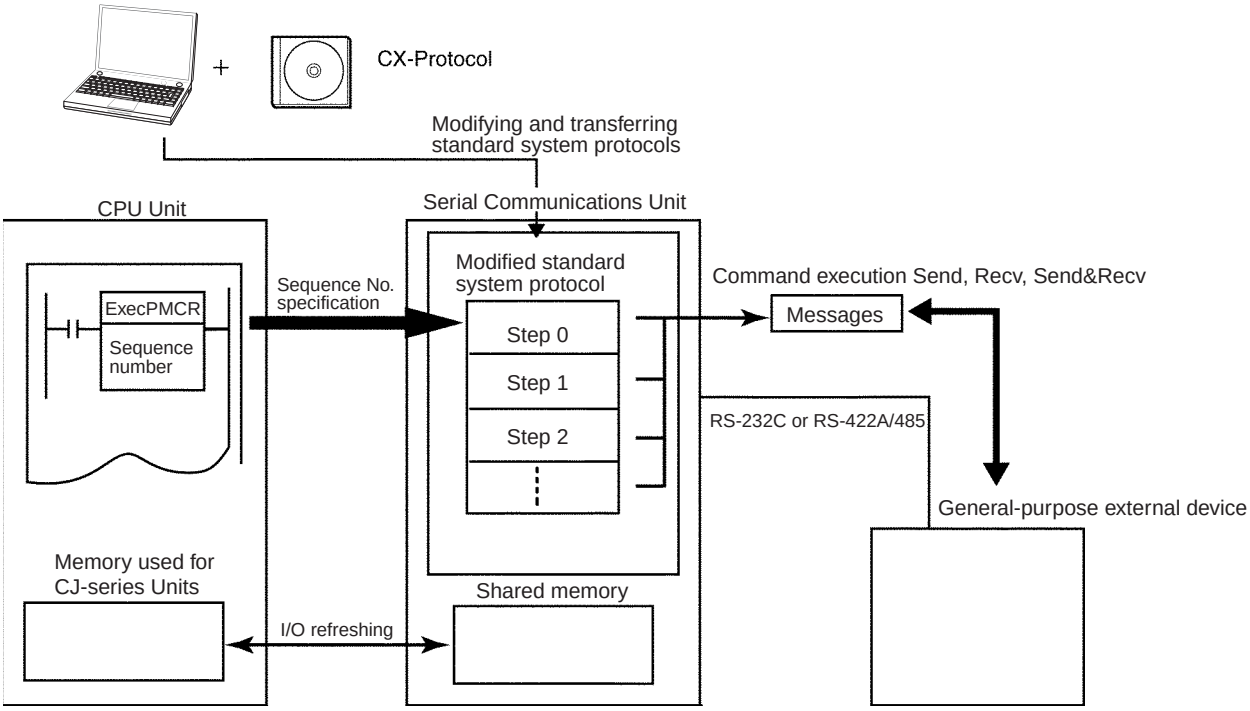
It is possible to connect OMRON devices and the NJ-series CPU Unit by specifying the sequence number of the standard system protocols in the Protocol Macro instruction (ExecPMCR). The system protocols are prepared in the Serial Communications Unit and CX-Protocol.



Note The devices for which standard system protocols are provided are listed below. For details, refer to *Ref A Standard System Protocol*
Bar Code Readers (V500/V520), Laser Micrometers (3Z4L), Hayes Modem AT Command, and digital temperature controllers (E5□N etc.) that support the CompoWay/F protocol.

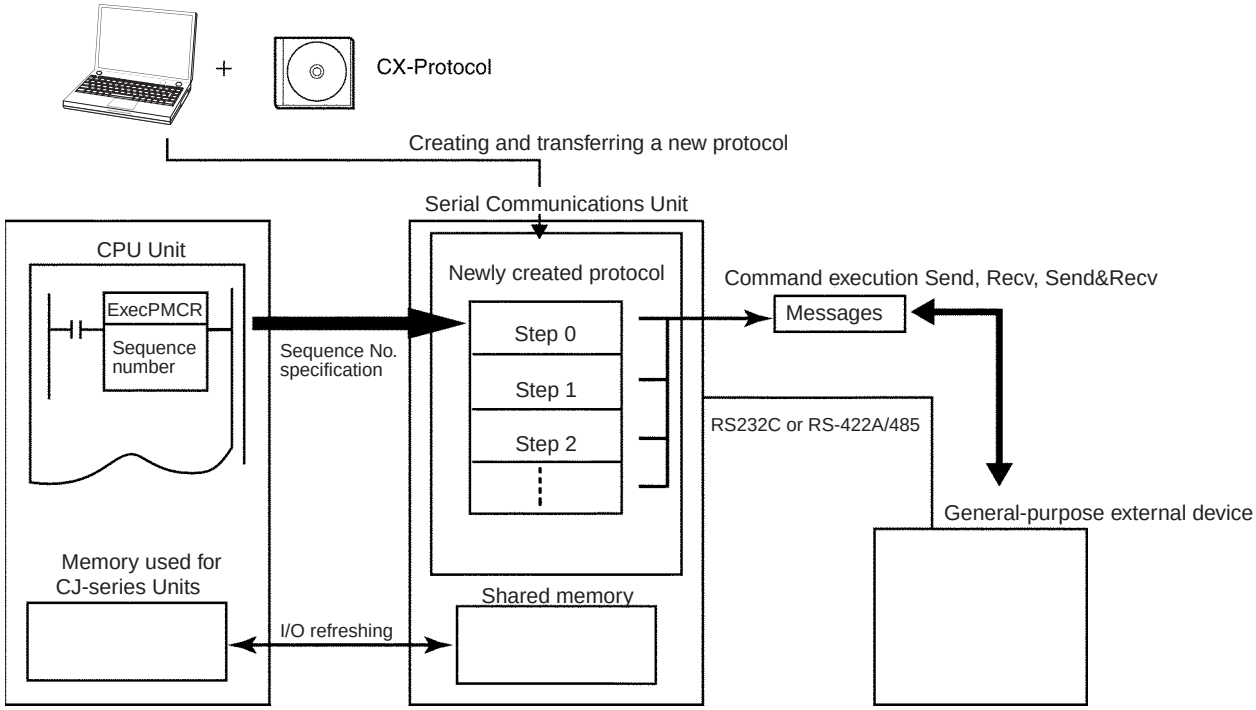
● Modifying Standard System Protocols

When you connect OMRON devices, if there is no standard system protocol or you wish to modify part of the protocol, use the CX-Protocol to modify the standard system protocol, transfer this as a separate communications sequence to the Serial Communications Unit, and execute the ExecP-MCR instruction.



● Creating a New Protocol

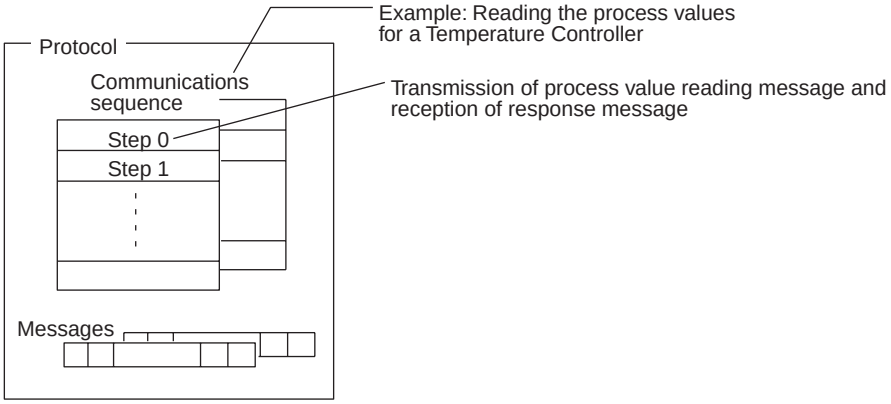
When you connect a general-purpose external device that has an RS-232C or RS-422A/485 port, use the CX-Protocol to create a new protocol that contains the communications specifications for the general-purpose external device, transfer these specifications to the Serial Communications Unit, and execute the ExecPMCR instruction.



In this manual, the protocol structure is explained in simple terms, and examples are given of the use of the ExecPMCR instruction during control of OMRON devices by using standard system protocols. For details on the protocols, the modification method for standard system protocols, and the creation method for new sequences, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

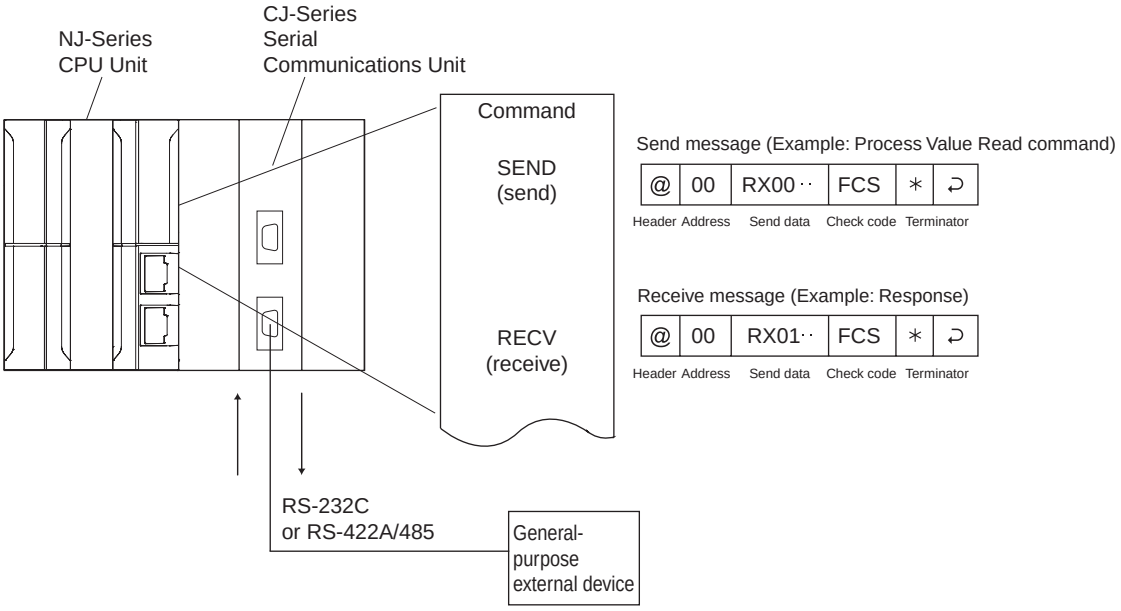
4-1-3 Protocol Structure

Protocols consist of communications sequences. A sequence consists of steps. These steps can be repeated, or they can be branched or ended depending on the responses received. A step consists of a command, send/receive messages, processing results, and the next process (which depends on the processing results).

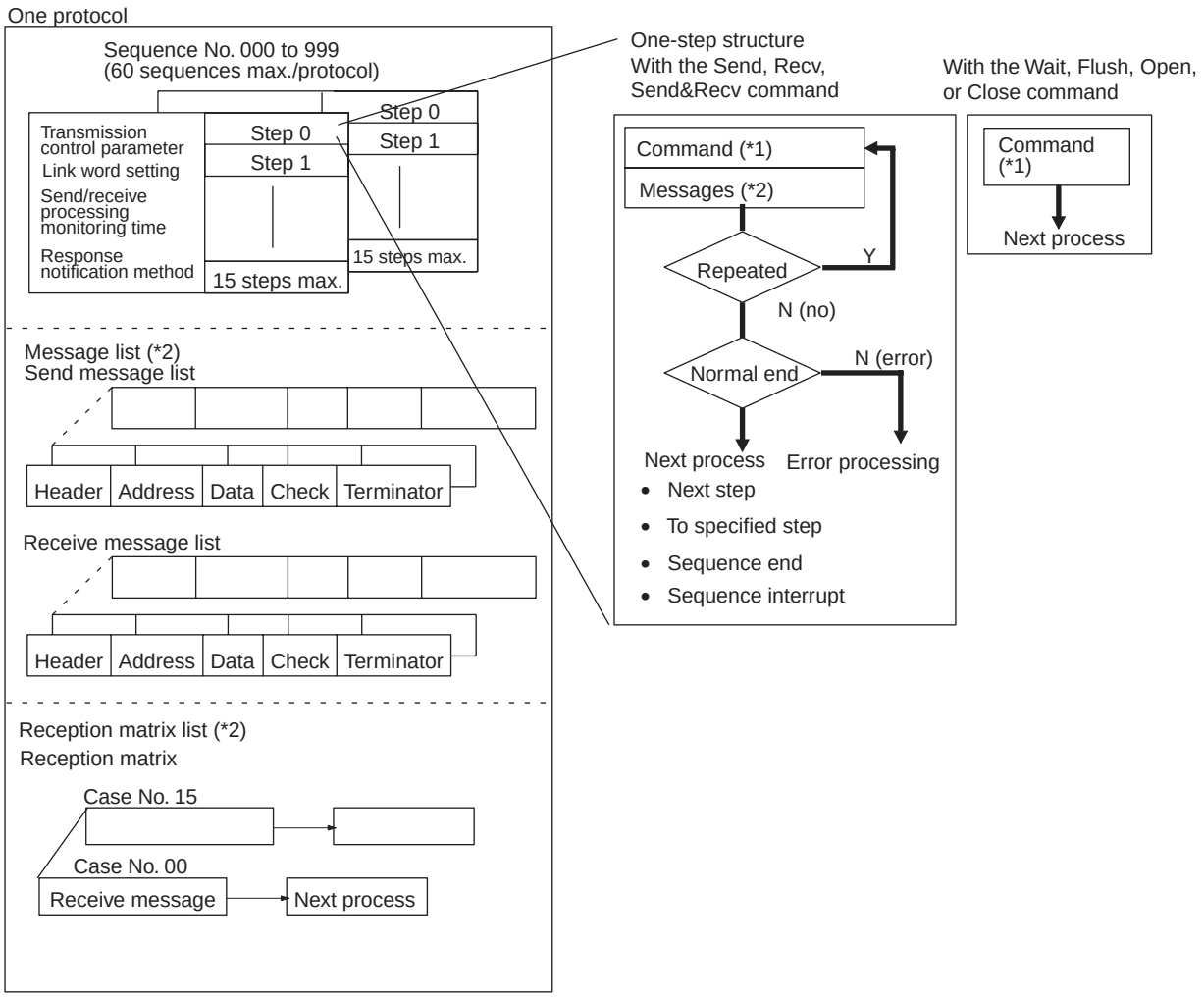


A protocol consists of processing sequences (such as reading the process value for a Temperature Controller) for a general-purpose external device. A sequence consists of a group of steps, each of which consists of a send/receive/control command, send/receive message, processing result, and a next step that depends on the processing results.

For example, with a sequence that reads the process value for a Temperature Controller, the sequence sends the send message for the connected Temperature Controller (a character string in which the Process Value Read command is inserted between the header + address and the check code + terminator) and receives the receive message (a character string in which the Process Value Read command response is inserted between the header + address and the check code + terminator).



Depending on the response received, this function can either choose to resend the same send message (retry processing), or to perform the next process (for example, read the process value for a Temperature Controller with a different address).



*1 You can use the Send, Recv, Send&Recv, Wait, Flush (reception buffer clear), Open (ER-ON), or Close (ER-OFF) command.

*2 Three types of reception matrix are available to switch the processing, depending on whether the messages are send messages, receive (wait) messages, or multiple receive (wait) messages. Unlike sequences, these matrixes are managed as lists.

● Sequence Parameters

Parameter	Meaning
Transmission control parameters	Control methods, such as flow control
Link words	Settings for words shared between the PLC and the Serial Communications Unit
Monitoring time	Monitoring time for send/receive processing
Response notification method	Timing for writing received data to memory used for CJ-series Units in the PLC

Step Parameters

Parameter		Meaning
Command		One of the following: Send, Recv, Send&Recv, Wait, Flush, Open, or Close
Messages	Send message	The message sent for Send.
	Receive message	The expected message for Recv.
	Send message and receive message	Both the message sent and the expected receive message for Send&Recv.
	Reception matrix	A group of expected messages that you can use to switch to different next processes when Send or Send&Recv is used.
Repeat counter	The number of times to repeat the step (0 to 255). The repeat counter can be used to change send/receive messages.	
Retry count	Used for Send&Recv to retry the command for errors (0 to 9).	
Send wait time	Used for SEND or Send&Recv to create a wait time before data is sent.	
Response write enable (for operand specification)	Specifies whether or not to write the received data to memory.	
Next process	Specifies the next step or to end the sequence when the current step is completed normally.	
Error processing	Specifies the next step or to end the sequence when the current step ends in an error.	

Precautions for Correct Use

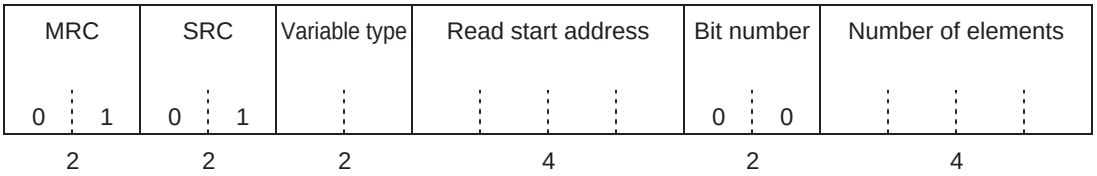
We recommend programming retry processing at any device that sends commands in case of noise or other factors result in transmission errors.

Standard System Protocol Example

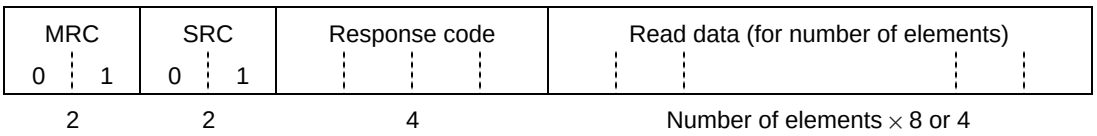
Example: Variable Area Read (Sequence No. 610) Sequence for CompoWay/F Master Protocol

Level	Item	Setting
Sequence	Link words	---
	Transmission control parameters	Modem control
	Response notification method	Scan
	Receive Wait Monitoring Time Tr	3s
	Receive Finished Monitoring Time Tfr	3s
	Send Finished Monitoring Time Tfs	3s
Steps	Step number	00
	Repeat counter	Reset/001
	Command	Send&Recv
	Retry count	3
	Send wait time	---
	Send message	SD MEM_R
	Receive message	RV MEM_R
	Response write enable	Write
	Next process	End
	Error process	Abort
Send message SD MEM_R	Header <h>	STX
	Terminator <t>	ETX
	Error check code <c>	LRC (horizontal parity) (0) (1 byte of BIN)
	Length <l>	---
	Address <a>	$ (R (1), 2)
	Message edited * Refer to A) outside the table for the message structure after MRC/SRC.	<h> + <a> + "00" + "0" + "0101" + $ ~ (R (2), 2) Node No. Subaddress SID MRC/SRC Variable type + $ (R (2), 2) + $ ~ (R (3), 4) + $ ~ (R (4), 4) + <t> + <c> Read start address Bit number Number of elements
Receive message RV MEM_R	Header <h>	STX
	Terminator <t>	ETX
	Error check code <c>	LRC (horizontal parity) (0) (1 byte of BIN)
	Length <l>	---
	Address <a>	$ (R (1), 2)
	Message edited * Refer to B) outside the table for the message structure after MRC/SRC.	<h> + <a> + "00" + (*, 2) + "0101" + & (W (1), 4) Node No. Subaddress End code MRC/SRC Response code + & (W (2), *) + <t> + <c> Read data (for number of elements)

A) Structure of Variable Area Read (MRC/SRC: 0101)* send message



B) Structure of Variable Area Read (MRC/SRC: 0101)* receive message

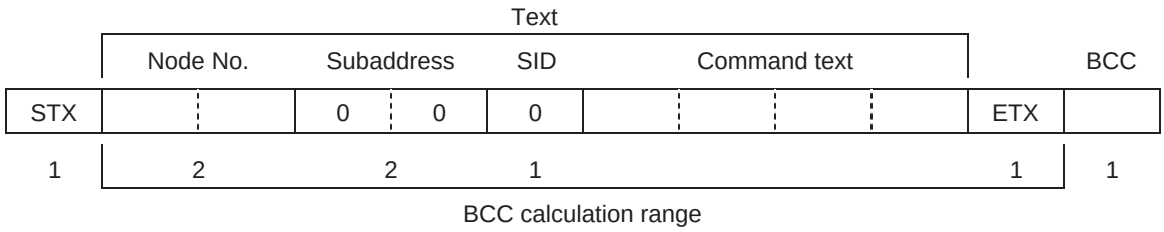


* MRC/SRC (0101) represents the Variable Area Read service available via CompoWay/F communication.

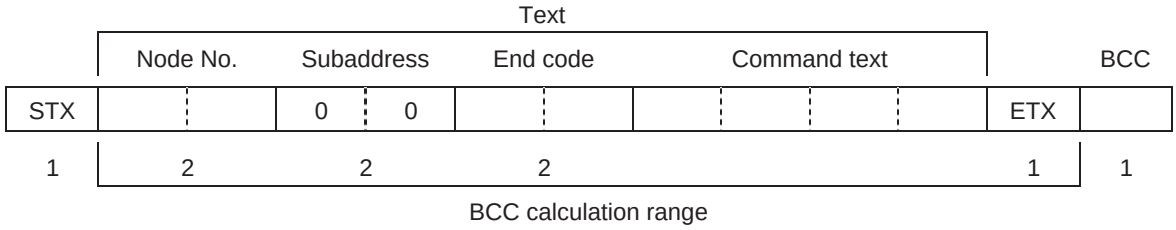
● Detailed Example of CompoWay/F Message

CompoWay/F communication protocol for digital temperature controller E5□N

Send message



Receive message



For message details, refer to the *E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers Communications Manual (Basic Type)* (Cat. No. H158).

Setting Device Variables for CJ-series Unit (For Use of Standard System Protocol)

Device variable for CJ-series Unit		Type	R/W	Name and function	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings Bit 15: Communications parameters Bits 08 to 11: Serial communications mode Bits 00 to 04: Communications parameters	Set serial communications mode to Protocol Macro Mode. Set to match the parameters of the external device.
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate	Set to match the baud rate of the external device.
*_P1_PmrTransTypCfg	*_P2_PmrTransTypCfg	BOOL	RW	Protocol macro Transmission method	Set to FALSE to specify half-duplex. TRUE: Full-duplex FALSE: Half-duplex (default)
*_P1_PmrMaxDatSzCfg	*_P2_PmrMaxDatSzCfg	UINT	RW	Maximum Number of Bytes in Protocol Macro Send/Receive Data	Set to 1,000 bytes.

Handling Communications Problems for Standard System Protocols

The NJ-series PLCs provide standard system protocols to enable communications with OMRON components without creating communications sequences. You can execute the sequences in the standard system protocols merely executing ExecPMCR instruction after specifying the sequence number and command data.

Processing for communications line problems during communications for the standard system protocols are set to normal settings, as shown in the following table. If these settings are not suitable to the application or if improvements are desired, use the CX-Protocol to modify the following settings in the required sequences. For details on the use of the CX-Protocol, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344). Refer to the standard protocol file that are included in the CX-Protocol for the settings in the standard system protocols.

Level	Item	Possible changes in settings
Sequence parameters	Transmission control parameters	Setting change unnecessary.
	Link words	
	Response notification method	
	Receive Wait Monitoring Time Tr	The monitoring times are set to 3 seconds for most sequences. The settings are different for send-only and receive-only sequences, as well as for sequences that require time for responses.
	Receive Finished Monitoring Time Tfr	
	Send Finished Monitoring Time Tfs	
Step parameters	Repeat counter	Setting change unnecessary.
	Command	
	Retry count	The retry count is generally set to 3 retries (4 tries total) for sequences that use the Send&Recv command. Different settings are used for sequences that have other commands.
	Send wait time	Setting change unnecessary.
	Send message	
	Receive message	
	Response write enable	
	Next process	
	Error process	

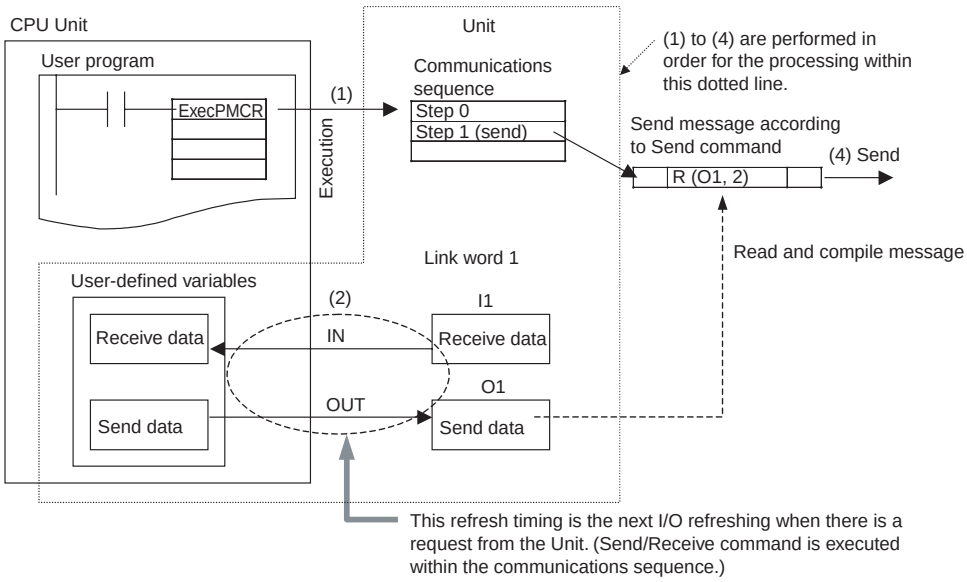
4-1-4 Data Exchange Method for Link Words

Link word specification is a method that specifies the storage location of send/receive data when you execute communications sequence by using the protocol macros (method that specifies area to share data between the CPU Unit and Unit).

● On-request I/O Refreshing

Link words are refreshed between the CPU Unit and Unit at every CPU Unit cycle.

The actual refresh timing with the CPU Unit, however, does not correspond to whenever the I/O is refreshed. I/O refresh is performed at the next I/O refreshing after the CPU Unit receives a request from the Unit (according to the Send/Receive command executed in the communications sequence, and it does not synchronized with the CPU Unit cycle). This is called on-request I/O refreshing.



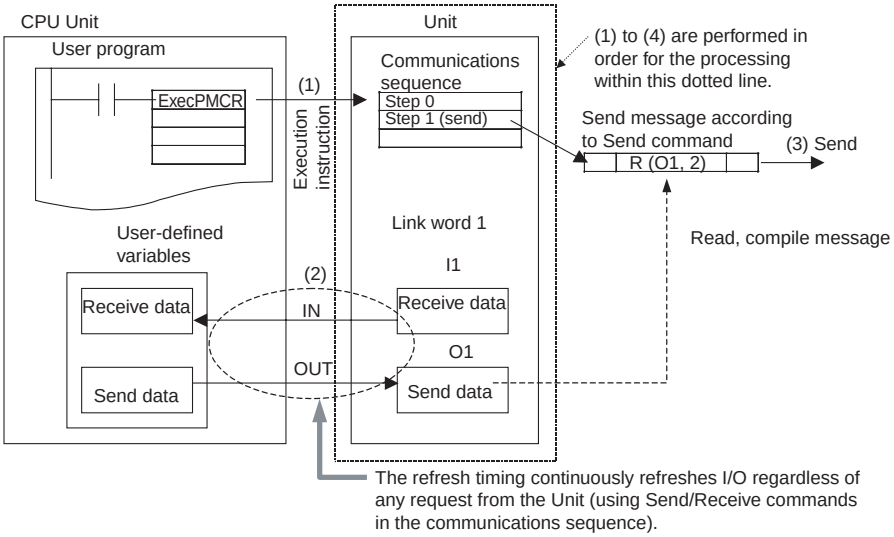
When a Send command is executed ((1) in the above diagram), the read processing of data that uses variables from the memory addresses used CJ-series Unit in the CPU Unit specified for the link words is performed in the next I/O refreshing (2). The send message is compiled based on this data (3), and then, the message is sent (4).

As a result, the actual send timing of the messages is not when the Send command is executed, but when the next I/O refreshing with the CPU Unit occurs.

● Continuous I/O Refreshing

I/O refreshing with the CPU Unit is continuously executed during execution of the ExecPMCR instruction, regardless of the request from the Unit. When the Send/Receive command is executed, the data from within the Unit is accessed and exchanged. This method is called continuous I/O refreshing and is set by using a device variable for CJ-series Unit.

CPU Unit and the Unit for Continuous I/O refreshing is executed at the same timing as that of the CPU Unit, in the same way as the On-request I/O refreshing.



When a Send command is executed in a step, the send message is compiled immediately based on data read from the Unit, and the message is sent. Therefore, the actual message transmission is performed immediately when the Send command is executed, without waiting for the next I/O refreshing between the CPU Unit and the Unit.

The Recv command operation is similar. When the receive data is stored in the Unit, Receive command execution is completed. The data received is stored in the user-defined variable area at the next I/O refresh with the CPU Unit.

Additional Information

If continuous I/O refreshing is specified for the data exchange method for link words, I/O refreshing is executed during the execution of protocol macros between the CPU Unit and the Unit without synchronizing with the execution of Send/Receive commands. Therefore it is necessary to pay attention to the data exchange method at the start and end of the protocol macros.

(1) The new data may not be sent by the Send command in a protocol macro that is executed immediately after the send data in memory in the CPU Unit is updated.
The send data is transferred to the Unit in the I/O refresh period before it will be sent by the Send command.

(2) Data received by a Receive command in a protocol macro may not be reflected in the receive data area of the CPU Unit if execution of the protocol macro is terminated immediately after the Receive command.
If the protocol macro is still executed during the I/O refresh period after the data is received by the Receive command, the receive data will be refreshed in the memory of the CPU Unit.

"Continuous I/O refreshing" in the Data exchange method for link words is suitable for applications in which Send/Receive commands are executed repeatedly in the one protocol macro (ExecPMCR instruction).
If data in the CPU Unit is to be sent with a Send command in the next ExecPMCR instruction or receive data for a Receive command is to be reflected in the CPU Unit and then the protocol macro ended, use the "on-request I/O refreshing" setting.

4-2 Device Variables for CJ-series Unit and System-defined Variables (Protocol Macro Mode)

This section describes the device variables for CJ-series Unit and system-defined variables used in the Protocol Macro Mode.

4-2-1 Device Variable for CJ-series Unit for System Settings

Use the device variables for CJ-series Unit shown below to perform System Settings when you use the Serial Communications Unit in Protocol Macro Mode.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Bit 15: User-specified setting inclusion (*) Bits 08 to 11: Serial communications mode (6 hex: Protocol macro) Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_*P1_PortCfg*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_*P2_PortCfg*.	Bit string	RW	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
*_P1_StartBitCfg	*_P2_StartBitCfg	BOOL	RW	Start Bits	Always 1 bit regardless of whether the setting is FALSE/TRUE. FALSE: 1 bit TRUE: 1 bit Default: FALSE
*_P1_DatBitCfg	*_P2_DatBitCfg	BOOL	RW	Data Length	FALSE: 7 bits TRUE: 8 bits Default: FALSE
*_P1_StopBitCfg	*_P2_StopBitCfg	BOOL	RW	Stop Bits	FALSE: 2 bits TRUE: 1 bit Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity Even/Odd	FALSE: Even TRUE: Odd Default: FALSE
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	0: 9600, 3: 1200, 4: 2400 5: 4800, 6: 9600, 7: 19200 8: 38400, 9: 57600 10: 115200, 11: 230400 Default: 0
*_P1_PmrSgwTimeoutCfg	*_P2_PmrSgwTimeoutCfg	WORD	RW	Serial Gateway Timeout Monitoring Time Setting	08 to 15: Serial Gateway response timeout monitoring time 00 to 07: Serial Gateway send start timeout monitoring time
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	USINT	RW	Serial Gateway Send Start Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrTransCfg	*_P2_PmrTransCfg	WORD	RW	Protocol macro Transmission Settings	Bit 15: Protocol Macro transmission method Bit 03: Clearing/holding the contents of the reception buffer in full-duplex mode Bit 02: Link word specification data exchange timing method
*_P1_PmrTransTypCfg	*_P2_PmrTransTypCfg	BOOL	RW	Protocol macro Transmission method	FALSE: Half-duplex (default) TRUE: Full-duplex
*_P1_PmrRBufClrCfg	*_P2_PmrRBufClrCfg	BOOL	RW	Clearing/Holding the Contents of the Reception Buffer in Full-duplex Mode	FALSE: Clear (default) TRUE: Hold
*_P1_PmrLkChAccessCfg	*_P2_PmrLkChAccessCfg	BOOL	RW	Link Word Specification Data Exchange Method	FALSE: On-request I/O refreshing (default) TRUE: Continuous I/O refreshing

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrMaxDatSzCfg	*_P2_PmrMaxDatSzCfg	UINT	RW	Maximum Number of Bytes in Protocol Macro Send/Receive Data	200 to 1,000 bytes Set 1,000 bytes when standard system protocol is used.

* When the default settings are used, the Baud Rate, Start Bits, Data Length, Stop Bits, Parity Yes/No, and Parity Even/Odd, settings are disabled. To specify settings for these items to the settings other than the default, apply user settings.
The default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

4-2-2 Area Descriptions

● User-specified Setting Inclusion

The setting for the port settings determines if the default settings or user settings will be used for port 1 and port 2. Be sure to use the same settings as the RS-232C port on the external devices connected in Protocol Macro Mode.

FALSE: default, TRUE: user settings

If the default port settings are specified, the settings of bits 00 to 04 will be ignored.

The default settings used are as follows: Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even, and Stop Bits: 2 bits.

If user port settings are specified, set bits 00 to 04 and the baud rate.

● Serial Communications Mode

Set the serial communications mode to 6 hex to use Protocol Macro Mode.

● Start Bits, Data Length, Stop Bits, Parity, and Baud Rate

If user settings are specified for the port settings, the number of Start Bits, Data Length, number of Stop Bits, Parity, and Baud Rate must be set. The Start Bits setting, however, will be ignored and 1 start bit will always be used.

● Serial Gateway Response Timeout Monitoring Time

The response timeout condition is monitored when a command is converted to the specified protocol and sent.
0: 5 (default), Setting range: 1 to 255 (0.1 to 25.5 s)
The response monitoring time is 5 s when this setting is set to default. Or, the user can specify it in the range 0.1 to 25.5 s by setting between 1 and 255.

If a timeout occurs, the command end code (0205 hex (Response Timeout)) is returned to the command source. If a response is received after a timeout, however, the message is converted and returned to the command source.

● Serial Gateway Send Start Timeout Monitoring Time

When the Unit converts commands to the specified protocol and send them during execution of protocol macros, the timeout condition is monitored from when the command is received until the command starts to be sent in the specified protocol.
0: 5 (default), Setting range: 1 to 255 (0.1 to 25.5 s)
The send start monitoring time is 5 s when this setting is set to default. Or, the user can specify it in the range 0.1 to 25.5 s by setting between 1 and 255.

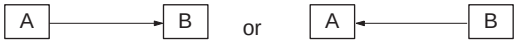
If a timeout occurs, a command end code (0204 hex (Remote node busy)) is returned to the command source. The send processing is not executed and the received command is discarded.

Protocol Macro Transmission Method

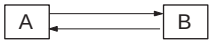
Set half-duplex (FALSE) or full-duplex (TRUE) depending on the transmission mode for the external device.

Additional Information

Half-duplex: Allows data to be sent between two Units in only one direction at any one time.



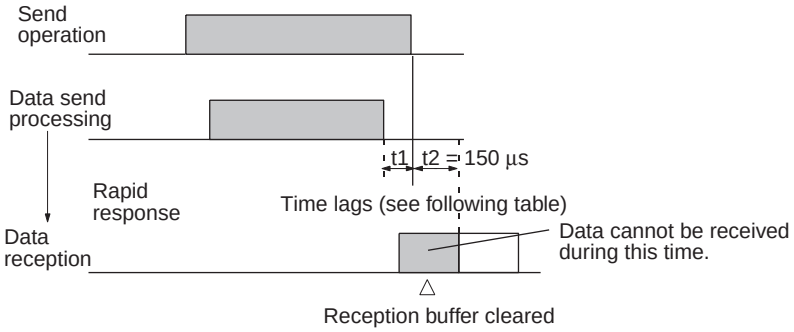
Full-duplex: Allows data to be exchanged both ways between two Units at the same time.



With half-duplex transmissions, the reception buffer is cleared immediately before the sequence is executed and immediately after Send completion (Send or Send&Recv command). Therefore, the data received before and during Send execution cannot be received as receive data by the next Recv command.

Precautions for Correct Use

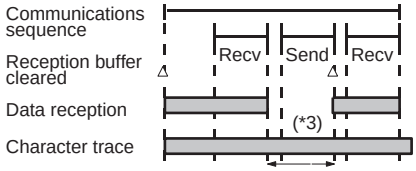
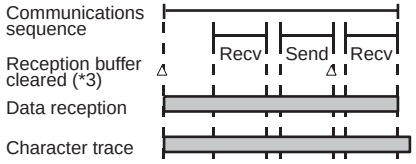
When you use Send with half-duplex transmission, there is a time lag, t1, between data send processing completion and Send completion. Therefore, if there is a rapid response from the remote device and a response is returned for Send after data is sent (communications or other command) and before Send is completed, the response during that time cannot be received by using half-duplex transmissions. If this problem occurs, use the full-duplex transmissions.
Also, if the external device is connected by using 2-wire connections from an RS-422A/485 port (Refer to *3-3-2 Recommended RS-422A/485 Wiring Examples*), send and receive data cannot both be on the same transmission line at the same time. This will create an additional lag time, t2, or 150 μs. If responses are received quickly from the external device, i.e., faster than t1 +t2, create a send delay at the external device or take other measures to allow for the lag times.



Time Lag t1

Baud rate (bps)	Time lag (μs)
1,200	1,116
2,400	578
4,800	288
9,600	144
19,200	73
38,400	36
57,600	24
115,200	12
230,400	6

With full-duplex mode, the reception buffer is cleared immediately before the sequence is executed. While Recv and Send commands are executed, data is input into the reception buffer and is used as the protocol macro data.

Transmission mode	Time reception buffer cleared	Data reception	Character trace	Timing chart (example)
Half-duplex	Immediately before communications sequence execution and immediately after Send completion by the Send or Send&Recv command	From Send completion to Recv completion, Send completion to immediately before Send execution	All during trace execution	
Full-duplex (*1)	Immediately before communications sequence execution (*2)	All during communications sequence execution	All during trace execution	

*1 With full-duplex, you can use RS-232C or RS-422A/485 (1:1 and 4-wire connections) can be used. You cannot use RS-422A/485 1:N or 2-wire connections.

*2 The Flush command can be used at any time to clear the reception buffer.

*3 Although the received data is discarded until completion of Send execution, it is reflected in the character trace.

Clearing/Holding the Contents of the Reception Buffer in Full-duplex Mode

Set to either clear or hold the contents of the reception buffer when the protocol macro starts.

FALSE: Clear
When set to clear, the contents of the reception buffer will be cleared when the protocol macro is executed.

TRUE: Hold
When set to hold, the contents of the reception buffer will not be lost if data acquisition fails after execution of the protocol macro.

This enables you to hold the data in the reception buffer received in the previous communications sequence after you switch the communications sequence during full-duplex communications.

This function prevents loss of data during full-duplex communications.

Data Exchange Method for Link Words

Set to perform I/O refresh upon request or continuously, as follows:

FALSE: On-request I/O refreshing (Immediate refresh mode)
Data exchange is performed during I/O refresh when a refresh request is sent to the CPU Unit for each Send/Receive command that is executed. A time delay will occur after the Send command is executed until the actual message is sent when this method is used.

TRUE: Continuous I/O refreshing (Cyclic refresh mode)
During protocol macro execution, I/O refreshing is continuously performed with the CPU Unit, the data in the link word area is refreshed from the CPU Unit, and the data in the Unit is accessed during Send/Receive command execution. When the Send command is executed with this method, you can send the actual message immediately.

Maximum Number of Bytes in Protocol Macro Send/Receive Data

You can set bytes from 200 bytes to a maximum of 1,000 bytes.

Any setting below 200 bytes will be treated as 200 bytes; any setting above 1,000 bytes will be treated as 1,000 bytes.

Set this value to the maximum 1,000 bytes when you use the standard system protocol.

Additional Information

Flow Control and Maximum Number of Send/Receive Data Words

There is a 2.5 KB reception buffer for each serial port in the Serial Communications Unit.

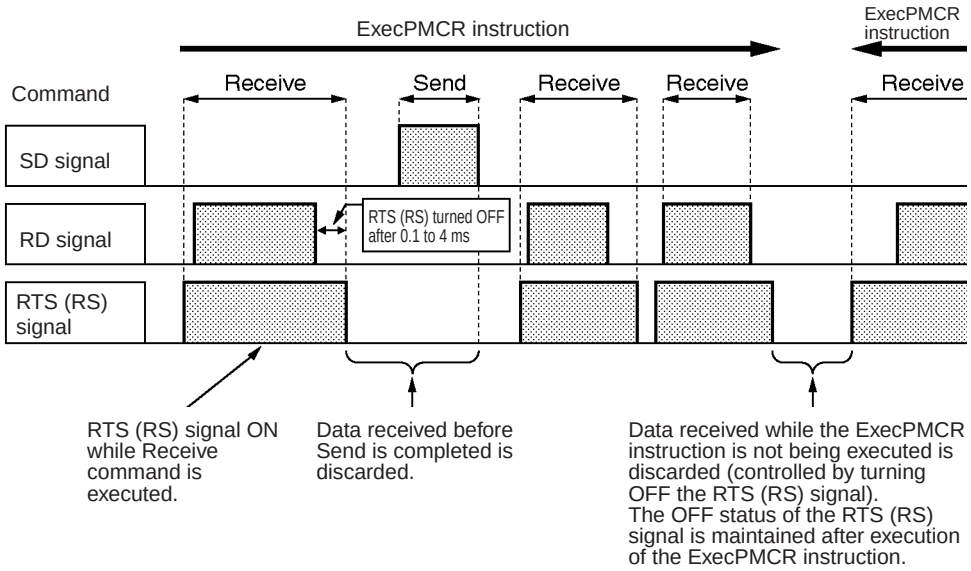
When flow control is used, initiate flow control after receiving about 2 KB, and then release control after processing all but 0.5 KB of receive data.

The Unit can store up to 1,000 bytes (500 words) of data for each Recv command if 2 KB of receive data is first stored in the buffer and 1,000 bytes is set as the maximum number of send/receive data bytes.

RS/CS Flow Control

● Half-duplex Communications

With NJ-series half-duplex protocol macro communications, flow control can be released by turning ON the RTS (RS) signal (CTS (CS) signal at the Remote Unit) while the Recv command is executed.



Note Signal names used are those at the Serial Communications Unit.

1 With protocol macro communications in half-duplex mode, the RTS (RS) signal is ON only while the Receive command is being executed.

2 The receive data (RD signal) from the remote device is initially stored in the reception buffer.

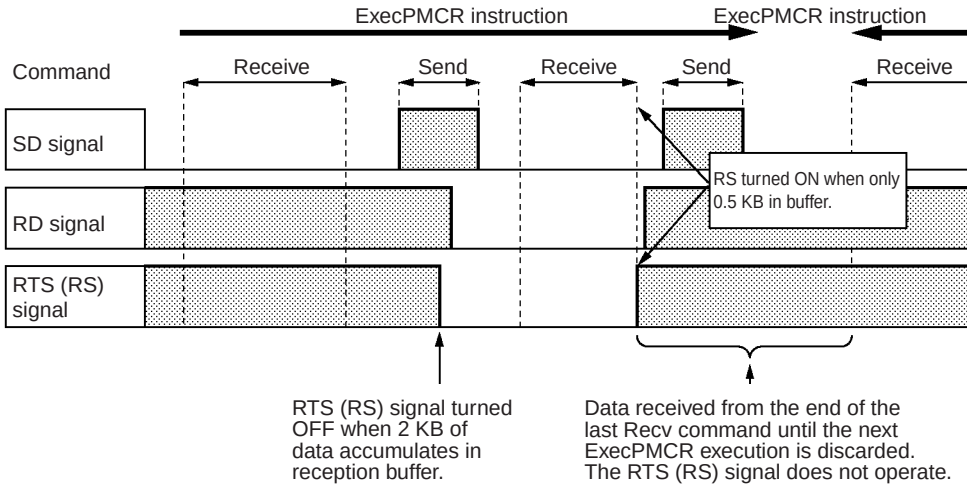
3 The data in the reception buffer is analyzed, and a search is performed for data matching an expected message registered with the Receive command.

4 When matching data is found, the RTS (RS) signal is turned OFF. The search starts after the final data is received. It takes between 100 μs and 4 ms from the start of the search until the RTS (RS) signal turns OFF.

5 While the Send command is being executed, and while the ExecPMCR instruction is not being executed, the RTS (RS) signal stays OFF and receive data is discarded.

Full-duplex Mode

There is a 2.5 KB reception buffer for each serial port in full-duplex mode of NJ-series Protocol Macro Mode. When flow control is used, initiate flow control after receiving about 2 KB, and then release control after processing all but 0.5 KB of receive data. The Unit can store up to 1,000 bytes (500 words) of data for each Receive command if 2 KB of receive data is first stored in the buffer and 1,000 bytes (03E8 hex) is set as the maximum number of send/receive data bytes.



Note Signal names used are those at the Serial Communications Unit.

1 With full-duplex protocol macro communications, the RTS (RS) signal is turned OFF when 2 KB of data is in the reception buffer (i.e., with 0.5 KB remaining).

2 The receive data (RD signal) from the remote device is stored in the reception buffer.

3 The data in the reception buffer is analyzed, and a search is performed for data matching an expected message registered with the Recv command.

4 When matching data is found, all the previous data is deleted from the reception buffer.

5 When the amount of data stored in the reception buffer decreases to less than 0.5 KB (i.e., more than 2 KB remaining), the RTS (RS) signal will turn ON.

6 Data that is received while the ExecPMCR instruction is not being executed is discarded.

7 In full-duplex mode, the data left over after the analysis performed with the last Recv command and any subsequent data received while the ExecPMCR instruction is stopped is discarded. During this interval, you cannot use RS flow control.

4-2-3 System-defined Variable

● Port 1 and Port 2 Port Settings Changing Flags

You can use an Out instruction or other instruction in the program to turn these bits from FALSE to TRUE to change communications settings and restart the Serial Communications Unit ports. After you change the settings and restart the communications port, the flag will automatically change to FALSE.

These flags are used both to change the communications port settings and to restart the communications port at the same time. Accordingly, in cases where these flags are turned from FALSE to TRUE only to restart a communications port by using an Out instruction or other instruction, you can turn these flags from FALSE to TRUE without changing the system settings of the device variables for CJ-series Unit.

List of System-defined Variables (corresponds to the unit number.)**

System-defined variable	Type	R/W	Name	Function
_CJB_SCU**P1ChgSta	BOOL	RW	Serial Communications Unit ** Port 1 Settings Changing Flag	TRUE: Port 1 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE
_CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit ** Port 2 Settings Changing Flag	TRUE: Port 2 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE

4-2-4 Devices Variable for CJ-series Unit for Software Switches

The device variables can be used to execute various commands for the Serial Communications Unit.

● List of Areas

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SoftSw	*_P2_SoftSw	BYTE	RW	Soft Switches	Bit 04: Serial Gateway Prohibit Switch Bit 03: Abort Switch Bit 02: One-shot Trace Switch Bit 01: Continuous Trace Switch Bit 00: Wait Release Switch
*_P1_SgwDsblCmd	*_P2_SgwDsblCmd	BOOL	RW	Serial Gateway Prohibit Switch (Protocol Macros)	TRUE→FALSE: Not prohibited FALSE→TRUE: Prohibited
*_P1_PmrAbtCmd	*_P2_PmrAbtCmd	BOOL	RW	Abort Switch (Protocol Macros)	TRUE: Abort FALSE: Aborted
*_P1_Pmr1ShotTraceCmd	*_P2_Pmr1ShotTraceCmd	BOOL	RW	One-shot Trace Switch (Protocol Macros) (*1)	TRUE: Start FALSE: Stop
*_P1_PmrContTraceCmd	*_P2_PmrContTraceCmd	BOOL	RW	Continuous Trace Switch (Protocol Macros) (*1)	TRUE: Start FALSE: Stop
*_P1_PmrWaitRlsCmd	*_P2_PmrWaitRlsCmd	BOOL	RW	Wait Release Switch (Protocol Macros)	TRUE: Release Wait FALSE: Wait released

● Software Switch Descriptions

The Software Switches function as described in the following table.

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Serial Gateway Prohibit Switch (Protocol Macros)	*_P1_SgwDsblCmd *_P2_SgwDsblCmd	The Serial Gateway (Mode) is prohibited during protocol macro processing when this Switch changes from FALSE to TRUE. The Serial Gateway is no longer prohibited when the Switch is changed from TRUE to FALSE.	Controller reset (*1)	Manipulated by user	Manipulated by user
Abort Switch (Protocol Macros)	*_P1_PmrAbtCmd *_P2_PmrAbtCmd	Protocol macro processing will be aborted when the switch changes from FALSE to TRUE. Processing may be completed if the Switch is changed too late.		Manipulated by user	Manipulated by user
One-shot Trace Switch (Protocol Macros) (*2)	*_P1_Pmr1ShotTeanceCmd *_P2_Pmr1ShotTeanceCmd	The CX-Protocol will start a one-shot trace when the Switch changes from FALSE to TRUE. The trace is ended when the Switch is changed from TRUE to FALSE.		Manipulated by CX-Protocol	At end of one-shot trace
Continuous Trace Switch (Protocol Macros) (*2)	*_P1_PmrContTranceCmd *_P2_PmrContTranceCmd	The CX-Protocol will start a continuous trace when the Switch changes from FALSE to TRUE. The trace is ended when the Switch is changed from TRUE to FALSE.		Manipulated by CX-Protocol	Manipulated by CX-Protocol
Wait Release Switch (Protocol Macros)	*_P1_PmrWaitRlsCmd *_P2_PmrWaitRlsCmd	Standby status for the Wait command will be released when the switch changes from FALSE to TRUE.		Manipulated by user	At end of Wait command

*1 The Software Switches will also be initialized at the following times: when the Controller is reset, when the operating mode is changed between PROGRAM and RUN Modes, when the Unit is restarted, or when the communications port is restarted.
After the variable is set, the Software Switch will be reset (cleared) at the timing indicated in "Reset" in the above table for each area.

*2 If both of the trace switches for one-shot trace and continuous trace are changed to TRUE, the one for which the switch was changed first is executed. (The other one does not start until its trace switch changes to FALSE and then back to TRUE after another trace operation is completed.) If both of the switches change to TRUE simultaneously, the Continuous Trace will take priority.
When the trace buffer becomes full, the Unit will clear it.
The CPU Unit will manipulate the One-shot Trace Switch and Continuous Trace Switch when trace operations are performed from the CX-Protocol. Do not manipulate these switches from a user program.

4-2-5 Device Variables for CJ-series Unit for Status

These variable are used for data input from the Serial Communications Unit to the CPU Unit.

You can reference the Serial Communications Unit port settings status, communications status, the transmission control signal status, and the transmission error status.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_Com_UnitSta		WORD	R	Serial Communication Unit Status	Bit 01: Error log EEPROM error Bit 00: Protocol data error
*_Com_UnitLogMemErr		BOOL	R	Error Log EEPROM Error	TRUE: Error log EEPROM error FALSE: Error log EEPROM normal
*_Com_UnitPmrDatErr		BOOL	R	Protocol Data Error	TRUE: Protocol data error FALSE: Protocol data normal
*_P1_SysSetSta	*_P2_SysSetSta	WORD	R	System Settings (*1)	Bits 12 to 15: Serial communications mode Bits 8 to 11: Baud rate Bit 04: Start bits Bit 03: Data length (*1) Bit 02: Stop bits (*1) Bit 01: Parity (Yes/No) (*1) Bit 00: Parity (Even/Odd) (*1)
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P1_SysSetSta.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P2_SysSetSta.	Bit string	R	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P1_SysSetSta.	There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P2_SysSetSta.	Bit string	R	Baud Rate	0: 9600, 3: 1200, 4: 2400 5: 4800, 6: 9600, 7: 19200 8: 38400, 9: 57600 10: 115200, 11: 230400 Default: 0
*_P1_StartBitSta	*_P2_StartBitSta	BOOL	R	Start Bits (always 1 bit)	FALSE: 1 bit TRUE: 1 bit (1 bit for both FALSE and TRUE.)
*_P1_DatBitSta	*_P2_DatBitSta	BOOL	R	Data Length (7 bits/8 bits)	FALSE: 7 bits TRUE: 8 bits
*_P1_StopBitSta	*_P2_StopBitSta	BOOL	R	Stop Bits (2 bits/1 bit)	FALSE: 2 bits TRUE: 1 bit
*_P1_ParityYNSta	*_P2_ParityYNSta	BOOL	R	Parity (Yes/No)	FALSE: Yes TRUE: No

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_ParityBitSta	*_P2_ParityBitSta	BOOL	R	Parity (Even/Odd)	FALSE: Even TRUE: Odd
*_P1_HwSetSta	*_P2_HwSetSta	WORD	R	Hardware Settings	Bit 15: RS-422/485 setting status Bit 14: RS-232C setting Bit 13: Terminating resistance setting status Bit 01: System Setup error Bit 00: Port operating status
*_P1_Ser485Sta	*_P2_Ser485Sta	BOOL	R	RS-422/485 Setting Status	Port types of each port *_P□_Ser485Sta/ *_P□_Ser232Sta: 00: No port 01: RS232C 10: RS422A/485 11: This status does not exist.
*_P1_Ser232Sta	*_P2_Ser232Sta	BOOL	R	RS-232C Setting Status	
*_P1_TermSta	*_P2_TermSta	BOOL	R	Terminating Resistance Setting Status	TRUE: Terminating resistance ON FALSE: Terminating resistance OFF
*_P1_SysSetupErr	*_P2_SysSetupErr	BOOL	R	System Setup error	TRUE: System Setup error FALSE: System Setup normal
*_P1_OperatingSta	*_P2_OperatingSta	BOOL	R	Port Operating Status	TRUE: Port operating FALSE: Port stopped
*_P1_TransCtlSta	*_P2_TransCtlSta	WORD	R	Communications Status	Bit 10: Remote Unit busy Bit 08: Local Unit busy Bit 07: DTR (ER) signal Bit 06: DSR (DR) signal Bit 04: CTS (CS) signal Bit 03: RTS (RS) signal
*_P1_RmtBusySta	*_P2_RmtBusySta	BOOL	R	Remote Unit Busy	TRUE: Remote Unit busy (Flow control) FALSE: Remote Unit ready to receive
*_P1_LclBusySta	*_P2_LclBusySta	BOOL	R	Local Unit Busy	TRUE: Local Unit busy (Flow control) FALSE: Local Unit ready to receive
*_P1_SigERSta	*_P2_SigERSta	BOOL	R	ER signal	TRUE: High FALSE: Low
*_P1_SigDRSta	*_P2_SigDRSta	BOOL	R	DR signal	TRUE: High FALSE: Low
*_P1_SigCSSta	*_P2_SigCSSta	BOOL	R	CS signal	TRUE: High FALSE: Low
*_P1_SigRSSta	*_P2_SigRSSta	BOOL	R	RS signal	TRUE: High FALSE: Low

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_TransErrSta	*_P2_TransErrSta	WORD	R	Transmission Error Status	Bit 15: Transmission error (*4) Bit 14: Tfs (send finished monitoring time) exceeded Bit 13: Tfr (receive finished monitoring time) exceeded Bit 12: Tr (receive wait monitoring time) exceeded Bits 08 to 11: Number of retries Bit 07: FCS check error Bit 06: Command error Bit 05: Timeout error Bit 04: Overrun error Bit 03: Framing error Bit 02: Parity error
*_P1_TransErr	*_P2_TransErr	BOOL	R	Transmission error (*2)	TRUE: Transmission error FALSE: No transmission error
*_P1_TfsErr	*_P2_TfsErr	BOOL	R	Tfs (Send Finished Monitoring Time) Exceeded	TRUE: Tfr (send finished monitoring time) exceeded FALSE: Normal
*_P1_TfrErr	*_P2_TfrErr	BOOL	R	Tfr (Receive Finished Monitoring Time) Exceeded	TRUE: Tfr (receive finished monitoring time) exceeded FALSE: Normal
*_P1_TrErr	*_P2_TrErr	BOOL	R	Tr (Receive Wait Monitoring Time) Exceeded	TRUE: Tr (receive wait monitoring time) exceeded FALSE: Normal
There is no specific device variable for CJ-series Unit to reference the number of retries. When you reference the number of retries, refer to bits 08 to 11 of *_*P1_TransErrSta*.	There is no specific device variable for CJ-series Unit to reference the number of retries. When you reference the number of retries, refer to bits 08 to 11 of *_*P2_TransErrSta*.	Bit string	R	Number of Retries	Range: 0 to 9
*_P1_FCSErr	*_P2_FCSErr	BOOL	R	FCS Check Error (*3)	TRUE: FCS check error FALSE: FCS check normal
*_P1_CmdErr	*_P2_CmdErr	BOOL	R	Command Error	TRUE: Command error FALSE: No command error
*_P1_TimeoutErr	*_P2_TimeoutErr	BOOL	R	Timeout Error (*4)	TRUE: Timeout (protocol macros: Tfs, Tfr, or Tr) error or Serial Gateway send/response timeout FALSE: Normal

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_OverRunErr	*_P2_OverRunErr	BOOL	R	Overrun Error	TRUE: Overrun error FALSE: Normal
*_P1_FramingErr	*_P2_FramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal
*_P1_ParityErr	*_P2_ParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal

*1 The current settings for the port are read. For details on the contents that are read refer to *4-2-1 Device Variable for CJ-series Unit for System Settings* on page 4-15. In the case operation is made using default settings due to System Setup error, those settings are read.

*2 If any of the error bits 00 to 14 becomes TRUE in the Protocol Macro Mode but then communications are recovered within the specified number of retries, the bit will become FALSE. The bit will remain TRUE if recovery is not possible within the specified number of retries.

*3 Used with Protocol Macro or Serial Gateway Mode.
This bit becomes TRUE if an error occurs in the transmission path with the Serial Gateway.

*4 This bit becomes TRUE if a send start timeout or response timeout occurs with the Serial Gateway.

● Status Area Descriptions

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Error Log EEPROM Error	*_Com_UnitLogMemErr	If a write to EEPROM fails for the error log, it is assumed the EEPROM is beyond its service life and this flag changes to TRUE. At the same time, the ERC indicator will also light. Although this has no effect on communications and other functions, replace the Unit promptly for ease of maintenance.	Controller reset (*)	At error	When power is cycled
Protocol Data Error	*_Com_UnitPmrDatErr	This variable changes to TRUE if an error is detected in the protocol data checksum when the Controller is reset. At the same time, RDY and ERC indicators will flash. This error may occur if the communications connector becomes disconnected or the CPU Unit power is turned OFF during protocol data transfer. Use the CX-Protocol to transfer protocol data again.		At error	When the error is cleared after protocol data is resent
System Setup error	*_P1_SysSetupErr *_P2_SysSetupErr	This variable changes to TRUE if a System Setup error occurs. After changing the System Settings, reset or restart the Controller, or restart the port.		At error	Controller reset (*)
Port Operating Status	*_P1_OperatingSta *_P2_OperatingSta	This variable changes to TRUE when the port can operate correctly. It changes to FALSE when protocol macro data is being transferred.		At error	After protocol data is transferred
Remote Unit Busy	*_P1_RmtBusySta *_P2_RmtBusySta	This variable indicates the receive status of a Remote Unit when Xon/Xoff flow control or RS/CS flow control is set in the transmission control parameters. When Xon/Xoff flow control is set, the reception buffer is cleared when the sequence starts, so the status area is set to Remote Unit ready to receive (FALSE) TRUE: Remote Unit busy (Reception is disabled because the reception buffer is full.) FALSE: Remote Unit ready to receive (Reception is enabled.)		When status is read	After busy status is released

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Local Unit Busy	*_P1_LclBusySta *_P2_LclBusySta	This variable indicates the receive status of the Local Unit (Unit) during Recv when Xon/Xoff flow control is set in the transmission control parameters. TRUE: Local Unit busy (Reception is disabled because the reception buffer is more than 4/5 (= 2 K bytes or more).) FALSE: Local Unit ready to receive (Reception is enabled because the reception buffer is less than 1/5 (= 0.5 K bytes or less).) This area is cleared when the Controller is reset, at port restart by the Port Settings changing flags (Auxiliary Area), or when the next sequence is started.	Controller reset (*)	When status is read	After busy status is released
Transmission Control Signal Status	[ER] *_P1_SigERSta *_P2_SigERSta [DR] *_P1_SigDRSta *_P2_SigDRSta [CS] *_P1_SigCSSta *_P2_SigCSSta [RS] *_P1_SigRSSta *_P2_SigRSSta	The status of each transmission control signal (DTR (ER), DSR (DR), CTS (CS), RTS (RS)) for each port is always read. TRUE: High, FALSE: Low		When status is read	When status is read
Transmission Error Status	*_P1_TransErrSta *_P2_TransErrSta	When an error occurs during transmission, the corresponding flag (in bits 02 to 07 or 12 to 15) changes to TRUE. The number of retries is stored in bits 08 to 11. **Note 1** The Transmission Error Flag (bit 15) changes to TRUE only when the protocol macro has moved to error processing due to an error in bits 00 to 14. **2** The number of retries in bits 08 to 11 is not equal to the number of times processing is performed when an error occurs. It is the set number of retries. When communications are restored by protocol macro retry processing, the error in bits 02 to 07 or 12 to 15 is stored. The Transmission Error Flag (bit 15), however, will remain FALSE. If another error occurs during retry processing, the status of the bit that indicates the cause is held.		At error	When sequence begins

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Hardware Settings	*_P1_HwSetSta *_P2_HwSetSta	The following are read in port setting status: 1. The serial communications modes and communications specifications set in the Setup Area (*_P1_PortCfg* and *_P2_PortCfg*) 2. The ports and the terminating resistance hardware settings 3. System settings errors, and Port Operating/Stopped Flags In Protocol Macro Mode, the port will be stopped if a protocol data error occurs while protocol data is transferred. If there is no protocol data error after the protocol data has been transferred, the flag will be changed to TRUE.	Controller reset (*)	When status is read	When the error is cleared after protocol data is resent

* The flags will also be initialized at the following times: when the Controller is reset, when the operating mode is changed between PROGRAM and RUN Modes, when the Unit is restarted, or when the communications port is restarted. After the variable is set, the status area will be reset (cleared) at the timing indicated in "Reset" in the above table for each area.

Additional Information

With the protocol macros, each port has a reception buffer that will hold 2.5 KB max. The Unit can use the reception buffer to hold a large quantity of data when it is received at once, or when the communications sequence is in Wait status.

If the Unit receives data when the reception buffer is full, the receive data will overwrite the 2.5 KB of previously received data in the buffer. Therefore, always use flow control when the Unit receives a large amount of data in Protocol Macro Mode.

Additional Information

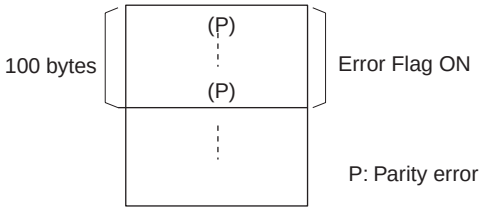
Overrun Errors, Framing Errors, Parity Errors and Error Flags

If an overrun error, framing error, or parity error is detected when the protocol macros is used, the receive data will be stored in the buffer with the error status included. The corresponding error flags will change to TRUE the following conditions are met.

Data which matches the expected receive message includes error information

When Recv is executed, the expected receive message is searched for in the reception buffer. If the error information is included in the received data, the corresponding error flags will change to TRUE.

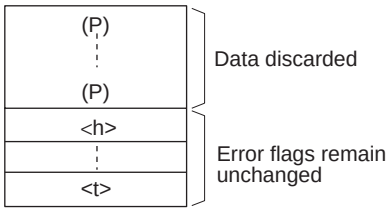
The following example shows when 100 bytes of data is received that matched an expected receive message.



Data which does not match the expected receive message includes error information

If error information is included in data that do not match an expected receive message, the data will simply be discarded and the error flag will remain unchanged. For trace information, all error details in the reception buffer will be stored within capacity for the trace data.

The following example shows when a parity error occurs for data that does not match an expected receive message.



4-2-6 Protocol Status

The information shown in the following table is input from the Unit to the Protocol Status Words in the CPU Unit.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrSta	*_P2_PmrSta	WORD	R	Protocol Macro Operating Status	Bit 15: Protocol Macro Executing Flag Bit 14: Step End Error Bit 13: Abort Flag Bit 12: Tracing Flag Bit 11: Sequence End Completion Flag Bit 10: Sequence Abort Completion Flag Bit 09: Sequence Wait Flag Bit 08: Serial Gateway Prohibited Flag (protocol macros) Bits 00 to 03: Protocol Macro Error Code
*_P1_PmrExecSta	*_P2_PmrExecSta	BOOL	R	Protocol Macro Executing Flag	This flag changes to TRUE when a ExecPMCR instruction (sequence) is executed. The flag remains FALSE when execution fails. When the sequence is completed and receive data is written, the flag is changed to FALSE after all the receive data is written to I/O memory. This flag is changed to FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort).
*_P1_PmrStepErr	*_P2_PmrStepErr	BOOL	R	Step End Error	This flag is changed to TRUE when a step ended abnormally. It remains FALSE if the step ends normally as a result of a retry. TRUE: Step ended abnormally FALSE: Step ended normally

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrAbtSta	*_P2_PmrAbtSta	BOOL	R	Abort Flag	This flag is changed to TRUE when processing is ended by using the Abort Switch from the user program. When the Abort Switch is turned ON at the end of a sequence, the sequence may end with either End or Abort status.
*_P1_PmrTracingSta	*_P2_PmrTracingSta	BOOL	R	Tracing Flag	This flag is changed to TRUE while time series data for send and receive messages is traced with an instruction from the CX-Protocol.
*_P1_PmrSeqEndSta	*_P2_PmrSeqEndSta	BOOL	R	Sequence End Completion Flag	This flag is changed to TRUE when a sequence is completed for the next process or for an error process with an End command. **Note** When a sequence ends normally, setting End (Abort when the sequence ends abnormally) enables this flag to be used to determine whether or not the sequence execution ended normally. TRUE: Sequence ended FALSE: Sequence not ended
*_P1_PmrSeqAbtSta	*_P2_PmrSeqAbtSta	BOOL	R	Sequence Abort Completion Flag	This flag is changed to TRUE when a sequence is ended for the next process or for an error processing with an Abort command. TRUE: Sequence aborted FALSE: Sequence not aborted
*_P1_PmrSeqWaitSta	*_P2_PmrSeqWaitSta	BOOL	R	Sequence Wait Flag	This flag is changed to TRUE when a sequence is waiting due to the Wait command. Waiting is released when the Wait Release Switch changes from FALSE to TRUE in the user program, and the sequence will move to the next step.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrSgwProhSta	*_P2_PmrSgwProhSta	BOOL	R	Serial Gateway Prohibited Flag (Protocol Macros)	This flag is set to TRUE when the Serial Gateway function (Mode) is prohibited due to the status of the Serial Gateway Prohibit Switch in the user program. This flag is set to FALSE when the Serial Gateway is not prohibited.
There is no specific device variable for CJ-series Unit to reference the Protocol Macro Error Code. When you reference the code, refer to bits 00 to 03 of *_P1_PmrSta.	There is no specific device variable for CJ-series Unit to reference the Protocol Macro Error Code. When you reference the code, refer to bits 00 to 03 of *_P2_PmrSta.	Bit string	R	Protocol Macro Error Code	0: No error 2: Sequence No. error 3: Data read/write area exceeded error 4: Protocol data syntax error
*_P1_PmrCommSeqNoSta	*_P2_PmrCommSeqNoSta	UINT	R	Communications Sequence No.	Range: 0 to 999
*_P1_PmrExecNoSta	*_P2_PmrExecNoSta	WORD	R	Executed Step and Case No.	Bits 08 to 11: Executed Step No. (code) Bits 00 to 03: Executed Reception Case No. (code)
*_P1_PmrStepNoCodeSta	*_P2_PmrStepNoCodeSta	USINT	R	Executed Step No. (Code)	Range: 0 to 15
*_P1_PmrRcvCaseNoCodeSta	*_P2_PmrRcvCaseNoCodeSta	USINT	R	Executed Reception Case No. (Code)	Range: 0 to 15
*_P1_PmrRcvCaseNoFlgSta[0-15]	*_P2_PmrRcvCaseNoFlgSta[0-15]	BOOL	R	Executed Reception Case No. Storage Flag	0 to 15: Correspond to bits 00 to 15
*_P1_PmrStepNoFlgSta[0-15]	*_P2_PmrStepNoFlgSta[0-15]	BOOL	R	Executed Step No. Storage Flag	0 to 15: Correspond to bits 00 to 15

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrRepCntSta	*_P2_PmrRepCntSta	WORD	R	Repeat Counter	Bits 08 to 15: Repeat Counter Setting Value Bits 00 to 07: Repeat Counter Present Value
*_P1_PmrSetRepCntSta	*_P2_PmrSetRepCntSta	USINT	R	Repeat Counter Setting Value (*)	The number of times a step is repeated is set in this variable. Range: 0 to 255
*_P1_PmrCurRepCntSta	*_P2_PmrCurRepCntSta	USINT	R	Repeat Counter Present Value (*)	The Repeat Counter variable N is set. The value is cleared when the sequence execution starts, when the STUP instruction is executed, and at restarts. Range: 0 to 255

* When the repeat counter is used to read words and 0 is read, 0 will be stored and the step will be skipped.

● Protocol Status Area Descriptions

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Protocol Macro Executing Flag	*_P1_PmrExecSta *_P2_PmrExecSta	This flag is changed to TRUE when a ExecPMCR instruction (sequence) is executed. The flag remains FALSE when execution fails. When the sequence is completed and the receive data is written, the flag is changed to FALSE after all the receive data is written to the memory used for CJ-series Unit. This flag is changed to FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort). **Note** When the scan response notification method is set for the sequence, first a check is made to see if the received data was written to the memory used for CJ-series Unit before the Protocol Macro Executing Flag is changed to FALSE.	Controller reset (*)	When instruction is executing	When instruction execution is completed
Step End Error	*_P1_PmrStepErr *_P2_PmrStepErr	This flag is changed to TRUE when a step ended abnormally. It remains FALSE if the step ends normally as a result of a retry. TRUE: Step ended abnormally FALSE: Step ended normally		When verification error occurs after receiving	When sequence starts
Abort Flag	*_P1_PmrAbtSta *_P2_PmrAbtSta	This flag is changed to FALSE when processing is ended by using the Abort Switch from the user program. When the Abort Switch is changed to TRUE at the end of a sequence, the sequence may end with either End or Abort status.		When a forced abort occurs	When sequence starts
Tracing Flag	*_P1_PmrTracingSta *_P2_PmrTracingSta	This flag is changed to TRUE while time-series data for send and receive messages is traced with an instruction from the CX-Protocol.		When trace begins	When sequence starts, and when trace ends.
Sequence End Completion Flag	*_P1_PmrSeqEndSta *_P2_PmrSeqEndSta	This flag is changed to TRUE when a sequence is completed for the next process or for an error process with an End command. When a sequence ends normally, setting End (Abort when the sequence ends abnormally) enables this flag to be used to determine whether or not the sequence execution ended normally. TRUE: Sequence ended FALSE: Sequence not ended		When sequence ends.	When sequence starts
Sequence Abort Completion Flag	*_P1_PmrSeqAbtSta *_P2_PmrSeqAbtSta	This flag is changed to TRUE when a sequence is ended for the next process or for an error processing with an Abort command. TRUE: Sequence aborted FALSE: Sequence not aborted		When sequence aborts	When sequence starts

<table>
<tr><th rowspan="2">Name</th><th rowspan="2">Device variable for CJ-series Unit</th><th rowspan="2">Meaning</th><th colspan="3">Timing</th></tr>
<tr><th>Initialize</th><th>Set</th><th>Reset</th></tr>
<tr><td>Sequence Wait Flag</td><td>*_P1_PmrSeqWaitSta
*_P2_PmrSeqWaitSta</td><td>This flag is changed to TRUE when a sequence is waiting due to the Wait command.
Waiting is released when the Wait Release Switch is changed from FALSE to TRUE in the user program, and the sequence will move to the next step.
Note Make sure to set the Wait Release Switch from FALSE to TRUE from the user program.</td><td rowspan="6">Controller reset (*)</td><td>When Wait command is executing</td><td>When Wait Release Switch is ON, and when sequence starts</td></tr>
<tr><td>Serial Gateway Prohibited Flag (Protocol Macros)</td><td>*_P1_PmrSgwProhSta
*_P2_PmrSgwProhSta</td><td>This flag is changed to TRUE when the Serial Gateway (Mode) is prohibited due to the status of the Serial Gateway Prohibit Switch in the user program. This flag is changed to FALSE when the Serial Gateway is not prohibited.</td><td>When instruction is executing</td><td>When instruction execution is completed</td></tr>
<tr><td>Protocol Macro Error Code</td><td>Bits 00 to 03 of *_P1_PmrSta and *_P2 _PmrSta</td><td>The contents of the error codes are shown in the following table.
<table>
<tr><th>Code</th><th>Error contents</th><th>Protocol macro execution</th></tr>
<tr><td>0</td><td>No error</td><td>Executed</td></tr>
<tr><td>2</td><td>Sequence No. Error
The sequence number specified by the ExecPMCR instruction does not exist in the Unit.</td><td>Not executed</td></tr>
<tr><td>3</td><td>Data Read/Write Area Exceeded Error
When data is written or read to the CPU Unit, the specified area range was exceeded.</td><td rowspan="2">Execution stops after the error occurs</td></tr>
<tr><td>4</td><td>Protocol Data Syntax Error
A code that cannot be executed occurs while the protocol macro was executed. (Example: A header comes after a terminator.)</td></tr>
</table>
No codes other than the above are used.
When an error occurs, the error code is held until the next sequence starts.
The error code is cleared when the Unit is restarted, or when the next sequence execution starts.</td><td>At error</td><td>When sequence starts</td></tr>
<tr><td>Communications Sequence No.</td><td>*_P1_PmrCommSeqNoSta
*_P2_PmrCommSeqNoSta</td><td>The current communications sequence number is set when the sequence execution starts. The number is set even when a sequence number error (Error Code: 2) occurs.</td><td>When sequence starts</td><td>None</td></tr>
<tr><td>Executed Step No. (Code)</td><td>*_P1_PmrStepNoCodeSta
*_P2_PmrStepNoCodeSta</td><td>Step numbers 0 to 15 (0 to F hex) for which execution is complete are stored.</td><td>When step is executed</td><td>When sequence starts</td></tr>
</table>

Name	Device variable for CJ-series Unit	Meaning	Timing		
			Initialize	Set	Reset
Executed Reception Case No. (Code)	*_P1_PmrRcvCaseNoCodeSta *_P2_PmrRcvCaseNoCodeSta	Reception matrix case numbers 0 to 15 (0 to F hex) for which reception is complete are stored. The number is cleared when the sequence execution starts, and at restarts. The Executed Reception Case No. is stored only when the reception matrix is set by using the Recv or Send&Recv command. If a reception matrix is not set, the case number will be set to 0 (cleared) when another command is executed.	Controller reset (*)	When matrix is received	When sequence starts
Executed Reception Case No. Storage Flag	*_P1_PmrRcvCaseNoFlgSta *_P2_PmrRcvCaseNoFlgSta	The bits (00 to 15) which correspond to the reception matrix case number No.0 to 15 are set to TRUE. These flags are cleared when the sequence is started, when restarted, and at every step execution. The Executed Reception Case No. Storage Flag in the bit that corresponds to the stored case number will be changed to TRUE only when the reception matrix is set for the Recv or Send&Recv command. If a reception matrix is not set, or when other command is executed, the case number will be set to FALSE (cleared).		When matrix is received	When sequence starts
Executed Step No. Storage Flag	*_P1_PmrStepNoFlgSta *_P2_PmrStepNoFlgSta	The bits 00 to 15 which correspond to the executed steps are changed to TRUE. Once a bit has been set, it is held as TRUE during the sequence and after the sequence is completed.		When step is executed	When sequence starts
Repeat Counter Setting Value	*_P1_PmrSetRepCntSta *_P2_PmrSetRepCntSta	The number of times a step is repeated is set.		When step starts	When sequence starts
Repeat Counter Present Value	*_P1_PmrCurRepCntSta *_P2_PmrCurRepCntSta	The repeat counter variable N is set. The value is cleared when the sequence execution starts, and at restarts. The present value N varies according to the method used to specify the initial value. • Reset: The variable N is set to 0 when the step starts, and the step is executed according to the set number of times. • Hold: The variable N for the present value is held when the step starts, and the step is executed according to the set number of times. **Note** If the Repeat Counter Setting Value is set to read word R( ), and 0 is read, then 0 will be stored and this step will be skipped (the next process setting will be ignored), and the sequence will move to the next step (+ 1). For details, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).		When repeat counter is refreshed	When sequence starts

* The flags will also be initialized at the following times:
When the Controller is reset, when the operating mode is changed between PROGRAM and RUN Modes, when the Unit is restarted, or when the communications port is restarted. After the variable is set, each area will be reset (cleared) at the timing indicated in "Reset" in the above table.

Precautions for Correct Use

Data read/write area exceeded error will occur in the Protocol Status if an EM bank that does not exist is specified in the Protocol Macro Mode.

4-3 Using Protocol Macros

4-3-1 Executing Communications Sequences

Use the ExecPMCR instructions to execute communications sequences.

The ExecPMCR instruction is supported by the NJ-series CPU Unit. For details on the ExecPMCR instruction, refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502).

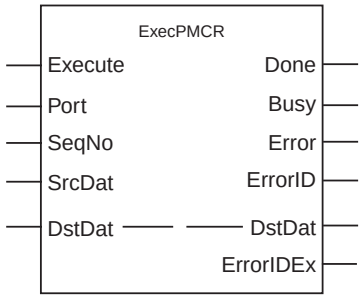
When a ExecPMCR instruction is executed, the communications sequence specified in SeqNo is executed from the serial port (physical port) of the device with the unit number specified in Port.

At first, define the send data array SendData[] and receive data array RecvData[] as user-defined variables, and send the send data stored following SendData[1] for the number of words specified in SendData[0]. The receive data is stored following RecvData[1]. The number of elements in the receive data is stored in RecvData[0].

If reception processing fails, the data following RecvData[1] (the number of words specified in RecvData[0]) specified before execution of the ExecPMCR instruction, is read from the reception buffer and stored again following RecvData[1]. This ensures that the current data will not be cleared to 0 and that the previous receive data will be maintained when receptions fail.

ExecPMCR Instruction Specifications

Execute	Execution conditions
Port	Port specification
SeqNo	Communications sequence No.
SrcDat	Send data array starting element
DstDat	Receive data array starting element



● Port (Port Specification)

Specifies the port at which communications sequences are to be executed using a _sPORT (structure) variable.

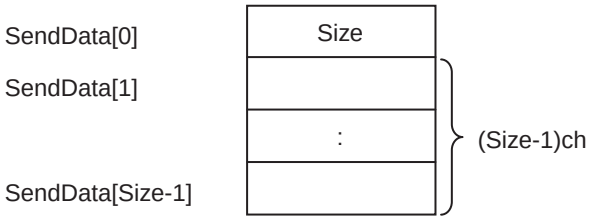
Variable	Name	Details	Data type	Valid range	Factory setting
Port	Destination Port Specification	Destination Port Specification	_sPORT	---	---
UnitNo	Unit Number	Unit number of Serial Communications Unit	_eUnitNo	_CBU_No00 to _CBU_No15	_CBU_No00
PhysicPortNo	Serial Port No.	Serial port number of Serial Communications Unit	USINT	1, 2	1

● SeqNo (Communications Sequence No.)

Specifies the communications sequence No. (000 to 999) in decimal numbers.

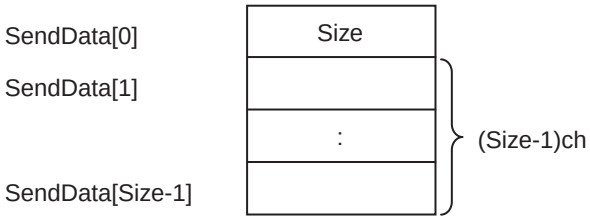
SrcDat (Send Data Array Starting Element)

Specifies the word array starting element of the Send Area. Although the size is set for word array SendData[0] (user-defined variable), set a value that includes the storage area of that size.



DstDat (Send Data Array Starting Element)

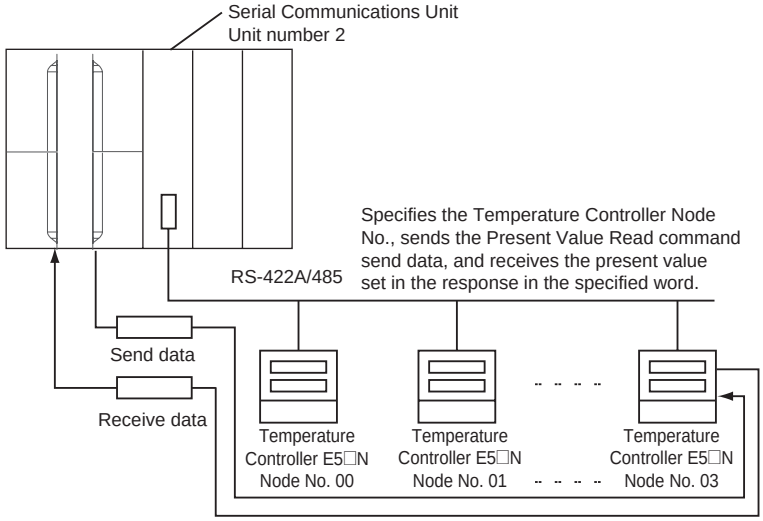
Specifies the word array starting element of the Receive Area. Although the size is set for word array RecvData[0] (user-defined variable), set a value that includes the storage area of that size.



4-3-2 User Program Example

The following diagram shows an example in which sequence number 610 (Variable Area Read) of the CompoWay/F Master Protocol is executed by using the protocol for an OMRON component connected to port 1 (RS-422A/485) of the CJ-series Serial Communications Unit.

● Connections



● Setting User-defined Variables

Define input variable *SrcDat* (Send Data Area) and output variable *DstDat* (Receive Data Area) of ExecPMCR instruction.

User-defined variable of Send Data Area

Variable name: *SendData*, Data type: ARRAY[0..4] OF WORD (five words)

User-defined variable of Receive Data Area

Variable name: *RecvData*, Data type: ARRAY[0..3] OF WORD (four words)

The details of send/receive word allocation for Sequence No. 610 (Variable Area Read) are shown below.

Send data Word data array

SendData[0]	Number of send data words	
SendData[1]	Not used	Node No.
SendData[2]	Variable type	
SendData[3]	Read start address	
SendData[4]	Number of elements	

Receive data Word data array

RecvData[0]	Number of receive data words
RecvData[1]	Response code
RecvData[2]	Receive data
RecvData[3]	Receive data

In this example, the details of send data *SendData[]* and receive data *RecvData[]* are as shown below.

Send data Word data array

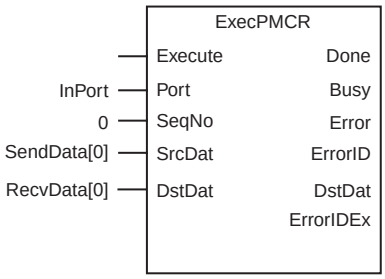
Variable	Item	Description of this example	Value
SendData[0]	Number of send data words	Data of 5 words of *SendData[0]* to *SendData[4]* are sent.	WORD#16#0005
SendData[1]	Node No.	Node No. 3.	WORD#16#0003
SendData[2]	Variable type + higher 1 byte of read start address	In this Present Value Read, the variable type is BYTE#16#C0 and read start address is WORD#16#00.	WORD#16#C000
SendData[3]	Lower 1 byte of read start address + fixed value of BYTE#16#00		WORD#16#0000
SendData[4]	Number of elements	The number of element is 1.	WORD#16#0001

Receive data Word data array

Variable	Item	Description of this example	Value
RecvData[0]	Number of receive data words	Data of 4 words of *RecvData[0]* to *RecvData[3]* are received.	WORD#16#0004
RecvData[1]	Response code	WORD#16#0000 is returned for normal end.	---
RecvData[2]	Receive data	The lower 2 bytes of the present values of the temperature controller are returned.	---
RecvData[3]		The higher 2 bytes of the present values of the temperature controller are returned.	---

● Operand Settings for the ExecPMCR Instruction

Reading and storing the present value of the node No. 03 E5□N.



Input variable	Function	Setting value
Execute	The operation SendCmd is executed when 1 is set.	---
Port	The destination is specified by using the Unit number and serial port number.	InPort.UnitNo = _eUnitNo#_CBU_No02 InPort.PhysicPortNo = USINT#1
SeqNo	Communications sequence No.	0
SrcDat	The starting element of the user-defined variable (array) that store the command data to be sent is specified.	SendData[0]
DstDat	The starting element of the user-defined variable (array) that store the data to be received is specified.	RecvData[0]

Example of User Program Creation

In the following example, sequence number 610 (Variable Area Read) of a CompoWay/F Master (Variable Area Read) is executed by the ExecPMCR instruction and the present value that was read upon successful completion of the sequence is transferred to another user-defined variable (defined as *TmpData* here).

● Unit Settings

Name	Setting target	Setting
Unit Configuration	CPU/Expansion Racks in Configuration and Setup of Sysmac Studio	Mount CJ1W-SCU42 in slot 0 of the CPU Rack.
Device name of this unit		SCU
Unit number	Unit number switch and Unit Configuration (CPU/Expansion Racks in Configuration and Setup of Sysmac Studio)	Unit number 2
Serial Communications Mode	System Settings data	Protocol Macro Mode
Port setting		Default (*)

* Make sure the settings match the corresponding settings at the destination.

The default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

● LD

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag becomes TRUE when there are internal logic ports available, FALSE when there is no internal logic port available.

User-defined variables (To be defined before or when creating a program)

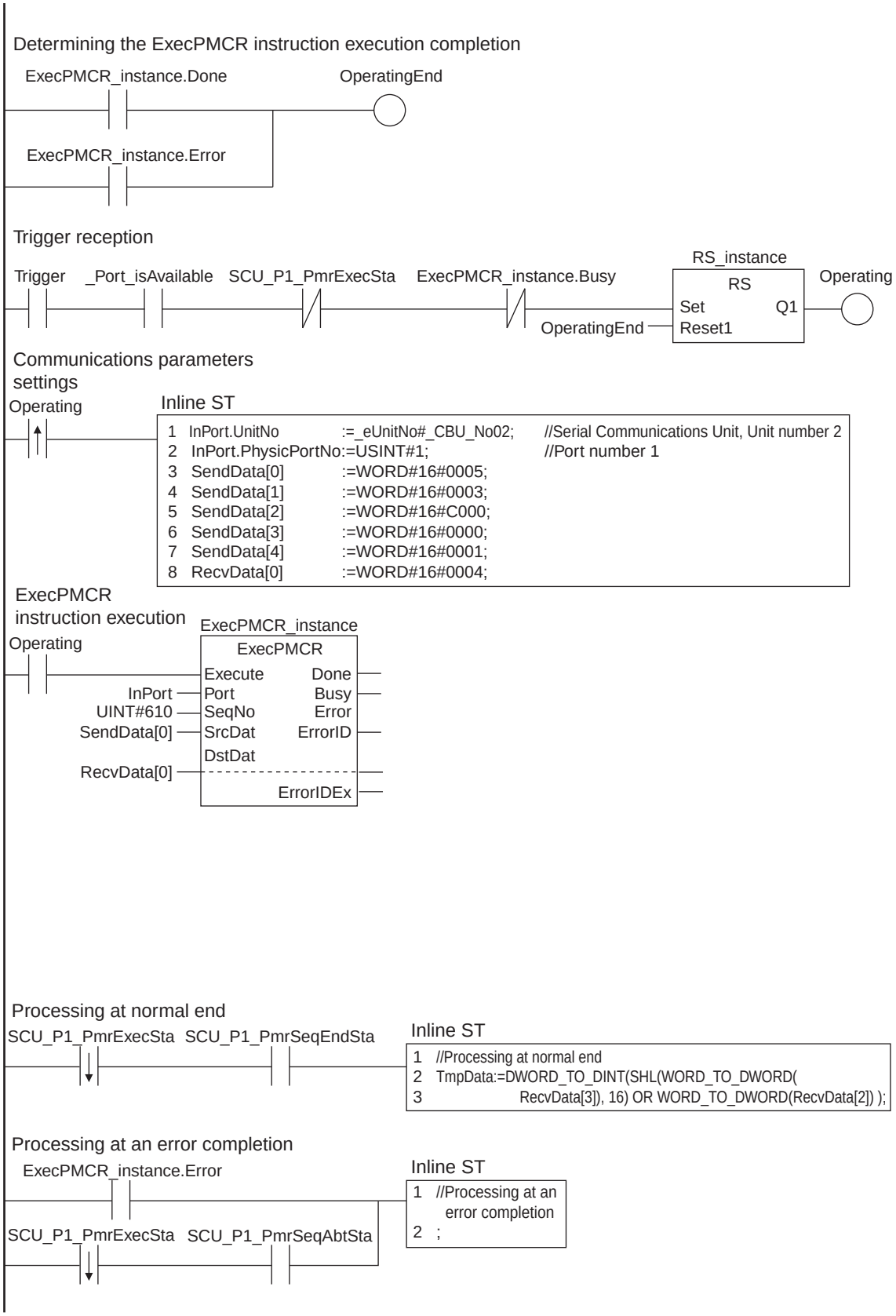
Name	Data type	Factory setting	Allocated address (AT)	Details
OperatingEnd	BOOL	False	---	Process completed
Trigger	BOOL	False	---	Execution conditions
Operating	BOOL	False	---	Processing
InPort	_sPORT	UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port setting
SendData	ARRAY[0..4] OF WORD	[5(16#0)]	---	Send data
RecvData	ARRAY[0..3] OF WORD	[4(16#0)]	%D200 (*)	Receive data
TmpData	DINT	0	---	Present value of E5□N
RS_instance	RS	---	---	---
ExecPMCR_instance	ExecPMCR	---	---	---

* When HR, DM, or EM is specified as an allocated address (AT) for user-defined variables, set the Retention Specification to Retained. When CIO/WR is specified, set it to No-retained.

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
SCU_P1_PmrExecSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrExecSta	Port 1: Protocol Macro Executing Flag	This flag becomes TRUE when a ExecPMCR instruction (sequence) is executed. This flag becomes FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort).
SCU_P1_PmrSeqEndSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrSeqEndSta	Port 1: Sequence End Completion Flag	The flag becomes TRUE when a sequence is completed for the next process or for an error process with an End command.
SCU_P1_PmrSeqAbtSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrSeqAbtSta	Port 1: Sequence Abort Completion Flag	The flag becomes TRUE when a sequence is ended for the next process or for an error processing with an Abort command.

Program Example



- **ST**

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag becomes TRUE when there are internal logic ports available, FALSE when there is no internal logic port available.

User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
State	INT	0	---	Transition status
Trigger	BOOL	False	---	Execution conditions
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port setting
SendData	ARRAY[0..4] OF WORD	[5(16#0)]	---	Send data
RecvData	ARRAY[0..3] OF WORD	[4(16#0)]	%D200 (*)	Receive data
End_ExecPMCR	BOOL	False	---	ExecPMCR instruction execution completion
TmpData	DINT	0	---	Present value of E5□N
RS_instance	RS	---	---	---
ExecPMCR_instance	ExecPMCR	---	---	---
F_TRIG_instance	F_TRIG	---	---	---

* When HR, DM, or EM is specified as an allocated address (AT) for user-defined variables, set the Retention Specification to Retained. When CIO/WR is specified, set it to No-retained.

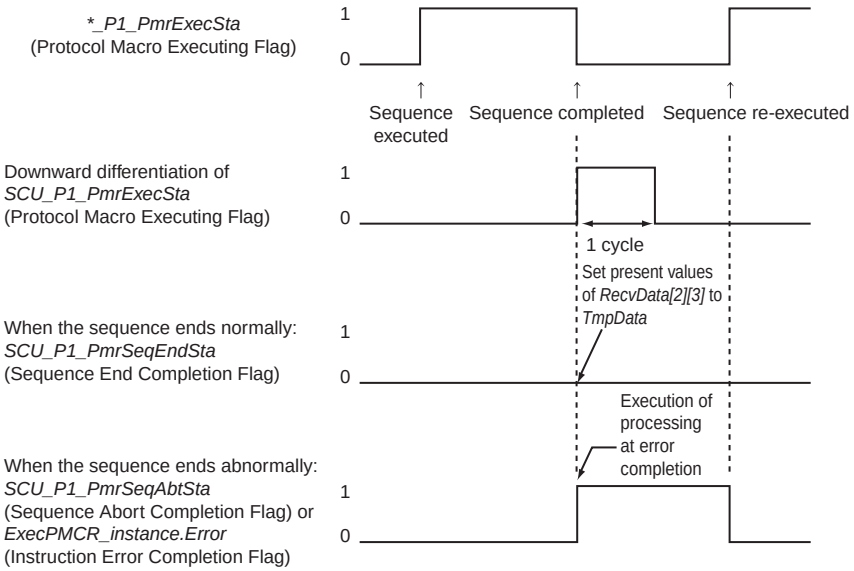
Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
SCU_P1_PmrExecSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrExecSta	Port 1: Protocol Macro Executing Flag	This flag becomes TRUE when a ExecPMCR instruction (sequence) is executed. This flag becomes FALSE when the sequence is completed for the next process or for an error process with an Abort command.
SCU_P1_PmrSeqEndSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrSeqEndSta	Port 1: Sequence End Completion Flag	The flag becomes TRUE when a sequence is completed for the next process or by an error processing End command.
SCU_P1_PmrSeqAbtSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1 _PmrSeqAbtSta	Port 1: Sequence Abort Completion Flag	The flag becomes TRUE when a sequence is ended for the next process or for an error processing with an Abort command.

Program Example

```
//Trigger reception
IF ( State = INT#0 ) THEN
   IF (( Trigger
= TRUE ) AND ( _Port_isAvailable = TRUE ) AND ( SCU_P1_PmrExecSta <> TRUE ) AND
( ExecPMCR_instance.Busy <> TRUE )) THEN
      State := INT#1;
   END_IF;
END_IF;
//Communication parameters settings and ExecPMCR instruction initialization
IF ( State = INT#1 ) THEN
   InPort.UnitNo := _eUnitNo#_CBU_No02;      //Serial Communications Unit, Unit number 2
   InPort.PhysicPortNo := = USINT#1;         //Port number 1
   SendData[0] := WORD#16#0005;
   SendData[1] := WORD#16#0003;
   SendData[2] := WORD#16#C000;
   SendData[3] := WORD#16#0000;
   SendData[4] := WORD#16#0001;
   RecvData[0] := WORD#16#0004;
   ExecPMCR_instance( Execute := FALSE,      //ExecPMCR instruction initialization
                DstDat := RecvData[0] );     //Dummy
   State := INT#2;
END_IF;
//ExecPMCR instruction execution
IF ( State = INT#2 ) THEN
   ExecPMCR_instance(
      Execute := TRUE,
      Port := InPort,
      SeqNo := UINT#610,
      SrcDat := SendData[0],
      DstDat := RecvData[0] );

   F_TRIG_instance(SCU_P1_PmrExecSta , End_ExecPMCR );

   IF( End_ExecPMCR = TRUE ) THEN
      End_ExecPMCR := FALSE;
      State := INT#3;
   END_IF;
```

```
    IF ( ExecPMCR_instance.Error = TRUE ) THEN
      State := INT#5;
    END_IF;

END_IF;

//Checking for ExecPMCR instruction execution completion
IF ( State = INT#3 ) THEN
    IF( SCU_P1_PmrSeqEndSta = TRUE ) THEN
    State := INT#4;
    END_IF;
    IF( SCU_P1_PmrSeqAbtSta = TRUE ) THEN
    State := INT#5;
    END_IF;
END_IF;

IF ( State = INT#4 ) THEN
    //Processing at normal end
    TmpData := DWORD_TO_DINT( SHL( WORD_TO_DWORD( RecvData[3]), 16) OR
WORD_TO_DWORD( RecvData[2] ));
    State := INT#0;
END_IF;

IF ( State = INT#5 ) THEN
    //Processing at error completion
    State := INT#0;
END_IF;
```



Additional Information

Usage of Receive Data Area before execution of ExecPMCR instruction

When the ExecPMCR instruction is executed, the reception buffer is cleared to 0 immediately before the communications sequence is executed.

Accordingly, a user program that routinely reads present value data, such as the one shown below, would clear the present value data to 0 if data could not be retried due to a reception error, etc.

This means that data corresponding to the first m words in the Receive Area has a function to read from the memory used for CJ-series Unit of the CPU Unit immediately before the communications sequence is executed and set again, so that the last receive data will be retained even if a reception error occurs.

This ensures that the present value data will not be cleared to 0 and that the previous receive data will be maintained when receptions fail.

Specify m representing the number of data words to be retained. (If 0 or 1 is specified, the last receive data will not be retained and all data will be cleared to 0.)

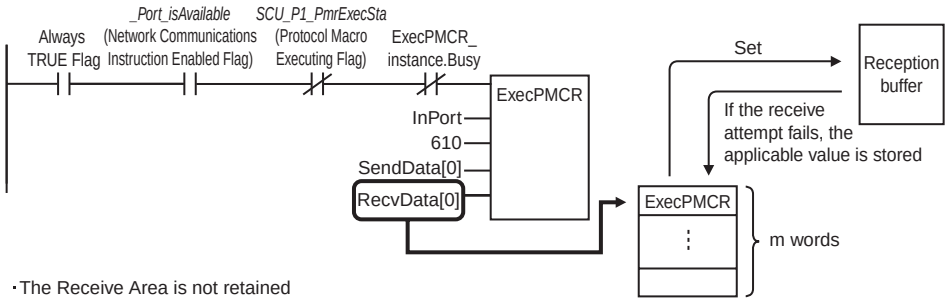
Example: Protocol that executes communications sequence once and ExecPMCR instruction to take in receive data continuously or periodically in the user program.

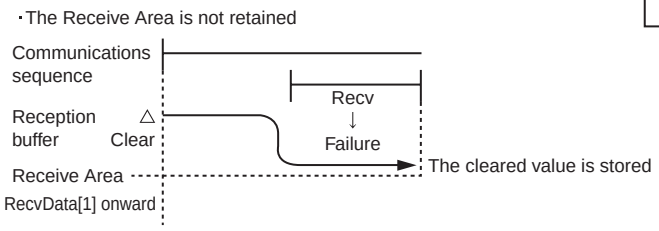
When the Serial Communications Unit is as follows:

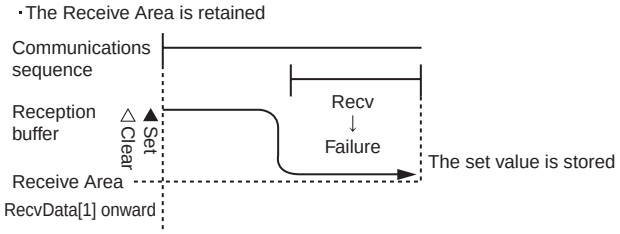
Device name: SCU

Unit number: 0

Port number: 1







Receive Data Area Function

Receive Data Area is used according to the following procedure.

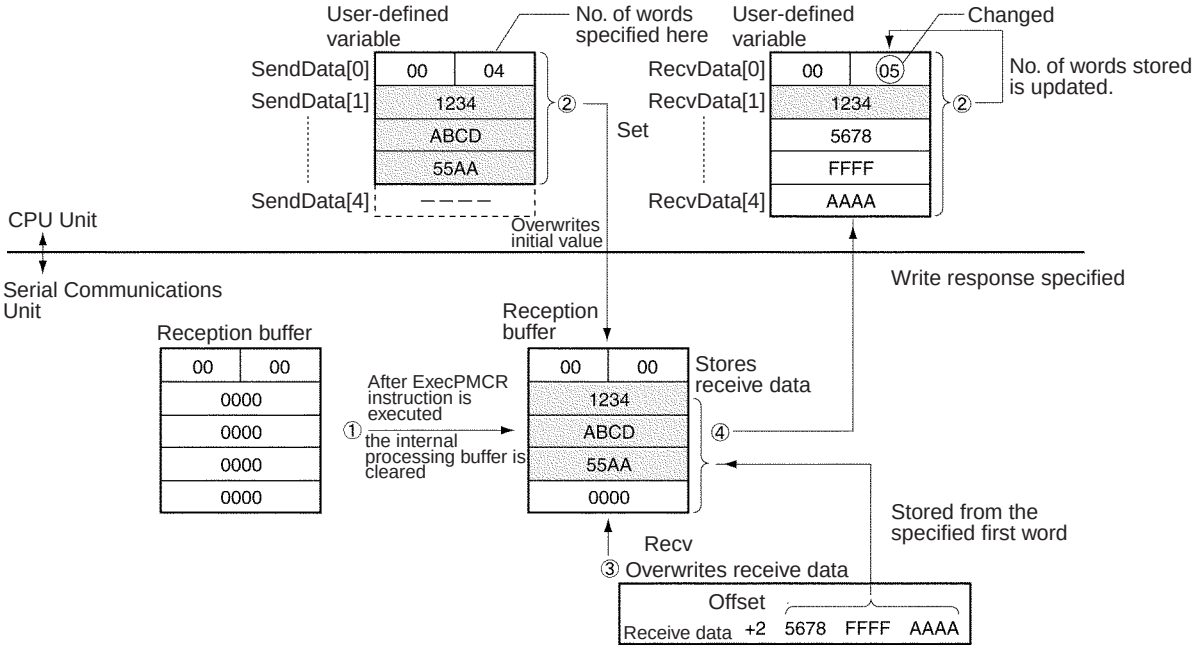
(1) When the ExecPMCR instruction is executed, 250 words of the reception buffer in the Serial Communications Unit are cleared.

(2) Before you execute the communications sequence, copy the data in the user-defined variables for CJ-series memory starting from RecvData[1] with the size specified with RecvData[0] -1, and overwrite the data to the reception buffer (excluding the first word). This becomes the initial value of the reception buffer, and the results of Recv command execution are waited for.
If the contents of the reception buffer exceeds the contents of the number of words specified in RecvData[0] (or the whole area if the number of words is specified as 00), the value in the reception buffer stays at the initial value of 16#0000.

(3) The data that is received as a result of Recv command execution will be stored in the reception buffer (excluding the first word) from the specified first word (offset) and will be verified against the expected receive messages. If writing the response data is not specified, the receive data will be saved in the reception buffer and will not be stored in the CPU Unit.

(4) If writing the response data is specified, the data in the reception buffer up to the last data (excluding the first word), will be stored in the memory area used for CJ-series Units from RecvData[1] onwards. The data stored for the number of words (including RecvData[0]) up to the last word will be saved. Whenever the number of data words stored exceeds the maximum, the number of words in RecvData[0] will be updated.

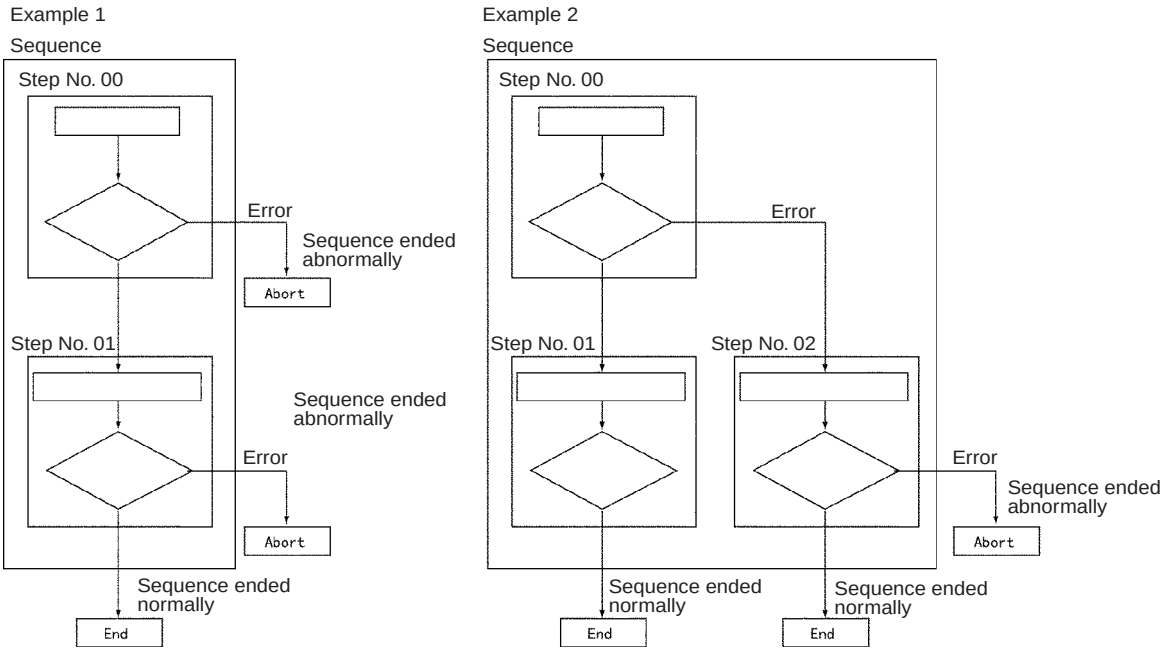
(5) Steps 3 and 4 are repeated until the protocol macro operation is completed.

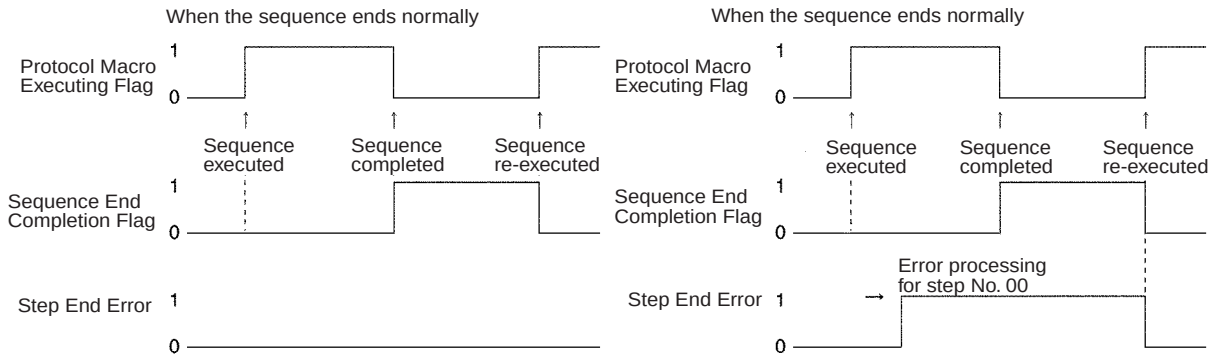


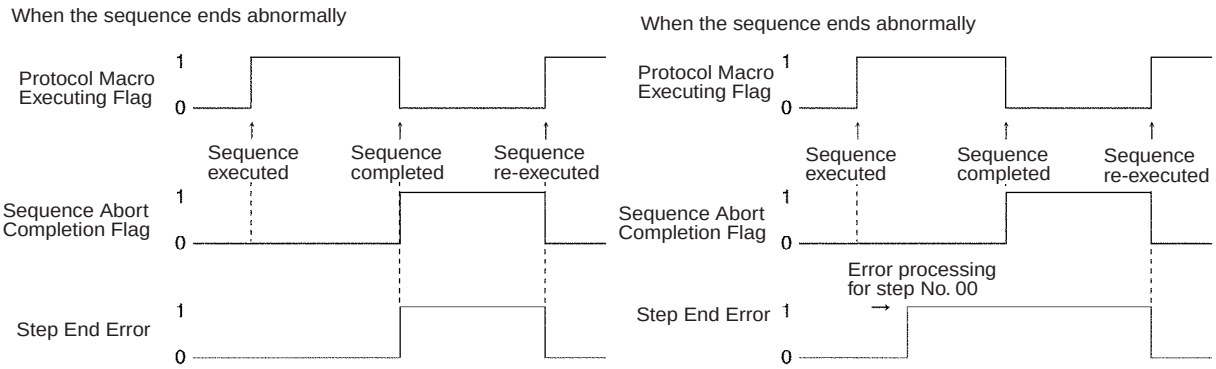
Additional Information

Processing When a Sequence Ends Abnormally

As shown in the following examples, if End is set when a sequence ends normally and Abort is set when a sequence ends abnormally, it is possible to determine whether each sequence ended normally or abnormally by using the Sequence End Completion Flag and the Sequence Abort Completion Flag.







Note The Step End Error is used to see whether error processing was executed for an individual step in a sequence, and not for the overall steps. Therefore, as shown in Example 2 above, after the Unit executes error processing during a sequence (step No. 00), the flag will remain ON, even if the next step ends normally. Be sure to understand that it is not always possible to use this flag to determine whether the overall sequence ended abnormally.

Precautions for Safe Use

You can use the Abort Switch to abort the sequence that is being executed. After changing the Abort switch from FALSE to TRUE from the user program, the system change the switch from TRUE to FALSE after the abort processing is completed. Do not attempt to force the Abort Switch to stay TRUE by using a user program or other Support Software.

5

Serial Gateway

This section provides an overview of the Serial Gateway, information on I/O memory allocations, and procedures to use the functions. Information on protocol conversion, routing table requirements, and communications frames is also provided. The Serial Gateway can be used only for Unit Ver. 1.2 or later.

5-1 Serial Gateway Overview 5-2
- 5-1-1 Overview 5-2
- 5-1-2 Operating Conditions 5-2
- 5-1-3 Features 5-3
- 5-1-4 Serial Gateway Specifications 5-4

5-2 Device Variables for CJ-series Unit and System-defined Variables (During Serial Gateway Mode) 5-5
- 5-2-1 Device Variables for CJ-series Unit for System Settings 5-5
- 5-2-2 System-defined Variable 5-8
- 5-2-3 Device Variable for CJ-series Unit for Software Switches 5-9
- 5-2-4 Device Variable for CJ-series Unit for Status 5-9

5-3 Using the Serial Gateway 5-12
- 5-3-1 Setting Device Variable for CJ-series Unit for System Settings and Software Switches 5-12
- 5-3-2 Sending Messages Using the SendCmd Instruction 5-14
- 5-3-3 Using the Serial Gateway Function When Protocol Macros Are Executed 5-15

5-4 Protocol Conversion 5-22
- 5-4-1 Types of Protocol Conversion 5-22
- 5-4-2 Converting to CompoWay/F 5-23
- 5-4-3 CompoWay/F Connection Examples 5-25
- 5-4-4 Converting to Modbus-RTU 5-26
- 5-4-5 Converting to Modbus-ASCII 5-28

5-5 Serial Gateway 5-29
- 5-5-1 Serial Gateway Execution Timing for Protocol Macros 5-29
- 5-5-2 Serial Gateway Timeout Monitoring 5-31
- 5-5-3 Other Functions 5-32

5-6 Communications Frames 5-33
- 5-6-1 CompoWay/F 5-33
- 5-6-2 Modbus-RTU 5-34
- 5-6-3 Modbus-ASCII 5-36

5-1 Serial Gateway Overview

5-1-1 Overview

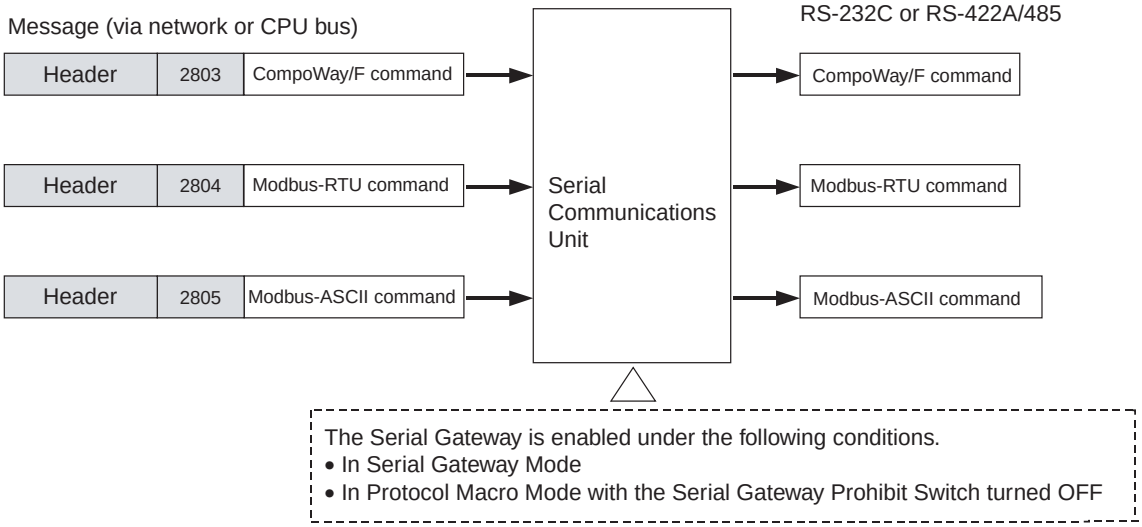
The messages (commands) that are received are automatically converted into the corresponding protocol and then sent via serial communications. The responses are also automatically converted. This function can convert messages into the following protocols.

- CompoWay/F
- Modbus-RTU
- Modbus-ASCII

5-1-2 Operating Conditions

The Serial Gateway is enabled under the following conditions.

- When Serial Gateway Mode is set as the serial communications mode.
- When Protocol Macro Mode is set as the serial communications mode, and the Serial Gateway Prohibit Switch is OFF. (The serial gateway is also enabled during execution of ExecPMCR instructions.)



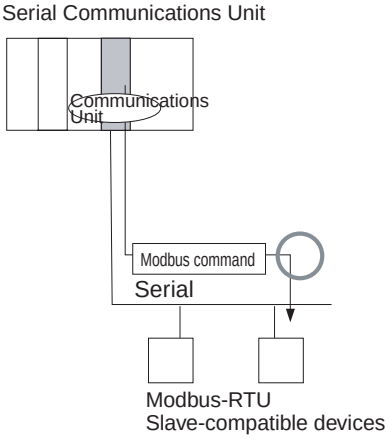
5-1-3 Features

Flexible Access CompoWay/F-compatible OMRON Component

The Serial Gateway enables flexible access to CompoWay/F-compatible OMRON components on the network (PT and PLC's CPU Unit).

Flexible Access Modbus-RTU Slave-compatible Device

The Serial Gateway enables flexible access to Modbus-RTU Slave-compatible devices on the network (PLC's CPU Unit and personal computer).



Serial Gateway Supported in Protocol Macro Mode

The Serial Gateway function can also be executed in the Protocol Macro Mode. (While the Serial Communications Mode is set to Protocol Macro Mode, change the Serial Gateway Prohibit Switches **_P1_SgwDsblCmd* and **_P2_SgwDsblCmd* to TRUE to prohibit and to FALSE to enable.)

5-1-4 Serial Gateway Specifications

Item	Details
Conversion source	Command (received via network or CPU bus)
Conversion functions	• Received commands are converted according to the following values before sending to the serial port of the Unit. 2803 hex: Removes header and converts to CompoWay/F command 2804 hex: Removes header and converts to Modbus-RTU command 2805 hex: Removes header and converts to Modbus-ASCII command
After conversion	• CompoWay/F commands • Modbus-RTU commands • Modbus-ASCII commands
Supported serial communications modes	Serial Gateway Mode or Protocol Macro Mode
Queuing	Up to five commands can be converted and then queued for processing.
Processing during protocol macro execution	When a command is received during execution of a protocol macro, the Serial Gateway is executed as an interrupt between steps in the communications sequence. If the next step is a receive command, however, the Serial Gateway will not be executed and will be delayed. Under all other conditions, the serial gateway is executed immediately. **Note** The reception buffer is cleared during Serial Gateway execution. **Note** You can prohibit the Serial Gateway function during the Protocol Macro Mode by changing **_P1_SgwDsblCmd* and **_P2_SgwDsblCmd* (Serial Gateway Prohibit Switch (Protocol Macros)) from FALSE to TRUE.
Response timeout monitoring	The time is monitored from when a message converted to another protocol by using the Serial Gateway is sent until a response is received (enabled in Serial Gateway mode or protocol macro mode). Default: 5 s; Setting range: 0.1 to 25.5 s **Note** If a response is received after a timeout, it is converted and returned to the command source.
Send start timeout monitoring	The time is monitored after a command is received and converted into another protocol until transmission starts (protocol macro mode only). Default: 5 s; Setting range: 0 to 25.5 s **Note** If a timeout occurs, the send processing is not executed and the received command is discarded.
Send delay	You can use the Serial Gateway to set the time after protocol conversion until actual data is sent (Serial Gateway Mode or Protocol Macro Mode only). Default: 0 s; Setting range: 0 to 300 s

Precautions for Safe Use

If the Serial Gateway is executed for the port that is set for Loopback Test Mode, an undefined command response (end code: 0401 hex) will be returned.

5-2 Device Variables for CJ-series Unit and System-defined Variables (During Serial Gateway Mode)

This section describes the device variables for CJ-series Unit and system-defined variables used in the Serial Gateway Mode.

5-2-1 Device Variables for CJ-series Unit for System Settings

Use the device variables for CJ-series Unit shown below to perform System Settings when you use the Serial Communications Unit in Serial Gateway Mode.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Bit 15: User-specified setting inclusion (*1) Bits 08 to 11: Serial communications mode (9hex: Serial Gateway Mode) Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_*P1_PortCfg*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_*P2_PortCfg*.	Bit string	RW	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
*_P1_StartBitCfg	*_P2_StartBitCfg	BOOL	RW	Start Bits	Always 1 bit regardless of whether the setting is FALSE/TRUE. FALSE: 1 bit TRUE: 1 bit Default: FALSE
*_P1_DatBitCfg	*_P2_DatBitCfg	BOOL	RW	Data Length	FALSE: 7 bits TRUE: 8 bits Default: FALSE
*_P1_StopBitCfg	*_P2_StopBitCfg	BOOL	RW	Stop Bits	FALSE: 2 bits TRUE: 1 bit Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity Even/Odd	FALSE: Even TRUE: Odd Default: FALSE
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	0: 9600, 3: 1200, 4: 2400 5: 4800, 6: 9600, 7: 19200 8: 38400, 9: 57600 10: 115200, 11: 230400 Default: 0
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	The bits serve the functions described below. Bit 15: Send delay time Bits 00 to 14: Send delay (user-specified)
*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	BOOL	RW	Send Delay Time	0: Default (0 ms) 1: User settings
There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_*P1_SendDelayCfg*.	There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you set this setting, set to bits 00 to 14 of *_*P2_SendDelayCfg*.	Bit string	RW	Send Delay (User-specified)	0 to 300 s (0 to 300,000 ms) (0000 to 7530 hex; 0 to 30,000 decimal) [Unit: 10 ms]
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control (*2)	FALSE: No TRUE: Yes
*_P1_PmrSgwTimeoutCfg	*_P2_PmrSgwTimeoutCfg	WORD	RW	Serial Gateway Timeout Monitoring Time Settings	The bits serve the functions described below. 08 to 15: Serial Gateway response timeout monitoring time 00 to 07: Serial Gateway send start timeout monitoring time
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Data range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	USINT	RW	Serial Gateway Send Start Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]

*1 When the default settings are used, the Baud Rate, Start Bits, Data Length, Stop Bits, Parity Yes/No, and Parity Even/Odd settings are disabled. To specify settings other than the default settings, apply user settings.
Default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

*2 With CTS control, turn ON the request to send (RTS) signal before the Serial Communications Unit starts to send, and be sure the clear to send (CTS) signal is ON before the Serial Communications Unit sends data. When there is no CTS control, turn ON the request to send (RTS) signal before the Serial Communications Unit starts to send, and then send data without checking the clear to send (CTS) signal.

● User-specified Setting Inclusion

Set whether to make the user-specified settings for port 1 or port 2. Enter the same settings as those for the RS-232C port of general-purpose external devices connected by using a protocol macro.

FALSE: Default; TRUE: User settings
When the default is set, the following details are set for the port and bits 00 to 04 do not need to be set separately.
Baud Rate: 9,600 bps; Start Bits: 1 bit; Data Length: 7 bits; Parity: Even; Stop Bits: 2 bits
When user settings are specified, set bits 00 to 04 and the Baud Rate.

Setting example: 0900 hex: Serial Gateway Mode, using default settings for Port Settings and Baud Rate.

● Serial Communications Mode

Serial Gateway Mode is used, so set to 9 hex.

● Start Bits, Data Length, Stop Bits, Parity, Baud Rate

Set these bits if the port setting is set to user settings. The start bit is always 1 bit regardless of its setting.

Do no set a Baud Rate higher than 12. Doing so will result in a system error and operation will proceed using the default setting (9,600 bps). Do not set 1 or 2 hex, which are reserved for the system.

● Send Delay (user-specified)

After the command is received by the Unit and converted to the specified protocol, it is not transferred immediately, but sent after the delay time is set within the following range:

0 to 30,000 [Unit: 10 ms]: 0 to 300 s (0 to 300,000 ms)

● CTS Control

When CTS control is enabled, the request to send signal (RTS) turns ON and the transmission starts after the clear to send signal (CTS) turns ON. When CTS control is disabled, the request to send signal (RTS) turns ON and the transmission starts without checking whether the clear to send signal (CTS) is ON.

● Serial Gateway Response Timeout Monitoring Time

After a command is converted to the specified protocol and sent, the response timeout is monitored.

0: 5 s (default), Setting range: 1 to 255 (0.1 to 25.5 s)

The response monitoring time is 5 s when set to the default setting, or can be a user-specified time set in the range 0.1 to 25.5 s by setting between 1 and 255.

If a timeout occurs, the command end code (0205 hex (Response Timeout)) is returned to the command source. If a response is received after a timeout, however, the message is converted and returned to the command source.

● Serial Gateway Send Start Timeout Monitoring Time

When a command is converted to the specified protocol and sent during protocol macro execution, the time is monitored from when the command is received until it starts to be sent in the converted protocol.

0: 5 s (default), Setting range: 1 to 255 (0.1 to 25.5 s)

The send start monitoring time is 5 s when set to the default setting, or can be a user-specified time set in the range 0.1 to 25.5 s by setting between 1 and 255.

If a timeout occurs, a command end code (0204hex (Remote node busy)) is returned to the command source. Send processing will not be executed and the received command will be discarded.

5-2-2 System-defined Variable

● Port 1 and Port 2 Setting Changing Flags

It is possible to change communications settings and restart the Serial Communications Unit ports by changing these flags from FALSE to TRUE with an Out instruction. These flags will automatically turn to FALSE when the settings are changed and the communications ports are restarted.

These flags are used both to change the communications port settings and to restart the communications port at the same time. Accordingly, in cases where these flags are changed to TRUE only to restart a communications port by using an Out instruction or other instruction, you can change these flags to TRUE without changing the System Settings of the device variable for CJ-series Unit.

List of System-defined Variables (** corresponds to the unit number.)

System-defined variable	Type	R/W	Name	Function
_CJB_SCU**P1ChgSta	BOOL	RW	Serial Communications Unit Port 1, Settings Changing Flag	TRUE: Port 1 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE
_CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit Port 2, Settings Changing Flag	TRUE: Port 2 Communications Unit Port Settings Change FALSE: All other statuses Default: FALSE

5-2-3 Device Variable for CJ-series Unit for Software Switches

These variable are used for data output from the CPU Unit to the Serial Communications Unit.

These variables are not available in the Serial Gateway Mode.

Use the device variables for CJ-series Unit shown below when you use the Serial Gateway function while executing the protocol macros during the Protocol Macro Mode.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SgwDsblCmd	*_P2_SgwDsblCmd	BOOL	RW	Serial Gateway Prohibit Switch (Protocol Macros)	TRUE→FALSE: Not prohibited FALSE→TRUE: Prohibited

5-2-4 Device Variable for CJ-series Unit for Status

These variables are used for data input from the Serial Communications Unit to the CPU Unit.

Use these variables to reference the port settings, the communications status, the transmission control signal status, and the transmission error status of the Serial Communications Unit.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_Com_UnitSta		WORD	R	Serial Communication Unit Status	Bit 01: Error log data error Bit 00: Protocol data error
*_Com_UnitLogMemErr		BOOL	R	Error Log EEPROM Error	TRUE: Error log EEPROM error FALSE: Error log EEPROM normal
*_Com_UnitPmrDatErr		BOOL	R	Protocol Data Error	TRUE: Protocol data error FALSE: Protocol data normal
*_P1_SysSetSta	*_P2_SysSetSta	WORD	R	System Settings (*)	Bits 12 to 15: Serial communications mode Bits 8 to 11: Baud rate Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P2_SysSetSta*.	Bit string	R	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P2_SysSetSta*.	Bit string	R	Baud Rate	0: 9600 3: 1200 4: 2400 5: 4800 6: 9600 7: 19200 8: 38400 9: 57600 10: 115200 11: 230400 Default: 0
*_P1_StartBitSta	*_P2_StartBitSta	BOOL	R	Start Bits (Always 1 bit)	FALSE: 1 bit TRUE: 1 bit (1 bit for both FALSE and TRUE.)
*_P1_DatBitSta	*_P2_DatBitSta	BOOL	R	Data Length (7 bits/8 bits)	FALSE: 7 bits TRUE: 8 bits
*_P1_StopBitSta	*_P2_StopBitSta	BOOL	R	Stop Bits (2 bits/1 bit)	FALSE: 2 bits TRUE: 1 bit
*_P1_ParityYNSta	*_P2_ParityYNSta	BOOL	R	Parity (Yes/No)	FALSE: Yes TRUE: No
*_P1_ParityBitSta	*_P2_ParityBitSta	BOOL	R	Parity (Even/Odd)	FALSE: Even TRUE: Odd
*_P1_HwSetSta	*_P2_HwSetSta	WORD	R	Hardware Settings	Bit 15: RS-422/485 setting status Bit 14: RS-232C setting status Bit 13: Terminating resistance setting status Bit 01: System Settings error Bit 0: Port operating status
*_P1_Ser485Sta	*_P2_Ser485Sta	BOOL	R	RS-422/485 Setting Status	Port types of each port *_P□_Ser485Sta/ *_P□_Ser232Sta: 00: No port 01:RS232C 10: RS422A/485 11: This status does not exist.
*_P1_Ser232Sta	*_P2_Ser232Sta	BOOL	R	RS-232C Setting Status	
*_P1_TermSta	*_P2_TermSta	BOOL	R	Terminating Resistance Setting Status	TRUE: Terminating resistance ON FALSE: Terminating resistance OFF
*_P1_SysSetupErr	*_P2_SysSetupErr	BOOL	R	System Setup Error	TRUE: System Settings error FALSE: System Settings normal
*_P1_OperatingSta	*_P2_OperatingSta	BOOL	R	Port Operating Status	TRUE: Port operating FALSE: Port stopped

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_TransCtlSta	*_P2_TransCtlSta	WORD	R	Communications Status	Bit 10: Remote Unit busy Bit 08: Local Unit busy Bit 07: DTR (ER) signal Bit 06: DSR (DR) signal Bit 04: CTS (CS) signal Bit 03: RTS (RS) signal
*_P1_RmtBusySta	*_P2_RmtBusySta	BOOL	R	Remote Unit Busy	TRUE: Remote Unit busy (Flow control) FALSE: Remote Unit ready to receive
*_P1_LclBusySta	*_P2_LclBusySta	BOOL	R	Local Unit Busy	TRUE: Local Unit busy (Flow control) FALSE: Local Unit ready to receive
*_P1_SigERSta	*_P2_SigERSta	BOOL	R	ER Signal	TRUE: High FALSE: Low
*_P1_SigDRSta	*_P2_SigDRSta	BOOL	R	DR Signal	TRUE: High FALSE: Low
*_P1_SigCSSta	*_P2_SigCSSta	BOOL	R	CS Signal	TRUE: High FALSE: Low
*_P1_SigRSSta	*_P2_SigRSSta	BOOL	R	RS Signal	TRUE: High FALSE: Low
*_P1_TransErrSta	*_P2_TransErrSta	WORD	R	Transmission Error Status	Bit 15: Transmission error Bit 07: FCS check error Bit 05: Timeout Bit 04: Overrun error Bit 03: Framing error Bit 02: Parity error
*_P1_TransErr	*_P2_TransErr	BOOL	R	Transmission Error	TRUE: Transmission error FALSE: No transmission error
*_P1_FCSErr	*_P2_FCSErr	BOOL	R	FCS Check Error	TRUE: FCS check error FALSE: FCS check normal
*_P1_TimeoutErr	*_P2_TimeoutErr	BOOL	R	Timeout Error	TRUE: Timeout (protocol macros: Tfs, Tfr, or Tr) error or Serial Gateway send/response timeout FALSE: Normal
*_P1_OverRunErr	*_P2_OverRunErr	BOOL	R	Overrun Error	TRUE: Overrun error FALSE: Normal
*_P1_FramingErr	*_P2_FramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal
*_P1_ParityErr	*_P2_ParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal

* The current settings for the port are read. For details on the read contents, refer to *5-2-1 Device Variables for CJ-series Unit for System Settings*. If a System Settings error occurs, the default settings will be read.

5-3 Using the Serial Gateway

Use of the Serial Gateway basically only requires setting of the device variables for CJ-series Unit for System Settings and Software Switches.

5-3-1 Setting Device Variable for CJ-series Unit for System Settings and Software Switches

Using Serial Gateway Alone

Set the device variables for CJ-series Unit for System Settings shown below.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Serial communications mode (bits 11 to 08): 9 hex: (Serial Gateway Mode) Bits 00 to 04: Set the serial communications conditions to match the protocol at the conversion destination.
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	Baud rate: Set to match the protocol at the conversion destination.
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	Bit 15: Send delay time Bits 00 to 14: Send delay (user-specified)
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control	FALSE: No TRUE: Yes
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Data range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]

Using Serial Gateway with Protocol Macros

Set the CJ-series Unit device variables for System Settings shown below.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Serial communications mode (bits 11 to 08): 6 hex: (Protocol Macro Mode) Bits 00 to 04: Set the serial communications conditions to match the protocol at the conversion destination.
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	Baud rate: Set to match the protocol at the conversion destination.
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Settings	Bit 15: Send delay time Bits 00 to 14: Send delay (user-specified)
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control	FALSE: No TRUE: Yes
*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	USINT	RW	Serial Gateway Response Timeout Monitoring Time	0: 5 s (default) Data range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]
*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	USINT	RW	Serial Gateway Send Start Timeout Monitoring Time	0: 5 s (default) Range: 1 to 255 0.1 to 25.5 s [Unit: 100 ms]

Use the following flag to check whether a Serial Gateway response timeout or send start timeout occurred.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_TimeoutErr	*_P2_TimeoutErr	BOOL	R	Timeout Error	TRUE: Timeout FALSE: Normal

Use the device variable for CJ-series Unit for Software Switches shown below to set the Serial Gateway to the Not prohibited status.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SgwDsblCmd	*_P2_SgwDsblCmd	BOOL	RW	Serial Gateway Prohibit Switch (Protocol Macros)	TRUE→FALSE: Not prohibited FALSE→TRUE: Prohibited

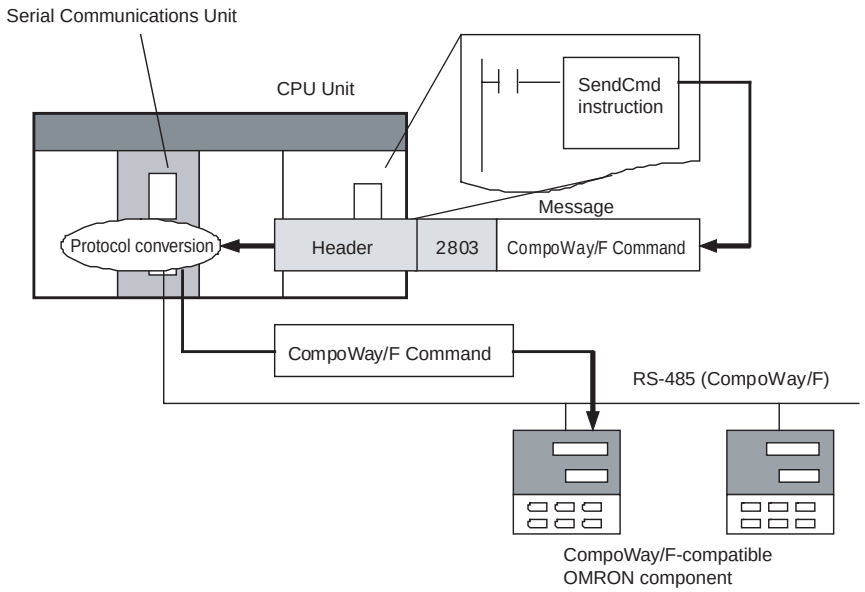
The Not prohibited/Prohibited status for the Serial Gateway can be checked by the following flag.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PmrSgwProhSta	*_P2_PmrSgwProhSta	BOOL	R	Serial Gateway Prohibited Flag (Protocol Macros)	This flag is set to TRUE when the user program prohibits the Serial Gateway function (Mode) by controlling the status of the Serial Gateway Prohibit Switch. This flag is set to FALSE when the Serial Gateway is not prohibited.

5-3-2 Sending Messages Using the SendCmd Instruction

You can use the SendCmd (command send) instruction on the CPU Unit user program to send messages.

Example: Send a CompoWay/F message to a CompoWay/F-compatible OMRON component connected to the Serial Communications Unit via a serial network.



For details on the SendCmd instruction, refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502).

5-3-3 Using the Serial Gateway Function When Protocol Macros Are Executed

The following user program example shows how to return the Serial Gateway to the not prohibited status after the ExecPMCR instruction is executed and the sequence is completed. (This example uses port number 1 of a Serial Communications Unit with unit number 2. Note that in this example, the sequence number specified by the ExecPMCR instruction is not specifically indicated.)

● Unit Settings

Name	Setting target	Setting
Unit Configuration	CPU/Expansion Racks in Configuration and Setup of Sysmac Studio	Mount CJ1W-SCU22 in slot 0 of the CPU Rack.
Device name of this unit		SCU
Unit number	Unit number switch and Unit Configuration (CPU/Expansion Racks in Configuration and Setup of Sysmac Studio)	Unit number 2
Serial Communications Mode	System Settings data	Protocol Macro Mode
Port setting		Default (*)

* Make sure the settings match the corresponding settings at the destination.

The default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

● LD

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag becomes TRUE when there are internal logic ports available. This flag becomes FALSE when there is no internal logic port available.

User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
OperatingEnd	BOOL	False	---	Process completed
Trigger	BOOL	False	---	Execution conditions
Operating	BOOL	False	---	Processing
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port setting
SendData	ARRAY[0..4] OF WORD	[5(16#0)]	---	Send data

Name	Data type	Factory setting	Allocated address (AT)	Details
RecvData	ARRAY[0..3] OF WORD	[4(16#0)]	%D200 (*)	Receive data
RS_instance	RS	---	---	---
ExecPMCR_instance	ExecPMCR	---	---	---

* When HR, DM, or EM is specified as an allocated address (AT) for user-defined variables, set the Retention Specification to Retained. When CIO/WR is specified, set it to No-retained.

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

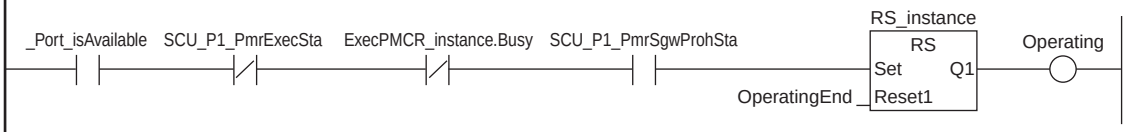
Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
SCU_P1_PmrExecSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrExecSta	Port 1: Protocol Macro Executing Flag	This flag becomes TRUE when an ExecPMCR instruction (sequence) is executed. This flag becomes FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort).
SCU_P1_PmrSeqEndSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSeqEndSta	Port 1: Sequence End Completion Flag	This flag becomes TRUE when a sequence is completed for the next process or for an error process with an End command.
SCU_P1_PmrSeqAbtSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSeqAbtSta	Port 1: Sequence Abort Completion Flag	This flag becomes TRUE when a sequence is ended for the next process or error processing with an Abort command.
SCU_P1_SgwDsblCmd	BOOL	---	IOBus://rack#0/slot#0/P1_SoftSw/P1_SgwDsblCmd	Port 1: Serial Gateway Prohibit Switch	When this switch is changed from TRUE to FALSE, Serial Gateway function is not prohibited.
SCU_P1_PmrSgwProhSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSgwProhSta	Port 1: Serial Gateway Prohibited Flag	This flag is set to TRUE when the Serial Gateway function (mode) is prohibited. This flag is set to FALSE when the Serial Gateway is not prohibited.

Program Example

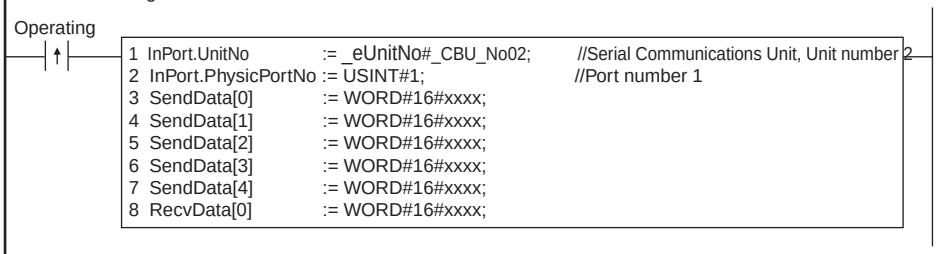
Determining the ExecPMCR instruction execution completion

Serial Gateway prohibition setting

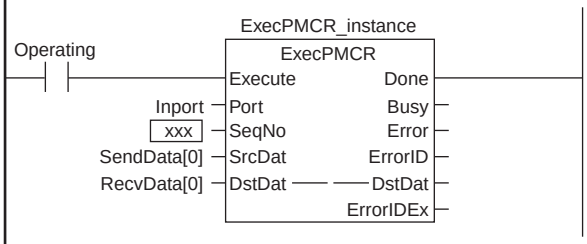
Start condition check



Parameter setting of ExecPMCR instruction

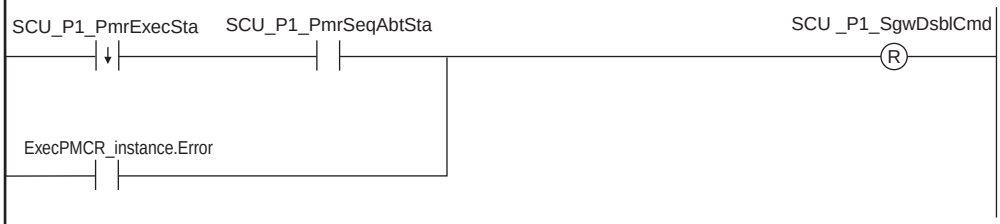


ExecPMCR instruction execution



Serial Gateway not prohibited (at normal end)

Serial Gateway not prohibited (at an error completion)



- **ST**

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag becomes TRUE when there are internal logic ports available. This flag becomes FALSE when there is no internal logic port available.

User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
Trigger	BOOL	---	---	Execution conditions
LastTrigger	BOOL	---	---	Trigger value of previous task period
State	INT	0	---	State transition
End_ExecPMCR	BOOL	False	---	End of protocol macro execution
FTrig_PmrExecSta	BOOL	---	---	Protocol Macro Executing Flag changing to FALSE
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port setting
SendData	ARRAY[0..4] OF WORD	[5(16#0)]	---	Send data
RecvData	ARRAY[0..3] OF WORD	[4(16#0)]	%D200 (*)	Receive data
ExecPMCR_instance	ExecPMCR	---	---	---
F_TRIG_instance	F_TRIG	---	---	---

* When HR, DM, or EM is specified as an allocated address (AT) for user-defined variables, set the Retention Specification to Retained. When CIO/WR is specified, set it to No-retained.

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
SCU_P1_PmrExecSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrExecSta	Port 1: Protocol Macro Executing Flag	This flag becomes TRUE when an ExecPMCR instruction (sequence) is executed. This flag becomes FALSE when the sequence is completed (either when it is ended by End, or when it is ended by Abort).
SCU_P1_PmrSeqEndSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSeqEndSta	Port 1: Sequence End Completion Flag	This flag becomes TRUE when a sequence is completed for the next process or for an error process with an End command.
SCU_P1_PmrSeqAbtSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSeqAbtSta	Port 1: Sequence Abort Completion Flag	This flag becomes TRUE when a sequence is ended for the next process or for an error processing with an Abort command.
SCU_P1_SgwDsblCmd	BOOL	---	IOBus://rack#0/slot#0/P1_SoftSw/P1_SgwDsblCmd	Port 1: Serial Gateway Prohibit Switch	When this switch is changed from TRUE to FALSE, Serial Gateway function is not prohibited.
SCU_P1_PmrSgwProhSta	BOOL	---	IOBus://rack#0/slot#0/P1_PmrSta/P1_PmrSgwProhSta	Port 1: Serial Gateway Prohibited Flag	This flag is set to TRUE when the Serial Gateway function (mode) is prohibited. This flag is set to FALSE when the Serial Gateway is not prohibited.

Program Example

```
//Serial Gateway prohibition setting
IF ( State = INT#0 ) THEN
   IF (( Trigger = TRUE ) AND (LastTrigger=FALSE)) THEN
      SCU_P1_SgwDsblCmd := TRUE;            //Serial Gateway prohibited
      State := INT#1;
   END_IF;
   LastTrigger := Trigger;
END_IF;
//Start condition check
IF ( State = INT#1 ) THEN
   IF (( _Port_isAvailable = TRUE ) AND ( SCU_P1_PmrExecSta <> TRUE ) AND ( SCU_P
1_PmrSgwProhSta = TRUE ) AND ( ExecPMCR_instance.Busy <> TRUE )) THEN
      State := INT#2;
   END_IF;
END_IF;
//Communication parameters settings and ExecPMCR instruction initialization
IF ( State = INT#2 ) THEN
   InPort.UnitNo := _eUnitNo#_CBU_No02;     //Serial Communications Unit, Unit number 2
   InPort.PhysicPortNo := USINT#1;          //Port number 1
   SendData[0] := WORD#16#xxxx;
   SendData[1] := WORD#16#xxxx;
   SendData[2] := WORD#16#xxxx;
   SendData[3] := WORD#16#xxxx;
   SendData[4] := WORD#16#xxxx;
   RecvData[0] := WORD#16#xxxx;
   ExecPMCR_instance( Execute := FALSE ,    //ExecPMCR instruction initialization
              DstDat := RecvData[0] );      //Dummy
   State := INT#3
END_IF;
//ExecPMCR instruction execution
IF ( State = INT#3 ) THEN
   ExecPMCR_instance( Execute := TRUE,
                      Port := InPort,
                      SeqNo := xxx,
                      SrcDat := SendData[0],
                      DstDat := RecvData[0] );
```

```
//Detecting Protocol Macro Executing Flag changing to FALSE
F_TRIG_instance(SCU_P1_PmrExecSta , FTrig_PmrExecSta );
IF( FTrig_PmrExecSta = TRUE ) THEN
      End_ExecPMCR := TRUE;
END_IF;

IF ( ExecPMCR_instance.Done = TRUE ) AND ( End_ExecPMCR = TRUE ) THEN
      End_ExecPMCR := FALSE;
//Clearing the workpiece indicating end of execution of the protocol macro
      State := INT#4;

   END_IF;
   IF ( ExecPMCR_instance.Error = TRUE ) THEN
      State := INT#6;
   END_IF;
END_IF;

//Checking for ExecPMCR instruction execution completion
IF ( State = INT#4 ) THEN
   IF( SCU_P1_PmrSeqEndSta = TRUE ) THEN
      State := INT#5;
   END_IF;
   IF( SCU_P1_PmrSeqAbtSta = TRUE ) THEN
      State := INT#6;
   END_IF;
END_IF;
//Serial Gateway not prohibited (at normal end)
IF ( State = INT#5 ) THEN
   SCU_P1_SgwDsblCmd:= FALSE;              //Serial Gateway not prohibited
   State := INT#0;
END_IF;
//Serial Gateway not prohibited (at error completion)
IF ( State = INT#6 ) THEN
   SCU_P1_SgwDsblCmd := FALSE;             //Serial Gateway not prohibited
   State := INT#0;
END_IF;
```

5-4 Protocol Conversion

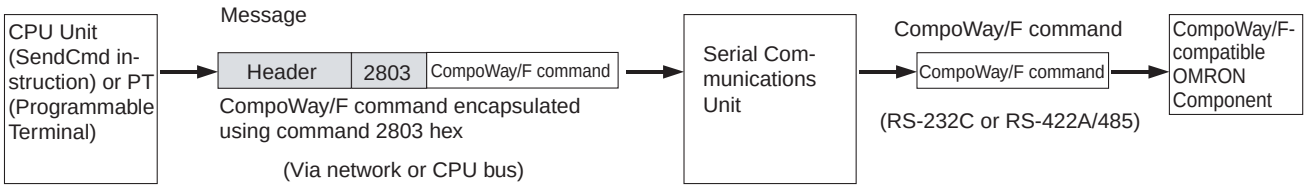
5-4-1 Types of Protocol Conversion

Type of conversion	Frame before conversion			Processing at Unit	Protocol after conversion (using serial communications)	Target (device to be connected)
	Destination address	Command	Data			
Converting to CompoWay/F	Serial port number on Unit	2803 hex	CompoWay/F command	CompoWay/F command is sent to serial port after its header is removed.	CompoWay/F command	OMRON Component (e.g., Temperature Controller, Digital Panel Indicator, or Smart Sensor)
Converting to Modbus-RTU		2804 hex	Modbus-RTU command	Modbus-RTU command is sent to serial port after its header is removed.	Modbus-RTU command	Modbus-RTU Slave-compatible device (including OMRON 3G3MX2, 3G3RX, and 3G3JX Inverters)
Converting to Modbus-ASCII		2805 hex	Modbus-ASCII command	Modbus-ASCII command is sent to serial port after its header is removed.	Modbus-ASCII command	Modbus-ASCII Slave-compatible device (e.g., temperature controller, indicator, or power monitor)

5-4-2 Converting to CompoWay/F

It is possible to access OMRON Components connected to a PLC via a serial network from the PLC CPU Unit or PT by using CompoWay/F commands.

- Sent message: Header + Command code 2803 hex + CompoWay/F command
- Message after conversion: CompoWay/F command

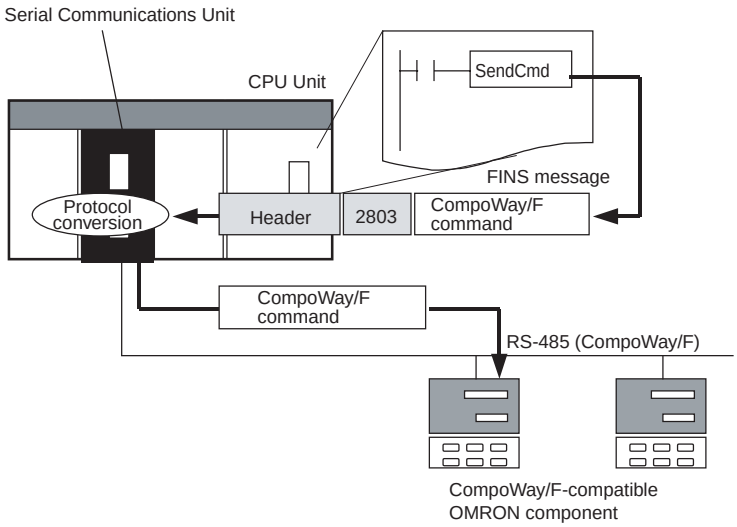


CompoWay/F Slave Components

Component		Model series
Temperature Controllers	Thermac NEO	E5GN (G components)
		E5CN
		E5EN
		E5AN
	Thermac R	E5AR
		E5ER
	Module type Temperature Controllers	E5ZN
Timer/Counters	Timers/Counters	H8GN (G components)
Digital Panel Indicators	Voltage/Current Panel Meters	K3HB-X
	High-speed Response Digital Panel Meters	K3HB-S
	Load Cell, mv Meters	K3HB-V
	Rotary/Pulse Meters	K3HB-R
	Time Interval Meters	K3HB-P
	Integration/Addition/Subtraction Pulse Meters	K3HB-C
	Temperature Panel Meters	K3HB-H
	Compact Digital Panel Meters	K3GN
Smart Sensors	ZX Communications Interface Units	ZX-SF11
Cam Positioners	---	3F88L-160, 3F88L-162
Safety Controllers	---	F3SX

System Configuration

● Sending Messages Using SendCmd Instructions in CPU Unit's User Program (The Unit converts the messages to CompoWay/F protocol)

CPU Bus-to-Serial	Details
	From the CPU Unit, it is possible to access OMRON components that are connected to the Serial Communications Unit via a serial network (CompoWay/F).

Note 1 The header contains the following information.

- Remote destination network address (DNA): Network address to specify actual remote Pocasset 0 (local network).
- Remote destination node address (DA1): Node address to specify actual remote Pocasset 0 (communications within local PLC).
- Remote destination unit address (DA2):
  Unit address of serial communications port. An appropriate value is calculated and set as follows:
  When port 1 is used: Unit address = BYTE#16#80 + BYTE#16#04 × Unit number (hexadecimal)
  When port 2 is used: Unit address = BYTE#16#81 + BYTE#16#04 × Unit number (hexadecimal)

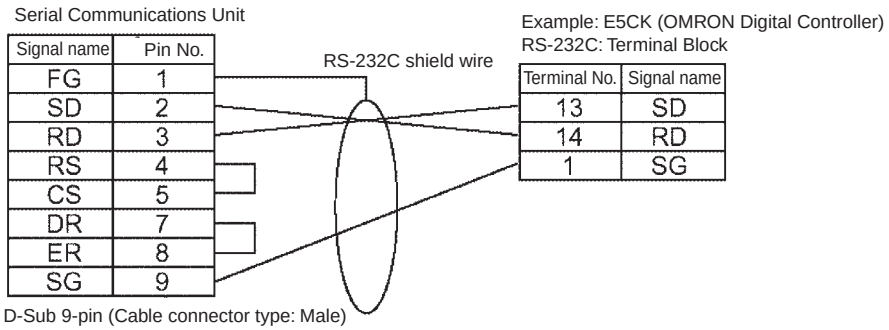
2 The contents of the CompoWay/F command enclosed in the message that is sent is as follows:
Node number + subaddress + SID + command text (ASCII must be used.)
STX, ETX+BCC are not required when sending commands. They are added automatically for serial communications.

5-4-3 CompoWay/F Connection Examples

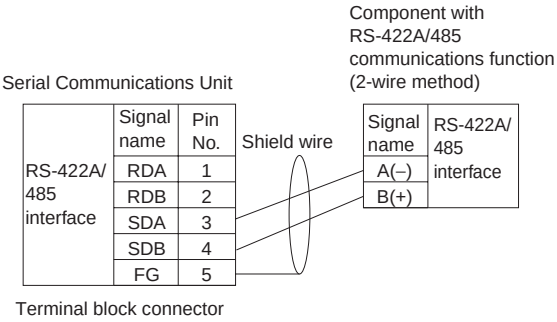
Connection diagrams are provided here. OMRON recommends the use of shielded twisted-pair cables for actual wiring to enhance noise resistance. For details on wiring methods, refer to *3-3 RS-232C and RS-422A/485 Wiring.*

1:1 Connection Example Using RS-232C Port

● Connection Example with E5CK Digital Controller

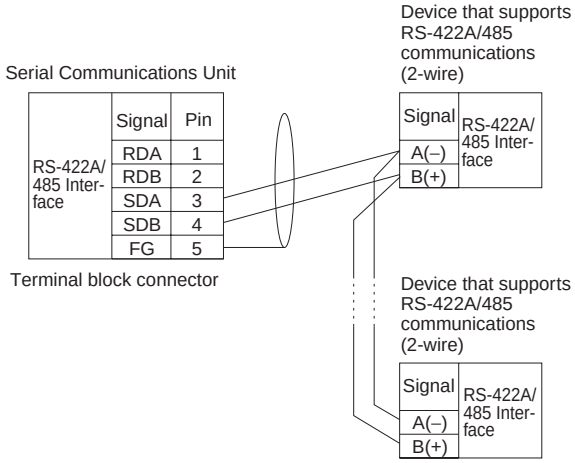


1:1 RS-485 Connection Example Using RS-422A/485 Port



Note Be sure to connect a terminating resistance of between 100 and 125Ω (1/2W) to the terminals of the remote devices at either end of the RS-422A/485 transmission path. (Set the terminating resistance of this Unit by using Terminating resistance ON/OFF switch located on the front panel of the Unit.

1:N RS-485 Connection Example Using RS-422A/485 Port

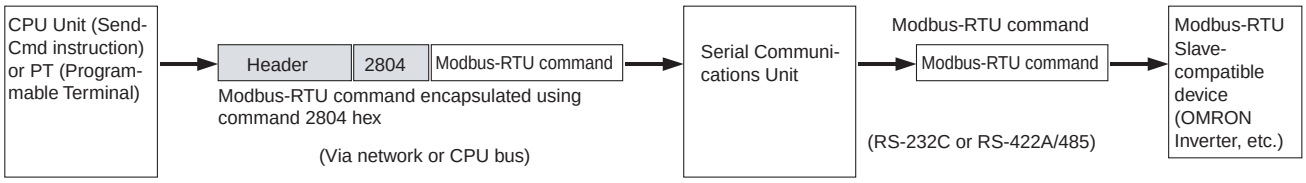


Note Be sure to connect a terminating resistance of between 100 and 125Ω(1/2W) to the terminals of the remote devices at either end of the RS-422A/485 transmission path. (Set the terminating resistance on this Unit by using Terminating resistance ON/OFF switch located on the front panel of the Unit.

5-4-4 Converting to Modbus-RTU

It is possible to access Modbus-RTU Slave-compatible devices (including OMRON inverters) that are connected to a PLC via a serial network (Modbus-RTU) from a PLC or PT by sending Modbus-RTU commands.

- Sent message: header + command code 2804 hex + Modbus-RTU command
- Message after conversion: Modbus-RTU command



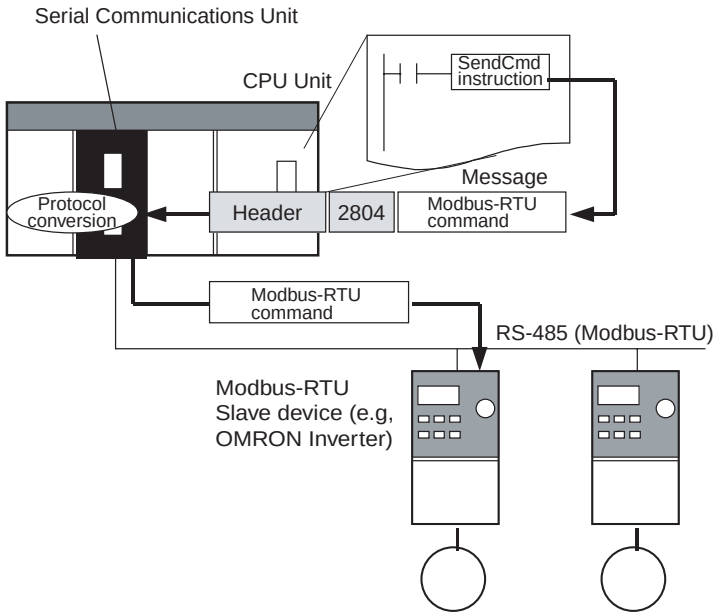
Examples of Modbus-RTU Slave OMRON Devices

Type	Model series
Inverters	3G3MX2
	3G3RX
	3G3JX
Temperature Controllers	E5CN
	EJ1

System Configuration

● Sending Messages Using SendCmd Instructions in CPU Unit's User Program

The Unit converts the messages to Modbus-RTU protocol for in this operation.

CPU Bus-to-Serial	Details
	From the CPU Unit, it is possible to access OMRON Inverters that are connected to the Serial Communications Unit via a serial network (Modbus-RTU).

Note 1 The header contains the following information.

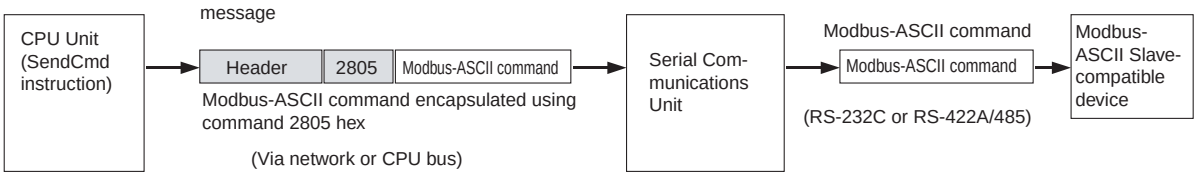
- Remote destination network address (DNA): Network address to specify actual remote Pocasset 0 (local network).
- Remote destination node address (DA1): Node address to specify actual remote Pocasset 0 (communications within local PLC).
- Remote unit address (DA2):
  Unit address of serial communications port. An appropriate value is calculated and set as follows:
  When port 1 is used: Unit address = BYTE#16#80 + BYTE#16#04 × Unit number (hexadecimal)
  When port 2 is used: Unit address = BYTE#16#81 + BYTE#16#04 × Unit number (hexadecimal)

2 The contents of the Modbus-RTU command enclosed in the message that is sent is as follows:
Slave address (binary) + FUNCTION code (binary) + Communications data (binary)
Start and CRC+End are not required when sending commands. They are added automatically for serial communications.

5-4-5 Converting to Modbus-ASCII

It is possible to send Modbus-ASCII commands to access Modbus-ASCII Slave devices that are connected to a PLC via a serial network (Modbus-ASCII).

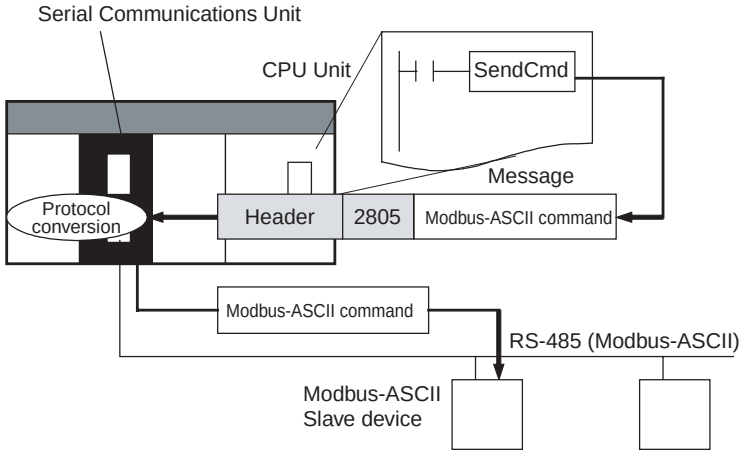
- Sent message: header + command code 2805 hex + Modbus-ASCII command
- Message after conversion: Modbus-ASCII command



System Configuration

● Sending Messages Using SendCmd Instructions in CPU Unit's User Program

The Unit converts the messages to Modbus-ASCII protocol for this operation.

CPU Bus-to-Serial	Details
	From the CPU Unit on the same controller, it is possible to access the Modbus-ASCII Slave-compatible devices that are connected to the Serial Communications Unit via a serial network (Modbus-ASCII).

Note 1 The header contains the following information.

- Remote destination network address (DNA): Network address to specify actual remote Pocasset 0 (local network).
- Remote destination node address (DA1): Node address to specify actual remote Pocasset 0 (communications within local PLC).
- Remote unit address (DA2):
  Unit address of serial communications port. An appropriate value is calculated and set as follows:
  When port 1 is used: Unit address = BYTE#16#80 + BYTE#16#04 × Unit number (hexadecimal)
  When port 2 is used: Unit address = BYTE#16#81 + BYTE#16#04 × Unit number (hexadecimal)

2 The contents of the Modbus-ASCII command enclosed in the message that is sent is as follows:
Slave address (ASCII) + FUNCTION code (ASCII) + Communications data (ASCII)
The header ":" (3A hex) and LRC+CR/LF are not required when sending commands. They are added automatically for serial communications.

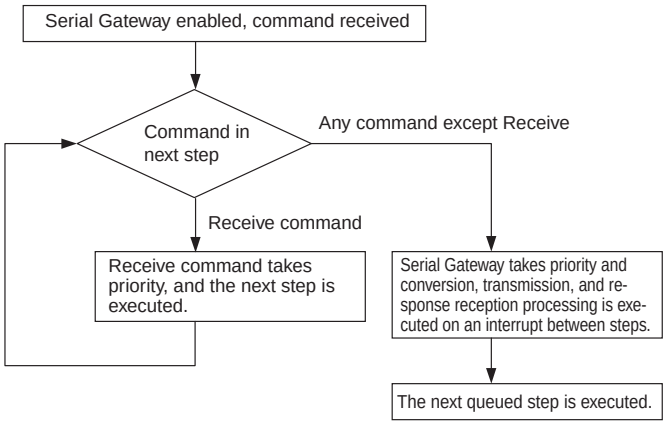
5-5 Serial Gateway

5-5-1 Serial Gateway Execution Timing for Protocol Macros

The execution timing for the Serial Gateway during execution of protocol macros is described here. The operation when the command is received with the Serial Gateway enabled during Protocol Macro Mode is as follows:

- Next step contains the Receive command: Priority is given to the Receive command, and the Serial Gateway is executed in the next step. The reception buffer is cleared during transfer processing using the Serial Gateway. Therefore, when the command is received, and the command in the following step is the Receive command, the Receive command takes priority over the Serial Gateway.
- Next step contains any command except the Receive command (Send, Send&Recv, Wait, Flush, Open, or Close): Priority is given to the Serial Gateway, for which conversion, transmission, and response reception processing is executed using interrupts between steps. The Serial Gateway is executed using interrupts between steps. The interrupts are not executed within a step. (Therefore, the Serial Gateway is never executed after the Send command in a Send&Recv command.)

The processing flowchart is as follows:



The details of the processing flow are as follows:

● Protocol Macro Priority over Serial Gateway

When the Serial Gateway is enabled during protocol macro mode and a command is received and if the command in the next step is a Receive command, this next step will be executed without execution of conversion, transmission, and response reception processing for the Serial Gateway.

After the step containing the Receive command is completed, if the next step contains any command except the Receive command (Send, Send&Recv, Wait, Flush, Open, or Close), the protocol macro communications sequence is temporarily suspended before the next step is executed, and the FINS command conversion and transmission is executed on an interrupt between steps using the Serial Gateway.

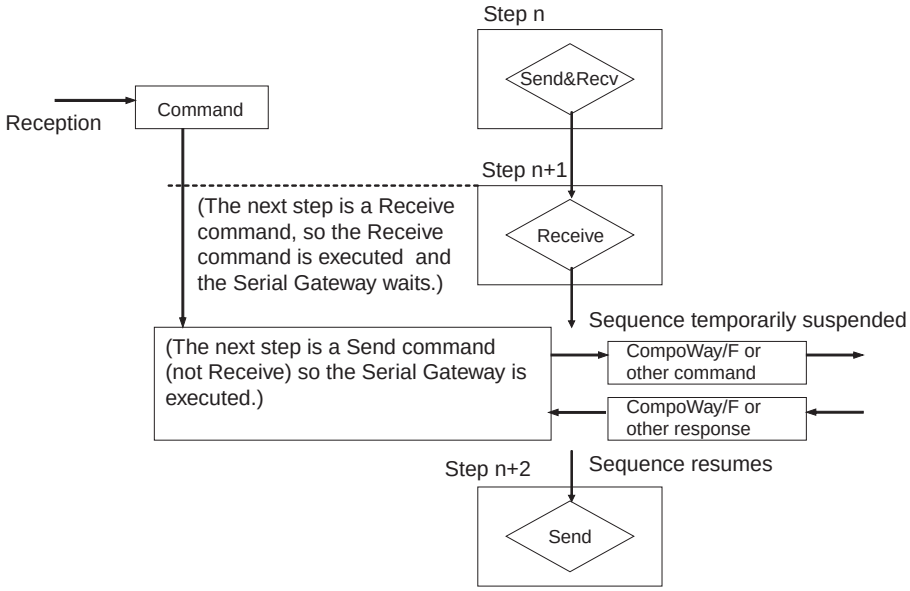
Until the response is received, the command in the step is not executed. After the response is received, the protocol macro is resumed, and execution is started from the communications sequence step that was suspended.

The step that is executing when a command is received is not interrupted. Therefore, if the Wait command is executing, the Serial Gateway will not be executed.

Immediate Execution of Serial Gateway

When the Serial Gateway is enabled during Protocol Macro Mode and a command is received, and if the command in the next step is any command except the Receive command (Send, Send&Recv, Wait, Flush, Open, or Close), the protocol macro communications sequence is temporarily suspended before the next step is executed, and the Serial Gateway is used to execute command conversion and transmission on an interrupt between steps.

Until the response is received, the command within the next step is not executed. After the response is received, the protocol macro is resumed, and execution is started from the communications sequence step that was suspended.



Precautions for Safe Use

If a multiple-frame command protocol macro is sent during protocol macro execution, set the Serial Gateway Mode status to *Prohibited*. To do so, make configuration with the **_P1_SgwDsblCmd* and **_P2_SgwDsblCmd* (Serial Gateway Prohibit Switch (Protocol Macros)).
Otherwise, a message converted using Serial Gateway will interrupt between steps of the executing protocol macro, and may occur in between frames of the multiple-frame command.

A multiple-frame command is a command in which the protocol macro command text is divided into multiple frames that are sent in series.

5-5-2 Serial Gateway Timeout Monitoring

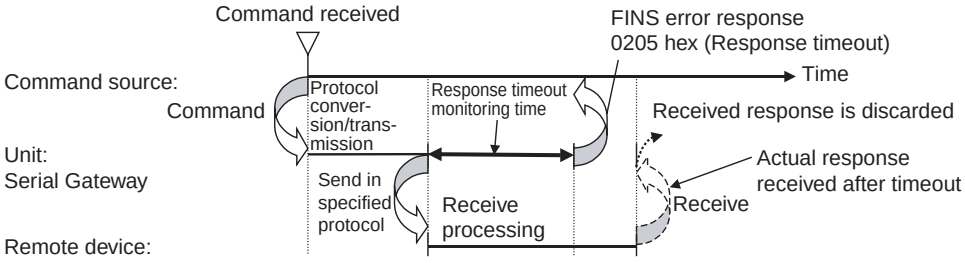
The Serial Gateway supports the following two timeout monitoring functions. These functions monitor the reception processing time of the remote device and the wait time of the Serial Gateway during execution of a protocol macro.

● Response Timeout Monitoring (Serial Gateway Mode/Protocol Macro Mode)

During Serial Gateway Mode or Protocol Macro Mode, the time is monitored from when the message converted into the specified protocol by Serial Gateway is sent until a response is received from the remote device. (The default is 5 s. The setting range for a user-specified value is between 0.1 and 25.5 s. Use **_P1_PmrSgwRespTimeoutCfg* and **_P2_PmrSgwRespTimeoutCfg* (Serial Gateway Response Timeout Monitoring Time) to set.

If a response is not received at the serial communications port within the set time, an error response is returned to the command source.

If a response is received after the timeout has occurred, however, the response received for each protocol is discarded and a response is not returned to the command source.



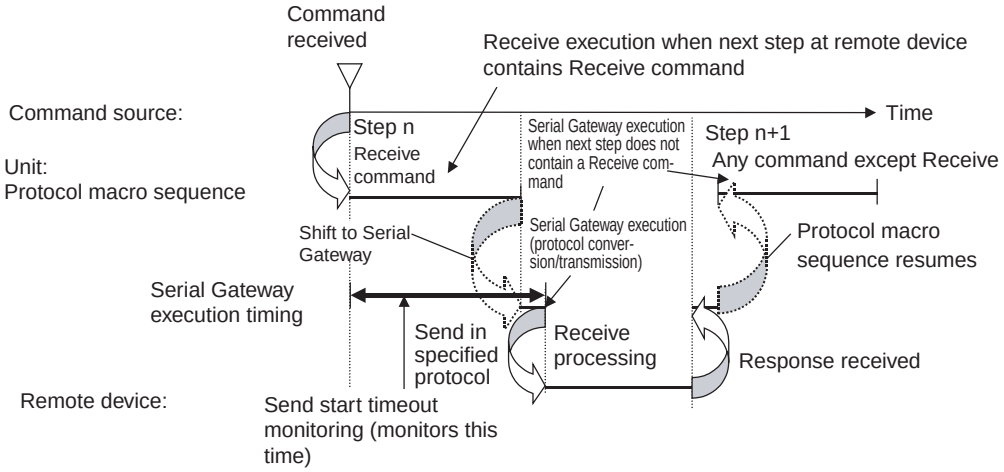
If a Serial Gateway response timeout occurs, **_P1_TimeoutErr* and **_P2_TimeoutErr* (Timeout Error) will become TRUE. Therefore, if the end code is 0205 hex and **_P1_TimeoutErr* and **_P2_TimeoutErr* (Timeout Error) are TRUE a Serial Gateway response timeout occurred.

● Send Start Timeout Monitoring (Protocol Macro Mode Only)

During Protocol Macro Mode, the time from when the command is received until it is converted and starts to send can be monitored. (The default is 5 s. The setting range for a user-specified value is between 0.1 and 25.5 s. Use **_P1_PmrSgwSendTimeoutCfg* and **_P2_PmrSgwSendTimeoutCfg* (Serial Gateway Send Start Timeout Monitoring Time) to set.

If the transmission does not start within the set monitoring time after reception of the command, an error response is returned to the command source. At this time, the received command is discarded without execution of send processing.

Step transition is suspended either because the next step is a Receive command or the current command is executing (Wait command, Send&Receive command, Receive command, etc.).



If a Serial Gateway send start timeout occurs, **_P1_TimeoutErr* and **_P2_TimeoutErr* (Timeout Error) become TRUE.

Precautions for Safe Use

When the Serial Gateway is executed during protocol macro execution, the communications sequence contents and the command reception timing may suspend step transition of the communications sequence (when the next step is a command other than a Receive command, the Serial Gateway will be executed by interruption of the sequence before the next step, and the step transition will be suspended).
Use the Serial Gateway send start timeout monitoring function to monitor at the command source whether step transition in the communications sequence was suspended due to execution of Serial Gateway. If sending of the command of each protocol does not start within the set time, either retry execution of the command or change the communications sequence.

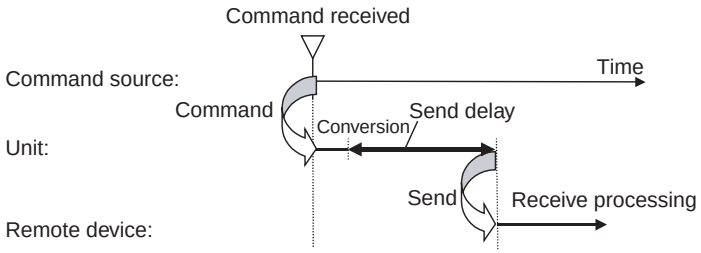
5-5-3 Other Functions

● Serial Gateway Send Delay (Serial Gateway Mode/Protocol Macro Mode)

Use the send delay function to prevent immediate transfer of a command to the serial port after the command is received by the Serial Communications Unit and converted into the specified protocol. With this function, the converted command is sent to the serial port after a set time. (The default is 0 s, and the setting range for user-specified value is 0 to 300 s.)

Use bits 00 to 14 of **_P1_SendDelayCfg* and **_P2_SendDelayCfg* (Send Delay Settings) to set the time.

For example, use the send delay function to prevent loss of send frames when receive processing at the connected device does not provide sufficient speed.



● Serial Gateway Message Queuing

The Serial Communications Unit can hold processing on standby for up to five commands for the Serial Gateway. If a sixth command is received at the serial port, a error response will be returned to the source of the command.

5-6 Communications Frames

5-6-1 CompoWay/F

● Command Frame

Frame before Conversion

Header				Command		CompoWay/F (See note.)				
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2)	Etc.	MRC	SRC					
Serial port allocated address / or local network address	00 hex / or local network node address	Serial port unit address		28	03	Node No. ($\times 10^1$) ($\times 10^2$) (ASCII code 2 bytes)	Sub-address "00" (ASCII code 3030 hex) etc.	SID "0" (ASCII code 30 hex)	Command (MRC, SRC) (ASCII code 4 bytes)	Text (ASCII code)

Frame after Conversion

CompoWay/F							
STX (02 hex)	Node No. ($\times 10^1$) ($\times 10^2$) (ASCII code 2 bytes)	Sub-address "00" (ASCII code 3030 hex) etc.	SID "0" (ASCII code 30 hex)	Command (MRC, SRC) (ASCII code 4 bytes)	Text (ASCII code)	ETX (03 hex)	BCC

Note CompoWay/F commands use ASCII code as the transmission code. Therefore, be sure to use ASCII code for the CompoWay/F command after the command code 2803 hex (from node number to text) when using SendCmd or another instruction.
Example: If the CompoWay/F command MRC SRC is "01" or "02" (where the quotation marks (" ") indicate ASCII characters), treat 0, 1, 0, and 2 as ASCII characters. Therefore, set "01" as 3031 hex (not 01 hex), and "02" as 3032 hex (not 02 hex).
Further, to write the CompoWay/F command to the command storage area by using SendCmd in frame order (without creating empty bytes), the SID component of the CompoWay/F command requires 1 byte of ASCII as 30 hex, so set the subsequent components in one byte each.

● Response Frame

Frame before Conversion

CompoWay/F								
STX (02 hex)	Node No. ($\times 10^1$) ($\times 10^2$) (ASCII code 2 bytes)	Sub-address "00" (ASCII code 3030 hex) etc.	End code (ASCII code 2 bytes)	Command (MRC, SRC) (ASCII code 4 bytes)	Response (MRES, SRES) (ASCII code 4 bytes)	Text (ASCII code)	ETX (03 hex)	BCC

Frame after Conversion

Header			Command		Command end code		CompoWay/F (See note.)					
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2) etc.	MRC	SRC	MRES	SRES						
Serial port allocated address	00 hex	Serial port unit address	28	03	User-specified	User-specified	Node No. ($\times 10^1$) ($\times 10^2$) (ASCII code 2 bytes)	Sub-address "00" (ASCII code 3030 hex) etc.	End code (ASCII code 2 bytes)	Command (MRC, SRC) (ASCII code 4 bytes)	Response (MRES, SRES) (ASCII code 4 bytes)	Text (ASCII code)

5-6-2 Modbus-RTU

● Command Frame

Frame before Conversion

Header				Command		Modbus-RTU (command section only)		
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2)	Etc.	MRC	SRC			
Serial port allocated address or local network address	00 hex or local network node address	Serial port unit address		28	04	Slave address (1 byte)	FUNCTION code(1 byte)	Communications data (n bytes)

Frame after Conversion

Modbus-RTU frame					
Start (silent interval of 3.5 characters) (See note.)	Slave address (1 byte)	FUNCTION code (1 byte)	Communications data (n bytes)	Error check CRC (1 byte)	End (silent interval of 3.5 characters) (See note.)

Note The silent interval in the Modbus-RTU frame is automatically generated by the Serial Communications Unit.

● Response Frame

Frame before Conversion

Modbus-RTU frame					
Start (silent interval of 3.5 characters) (See note.)	Slave address (1 byte)	FUNCTION code (1 byte)	Communications data (n bytes)	Error check CRC (1 byte)	End (silent interval of 3.5 characters) (See note.)

Frame after Conversion

Header				Command		Command end code		Modbus-RTU (command section only)		
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2)	Etc.	MRC	SRC	MRES	SRES			
Serial port allocated address or local network address	00 hex or local network node address	Serial port unit address		28	04	User-specified	User-specified	Slave address (1 byte)	FUNCTION code (1 byte)	Communications data (n bytes)

5-6-3 Modbus-ASCII

● Command Frame

Frame before Conversion

Header				Command		Modbus-ASCII (command section only)		
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2)	Etc.	MRC	SRC			
Serial port allocated address / or local network address	00 hex / or local network node address	Serial port unit address		28	05	Slave address (ASCII code 2 characters: 2 bytes)	FUNCTION code (ASCII code 2 characters: 2 bytes)	Communications data (ASCII code n characters)

Frame after Conversion

Modbus-ASCII frame						
Header ":" (ASCII code 3A hex)	Slave address (ASCII code 2 characters: 2 bytes)	FUNCTION code (ASCII code 2 characters: 2 bytes)	Communications data (ASCII code n characters)	LRC (2 ASCII characters: 2 bytes)	CR (0D hex)	LF (0A hex)

● Response Frame

Frame before Conversion

Modbus-ASCII frame						
Header ":" (ASCII code 3A hex)	Slave address (ASCII code 2 characters: 2 bytes)	FUNCTION code (ASCII code 2 characters: 2 bytes)	Communications data (ASCII code n characters) or error code	LRC (2 ASCII characters: 2 bytes)	CR (0D hex)	LF (0A hex)

Frame after Conversion

Header				Command		Command end code		Modbus-ASCII (command section only)		
Remote network address (DNA)	Remote node address (DA1)	Remote unit address (DA2)	Etc.	MRC	SRC	MRES	SRES			
Serial port allocated address / or local network address	00 hex / or local network node address	Serial port unit address		28	05	User-specified	User-specified	Slave address (ASCII code 2 characters: 2 bytes)	FUNCTION code (ASCII code 2 characters: 2 bytes)	Communications data (ASCII code n characters) or error code

6

No-protocol Mode

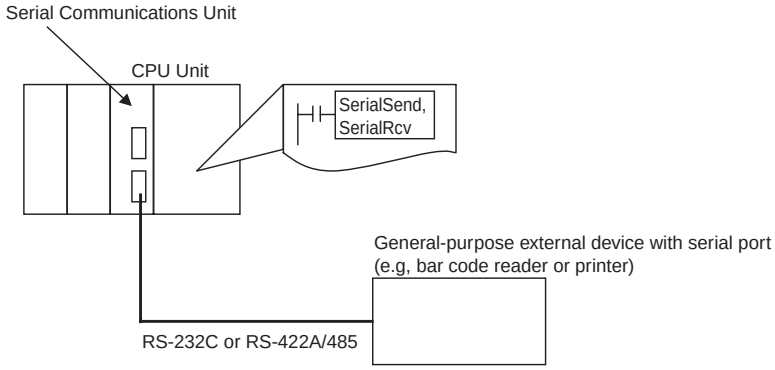
6-1 Overview 6-2
6-1-1 Definition 6-2
6-1-2 Specifications 6-3
6-1-3 Connections for No-protocol Mode 6-4
6-2 Device Variables for CJ-series Unit and System-defined Variables (No-protocol Mode) 6-5
6-2-1 Device Variables for CJ-Series Unit for System Settings 6-5
6-2-2 System-defined Variable 6-8
6-2-3 Device Variable for CJ-series Unit for Software Switches 6-8
6-2-4 Device Variable for CJ-series Unit for Status 6-8
6-2-5 Device Variable for CJ-series Unit for Status (When Sending/Receiving Data with SerialSend, SerialRcv, or SerialRcvNoClear Instruction) 6-11
6-3 Using Serial Port I/O Instructions 6-12
6-3-1 System Settings 6-12
6-3-2 Instruction Execution Methods 6-12

6-1 Overview

6-1-1 Definition

Use No-protocol Mode to send and receive data using Serial Port I/O instructions (SerialSend, SerialRcv, and SerialRcvNoclear) without conversion or a specific protocol. In No-protocol Mode, communications procedures, such as retry processing, data format conversion, and processing branching according to the receive data are not performed.

No-protocol Mode enables single-directional data exchange with any general-purpose external device with an RS-232C port or RS-422A/485 port by using the SerialSend, SerialRcv, and SerialRcvNoclear instructions. In No-protocol Mode, it is possible to send and receive data easily, such as data input from a bar code reader or data output to a printer.



Addition of a start code at the beginning of the data, and end code at the end of the data (or specifying the number of receive data bytes) is possible before sending/receiving. It is also possible to control the RS and CS and other control signals.

No-protocol Mode is supported for RS-422A/485 if the 4-wire method is used.

Additional Information

The SerialRcv instruction clears the receive buffer after it reads the receive data. The SerialRcvNoClear instruction does not clear the receive buffer after it reads the receive data. The SerialRcvNoClear instruction is suitable for applications in which data is received consecutively at short intervals and you do not want to miss any data.

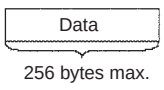
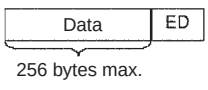
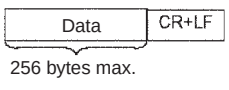
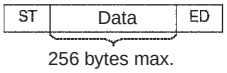
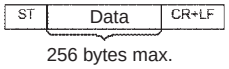
Version Information

A Serial Communications Unit with unit version 2.1 or later, a CPU Unit with unit version 1.03 or later, and Sysmac Studio version 1.04 or higher are required to use the SerialRcvNoClear instruction.

6-1-2 Specifications

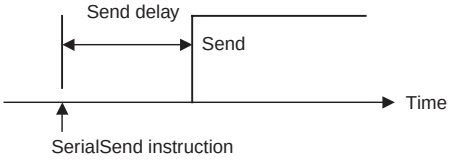
Item	Description	
Communications mode	Full-duplex	
Messages (communications frame structure)	Set either of the following types in the Device Variable for CJ-series Unit for system settings 1. Data only (without start code or end code) 2. Start code + data 3. Data + end code 4. Start code + data + end code 5. Data + CR + LF 6. Start code + data +CR + LF Set in Device Variable for CJ-Series Unit for system settings (With/without a start code, with/without an end code, setting 00 to FF hex for when using a start code, setting 00 to FF hex for when using an end code, and set the number of receive data bytes for when not using an end code.)	
	Start code	None, or 00 to FF hex
	End code	None, 00 to FF hex, or CR + LF
	Number of receive data bytes during reception	Set the number of receive data bytes between 1 and 256 bytes using Sysmac Studio or device variables for CJ-series Unit when frame structure 1 or 2 above is used.
Sending messages	SerialSend instruction	
Receiving messages	SerialRcv or SerialRcvNoClear instruction	
Maximum message length	Sending and receiving: Up to 259 bytes including the start code and end code (up to 256 bytes excluding start/end codes)	
Data conversion	No conversion	
Communications protocol	None	
Send delay time	When the SerialSend instruction is executed and the send delay time elapses, the data is sent from the port. 0 to 300 s (0 to 300,000 ms) (Setting in increments of 10 ms. Set with *_*P1_SendDelayCfg* and *_ *P2_SendDelayCfg* (Send Delay Settings).)	
Receive counter	Counts the number of data bytes (0 to 256) received at the port.	
Reception buffer clear timing	SerialRcv instruction: After reading the receive data SerialRcvNoClear instruction: When the receive data size variable (*Size*) is set to 0	

● Send/Receive Message Frames for No-protocol Communications

Start Code	End code		
	No	Yes	CR+LF
No			
Yes			

Additional Information

- If there are multiple start codes, the first start code is enabled.
- If there are multiple end codes, the first end code is enabled.
- If the end code overlaps with the send/receive data and causes data reception to be interrupted, use CR+LF as the end code.
- If the send delay is set when you send SerialSend instruction (No-protocol Mode), data can be sent when the send delay time is elapsed after execution of the SerialSend instruction, as shown below.



For details on the SerialSend instructions, refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502).

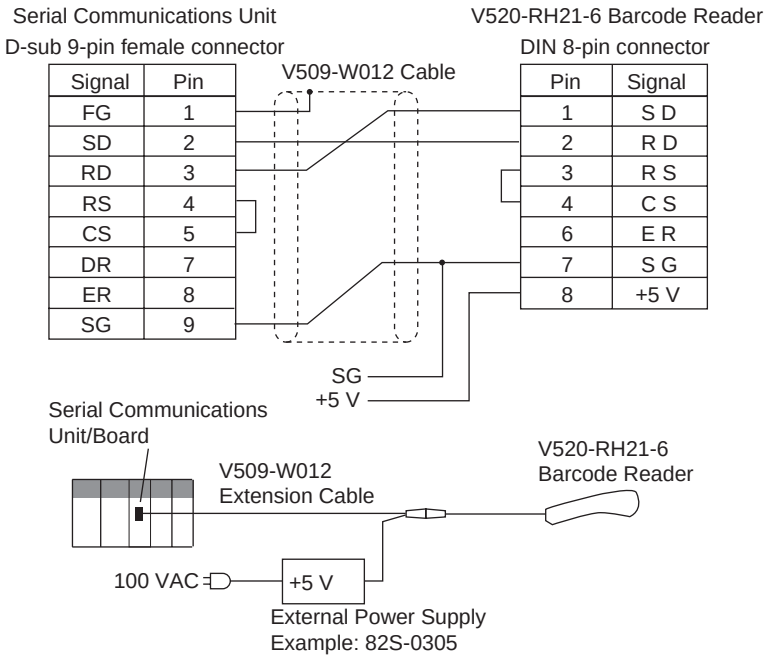
Precautions for Safe Use

If the system executes a no-protocol instruction to a serial communications port which is set for a Serial Communications Mode other than No-protocol Mode, an instruction error will occur.

6-1-3 Connections for No-protocol Mode

Connection diagrams are provided here. OMRON recommends the use of shielded twisted-pair cables for actual wiring to enhance noise resistance. For details on wiring methods, refer to *3-3 RS-232C and RS-422A/485 Wiring.*

● RS-232C Connections to a Barcode Reader



6-2 Device Variables for CJ-series Unit and System-defined Variables (No-protocol Mode)

This section explains the device variables for CJ-series Unit and system-defined variables used in the No-protocol Mode.

6-2-1 Device Variables for CJ-Series Unit for System Settings

Use the device variables for CJ-series Unit shown below to perform System Settings when you use the Serial Communications Unit in No-protcol Mode.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Setting	Bit 15: User-specified setting inclusion (*1) Bits 08 to 11: Serial Communications Mode (3hex: No-protocol Mode) Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you configure this setting, set to bits 08 to 11 of *_*P1*_*PortCfg*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you configure this setting, set to bits 08 to 11 of *_*P2* _*PortCfg*.	Bit string	RW	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
*_P1_StartBitCfg	*_P2_StartBitCfg	BOOL	RW	Start Bits	1 start bit is always used regardless of whether the setting is FALSE/TRUE. FALSE: 1 bit TRUE: 1 bit Default: FALSE
*_P1_DatBitCfg	*_P2_DatBitCfg	BOOL	RW	Data Length	FALSE: 7 bits TRUE: 8 bits Default: FALSE
*_P1_StopBitCfg	*_P2_StopBitCfg	BOOL	RW	Stop Bits	FALSE: 2 bits TRUE: 1 bit Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity (Yes/No)	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity (Even/Odd)	FALSE: Even TRUE: Odd Default: FALSE
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	0: 9600 3: 1200 4: 2400 5: 4800 6: 9600 7: 19200 8: 38400 9: 57600 10: 115200 11: 230400 Default: 0
*_P1_SendDelayCfg	*_P2_SendDelayCfg	WORD	RW	Send Delay Setting	Bit 15: Send delay time Bits 00 to 14: Send delay setting range
*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	BOOL	RW	Send Delay Time	FALSE: Default (0 ms) TRUE: User settings
There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you configure this setting, set to bits 00 to 14 of *_*P1_SendDelayCfg*.	There is no specific device variable for CJ-series Unit to reference the send delay setting range. When you configure this setting, set to bits 00 to 14 of *_*P2_SendDelayCfg*.	Bit string	RW	Send delay setting range	0 to 300 s (0 to 300,000 ms) (0000 to 7530 hex; 0 to 30,000 decimal) [Unit: 10 ms]
*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	BOOL	RW	CTS Control (*2)	FALSE: No TRUE: Yes Default: FALSE
*_P1_NopStartCodeCfg	*_P2_NopStartCodeCfg	USINT	RW	No-protocol Start Code	Range: 0 to 255
*_P1_NopEndCodeCfg	*_P2_NopEndCodeCfg	USINT	RW	No-protocol End Code	Range: 0 to 255
*_P1_NopCfg	*_P2_NopCfg	WORD	RW	No-protocol Settings	Bit 12: No-protocol start code inclusion setting Bit 09: No-protocol CR + LF specification setting Bit 08: No-protocol end code inclusion setting Bits 00 to 07: Number of received data bytes in No-protocol Mode
*_P1_NopStartCodeYNCfg	*_P2_NopStartCodeYNCfg	BOOL	RW	No-protocol Start Code Inclusion Setting	TRUE: Yes FALSE: No (default)

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_NopCRLFCfg	*_P2_NopCRLFCfg	BOOL	RW	No-Protocol CR + LF Specification Setting	End code P*_NopCRLFCfg/ P*_NopEndCodeYNCfg 00: No (specify number of receive data bytes) 01: Yes 10: CR + LF specified 11: Prohibited
*_P1_NopEndCodeYNCfg	*_P2_NopEndCodeYNCfg	BOOL	RW	No-protocol End Code Inclusion Setting	
*_P1_NopRcvDatSzCfg	*_P2_NopRcvDatSzCfg	USINT	RW	Number of Received Data Bytes in No-protocol Mode	0: 256 bytes (default) Range: 1 to 255 bytes

*1 When the default settings are used, the Baud Rate, Start Bits, Data Length, Stop Bits, Parity Yes/No and Parity Even/Odd settings are disabled. To specify settings for these items to the settings other than the default, select User settings.
Default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

*2 When CTS control is enabled, the request to send signal (RTS) turns ON and the transmission starts after the clear to send signal (CTS) turns ON. When CTS control is disabled, the request to send signal (RTS) turns ON and the transmission starts without checking whether the clear to send signal (CTS) is ON.

6-2-2 System-defined Variable

● Port 1/2 Settings Changing Flag

You can change communications settings and restart the Serial Communications Unit port by changing these bits from FALSE to TRUE in an Out instruction or other instruction. After you change the settings and restart the communications port, the flag will automatically changes to FALSE.

These flags are used both to change the communications port settings and to restart the communications port. If you want to perform only restarting a communications port, change these flags to TRUE in instructions such as Out instruction without changing the System Settings of the device variable for CJ-series Unit.

List of System-defined Variables (within the system-defined variable is the Unit number)**

System-defined variable	Type	R/W	Name	Function
_ CJB_SCU **P1ChgSta	BOOL	RW	Serial Communications Unit **, Port 1 Settings Changing Flag	1: Changing Port 1 Communications Unit Port Settings 0: All other statuses Default: 0
_CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit **, Port 2 Settings Changing Flag	1: Changing Port 2 Communications Unit Port Settings 0: All other statuses Default: 0

● Variables Related to the SerialSend, SerialRcv, and SerialRcvNoClear Instructions in No-protocol Mode

System-defined variable	Description
_Port_isAvailable	Network Communications Instruction Enabled Flag TRUE when execution of SerialSend, SerialRcv, SerialRcvNoClear, and other network communications instructions (such as SendCmd and ExecPMCR) is enabled.

6-2-3 Device Variable for CJ-series Unit for Software Switches

These variable are used for data output from the CPU Unit to the Serial Communications Unit.

These variables are not available in the No-protocol Mode.

6-2-4 Device Variable for CJ-series Unit for Status

These variable are used for data input from the Serial Communications Unit to the CPU Unit.

Use these variables to reference the port settings, the communication status, the transmission control signal status, and the transmission error status of the Serial Communications Unit.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_Com_UnitLogMemErr		BOOL	R	Error Log EEPROM Error	TRUE: Error log EEPROM error FALSE: Error log EEPROM normal

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_SysSetSta	*_P2_SysSetSta	WORD	R	System Settings (*1)	Bits 12 to 15: Serial communications mode Bits 8 to 11: Baud rate Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P2_SysSetSta*.	Bit string	R	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P2_SysSetSta*.	Bit string	R	Baud Rate	0: 9600 3: 1200 4: 2400 5: 4800 6: 9600 7: 19200 8: 38400 9: 57600 10: 115200 11: 230400 Default: 0
*_P1_StartBitSta	*_P2_StartBitSta	BOOL	R	Start Bits (Always 1 bit)	FALSE: 1 bit TRUE: 1 bit (1 start bit is always used regardless of whether the setting is FALSE/TRUE.)
*_P1_DatBitSta	*_P2_DatBitSta	BOOL	R	Data Length (7 bits/8 bits)	FALSE: 7 bits TRUE: 8 bits
*_P1_StopBitSta	*_P2_StopBitSta	BOOL	R	Stop Bits (2 bits/1 bit)	FALSE: 2 bits TRUE: 1 bit
*_P1_ParityYNSta	*_P2_ParityYNSta	BOOL	R	Parity (Yes/No)	FALSE: Yes TRUE: No
*_P1_ParityBitSta	*_P2_ParityBitSta	BOOL	R	Parity (Even/Odd)	FALSE: Even TRUE: Odd
*_P1_HwSetSta	*_P2_HwSetSta	WORD	R	Hardware Settings	Bit 15: RS-422/485 setting status Bit 14: RS-232C setup status Bit 13: Terminating resistance setting status Bit 01: System Setup error Bit 0: Port operating status

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_Ser485Sta	*_P2_Ser485Sta	BOOL	R	RS-422/485 Setting Status	Port types of each port *_P_Ser485Sta/*_P*_Ser232Sta 00: No port 01: RS232C 10: RS422A/485 11: This status does not exist.
*_P1_Ser232Sta	*_P2_Ser232Sta	BOOL	R	RS-232C Setting Status	
*_P1_TermSta	*_P2_TermSta	BOOL	R	Terminating Resistance Setting Status	TRUE: Terminating resistance ON FALSE: Terminating resistance OFF
*_P1_SysSetupErr	*_P2_SysSetupErr	BOOL	R	System Setup error	TRUE: System Setup error FALSE: System Setup normal
*_P1_OperatingSta	*_P2_OperatingSta	BOOL	R	Port Operating Status	TRUE: Port operating FALSE: Port stopped
*_P1_TransCtlSta	*_P2_TransCtlSta	WORD	R	Communications Status	Bit 10: Remote Unit busy Bit 08: Local Unit busy Bit 07: DTR (ER) signal Bit 06: DSR (DR) signal Bit 04: CTS (CS) signal Bit 03: RTS (RS) signal
*_P1_RmtBusySta	*_P2_RmtBusySta	BOOL	R	Remote Unit Busy	TRUE: Remote Unit busy (Flow control) FALSE: Remote Unit ready to receive
*_P1_LclBusySta	*_P2_LclBusySta	BOOL	R	Local Unit Busy	TRUE: Local Unit busy (Flow control) FALSE: Local Unit ready to receive
*_P1_SigERSta	*_P2_SigERSta	BOOL	R	DTR (ER) signal	TRUE: High FALSE: Low
*_P1_SigDRSta	*_P2_SigDRSta	BOOL	R	DSR (DR) signal	TRUE: High FALSE: Low
*_P1_SigCSSta	*_P2_SigCSSta	BOOL	R	CTS (CS) signal	TRUE: High FALSE: Low
*_P1_SigRSSta	*_P2_SigRSSta	BOOL	R	RTS (RS) signal	TRUE: High FALSE: Low
*_P1_TransErrSta	*_P2_TransErrSta	WORD	R	Transmission Error Status	Bit 15: Transmission error Bit 04: Overrun error Bit 03: Framing error Bit 02: Parity error
*_P1_TransErr	*_P2_TransErr	BOOL	R	Transmission error	TRUE: Transmission error FALSE: No transmission error
*_P1_OverRunErr	*_P2_OverRunErr	BOOL	R	Overrun Error (*2)	TRUE: Overrun error FALSE: Normal

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_FramingErr	*_P2_FramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal
*_P1_ParityErr	*_P2_ParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal

*1 The current settings for the port are read. For details on the read contents, refer to *6-2-1 Device Variables for CJ-Series Unit for System Settings*. If a System Setup error occurs, the default settings will be read.

*2 The status becomes TRUE when 260 bytes or more is stored in the reception buffer.

6-2-5 Device Variable for CJ-series Unit for Status (When Sending/Receiving Data with SerialSend, SerialRcv, or SerialRcvNoClear Instruction)

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_NopSta	*_P2_NopSta	WORD	R	No-protocol Mode Status	Bit 07: Reception Overflow Flag Bit 06: Reception Completed Flag Bit 05: SerialSend Executing Flag
*_P1_NopRcvOvfSta	*_P2_NopRcvOvfSta	BOOL	R	Reception Overflow Flag	1: Unit received more than the specified number of bytes 0: Unit did not receive more than the specified number of bytes
*_P1_NopRcvCompleteSta	*_P2_NopRcvCompleteSta	BOOL	R	Reception Completed Flag	TRUE: Reception completed FALSE: No reception or reception in progress
*_P1_NopSerialSendExecSta	*_P2_NopSerialSendExecSta	BOOL	R	SerialSend Executing Flag	TRUE: Executing FALSE: Not executed
*_P1_NopRcvCntSta	*_P2_NopRcvCntSta	UINT	R	Reception Counter (Number of Receive Data Bytes)	Counts the number of received data bytes that have not been read from 0 to 256 (0 to 256 bytes). If an end code is present, counts the number of unread data bytes up to the end code.

Precautions for Correct Use

Reception Buffer Clear Timing in No-protocol Mode:

The reception buffer is cleared after the SerialRcv instruction is executed for the serial communications port of the Unit. Therefore, you cannot repeatedly use the SerialRcv instruction to receive data in several steps. With the SerialRcvNoClear instruction, the reception buffer is not cleared after the instruction is executed, so you can receive data in several steps.

6-3 Using Serial Port I/O Instructions

6-3-1 System Settings

Perform system settings by using Sysmac Studio.

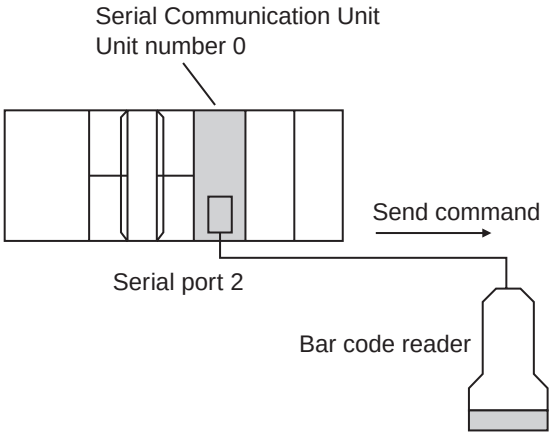
6-3-2 Instruction Execution Methods

Use the SerialSend, SerialRcv, or SerialRcvNoClear instruction. Programming examples are provided below.

Sending from Controller to External Device

Send the no-protocol command to the OMRON bar code reader V500-R521C2 connected to serial port 2 of the Serial Communications Unit (unit number 0, device name 'Barcode'). The command sent is the scene number acquisition command '@READ.'

The send data is the content of the array variable *SendDat[]*. There is no start code and the end code is 16#OD (CR).



● Unit Settings

Name	Setting target	Setting
Unit Configuration	CPU/Expansion Racks in Configuration and Setup of Sysmac Studio	Mount CJ1W-SCU22 in slot 0 of the CPU Rack.
Device name of this unit		Barcode
Unit number	Unit number switch and Unit Configuration (CPU/Expansion Racks in Configuration and Setup of Sysmac Studio)	Unit number: 0
Serial Communications Mode	System Settings data	No-protocol Mode
Port setting		Default (*)
No-protocol End Code		D
No-protocol Start Code inclusion		No
No-protocol End Code inclusion		Yes (Specify a desired end code.)

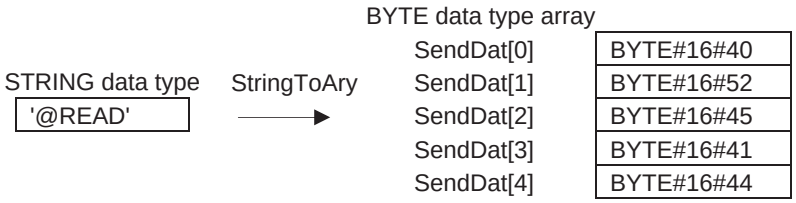
* Make sure the settings match the corresponding settings at the destination.

The default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

● Send Data Setting

Break the character string '@READ' into individual characters and store the character codes as array elements in *SendDat[]*.

In other words, BYTE#16#40(@) is stored in *SendDat[0]* and BYTE#16#52(R) in *SendDat[1]*. This processing uses the StringToAry instruction.



● LD

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag is TRUE when there are internal logical ports available, FALSE when there is no internal logical port available.

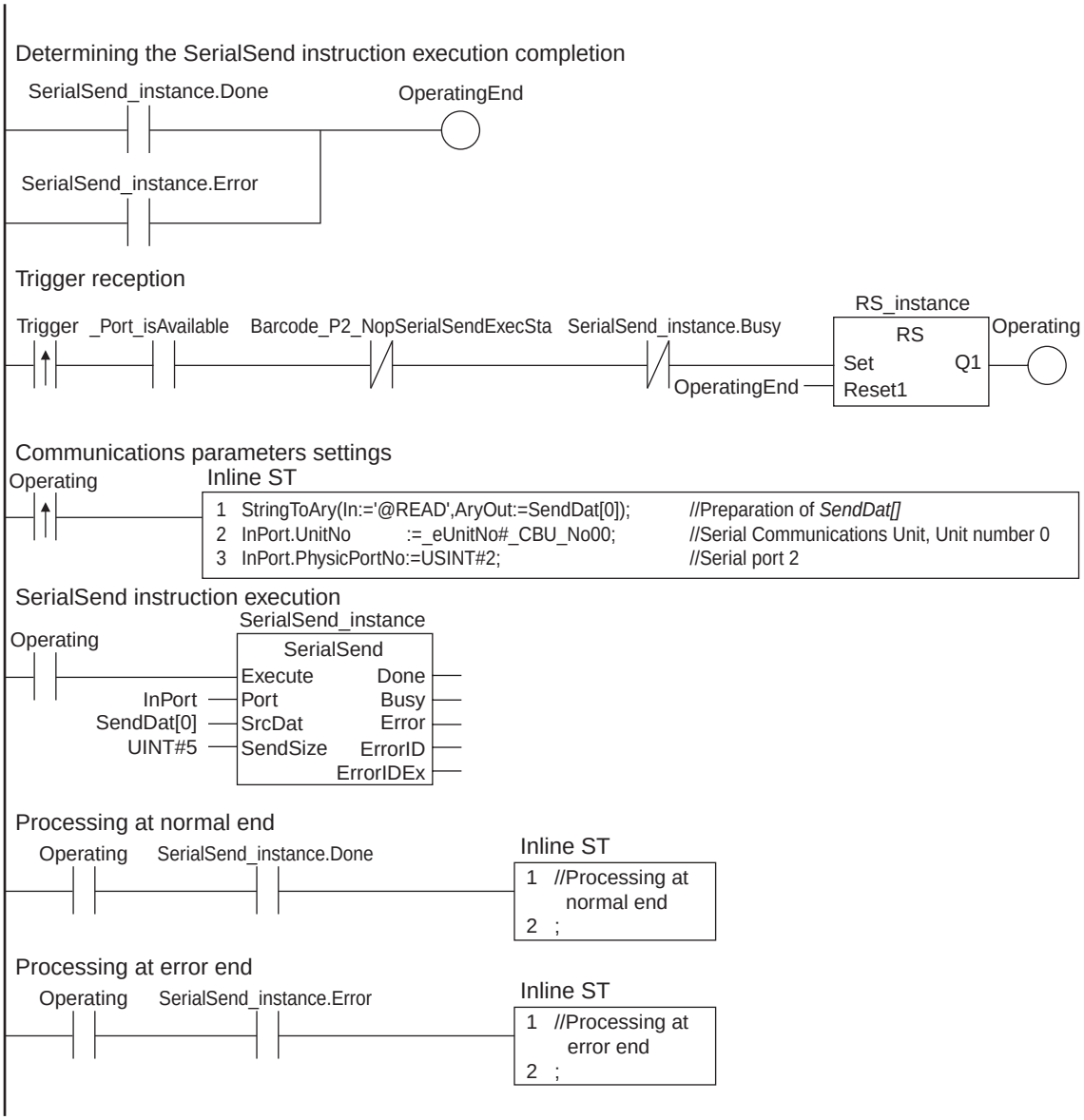
User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
OperatingEnd	BOOL	False	---	Process completed
Trigger	BOOL	False	---	Execution conditions
Operating	BOOL	False	---	Processing
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port specification
SendDat	ARRAY[0..4] OF BYTE	[5(16#0)]	---	Send data
RS_instance	RS	---	---	---
SerialSend_instance	SerialSend	---	---	---

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
Barcode_P2_NopSerialSendExecSta	BOOL	---	IOBus://rack#0/slot#0/P2_NopSta/P2_NopSerialSendExecSta	Port 2: SerialSend Executing Flag	This flag is TRUE while execution of the instruction is in progress.

Program Example



- **ST**

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag is TRUE when there are internal logical ports available, FALSE when there is no internal logical port available.

User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
Trigger	BOOL	False	---	Execution conditions
LastTrigger	BOOL	False	---	Trigger value of previous task period
OperatingStart	BOOL	False	---	Start processing
Operating	BOOL	False	---	Processing
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port specification
SendDat	ARRAY[0..4] OF BYTE	[5(16#0)]	---	Send data
SerialSend_instance	SerialSend	---	---	---

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
Barcode_P2_NopSerialSendExecSta	BOOL	---	IOBus://rack#0/slot#0/P2_NopSta/P2_NopSerialSendExecSta	Port 2: SerialSend Executing Flag	This flag is TRUE while execution of the instruction is in progress.

Program Example

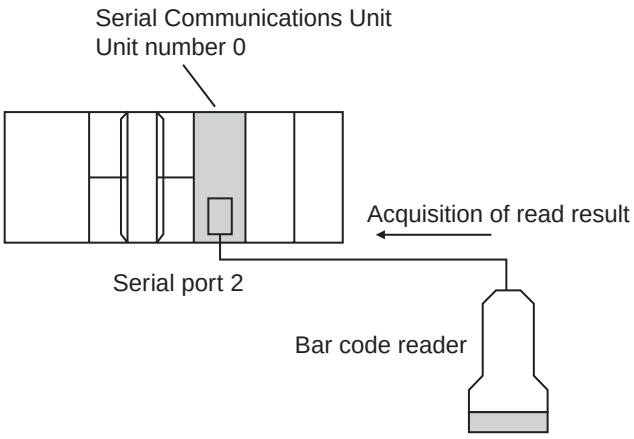
```
//Detection of rising edge of trigger
IF ( (Trigger=TRUE) AND (LastTrigger=FALSE) AND (_Port_isAvailable=TRUE) AND (Barcode_P2_NopSerialSendExecSta =FALSE) AND (SerialSend_instance.Busy=FALSE)) THEN
   OperatingStart:=TRUE;
   Operating:=TRUE;
END_IF;
LastTrigger := Trigger;
//Communication parameters settings and SerialSend instruction initialization
IF (OperatingStart=TRUE) THEN
   SerialSend_instance(Execute:=FALSE);   //Instance initialization
   StringToAry(In:='@READ', AryOut:=SendDat[0]);
   InPort.UnitNo := _eUnitNo#_CBU_No00;  //Serial Communications Unit, Unit number 0
   InPort.PhysicPortNo := USINT#2;          //Serial port 2
   OperatingStart:=FALSE;
END_IF;

//SerialSend instruction execution
IF (Operating=TRUE) THEN
   SerialSend_instance(
      Execute:=TRUE,
      Port := InPort,                        //Port specification
      SrcDat := SendDat[0]                   //Send data
```

```
    SendSize := UINT#5 );                    //Send data size
IF (SerialSend_instance.Done = TRUE) THEN
    //Processing at normal end
    Operating := FALSE;
END_IF;
IF (SerialSend_instance.Error = TRUE) THEN
    //Processing at error end
    Operating := FALSE;
    END_IF;
END_IF;
```

Receiving by Controller from External Device

Acquire the read result of the OMRON bar code reader V500-R521C2 connected to serial port 2 of the Serial Communications Unit of the CJ Series (unit number 0, device name 'Barcode').

The receive data is stored in the array variable *RecvDat[]*. There is no start code and the end code is 16#OD (CR).



● Unit Settings

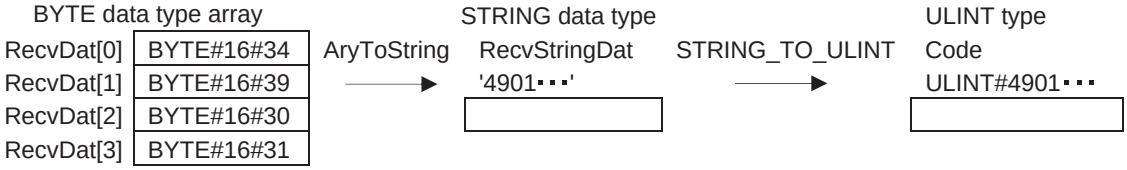
Name	Setting target	Setting
Unit Configuration	CPU/Expansion Racks in Configuration and Setup of Sysmac Studio	Mount CJ1W-SCU22 in slot 0 of the CPU Rack.
Device name of this unit		Barcode
Unit number	Unit number switch and Unit Configuration (CPU/Expansion Racks in Configuration and Setup of Sysmac Studio)	Unit number: 0
Serial Communications Mode	System Settings data	No-protocol Mode
Port setting		Default (*)
No-protocol End Code		D
No-protocol Start Code inclusion		No
No-protocol End Code inclusion		Yes (Specify a desired end code.)

* Make sure the settings match the corresponding settings at the destination.

The default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: Even parity and Stop Bits: 2 bits.

● Processing of receive data

The data stored in *RecvDat[]* is a bit string consisting of character codes that correspond to the individual character values of the bar code. One array element of *RecvDat[]* corresponds to one bar code character. First, the characters are converted to the character string RecvStringDat by using the AryToString instruction. Next, RecvStringDat is converted to the ULINT integer code by using the STRING_TO_ULINT instruction.



● LD

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag is TRUE when there are internal logical ports available, FALSE when there is no internal logical port available.

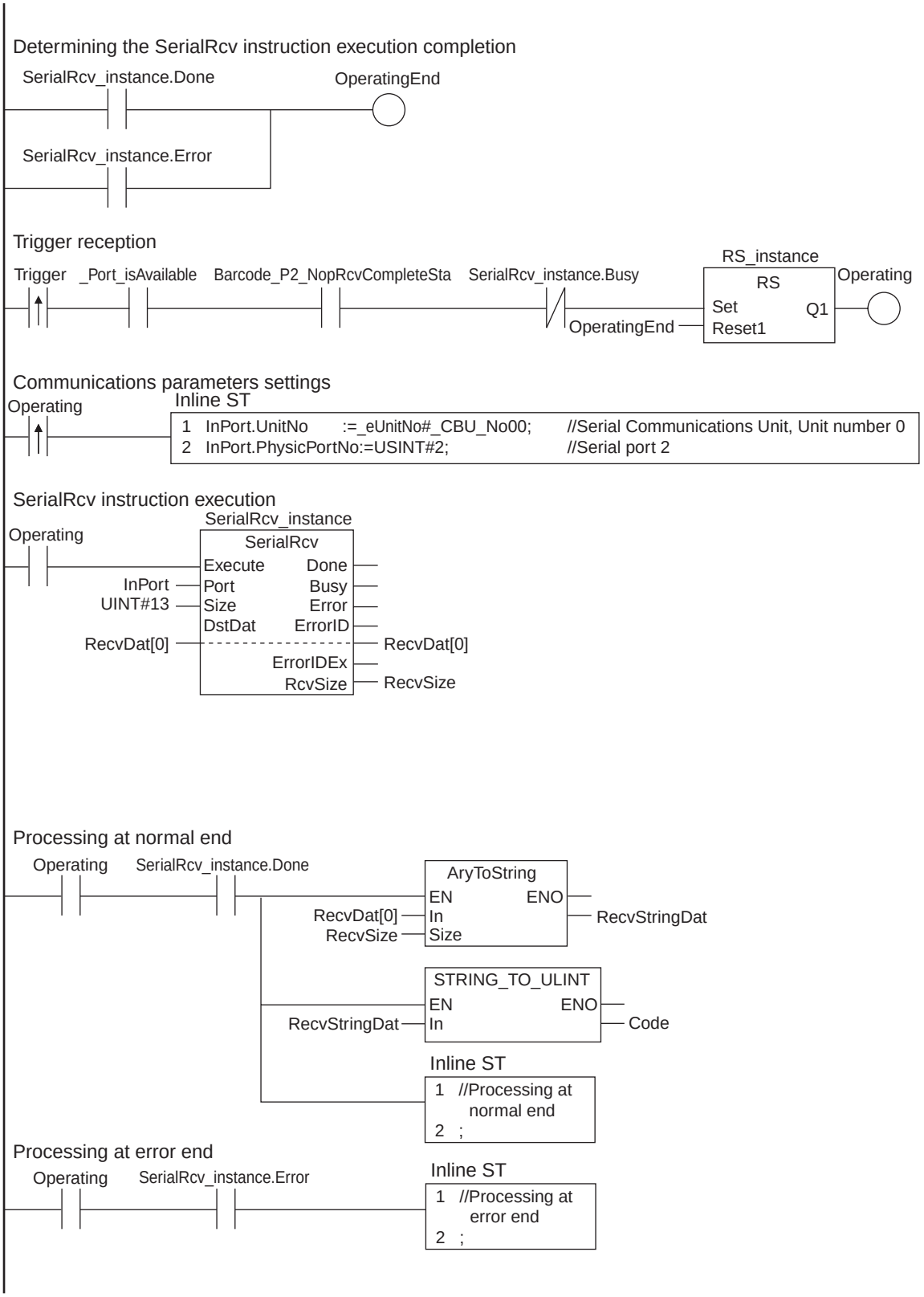
User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
OperatingEnd	BOOL	False	---	Process completed
Trigger	BOOL	False	---	Execution conditions
Operating	BOOL	False	---	Processing
InPort	_sPORT	UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port specification
RecvDat	ARRAY[0..12] OF BYTE	[13(16#0)]	---	Receive data
RecvSize	UINT	0	---	Receive data size
RecvStringDat	STRING[255]	''	---	Bar code (string)
Code	ULINT	0	---	Bar code (integer)
RS_instance	RS	---	---	---
SerialRcv_instance	SerialRcv	---	---	---

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Allocated address (AT)	Comments	Details
Barcode_P2_NopRcvCompleteSta	BOOL	---	IOBus://rack#0/slot#0/P2_NopSta/P2_NopRcvCompleteSta	Port 2: Reception Completed Flag	This flag is TRUE when the receiving is complete.

Program Example



- **ST**

System-defined variable

Name	Data type	Factory setting	Comments	Details
_Port_isAvailable	BOOL	---	Network Communications Instruction Enabled Flag	This flag is TRUE when there are internal logical ports available, FALSE when there is no internal logical port available.

User-defined variables (To be defined before or when creating a program)

Name	Data type	Factory setting	Allocated address (AT)	Details
Trigger	BOOL	False	---	Execution conditions
LastTrigger	BOOL	False	---	Trigger value of previous task period
OperatingStart	BOOL	False	---	Start processing
Operating	BOOL	False	---	Processing
InPort	_sPORT	(UnitNo:=_CBU_No00, PhysicPortNo:=0)	---	Port specification
RecvDat	ARRAY [0..12] OF BYTE	[13(16#0)]	---	Receive data
RecvSize	UINT	0	---	Receive data size
RecvStringDat	STRING[255]	''	---	Bar code (string)
Code	ULINT	0	---	Bar code (integer)
SerialRcv_instance	SerialRcv	---	---	---

Device variables for CJ-series Unit (To be created on the I/O Map View window after the unit configuration is created)

Name	Data type	Factory setting	Address	Comments	Details
Barcode_P2_NopRcvCompleteSta	BOOL	---	IOBus://rack#0/slot#0/P2_NopSta/P2_NopRcvCompleteSta	Port 2: Reception Completed Flag	This flag is TRUE when the receiving is complete.

Program Example

```
//Detection of rising edge of trigger
IF ( (Trigger=TRUE) AND (LastTrigger=FALSE) AND (_Port_isAvailable=TRUE) AND (Barcorde_P2_NopRcvCompleteSta =TRUE) AND (SerialRcv_instance.Busy=FALSE) ) THEN
   OperatingStart:=TRUE;
   Operating:=TRUE;
END_IF;
LastTrigger := Trigger;
//Communication parameters settings and SerialRcv instruction initialization
```

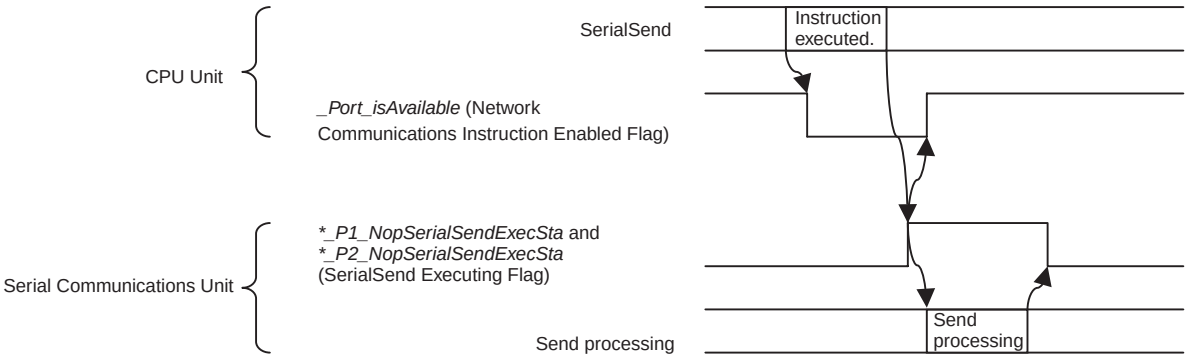
```
IF (OperatingStart=TRUE) THEN
   SerialRcv_instance(
      Execute:=FALSE,                  //Instance initialization
      Port := InPort,                  //Port specification
      Size := UINT#13,                 //Receive data size
      DstDat := RecvDat[0],            //Receive data
      RcvSize => RecvSize);            //Size of actually received data
   InPort.UnitNo := _eUnitNo#_CBU_No00;     //Serial Communications Unit, Unit number 0
   InPort.PhysicPortNo := USINT#2;          //Serial port 2
   OperatingStart:=FALSE;
   END_IF;

//SerialRcv instruction execution
IF (Operating=TRUE) THEN
   SerialRcv_instance(
      Execute:=TRUE,                   //Start condition
      Port := InPort,                  //Port specification
      Size := UINT#13,                 //Receive data size
      DstDat := RecvDat[0],            //Receive data
      RcvSize => RecvSize);            //Size of actually received data

   IF (SerialRcv_instance.Done = TRUE) THEN
      //Processing at normal end
      RecvStringDat := AryToString(In := RecvDat[0], Size := RecvSize);   //Conversion of character
                                                                            codes to character string
      Code:=STRING_TO_ULINT(RecvStringDat);                               //Conversion of character
                                                                            string to integer
      Operating := FALSE;
   END_IF;
   IF (SerialRcv_instance.Error = TRUE) THEN
      //Processing at error end
      Operating := FALSE;
   END_IF;
END_IF;
```

Additional Information

Flags Related to Instructions Addressed to Serial Communications Units

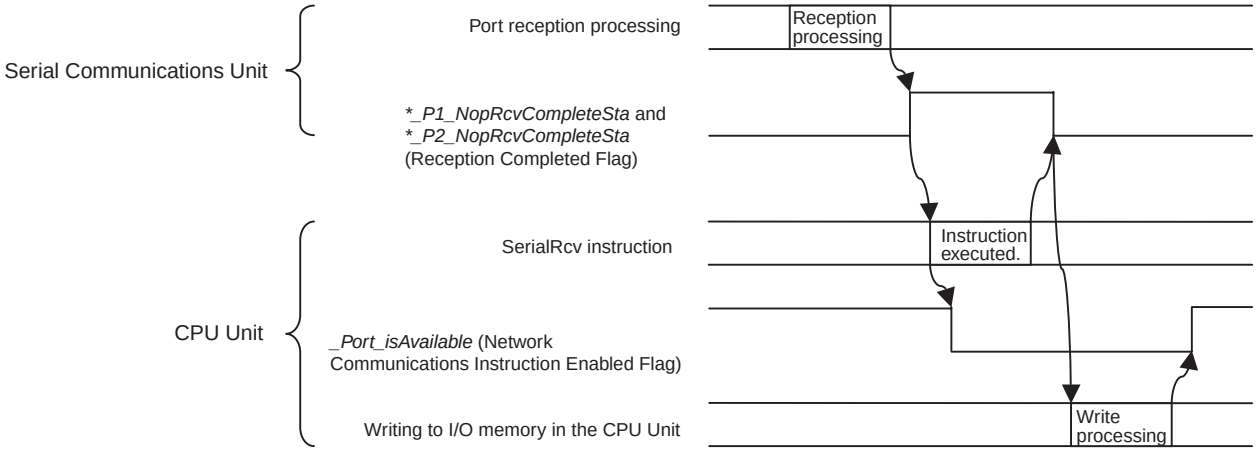
The changes and processing timing of flags related to instructions addressed to Units (SerialSend and SerialRcv instructions) are shown below.

SerialSend Instruction



Note Internally, the SerialSend instruction uses a command. Instruction processing is therefore performed in peripheral servicing. To achieve this, sometimes multiple cycles are required after the instruction is executed to process the send.

SerialRcv Instruction



Note Internally, the SerialRcv instruction uses a command. Instruction processing is therefore performed in peripheral servicing. To achieve this, sometimes multiple cycles are required after the instruction is executed until the received data is stored in I/O memory.

Additional Information

Refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502) for details on the instructions that are used in No-protocol Mode (SerialSend, SerialRcv, and SerialRcvNoClear).

7

Using Modbus-RTU Slave Mode

This section describes the procedure and other information required to use Modbus-RTU Slave Mode.

7-1 Modbus-RTU Slave System 7-2
7-1-1 Modbus-RTU Slave System 7-2
7-1-2 Modbus-RTU Specifications 7-2
7-1-3 Communicating with NJ-series CPU Units Using Modbus 7-3
7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode) 7-5
7-2-1 Device Variable for CJ-series Unit for System Settings 7-5
7-2-2 System-defined Variable 7-8
7-2-3 Device Variable for CJ-series Unit for Software Switches 7-8
7-2-4 Device Variable for CJ-series Unit 7-9
7-3 Command and Response Details 7-13
7-3-1 Supported Modbus-RTU Commands 7-13
7-3-2 Command and Response Details 7-14

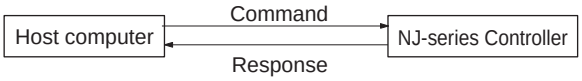
7-1 Modbus-RTU Slave System

7-1-1 Modbus-RTU Slave System

A Modbus-RTU Slave System can be used to send Modbus-RTU commands from a host computer (e.g. personal computer) to read and write the memory used for CJ-series Unit of the CPU Unit of the NJ-series Controller.

● Host-initiated Communications

Communications in a Modbus-RTU Slave System are started by the host computer.



The host computer sends a command to the controller. The controller processes the command and returns a response to the host computer. This process is repeated, allowing the host computer to monitor and control controller operation.

Additional Information

Only the Modbus-RTU Slave Mode is supported. The Modbus-ASCII Slave Mode is not supported by the Serial Communications Units.

7-1-2 Modbus-RTU Specifications

Item	Description
Mode	Modbus-RTU Slave Mode (*1)
Baud rate	1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200/230,400 bps Default: 19,200 bps
Data length	8 bits (*2)
Parity	Odd, even, or none Default: Even
Stop bits	Odd or even parity:1 bit No parity: 2 bits (*3)
Address setting range	1 to 247 (broadcasting: 0) (*4)
Frame format	Slave address: 1 byte Function code: 1 byte Data: 0 to 252 bytes CRC code: 2 bytes

*1 Modbus-ASCII Mode is not supported.

*2 The data length is fixed at 8 bits and cannot be changed by the user.

*3 The number of stop bits is automatically determined by the parity and cannot be set by the user.

*4 The address cannot be set to 0. In commands, 0 is used for broadcast commands.

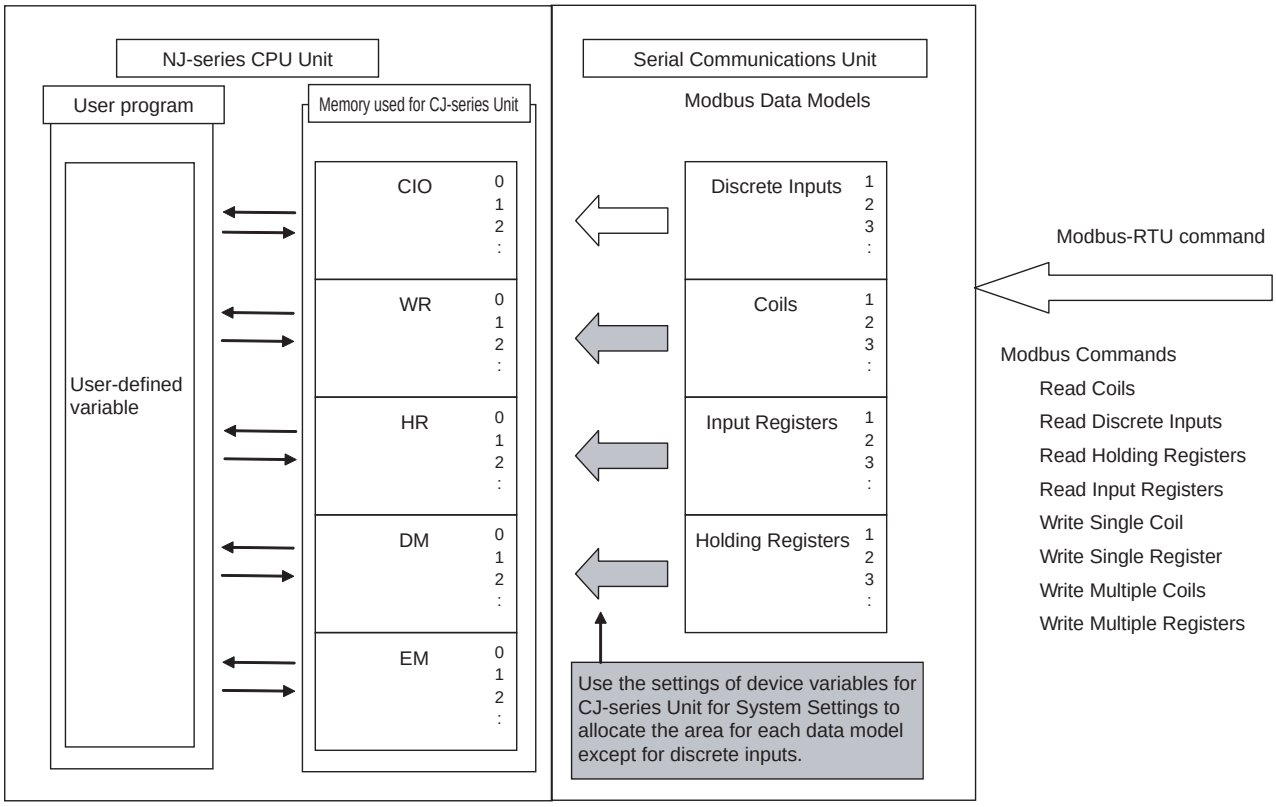
7-1-3 Communicating with NJ-series CPU Units Using Modbus

There are four data models that are defined for Modbus.

Settings in the device variable for CJ-series Unit for System Settings are used to allocate each area of these data models in the memory used for CJ-series Unit of the NJ-series CPU Unit for use by the Serial Communications Unit.

Modbus data model areas	Allocated CJ Unit memory of NJ-series CPU Unit
1 Discrete Inputs:	CIO Area (fixed)
2 Coils:	CIO, Work, Holding, or Auxiliary Area
3 Input Registers:	CIO, Work, Holding, or Auxiliary Area
4 Holding Registers:	DM or EM Area

The Modbus-RTU command that accesses a specific Modbus data model is used to read and write memory areas used for CJ-series Unit in the NJ-series CPU Unit. It is also necessary to allocate user-defined variables when accessing the memory used for CJ-series Unit from the user program. For details on creating user-defined variables, refer to *2-2-2 How to Specify and Create Variables.*



Refer to *7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode)* for the setting allocation areas using system settings.

Refer to *7-3 Command and Response Details* for details on Modbus-RTU commands.

Precautions for Safe Use

System Settings become valid when the Controller is reset, when the Serial Communications Unit is restarted, or when the port is restarted. If any of the allocations are changed, reset the Controller or restart the Serial Communications Unit or port after the safety of the connection destination is confirmed.

Additional Information

Addresses in Modbus data models start from 1, but addresses specified in Modbus-RTU commands and addresses in the NJ-series CPU Unit start from 0. Refer to *Allocation Areas for Coils, Input Registers, and Holding Registers* in *7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode)* for details on the I/O memory area addresses in NJ-series PLCs that are allocated to Modbus data models (Coils, Input Registers, and Holding Registers), addresses in Modbus data models, and addresses specified in Modbus-RTU commands.

7-2 Device Variables for CJ-series Unit and System-defined Variables (Modbus-RTU Slave Mode)

This section describes the device variables for CJ-series Unit and system-defined variables used in the Modbus-RTU Slave Mode.

7-2-1 Device Variable for CJ-series Unit for System Settings

The Serial Communications Unit uses the following device variables for CJ-series Unit to perform System Settings when Modbus-RTU Slave communications are used.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Settings	Bit 15: User-specified setting inclusion (*) Bits 08 to 11: Serial communications mode (A hex: Modbus-RTU Slave) Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P1_PortCfg*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P2_PortCfg*.	Bit string	RW	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol Macro 9 hex: Serial Gateway A hex: Modbus-RTU Slave F hex: Loopback Test Default: 0
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity Even/Odd	FALSE: Even TRUE: Odd Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	0: 19,200 3: 1,200 4: 2,400 5: 4,800 6: 9,600 7: 19,200 8: 38,400 9: 57,600 10: 115,200 11: 230,400 Default: 0
*_P1_MbsSlavAdrCfg	*_P2_MbsSlavAdrCfg	USINT	RW	Modbus-RTU Slave Address	Range: 1 to 247 Default: 0
*_P1_MbsCoilsAreaCfg	*_P2_MbsCoilsAreaCfg	BYTE	RW	Coils Allocation Area	16#00: CIO area (default) 16#B0: CIO area 16#B1: Work area 16#B2: Holding area 16#B3: Auxiliary area
*_P1_MbsRegAreaCfg	*_P2_MbsRegAreaCfg	WORD	RW	MODBUS-RTU Settings	Bits 08 to 15: Input Registers Allocation Area Bits 00 to 07: Holding Registers Allocation Area
*_P1_MbsInRegAreaCfg	*_P2_MbsInRegAreaCfg	BYTE	RW	Input Registers Allocation Area	16#00: CIO area (default) 16#B0: CIO area 16#B1: Work area 16#B2: Holding area 16#B3: Auxiliary area
*_P1_MbsHdRegAreaCfg	*_P2_MbsHdRegAreaCfg	BYTE	RW	Holding Registers Allocation Area	16#00: DM area (default) 16#82: DM area 16#50 to 5C: EM bank 0 to bank C 16#A0 to AC: EM bank 0 to bank C

* When default settings are specified, settings of the Baud Rate, Parity Yes/No and Parity Even/Odd settings are disabled. To specify settings other than the default settings, apply user settings.
The default settings are Baud Rate: 19,200 bps, Data Length: 8 bits, Parity: Even, and Stop Bits: 1 bit.

● User-specified Setting Inclusion

The port settings determine if the default settings or user settings will be used for port 1 and port 2. Be sure to use the same settings as the communications port on the host computer connected via the Modbus-RTU slave network.

FALSE: Default TRUE: User setting

If the default port settings are specified, then the setting of bits 00 and 01 and the baud rate (next word) will be ignored.

The default settings used are as follows: Baud Rate: 19,200 bps, Start Bits: 1 bit, Data Length: 8 bits, Parity: Even, and Stop Bits: 1 bit.

If user port settings are specified, set bits 00 and 01 and set the baud rate (next word).

● Serial Communications Mode

Set the Serial Communications Mode to A hex to use Modbus-RTU slave Slave Mode.

● Parity and Baud Rate

If user settings are specified for the port settings, the parity and baud rate must be set.

● Modbus-RTU Slave Address

Set the Modbus-RTU slave address between 1 and 247 in Hex (between 1 and F7 hex).

● Allocation Areas for Coils, Input Registers, and Holding Registers

You can set the memory used for CJ-series Unit of the CPU Unit of the NJ-series Controller that corresponds to the Modbus data models (Coils, Input Registers, and Holding Registers). The Discrete Inputs data model is always allocated to the CIO Area.

It is also necessary to allocate user-defined variables to access the memory used for CJ-series Unit from the user program. For details on creating user-defined variables, refer to *2-2-2 How to Specify and Create Variables.*

Modbus data model	Modbus address	Address specified in Modbus-RTU commands	Corresponding NJ-series CPU Unit address	Allocation area setting (in DM System Settings)
Discrete Inputs	1 to 5120	0 to 5119	CIO 0 to CIO 319 (bits 0 to 5119)	CIO Area (fixed: there is no system setting)
Coils	1 to 65536	0 to 65535	CIO 0 to CIO 4095 (*1) (bits 0 to 65535)	CIO Area (default)
	1 to 8192	0 to 8191	W0 to W511 (bits 0 to 8191)	Work Area
	1 to 8192	0 to 8191	H0 to H511 (bits 0 to 8191)	Holding Area
	1 to 15360	0 to 15359	A0 to A959 (bits 0 to 15359)	Auxiliary Area
Input Registers	1 to 6144	0 to 6143	CIO 0 to CIO 6143	CIO Area (default)
	1 to 512	0 to 511	W0 to W511	Work Area
	1 to 512	0 to 511	H0 to H511	Holding Area
	1 to 960	0 to 959	A0 to A959	Auxiliary Area
Holding Registers (*2)	1 to 32768	0 to 32767	D0 to D32767	DM Area (default)
	1 to 32768	0 to 32767	E□_0 to E□_32767	EM Area bank □

Additional Information

Addresses in Modbus data models start from 1, but addresses specified in Modbus-RTU commands and addresses in the NJ-series Controller start from 0. Refer to the above table when specifying addresses in applications.

7-2-2 System-defined Variable

● Port 1/2 Settings Changing Flag

You can use an Out instruction or another instruction from the program to turn these flags to TRUE to change communications settings and restart the Serial Communications Unit ports. After you change the settings and restart the communications port, the flag will automatically be turned to FALSE.

Note These flag are used both to change the communications port settings and to restart the communications port at the same time.
Accordingly, in cases where these flags are changed to TRUE only to restart a communications port by using an Out instruction or another instruction, change these flags to TRUE without changing the System Settings of the device variable for CJ-series Unit.

List of System-defined Variables (within the system-defined variable is the Unit number)**

System-defined variable	Type	R/W	Name	Function
*_CJB_SCU**P1ChgSta*	BOOL	RW	Serial Communications Unit ** Port 1 Settings Changing Flags	TRUE: Port 1 Serial Communications Port Settings Change FALSE: All other statuses Default: FALSE
*_CJB_SCU**P2ChgSta*	BOOL	RW	Serial Communications Unit ** Port2 Settings Changing Flags	TRUE: Port 2 Serial Communications Port Settings Change FALSE: All other statuses Default: FALSE

7-2-3 Device Variable for CJ-series Unit for Software Switches

These variables are used for data exchange from the CPU Unit to the Serial Communications Unit [output].

These variables are not available in the Modbus-RTU Slave Mode.

7-2-4 Device Variable for CJ-series Unit

These variables are used for data exchange [input] from the Serial Communications Unit to the CPU Unit [input].

These variables are used to reference the port settings, the communication status, the transmission control signal status, and the transmission error status settings of the Serial Communications Unit.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_Com_UnitSta		WORD	R	Serial Communication Unit Status	Bit 01: Error log EEPROM error Bit 00: Protocol data error
*_Com_UnitLogMemErr		BOOL	R	Error Log EEPROM Error	TRUE: Error log EEPROM error FALSE: Error log EEPROM normal
*_Com_UnitPmrDatErr		BOOL	R	Protocol Data Error	TRUE: Protocol data error FALSE: Protocol data normal
*_P1_SysSetSta	*_P2_SysSetSta	WORD	R	System Settings (*1)	Bits 12 to 15: Serial communications mode Bits 8 to 11: Baud rate Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you reference this setting status, reference bits 12 to 15 of *_P2_SysSetSta*.	Bit string	R	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol Macro 9 hex: Serial Gateway A hex: Modbus-RTU Slave F hex: Loopback Test Default: 0
There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P1_SysSetSta*.	There is no specific device variable for CJ-series Unit to reference the baud rate. When you reference this setting status, reference bits 08 to 11 of *_P2_SysSetSta*.	Bit string	R	Baud Rate	0: 9,600 3: 1,200 4: 2,400 5: 4,800 6: 9,600 7: 19,200 8: 38,400 9: 57,600 10: 115,200 11: 230,400 Default: 0
*_P1_StartBitSta	*_P2_StartBitSta	BOOL	R	Start Bits (always 1 bit)	FALSE: 1 bit TRUE: 1 bit (1 bit for both FALSE and TRUE.)
*_P1_DatBitSta	*_P2_DatBitSta	BOOL	R	Data Length (7 bits/8 bits)	FALSE: 7 bits TRUE: 8 bits

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_StopBitSta	*_P2_StopBitSta	BOOL	R	Stop Bits (2 bits/1 bit)	FALSE: 2 bits TRUE: 1 bit
*_P1_ParityYNSta	*_P2_ParityYNSta	BOOL	R	Parity (Yes/No)	FALSE: Yes TRUE: No
*_P1_ParityBitSta	*_P2_ParityBitSta	BOOL	R	Parity (Even/Odd)	FALSE: Even TRUE: Odd
*_P1_HwSetSta	*_P2_HwSetSta	WORD	R	Hardware Settings	Bit 15: RS-422/485 setting status Bit 14: RS-232C setting status Bit 13: Terminating resistance setting status Bit 01: System Setup error Bit 0: Port operating status
*_P1_Ser485Sta	*_P2_Ser485Sta	BOOL	R	RS-422/485 Setting Status	Port types of each port *_P_Ser485Sta/*_P_Ser232Sta: 00: No port 01: RS232C 10: RS422A/485 11: This status does not exist.
*_P1_Ser232Sta	*_P2_Ser232Sta	BOOL	R	RS-232C Setting Status	
*_P1_TermSta	*_P2_TermSta	BOOL	R	Terminating Resistance Setting Status	TRUE: Terminating resistance ON FALSE: Terminating resistance OFF
*_P1_SysSetupErr	*_P2_SysSetupErr	BOOL	R	System Setup error	TRUE: System Setup error FALSE: System Setup normal
*_P1_OperatingSta	*_P2_OperatingSta	BOOL	R	Port Operating Status	TRUE: Port operating FALSE: Port stopped
*_P1_TransCtlSta	*_P2_TransCtlSta	WORD	R	Communications Status	Bit 10: Remote Unit busy (*2) Bit 08: Local Unit busy (*3) Bit 07: DTR (ER) signal Bit 06: DSR (DR) signal Bit 04: CTS (CS) signal Bit 03: RTS (RS) signal
*_P1_RmtBusySta	*_P2_RmtBusySta	BOOL	R	Remote Unit Busy (*2)	TRUE: Remote Unit busy (Flow control) FALSE: Remote Unit ready to receive
*_P1_LclBusySta	*_P2_LclBusySta	BOOL	R	Local Unit Busy (*3)	TRUE: Local Unit busy (Flow control) FALSE: Local Unit ready to receive
*_P1_SigERSta	*_P2_SigERSta	BOOL	R	ER signal	TRUE: High FALSE: Low
*_P1_SigDRSta	*_P2_SigDRSta	BOOL	R	DR signal	TRUE: High FALSE: Low
*_P1_SigCSSta	*_P2_SigCSSta	BOOL	R	CS signal	TRUE: High FALSE: Low
*_P1_SigRSSta	*_P2_SigRSSta	BOOL	RI	RS signal	TRUE: High FALSE: Low

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_TransErrSta	*_P2_TransErrSta	WORD	R	Transmission Error Status	Bit 15: Transmission error Bit 07: FCS check error Bit 04: Overrun error Bit 03: Framing error Bit 02: Parity error
*_P1_TransErr	*_P2_TransErr	BOOL	R	Transmission Error	TRUE: Transmission error FALSE: No transmission error
*_P1_FCSErr	*_P2_FCSErr	BOOL	R	FCS Check Error (*4)	TRUE: FCS check error FALSE: FCS check normal
*_P1_OverRunErr	*_P2_OverRunErr	BOOL	R	Overrun Error	TRUE: Overrun error FALSE: Normal
*_P1_FramingErr	*_P2_FramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal
*_P1_ParityErr	*_P2_ParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal
*_P1_MbsCmdRxCntSta	*_P2_MbsCmdRxCntSta	UINT	R	Number of Normally Received Commands	The number of normal Modbus-RTU commands received from the communications port is stored.
*_P1_MbsRespTxCntSta	*_P2_MbsRespTxCntSta	UINT	R	Number of Normally Sent Responses	The number of normal Modbus-RTU responses sent to the communications port is stored.
*_P1_MbsTxErrCnt	*_P2_MbsTxErrCnt	UINT	R	Number of Overrun Errors, Framing Errors, and Parity Errors (Transmission Errors)	The number of overrun errors, framing errors, and parity errors that occurred is stored.
*_P1_MbsCRCErrCnt	*_P2_MbsCRCErrCnt	UINT	R	Number of CRC Errors (Transmission Errors)	The number of CRC errors that occurred is stored.
*_P1_MbsCmdErrCnt	*_P2_MbsCmdErrCnt	UINT	R	Number of Command Format Errors (Illegal Function Codes and Illegal Addresses)	The number of illegal function codes and illegal addresses/data in received Modbus-RTU commands is stored.

*1 The current settings for the port are read. For details on the read contents, refer to *7-2-1 Device Variable for CJ-series Unit for System Settings*. If a System Setup error occurs, the default settings will be read.

*2 The status of this bit is not fixed in the Modbus-RTU Slave Mode.

*3 Always FALSE in the Modbus-RTU Slave Mode.

*4 In the Modbus-RTU Slave Mode, this bit is changed to TRUE if a CRC check error has occurred.

● Error Log EEPROM Error

This bit will be set to TRUE if an error occurs in reading or writing the error log stored in EEPROM on the assumption that the EEPROM has reached its useful life. At the same time, the ERC indicator will also light.

Protocol Data Error

This bit will be set to TRUE if a checksum error is detected in the protocol data when the Controller is reset. At the same time, the ERC indicator will flash. The checksum is checked for all serial communications modes.

The operation of Modbus-RTU Slave communications is not affected by protocol data error.

Port Setting Status (System Settings and Hardware Settings)

The system settings for the following items will be stored: Serial Communications Mode and Communications Specifications, Hardware Settings for Port Types and Terminating Resistance ON/OFF, System Settings Error, Port Operating/Stopped Status. The Port Operating Status will always be TRUE for Modbus-RTU Slave Mode.

Communications Status

The flow control and buffer statuses are shown.

These statuses are not used in the Modbus-RTU Slave Mode.

These bits are cleared when the Controller is reset or when a port is restarted using the Port 1/Port 2 Port Settings Change Bits.

Communications Status

The status of the following transmission control signals is stored: DTR signal, DSR signal, CTS signal, and RTS signal (TRUE: High, FALSE: Low).

Transmission Error Status

The Transmission Error Flag (bit 15) will be changed to TRUE if any of the following flags is changed to TRUE: CRC error (bit 07), Overrun Error (bit 04), Framing Error (bit 03), or Parity Error (bit 02).

Number of Normally Received Commands

The number of normal Modbus-RTU commands received from the communications port is stored.

Number of Normally Sent Responses

The number of normal Modbus-RTU responses sent to the communications port is stored.

Number of Overrun Errors, Framing Errors, and Parity Errors

The number of overrun errors, framing errors, and parity errors that occurred is stored.

Number of CRC Errors

The number of CRC errors that occurred is stored.

Number of Command Format Errors

The number of illegal function codes and illegal addresses in received Modbus-RTU commands is stored.

Additional Information

The above counters (Number of Normally Received Commands, Number of Normally Sent Responses, Number of Transmission Errors and Number of Command Format Errors) are cleared to 0 when the Controller is reset. Counting will stop if they reach 65,535.

7-3 Command and Response Details

7-3-1 Supported Modbus-RTU Commands

The Modbus-RTU Slave Mode of the Serial Communications Unit supports the following Modbus-RTU commands.

Function code (hexadecimal)	Function	Modbus name
01	Reads multiple bits from the CIO, Work, Holding, or Auxiliary Area of the memory used for CJ-series Unit	Read Coils
02	Reads multiple bits from the CIO Area of the memory used for CJ-series Unit	Read Discrete Inputs
03	Reads multiple words from the DM or EM Area of the memory used for CJ-series Unit	Read Holding Registers
04	Reads multiple words from the CIO, Work, Holding, or Auxiliary Area of the memory used for CJ-series Unit	Read Input Registers
05	Writes a bit in the memory used for CJ-series Unit	Write Single Coil
06	Writes a word in the DM or EM Area of the memory used for CJ-series Unit.	Write Single Register
08	Executes an echoback test.	Diagnostic
0F	Writes multiple bits in the memory used for CJ-series Unit	Write Multiple Coils
10	Writes multiple words in the DM or EM Area of the memory used for CJ-series Unit	Write Multiple Registers

The frame format used in Modbus-RTU Slave Mode is as follows:

Slave address	Function code	Data	CRC
1 byte	1 byte	0 to 252 bytes	2 bytes (*)

* The CRC code is given in the order of low byte to high byte.

Additional Information

- Set the slave address to 0 for a broadcast command. Responses are not returned for broadcast commands.
- Modbus data models are allocated to the memory used for CJ-series Unit by the System Settings. System settings are read when the Controller is reset, when the Serial Communications Unit is restarted, or when the port is restarted.

Precautions for Correct Use

Create a program for retry processing on the host computer (e.g. personal computer) for a transmission error or other communications errors.

7-3-2 Command and Response Details

Read Coils

● Function

Reads multiple bits from the CIO, Work, Holding, or Auxiliary Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	01 hex
Starting Address	2 bytes	0000 to FFFF hex (*)
Quantity of Coils	2 bytes	0001 to 03E8 hex (1 to 1000)

* The address depends on the area that is allocated.

● Response

	Length	Data
Function Code	1 byte	01 hex
Byte Count	1 byte	N (*)
Coil Status	n byte	n = N or N+1

* N=Quantity of Registers

● Reading 19 Bits from CIO 0001.04 to CIO 0002.06

Request	
	Data
Function Code	01 hex
Starting Address (H)	00 hex
Starting Address (L)	14 hex
Quantity of Coils (H)	00 hex
Quantity of Coils (L)	13 hex

Response	
	Data
Function Code	01 hex
Byte Count	03 hex
Coil Status 27 to 20	CD hex
Coil Status 35 to 28	6B hex
Coil Status 38 to 36	05 hex

Note Unused bits are filled with zeros.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 1	31 $_1$	30 $_0$	29 $_1$	28 $_1$	27 $_1$	26 $_1$	25 $_0$	24 $_0$	23 $_1$	22 $_1$	21 $_0$	20 $_1$	19	18	17	16
CIO 2	47	46	45	44	43	42	41	40	39	38 $_1$	37 $_0$	36 $_1$	35 $_0$	34 $_1$	33 $_1$	32 $_0$
CIO 3	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Note The subscript numbers in the shaded boxes indicate the TRUE/FALSE (1/0) status of the bits that are read.

Read Discrete Inputs

● Function

Reads multiple bits from the CIO Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	02 hex
Starting Address	2 bytes	0000 to 13FF hex
Quantity of Coils	2 bytes	0001 to 03E8 hex (1 to 1000)

● Response

	Length	Data
Function Code	1 byte	02 hex
Byte Count	1 byte	N (*)
Coil Status	n byte	n = N or N+1

* N=Quantity of Registers

● Reading 19 Bits from CIO 0001.04 to CIO 0002.06

Request	
	Data
Function Code	02 hex
Starting Address (H)	00 hex
Starting Address (L)	14 hex
Quantity of Coils (H)	00 hex
Quantity of Coils (L)	13 hex

Response	
	Data
Function Code	02 hex
Byte Count	03 hex
Coil Status 27 to 20	CD hex
Coil Status 35 to 28	6B hex
Coil Status 38 to 36	05 hex

Note Unused bits are filled with zeros.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 1	31 $_1$	30 $_0$	29 $_1$	28 $_1$	27 $_1$	26 $_1$	25 $_0$	24 $_0$	23 $_1$	22 $_1$	21 $_0$	20 $_1$	19	18	17	16
CIO 2	47	46	45	44	43	42	41	40	39	38 $_1$	37 $_0$	36 $_1$	35 $_0$	34 $_1$	33 $_1$	32 $_0$
CIO 3	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Note The subscript numbers in the shaded boxes indicate the TRUE/FALSE (1/0) status of the bits that are read.

Read Holding Registers

● Function

Reads multiple words from the DM or EM Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	03 hex
Starting Address	2 bytes	0000 to 7FFF hex (*)
Quantity of Registers	2 bytes	0001 to 007D hex

* The address depends on the area that is allocated.

● Response

	Length	Data
Function Code	1 byte	03 hex
Byte Count	1 byte	N × 2 (*)
Register Value	N × 2 bytes	

* N = Quantity of Registers

● Reading 3 Words from DM 1000 to DM 1002

Request	
	Data
Function Code	03 hex
Starting Address (H)	03 hex
Starting Address (L)	E8 hex
Quantity of Registers (H)	00 hex
Quantity of Registers (L)	03 hex

Response	
	Data
Function Code	03 hex
Byte Count	06 hex
Register Value (H) DM1000	AB hex
Register Value (L) DM1000	12 hex
Register Value (H) DM1001	56 hex
Register Value (L) DM1001	78 hex
Register Value (H) DM1002	97 hex
Register Value (L) DM1002	13 hex

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DM1000	A				B				1				2			
DM1001	5				6				7				8			
DM1002	9				7				1				3			

Read Input Registers

● Function

Reads multiple words from the CIO, Work, Holding, or Auxiliary Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	04 hex
Starting Address	2 bytes	0000 to 17FF hex (*)
Quantity of Registers	2 bytes	0001 to 007D hex

* The address depends on the area that is allocated.

● Response

	Length	Data
Function Code	1 byte	04 hex
Byte Count	1 byte	N × 2 (*)
Register Value	N × 2 bytes	

* N = Quantity of Registers

● Reading 3 Words from DM 1000 to DM 1002

Request	
	Data
Function Code	04 hex
Starting Address (H)	03 hex
Starting Address (L)	E8 hex
Quantity of Registers (H)	00 hex
Quantity of Registers (L)	03 hex

Response	
	Data
Function Code	04 hex
Byte Count	06 hex
Register Value (H) DM1000	AB hex
Register Value (L) DM1000	12 hex
Register Value (H) DM1001	56 hex
Register Value (L) DM1001	78 hex
Register Value (H) DM1002	97 hex
Register Value (L) DM1002	13 hex

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DM1000	A				B				1				2			
DM1001	5				6				7				8			
DM1002	9				7				1				3			

Write Single Coil

● Function

Writes a bit in the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	05 hex
Output Address	2 bytes	0000 to FFFF hex (*)
Output Value	2 bytes	0000 hex (OFF) or FF00 (ON)

* The address depends on the area that is allocated.

● Response

	Length	Data
Function Code	1 byte	05 hex
Output Address	2 bytes	0000 to FFFF hex
Output Value	2 bytes	0000 hex or FF00

● Writing 1 (ON) to CIO 0002.02

Request	
	Data
Function Code	05 hex
Output Address (H)	00 hex
Output Address (L)	22 hex
Output Value (H)	FF hex
Output Value (L)	00 hex

Response	
	Data
Function Code	05 hex
Output Address (H)	00 hex
Output Address (L)	22 hex
Output Value (H)	FF hex
Output Value (L)	00 hex

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 1	31_{1}	30_{0}	29_{1}	28_{1}	27_{1}	26_{1}	25_{0}	24_{0}	23_{1}	22_{1}	21_{0}	20_{1}	19	18	17	16
CIO 2	47	46	45	44	43	42	41	40	39	38_{1}	37_{0}	36_{1}	35_{0}	34_{1}	33_{1}	32_{0}
CIO 3	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Note The subscript number in the shaded box indicates the TRUE/FALSE (1/0) status of the bit that is read.

Write Single Register

● Function

Writes multiple words in the DM or EM Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	06 hex
Register Address	2 bytes	0000 to 7FFF hex (*)
Register Value	2 bytes	0000 to FFFF hex

* The address depends on the area that is allocated.

● Response

	Length	Data
Function Code	1 byte	06 hex
Register Address	2 bytes	0000 to 7FFF hex
Register Value	2 bytes	0000 to FFFF hex

● Writing 3AC5 Hex to DM2000

Request	
	Data
Function Code	06 hex
Register Address (H)	07 hex
Register Address (L)	D0 hex
Register Value (H)	3A hex
Register Value (L)	C5 hex

Response	
	Data
Function Code	06 hex
Register Address (H)	07 hex
Register Address (L)	D0 hex
Register Value (H)	3A hex
Register Value (L)	C5 hex

	15 14 13 12	11 10 9 8	7 6 5 4	3 2 1 0
DM2000	3	A	C	5
DM2001				
DM2002				

Diagnostic

Function

Executes an echoback test. Send data will be returned.

Command

	Length	Data
Function Code	1 byte	08 hex
Sub-function Code	2 bytes	0000 hex
Data	N × 2 bytes (*)	---

* From 2 to 125 (2 to 7D hex) bytes can be specified.

Response

	Length	Data
Function Code	1 byte	08 hex
Sub-function Code	2 bytes	0000 hex
Data	N × 2 bytes (*)	---

* Same as Data in Command.

Sending A537 Hex

Request	
	Data
Function Code	06 hex
Sub-function Code (H)	00 hex
Sub-function Code (L)	00 hex
Data (H)	A5 hex
Data (L)	37 hex

Response	
	Data
Function Code	06 hex
Sub-function Code (H)	00 hex
Sub-function Code (L)	00 hex
Data (H)	A5 hex
Data (L)	37 hex

Write Multiple Coils

Function

Writes multiple bits in the memory used for CJ-series Unit. Allocated memory is in the CIO Area (fixed).

Command

	Length	Data
Function Code	1 byte	0F hex
Starting Address	2 bytes	0000 to FFFF hex
Quantity of Output	2 bytes	0001 to 03E8 hex
Byte Count	1 byte	N
Output Value	n byte	n = N or N + 1

● Response

	Length	Data
Function Code	1 byte	0F hex
Starting Address	2 bytes	0000 to FFFF hex
Quantity of Output	2 bytes	0001 to 07B0 hex

● Writing 10 Bits Starting from CIO 0001.04 (xxxx xx11 1100 1101)

Request	
	Data
Function Code	0F hex
Starting Address (H)	00 hex
Starting Address (L)	14 hex
Quantity of Output (H)	00 hex
Quantity of Output (L)	0A hex
Byte Count	02 hex
Output Value (H)	3A hex
Output Value (L)	01 hex

Response	
	Data
Function Code	0F hex
Starting Address (H)	00 hex
Starting Address (L)	13 hex
Quantity of Output (H)	00 hex
Quantity of Output (L)	0A hex

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CIO 1	31 $_0$	30 $_0$	29 $_0$	28 $_1$	27 $_0$	26 $_0$	25 $_1$	24 $_1$	23 $_1$	22 $_0$	21 $_1$	20 $_0$	19 $_0$	18 $_0$	17 $_0$	16 $_0$

Note The subscript numbers in the shaded boxes indicate the TRUE/FALSE (1/0) status of the corresponding bits. Other bits in the same word are set to FALSE.

Write Multiple Registers

● Function

Writes multiple words in the DM or EM Area of the memory used for CJ-series Unit.

● Command

	Length	Data
Function Code	1 byte	10 hex
Starting Address	2 bytes	0000 to 7FFF hex
Quantity of Registers	2 bytes	0001 to 007B hex
Byte Count	1 byte	2 × N (*)
Registers Value	N × 2 bytes	value

* N = Number of write bytes

● Response

	Length	Data
Function Code	1 byte	10 hex
Starting Address	2 bytes	0000 to 17FF hex
Quantity of Registers	2 bytes	0001 to 007B hex

● Writing 3AC5 and 9713 Hex to 2 Words, DM1000 and DM1001

Request	
	Data
Function Code	10 hex
Starting Address (H)	03 hex
Starting Address (L)	E8 hex
Quantity of Registers (H)	00 hex
Quantity of Registers (L)	02 hex
Byte Count	04 hex
Registers Value (H)	3A hex
Registers Value (L)	C5 hex
Registers Value (H)	97 hex
Registers Value (L)	13 hex

Response	
	Data
Function Code	10 hex
Starting Address (H)	03 hex
Starting Address (L)	E8 hex
Quantity of Registers (H)	00 hex
Quantity of Registers (L)	02 hex

	15 14 13 12	11 10 9 8	7 6 5 4	3 2 1 0
DM1000	3	A	C	5
DM1001	9	7	1	3

Error Format

	Length	Data
Function Code	1 byte	Function code + 80 hex
Exception Code	1 byte	Error code

Error code	Name	Description
01	Illegal function	• There is an error in the specified function code. • A function code not supported by the Serial Communications Unit was specified.
02	Illegal data address	• There is an error in the specified starting address. • The combination of the specified starting address and data length (quantity of registers/coils) exceeds the valid range. • The specified data length (quantity of registers/coils) exceeds the valid range. • The specified data length (quantity of registers/coils) differs from the actual data length. • Less than 4 bytes of data was received.
03	Illegal data value	• There is an error in the specified data. (The data for the Write Single Coil Command is not 0000 hex or FF00 hex.)
04	Slave device failure	• Reading or writing could not be performed because an error occurred in the CPU Unit.

8

Loopback Test

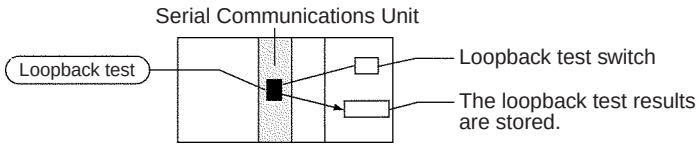
This section describes the procedure and other information required to conduct loopback tests to check the serial ports.

8-1 Executing Loopback Tests 8-2
8-1-1 Overview 8-2
8-1-2 Connection Method 8-2
8-1-3 Procedure 8-2
8-1-4 Indicators Used for the Loopback Test 8-3
8-2 Device Variable for CJ-series Unit (Loopback Test) 8-4
8-2-1 Device Variables for CJ-Series Unit for System Settings 8-4
8-2-2 Device Variables for CJ-Series Unit for Status 8-5

8-1 Executing Loopback Tests

8-1-1 Overview

The loopback test is a testing function for a communications circuit. The Serial Communications Unit compares transmitted data and loopback data. To perform loopback tests, connect a loop backwire connector to the port of Serial Communications Unit.



8-1-2 Connection Method

Make the connections according to the type of port, as shown in the following diagrams.

● RS-232C Port

Pin	Signal
2	SD
3	RD
4	RTS
5	CTS
1	FG
8	DTR
7	DSR

● RS-422A/485 Port

Pin	Signal
1	RDA
2	RDB
3	SDA
4	SDB

8-1-3 Procedure

The loopback test is performed using the procedure shown below.

1 Connect the connector of the port to be used to execute the loopback test. See *8-1-2 Connection Method* for details.

2 Set the serial communications mode to Loopback Test (F hex) using the applicable CJ-series Unit Device Variables for System Setting. Refer to *8-2-1 Device Variables for CJ-Series Unit for System Settings*.

3 Set the following communication settings for the loopback test in the Device Variables for CJ-Series Unit for System Settings: Baud Rate, Stop Bits, Parity, and Data Length. For details, refer to *8-2-1 Device Variables for CJ-Series Unit for System Settings*.

4 Reconnect the Controller power, restart the Serial Communications Unit (change the system-defined variable *_CJB_CBU**Restart* to TRUE), or restart the serial port (change the system-defined variable *_CJB_SCU**P1ChgSta* or *_CJB_SCU**P2ChgSta* to TRUE).

5 Set the Loopback Test Switch of the Software Switch to TRUE.

To end the test, set the switch to FALSE.

**_P1_LbtTestTrigCmd* for port 1
**_P2_LbtTestTrigCmd* for port 2

Refer to *2-3-3 Device Variable for CJ-series Unit for Software Switches*.

6 Use the loopback status to check the results.

Refer to *8-2-2 Device Variables for CJ-Series Unit for Status.*

System-defined variable	Type	R/W	Name	Function
_CJB_CBU**Restart	BOOL	RW	CPU Bus Unit Restart Bits (** indicates the unit number (00-15).)	The CPU Bus Unit restarts when the variable changes to TRUE. (The system will restore the variable to FALSE after restart.) The number at the end of each system-defined variable corresponds to the Unit No.
_CJB_SCU**P1ChgSta _CJB_SCU**P2ChgSta	BOOL	RW	Serial Communications Unit **, Port 1/2 Settings Changing Flag (** indicates the unit number (00-15).)	• The flag changes to TRUE when changing the setting of the corresponding port or executing a Serial Port Setting Change instruction. • The flag returns to FALSE when an event is sent from the Serial Unit when settings are changed. • It is also possible for the user to set the flag to TRUE and notify the Serial Unit change in serial port setting.

8-1-4 Indicators Used for the Loopback Test

When the test is being executed, the indicators shown below will flash. Use the Loopback Test Status in the Protocol Status to check whether or not the test is executed normally.

Port 1: SD1/RD1 indicator
Port 2: SD2/RD2 indicator

8-2 Device Variable for CJ-series Unit (Loopback Test)

This section describes the device variable for CJ-series Unit used in the loopback test.

8-2-1 Device Variables for CJ-Series Unit for System Settings

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_PortCfg	*_P2_PortCfg	WORD	RW	Port Setting	Bit 15: User-specified setting inclusion (*) Bits 08 to 11: Serial communications mode (F hex: Loopback test) Bit 04: Start bits Bit 03: Data length Bit 02: Stop bits Bit 01: Parity (Yes/No) Bit 00: Parity (Even/Odd)
*_P1_SerSetCfg	*_P2_SerSetCfg	BOOL	RW	User-specified Setting Inclusion	FALSE: Default TRUE: User settings Default: FALSE
There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P1_PortCfg*.	There is no specific device variable for CJ-series Unit to reference the serial communications mode. When you set this setting, set to bits 08 to 11 of *_P2_PortCfg*.	Bit string	RW	Serial Communications Mode	Serial communications mode 3 hex: No-protocol 6 hex: Protocol macro 9 hex: Serial Gateway A hex: Modbus-RTU slave F hex: Loopback test Default: 0
*_P1_StartBitCfg	*_P2_StartBitCfg	BOOL	RW	Start Bits	1 start bit is always used regardless of whether the setting is FALSE/TRUE. FALSE: 1 bit TRUE: 1 bit Default: FALSE
*_P1_DatBitCfg	*_P2_DatBitCfg	BOOL	RW	Data Length	FALSE: 7 bits TRUE: 8 bits Default: FALSE
*_P1_StopBitCfg	*_P2_StopBitCfg	BOOL	RW	Stop Bits	FALSE: 2 bits TRUE: 1 bit Default: FALSE
*_P1_ParityYNCfg	*_P2_ParityYNCfg	BOOL	RW	Parity	FALSE: Yes TRUE: No Default: FALSE
*_P1_ParityBitCfg	*_P2_ParityBitCfg	BOOL	RW	Parity Even/Odd	FALSE: Even TRUE: Odd Default: FALSE

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_BaudrateCfg	*_P2_BaudrateCfg	USINT	RW	Baud Rate (unit: bps)	0: 9600 3:1200 4: 2400 5: 4800 6: 9600 7: 19200 8: 38400 9: 57600 10: 115200 11: 230400 Default: 0

* When the default settings are used, the Baud Rate, Start Bits, Data Length, Stop Bits, Parity Yes/No, and Parity Even/Odd settings are disabled. To specify settings for these items to the settings other than the default, apply user settings.
Default settings are Baud Rate: 9,600 bps, Start Bits: 1 bit, Data Length: 7 bits, Parity: even parity and Stop Bits: 2 bits.

8-2-2 Device Variables for CJ-Series Unit for Status

You can read information concerning the loopback test status. If an error occurs, the device variable for CJ-series Unit shown below will become TRUE.

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_LbtSta	*_P2_LbtSta	WORD	R	Loopback Test Status	Bit 15: Error Bit 08: DTR check error Bit 07: CTS check error Bit 05: Timeout error Bit 04: Parity error Bit 03: Overrun error Bit 02: Framing error Bit 00: Comparison error
*_P1_LbtErrSta	*_P2_LbtErrSta	BOOL	R	Error	TRUE: Error FALSE: Normal
*_P1_LbtDRErr	*_P2_LbtDRErr	BOOL	R	DTR Check Error	TRUE: DTR check error FALSE: Normal
*_P1_LbtCSErr	*_P2_LbtCSErr	BOOL	R	CTS Check Error	TRUE: CTS check error FALSE: Normal
*_P1_LbtTimeoutErr	*_P2_LbtTimeoutErr	BOOL	R	Timeout Error	TRUE: Timeout error FALSE: Normal
*_P1_LbtParityErr	*_P2_LbtParityErr	BOOL	R	Parity Error	TRUE: Parity error FALSE: Normal
*_P1_LbtOverRunErr	*_P2_LbtOverRunErr	BOOL	R	Overrun Error	TRUE: Overrun error FALSE: Normal
*_P1_LbtFramingErr	*_P2_LbtFramingErr	BOOL	R	Framing Error	TRUE: Framing error FALSE: Normal

Device variable for CJ-series Unit		Type	R/W	Name	Function
Port 1	Port 2				
*_P1_LbtCmpErr	*_P2_LbtCmpErr	BOOL	R	Comparison Error	TRUE: Comparison error FALSE: Normal
*_P1_LbtTestCntSta	*_P2_LbtTestCntSta	UINT	R	Test Execution Count	The test execution count is cleared at startup. If the number of tests is counted to 65535, the value of the count will remain at 65535, but testing will continue.
*_P1_LbtTestErrCntSta	*_P2_LbtTestErrCntSta	UINT	R	Test Error Count	The test error count is cleared at startup. If the number of tests is counted to 65535, the value of the count will remain at 65535, but testing will continue.

9

Troubleshooting and Maintenance

This section describes the troubleshooting and maintenance procedures for the Serial Communications Unit.

9-1 Indicator Error Displays 9-2

9-2 Communications Status Error Notification 9-3

9-2-1 Status Area Error Information 9-3

9-3 Troubleshooting 9-4

9-3-1 Serial Gateway (Serial Gateway or Protocol Macro Mode) 9-4

9-3-2 No-protocol Mode 9-10

9-3-3 Protocol Macros 9-16

9-3-4 Modbus-RTU Slave Mode 9-22

9-4 Error Logs 9-25

9-4-1 Error Log Data 9-25

9-4-2 Error Contents and Details 9-26

9-4-3 Error Codes and Troubleshooting 9-28

9-5 Event Logs 9-30

9-5-1 Overview of the Event Logs 9-30

9-5-2 Error Table 9-30

9-5-3 Error Descriptions 9-36

9-6 Cleaning and Inspection 9-53

9-6-1 Cleaning 9-53

9-6-2 Inspection 9-53

9-7 Replacement Precautions 9-55

9-7-1 Precautions when Replacing Unit 9-55

9-7-2 Settings after Replacing Unit 9-55

9-7-3 Replacing the Unit 9-56

9-1 Indicator Error Displays

Indicators				Possible cause	Remedy
RUN	ERC	ERH	RDY		
Lit	Not lit	Not lit	Lit	The Serial Communications Unit started normally.	---
Not lit	Lit	---	---	The Serial Communications Unit is found to be faulty (by the hardware self-diagnostic function).	If the ERC indicator lights when the Serial Communications Unit is mounted to another CPU Unit, replace the Unit.
Not lit	Not lit	Lit	---	There is more than one identical unit number within the same CPU Unit. An initial recognition error occurred (the Serial Communications Unit was not correctly recognized by the CPU Unit).	Assign a unique unit number to each CPU Unit on the CPU Rack and Expansion Racks. After correcting the unit number setting, cycle the power to the Controller. If the ERH indicator lights up when the Serial Communications Unit is mounted to another CPU Unit, replace the Unit.
Not lit	Lit	Lit	---	An initial recognition error occurred (the Serial Communications Unit was not correctly recognized by the CPU Unit).	If the ERC and ERH indicators light when the Serial Communications Unit is mounted to another CPU Unit, replace the Unit.
Not lit	Not lit	Not lit	Not lit	The Power Supply Unit power supply reception is not normal. The Serial Communications Unit is not correctly secured to the next Unit. The Serial Communications Unit is not mounted in an appropriate slot. The Serial Communications Unit is faulty.	Check the power supply voltage and supply the correct electric power to the Unit. Firmly secure the Unit. Mount the Unit in an appropriate slot. If all the indicators are not lit when the Serial Communications Unit is mounted to another CPU Unit, replace the Unit.
Lit	---	Flashing	---	A system setup error occurred.	Correct the System Settings, reset or restart the Controller, or restart the port.
Lit	Lit	---	---	The error log EEPROM is faulty.	If the problem persists even if the power supply is cycled, replace the Unit.
Lit	---	Lit	---	An error (such as a CPU Unit WDT error) occurred in the CPU Unit. A CPU Unit service monitoring error occurred. A bus error occurred.	Eliminate the cause of the error. If the error persists, replace the CPU Unit. Check the operating environment and eliminate the cause of the error. (Check to be sure that the problem is not caused by another CPU Bus Unit with the same unit number.) Check the operating environment and eliminate the cause of the error. Firmly secure the Unit.

9-2 Communications Status Error Notification

This section describes the error information for the Device Variables for CJ-series Unit for status.

9-2-1 Status Area Error Information

When an error occurs, the corresponding flag is set to TRUE.

Device variable for CJ-series Unit		Flag name	Possible cause	Remedy
Port 1	Port 2			
*_Com_UnitLogMemErr		Error Log EEPROM Error	The error log EEPROM is faulty.	If the problem persists even if the power supply is cycled, replace the Unit.
*_Com_UnitPmrDatErr		Protocol Data Error	A protocol data checksum error occurred.	If the error persists when protocol data is retransmitted, replace the Unit.
*_P1_SysSetupErr	*_P2_SysSetupErr	System Setup error	A System Setup error occurred.	Correct the System Settings, reset the Controller, or restart the Unit.
*_P1_RmtBusySta	*_P1_RmtBusySta	Remote Unit Busy	The Remote Unit is in reception buffer busy status when flow control is set for the protocol.	Cancel the communications with the Remote Unit until this flag is set to FALSE.
*_P1_LclBusySta	*_P2_LclBusySta	Local Unit Busy	The local Unit is in reception buffer busy status.	Increase the transmission interval to reduce transmission load to the Remote Unit for which flow control is set.

9-3 Troubleshooting

9-3-1 Serial Gateway (Serial Gateway or Protocol Macro Mode)

Responses Returned to the Command Source

● Conversion Failure

Error conditions					Cause	Remedy
Unit status	Serial communications mode	Indicator display	Command end code sent to command source	Confirmation of device variable for CJ-series Unit, etc.		
The Unit cannot convert the received (via CPU bus) command into any of the protocols.	The serial communications mode is set to a mode other than Serial Gateway Mode or Protocol Macro Mode.	---		Bits 12 to 15 (*Serial communications mode*) of *_P1(orP2)_SysSetSta* are set to a value other than 9 hex or 6 hex.	Serial communications mode is not set correctly.	Set bits 08 to 11 (Serial communications mode) of *_P1(orP2)_PortCfg* either to 9 hex (*Serial Gateway Mode*) or 6 hex (*Protocol Macro Mode*).
	NT Link, loopback test, or No-protocol Mode		0401 hex (undefined command)	2 hex, F hex, or 3 hex	Serial Gateway command was sent.	
	Host Link	---	0205 hex (response timeout), etc.	0 hex or 5 hex		
The Unit cannot convert the received (via CPU bus) command into any of the protocols.	The serial communications mode is set to Serial Gateway or Protocol Macro Mode.	The SD□ indicators do not flash at all. (Communications were not electrically established.)	0205 hex (response timeout), etc.	---	A hardware error occurred.	Conduct a loopback test in LoopbackTest Mode to check the transmission lines. If an error occurs during the test, replace the Unit.
		The SD□ indicators do not flash.	0202 hex (no Unit) or 0401 hex (undefined command)	---	The command destination address is not specified correctly.	Correct the command destination address specification, and then resend the message.
	The serial communications mode is set to Serial Gateway or Protocol Macro Mode.	The SD□ indicators do not flash at all.	2605 hex (service executing)	---	The serial communications port received a sixth command when five commands are still waiting for processing.	Add retry processing on the command source for response code 2605 hex.

● Conversion Successful but Transmission Failed

Error conditions					Cause	Remedy
Unit status	**Serial communications mode**	**Indicator display**	**Command end code sent to command source**	**Confirmation of device variable for CJ-series Unit, etc.**		
The Unit converted the received (via CPU bus) command, but could not send the command to the remote device after conversion.	Serial communications mode is set to Protocol Macro Mode.	The SD□ indicators do not flash at all.	0204 hex (Remote node busy)	*_P1(orP2)_TimeoutErr* (Timeout Error) is set to TRUE.	A Serial Gateway send start timeout occurred. (The converted command will be discarded without being sent). The command was received by the Unit, but the step transition in the communications sequence of the protocol macro is suspended for either of the following reasons. • The next step is a Receive command. • The Wait command is being executed.	Correct the communications sequence. Alternatively, adjust *_P1(orP2)_PmrSgwSendTimeoutCfg* (Serial Gateway Send Start Timeout Monitoring Time), as required.
			2607 hex (transmission command error (no right to execute service))	*_P1(orP2)_PmrSgwProhSta* (Serial Gateway Prohibited Flag (Protocol Macros)) is TRUE (*Prohibited status*).	The Serial Gateway is prohibited.	Change *_P1(orP2)_SgwDsblCmd* (Serial Gateway Prohibit Switch (Protocol Macros)) to FALSE.
			0205 hex (response timeout), etc.	*_P1(orP2)_HlkCTSCtlCfg* (CTS Control) is TRUE but *_P1(orP2)_SigCSSta*(CS signal) is FALSE.	CTS control is set to TRUE(Yes) but the RTS (RS) signal from the remote device was not input to the CTS (CS) signal of the Local Unit.	Perform either of the following: Loop the RTS (RS)-CTS (CS) signals of the Local Unit. Disable CTS control. Input the RTS (RS) signal from the Remote Unit to the CTS (CS) signal of the Local Unit and use CTS control.

● Transmission Successful but Response from Remote Device Not Received

Error conditions					Cause	Remedy
Unit status	**Serial communications mode**	**Indicator display**	**Command end code sent to command source**	**Confirmation of device variable for CJ-series Unit, etc.**		
The converted command could be sent to the remote device but a normal response is not received from the remote device.	The serial communications mode is set to Serial Gateway or Protocol Macro Mode.	The SD□ indicators flash but the RD□ does not flash.	0205 hex (response timeout).	*_P1(orP2)_TimeoutErr* (Timeout Error) is set to TRUE.	A Serial Gateway response timeout occurred and you cannot receive the response data after the timeout. Either of the following causes is possible.	Perform the following remedies.
					A remote device that can receive the command after conversion does not exist at the specified command destination address.	Check the device at the specified command destination address.
					The sent command frame is illegal.	Revise the command frame to be converted.
					The communications conditions and baud rate settings for the serial communications path do not match the settings at the remote device.	Revise the system settings and at the remote device.
					Cable connections are incorrect or faulty. The terminating resistance switch setting is not correct for RS-422A/485 port. Adapters such as the NT-AL001 are incorrectly wired or terminating resistance is not set correctly.	• Check the wiring. • Turn ON the terminating resistance switch at two end locations (remote device or Unit) and turn OFF the terminating resistance switch of all other Units.
					A command was sent in a protocol not understood by the remote device.	Check the command specifications of the remote device and the source of command conversion.
					A hardware error occurred in the remote device.	Replace the remote device.

Error conditions					Cause	Remedy
Unit status	**Serial communications mode**	**Indicator display**	**Command end code sent to command source**	**Confirmation of device variable for CJ-series Unit, etc.**		
The converted command could be sent to the remote device but a normal response is not received from the remote device.	The serial communications mode is set to Serial Gateway or Protocol Macro Mode.	Either the SD@ or RD@ indicator flashes.	0205 hex (response timeout).	*_P1(orP2)_TimeoutErr* (Timeout Error) is set to TRUE.	The response from the remote device was too fast and the data received by the Unit was discarded.	Delay the response from the remote device.
		The SD□ indicators flash, but a response is not always returned.	0205 hex (response timeout) occurs sometimes.	*_P1(orP2)_TransErr*, *_P1(orP2)_OverRunErr*, *_P1(orP2)_FramingErr*, *_P1(orP2)_ParityErr* (Transmission Error, Overrun Error, Framing Error, or Parity Error) is TRUE.	A hardware error occurred in the reception circuit of the Unit.	Conduct a loopback test in serial communications mode to check the transmission lines. If an error occurs during the test, replace the Unit.
		The RD□/SD□ indicators flash, but a response is not always returned.			A transmission error occurred due to noise.	Use shielded twisted-pair cables. Lay power lines separately by using ducts. Increase the number of resends at the command source. Perform communications retry if required.

● Response Received from Remote Device but Error Remains

Error conditions					Cause	Remedy
Unit status	**Serial communications mode**	**Indicator display**	**Command end code sent to command source**	**Confirmation of device variable for CJ-series Unit, etc.**		
A normal end code is returned from the remote device, but there is no response data after the end code.	The serial communications mode is set to Serial Gateway or Protocol Macro Mode.	The RD□/SD□ indicators all flash.	0000 hex	---	The command requires a response, but the command after conversion does not require a response (e.g., broadcasting)	Check the specifications of the command to be converted.
A response was received from the remote device after a response timeout error was received for a converted command that was sent to the remote device.			0205 hex (response timeout), etc.	*_P1(orP2)_TimeoutErr* (Timeout Error) is set to TRUE.	A Serial Gateway response timeout occurred, but the response data was received normally after the timeout. This occured because the *_P1(orP2)_PmrSgwRespTimeoutCfg* (Serial Gateway Response Timeout Monitoring Time) setting is too short.	Set a longer time for *_P1(orP2)_PmrSgwRespTimeoutCfg* (Serial Gateway Response Timeout Monitoring Time).
An error end code was returned to the transmission source.			0206 hex (transmission line error)	*_P1(orP2)_FCSErr* (FCS Check Error) or *_P1(orP2)_ParityErr* (Parity Error) is TRUE.	Either of the following errors occurred in the protocol after conversion. Conversion to CompoWay/F command: BCC error or parity error Conversion to Modbus-RTU command: CRC error or parity error Conversion to Modbus-ASCII command: CRC error or checksum error Conversion to Host Link command: FCS error or parity error	Use shielded twisted-pair cables. Lay power lines separately by using ducts. Increase the number of resends at the command source. Perform communications retry as required.
			Other error end code	---	The Serial Gateway was executed, but the error completion occurred.	Perform error processing based on the following table of Cause and Countermeasure by Command End Code.

● Cause and Countermeasure by Command End Code

Main response code (hex)		Sub response code (hex)		Check point	Possible cause	Remedy
Value	Details	Value	Details			
00	Normal end	00	Normal end	---	---	---
		04	Destination busy	*_P1(orP2)_TimeoutErr* (Timeout Error)	The Serial Gateway function cannot be executed by interrupting the macro between protocol macro steps.	Retry the command or correct the communications sequence.
02	Destination error	05	Response timeout at command source side	*_P1(orP2)_TimeoutErr* (Timeout Error)	When the message frame is damaged by noise.	If *_P1(orP2)_TimeoutErr* is TRUE, assume that the command source generated a response timeout. • Check the noise condition by an internode test. • Increase the number of resends at the command source. • Perform communications retry if required.
				Instruction control data	Response monitoring time is short.	Set a longer parameter value for response monitoring time.
				Error log read	Discarding of send and receive frame	Take the correct action after checking the error log.
			Serial gateway response timeout	*_P1(orP2)_TimeoutErr* (Timeout Error)	Serial Gateway Response Timeout occurred.	If *_P1(orP2)_TimeoutErr* is set to TRUE, assume that the Serial Gateway generated a response timeout and take the appropriate actions.
		06	Transmission line error	*_P1(orP2)_FCSErr* (FCS Check Error) or *_P1(orP2)_ParityErr* (Parity Error)	• Conversion to CompoWay/F command: BCC error or parity error • Conversion to Modbus-RTU command: CRC error or parity error • Conversion to Modbus-ASCII command: CRC error or checksum error	Use shielded twisted-pair cables. Lay power lines separately by using ducts. Increase the number of resends at the command source. Perform communications retry as required.
10	Command format error	01	Command packet too long	Command data	Command length is long.	Set the command data correctly by referring to the command format.
		02	Insufficient command length	Command data	Command length is short.	Set the command data correctly by referring to the command format.
11	Parameter error	0C	Parameter error	Parameters in command data	Parameter is not set correctly.	Set the parameters again, this time correctly, after you check the command data.
26	Command error	05	Service executing	---	Service executing (The serial communications port received a sixth command when five commands are still waiting for processing.)	Add retry processing on the command source for response code 2605 hex.
		07	No right to execute service	Serial Gateway prohibited or not	*_P1(orP2)_PmrSgwProhSta* (Serial Gateway Prohibited Flag (Protocol Macros)) is set to TRUE.	While the Serial Gateway is prohibited, set *_P1(orP2)_SgwDsblCmd* (Serial Gateway Prohibit Switch (Protocol Macros)) from TRUE to FALSE.

9-3-2 No-protocol Mode

● Reception Failure (SerialRcv or SerialRcvNoClear)

Error conditions			Confirmation of device variable for CJ-series Unit, etc.		Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions				
The serial communications mode is set to a mode other than No-protocol Mode	---	---	Bits 12 to 15 (*Serial communications mode*) of **P1(orP2)_SysSetSta* are set to a value other than 3 hex.		The serial communications mode is not set correctly.	---
The Serial communications mode is set to any of the following modes: Protocol Macro Mode, Serial Gateway Mode, Modbus-RTU Slave Mode, Loopback Test Mode.	---	---	When the SerialRcv or SerialRcvNoClear instruction is executed	Command end code such as 0401 hex (undefined command) is returned.	The serial communications mode is not set correctly.	Set bits 08 to 11 (*Serial communications mode*) of **_P1(orP2)_PortCfg* to 3 hex (*No-protocol Mode*).

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions			
The serial communications mode is set to No-protocol Mode.	---	---	---	A hardware error occurred.	Conduct a loopback test in serial communications mode to check the transmission lines. If an error occurs during the test, replace the Unit.
		---	---	The cables are not connected correctly. The setting of the 2/4-wire switch for the RS-422A/485 port does not match the actual wiring. The wiring of adapters such as the NT-AL001 is incorrect.	Check the wiring. Check the setting of the 2/4-wire switch. Wire all nodes by using the 4-wire method.
		---	*_P1(orP2)_HlkCTSCtlCfg* (CTS Control) is TRUE, but *_P1(orP2)_SigCSSta* (CS signal) is FALSE.	CTS control is set, but the Remote Unit's RTS (RS) signal is not input in the Local Unit's CTS (CS) signal.	Perform either of the following: • Loop the RTS (RS) -CTS (CS) signals of the Local Unit. • Disable CTS control. • Input the RTS (RS) signal from Remote Unit to the CTS (CS) signal of the Local Unit and use CTS control.
	The RD□ indicators flash but communications are not always possible.	A transmission error occurred.	*_P1(orP2)_TransErr* (Transmission Error) or *_P1(orP2)_OverRunErr* (Overrun Error) is TRUE.	The settings in the System Settings such as baud rate and frame format do not match those of the remote device. The baud rate is outside the permissible range, or the bits such as stop bits are misaligned.	Correct the System Settings. Revise the remote device settings and program (e.g., baud rate, frame format)

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions			
The serial communications mode is set to No-protocol Mode.	---	With Unit: The SerialRcv or SerialRcvNoClear instruction was executed, but data was not received.	The *Error* output variable from the SerialRcv or SerialRcvNoClear instruction is TRUE.	• This instruction was executed when the Serial Communications Mode was not No-protocol Mode. • *_Port_isAvailable* is set to FALSE. • The value of *Port.UnitNo* or *Port.PhysicPortNo* is out of the valid range. • The Serial Communications Unit is not mounted at the specified Unit number. • The value of *StoreSize* is out of valid range. • The value of *StoreSize* exceeds the size in *DstDat[]*. • This instruction was executed while the unit was restarting.	• Review the settings in the SerialRcv or SerialRcvNoClear instruction. • Review the program for instances where the causes specified on the left might occur.
				Command end code: 2201 hex (not possible during execution) was returned. If the SerialRcv or SerialRcvNoClear instruction was executed, the operation is disabled because the port is busy receiving data.	Insert an AND in the input condition for a Network Communications Instruction Enabled Flag (*_Port_isAvailable*).
				Command end code: 2202 hex (not possible while stopped) was returned. Execution is not possible while the protocol is switched.	Insert an AND in the input condition for an N.C. of the Serial Communications Unit's Port 1/2 Settings Changing Flag (*_CJB_SCU**P1(orP2)ChgSta:* Unit number **).

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions			
The serial communications mode is set to No-protocol Mode.	---	---	Overrun Error *_P1(orP2)_OverRunErr* is TRUE.	The reception buffer received more than 259 bytes of data before the SerialRcv or SerialRcvNo-Clear instruction was executed.	Cycle the power or restart the Unit and clear the reception buffer. The Overrun Error Flag is turned to FALSE when the reception buffer is cleared.
		---	The Reception Overflow Flag is ON. *_P1(orP2)_NopRcvOvfSta* is TRUE.	After reception was completed (after the Reception Completed Flag turned ON), further data was received (1 byte or more).	After data reception is completed (i.e., after the Reception Completed Flag changes to TRUE), execute the SerialRcv or SerialRcvNo-Clear instruction again.
		---	The Reception Completed Flag is OFF. *_P1(orP2)_NopRcvCompleteSta* is FALSE.	Reception for the SerialRcv or SerialRcvNoClear instruction was not completed. One of the following is the cause.	---
				The start code/end code setting is incorrect.	Revise the settings for the Start Code/End Code in *_P1(orP2)_NopStartCodeCfg* (No-protocol Start Code), *_P1(orP2)_NopEndCodeCfg* (No-protocol End Code).
				No data was received.	
				The specified number of data bytes was not received.	Revise the specified number of receive data bytes in *_P1(orP2)_NopRcvDatSzCfg* (Number of Receive Data Bytes in No-protocol Mode).
				Overrun error (The reception buffer received more than 259 bytes of data before the SerialRcv or SerialRcvNoClear instruction was executed.)	Cycle the power or restart the Unit to clear the reception buffer. The Overrun Error Flag is turned to FALSE when the reception buffer is cleared.
		---	---	A hardware error occurred in the reception circuit of the Unit.	Conduct a loopback test in serial communications mode to check the transmission lines. If an error occurs during the test, replace the Unit.

● Transmission Failure (SerialSend Instruction)

Error conditions			Confirmation of device variable for CJ-series Unit, etc.		Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions				
Serial communications mode is No-protocol Mode.	---	---	Bits 12 to 15 (*Serial communications mode*) of **P1(orP2)_SysSetSta* are set to a value other than 3 hex.		The serial communications mode is not set correctly.	---
Protocol Macro Mode, Serial Gateway Mode, Modbus-RTU Slave Mode or Loopback Test Mode	---	---	During execution of the SerialSend instruction	Command end code such as 0401 hex (undefined command) is returned.	The serial communications mode is not set correctly.	Set bits 08 to 11 (*Serial communications mode*) of **_P1(orP2)_PortCfg* to 3 hex (*No-protocol Mode*).
The serial communications mode is set to No-protocol Mode.	The SD□ indicators do not flash at all. (Communications were not electrically established.)	---	---		A hardware error occurred.	Set the serial communications mode to Loopback Test Mode and check the transmission lines. If an error occurs during the test, replace the Unit.
		---	---		The cables are not connected correctly. The setting of the 2/4-wire switch for the RS-422A/485 port does not match the actual wiring. The wiring of adapters such as the NT-AL001 is incorrect.	Check the wiring. Check the setting of the 2/4-wire switch. Wire all nodes by using the 4-wire method.
		---	**_P1(orP2)_HlkCTSCtlCfg* (CTS Control) is ON, but **_P1(orP2)_SigCSSta* (CS signal) is FALSE.		CTS control is set, but the Remote Unit's RTS (RS) signal is not input in the Local Unit's CTS (CS) signal.	Perform either of the following: Loop the RTS (RS)-CTS (CS) signals of the Local Unit. Disable CTS control. Input the RTS (RS) signal from the Remote Unit to the CTS (CS) signal of the Local Unit and use CTS control.
	The SD□ indicators flash but communications are not always possible.	A transmission error occurred.	**_P1(orP2)_TransErr* (Transmission error) or **_P1(orP2)_OverRunErr* (Overrun Error) is TRUE.		The settings in the System Settings such as baud rate and frame format do not match those of the remote device. The baud rate is outside the permissible range, or the bits such as stop bits are misaligned.	Correct the system settings. Revise the remote device settings and program (e.g., baud rate, frame format)

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator display	Status and other conditions			
The serial communications mode is set to No-protocol Mode.	---	The SerialSend instruction was executed, but sending was not executed.	The output variable Error of the SerialSend instruction is TRUE.	• This instruction was executed when the Serial Communications Mode was not No-protocol Mode. • *_Port_isAvailable* is set to FALSE. • The value of *Port.UnitNo* or *Port.PhysicPortNo* is out of the valid range. • The Serial Communications Unit is not mounted at the specified Unit number. • The value of *SendSize* is out of valid range. • The value of *SendSize* exceeds the size in *SrcDat[]*. • This instruction was executed while the unit was restarting.	• Review the setting contents for the SerialSend instruction. • Review the program for instances where the causes specified on the left might occur.
				Command end code: 2201 hex (not possible during execution) was returned. If the SerialSend instruction was executed, the operation is disabled because the port was busy while sending.	Insert an AND in the input condition for an N.C. of the SerialSend Executing Flag (**_P1(orP2)_NopSerialSendExecSta*).
				Command end code: 2202 hex (not possible while stopped) was returned. Execution is not possible while the protocol is switched by using the SerialSetUp instruction.	Insert an AND in the input condition for an N.C. of the Serial Communications Unit's Port Settings Change Bit (*_CJB_SCU**P1(orP2)ChgSta:* Unit number **).
	---	---		A hardware error occurred in the transmission circuit.	Conduct a loopback test in serial communications mode to check the transmission lines. If an error occurs during the test, replace the Unit.

9-3-3 Protocol Macros

Error conditions				Cause	Remedy
Serial communications mode	**Indicator display**	**Status information, etc.**	**Confirmation of device variable for CJ-series Unit, etc.**		
Serial communications mode is not set to protocol macro.	---	---	Bits 12 to 15 (*Serial communications mode*) of **P1(orP2)_SysSetSta* are set to a value other than 6 hex.	Serial communications mode is not set correctly.	Set bits 08 to 11 (*Serial communications mode*) of **_P1(orP2)_PortCfg* to 6 hex (*Protocol Macro*).
	The SD□/RD□ indicators do not flash at all. (Communications was not electrically established.)	The ExecPMCR instruction is executed, but **_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag) is not set to TRUE.	As ExecPMCR instruction execution conditions, **_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag) is used as N.O.	The program is incorrect.	As ExecPMCR instruction execution conditions, use **_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag) as N.C.
			The output variable Error of the Exec PMCR instruction is TRUE.	• This instruction was executed when the Serial Communications Mode was not Protocol Macro Mode. • The value of *_Port_isAvailable* is set to FALSE. • The value of *SeqNo* is out of valid range. • The value of *Port.UnitNo* or *Port.PhysicPortNo* is out of the valid range. • The Serial Communications Unit is not mounted at the specified Unit number. • The value of *SrcDat[0]* exceeds the size in *SrcDat[]*. • The value of *DstDat[0]* exceeds the size in *DstDat[]*. • The value of *SrcDat[0]* or *DstDat[0]* exceeds 250 words. • The user-defined variable of *DstDat[]* is not AT specified. • The AT specified address of the user-defined variable of *DstDat[]* does not match the address specified in the protocol macro.	• Check the ExecPMCR instruction I/O variable settings for errors. • Review the program for instances where the causes specified on the left might occur.

Note 1 The System Settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

2 For details on the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

Error conditions				Cause	Remedy
Serial communications mode	Indicator display	Status information, etc.	Confirmation of device variable for CJ-series Unit, etc.		
Serial communications mode is set to protocol macro.	The SD□/RD□ indicators do not flash at all. (Communications was not electrically established.)	The ExecPMCR instruction is executed, but *_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag) is not set to TRUE.	Bits 00 to 03 (Protocol macro error code) of *_P1(orP2)_PmrSta* are set to 2 hex (*Sequence No. error*).	The sequence number specified in the ExecPMCR instruction input variable SeqNo is a value other than 000 to 999 in decimal notation. The specified communications sequence number does not exist in the protocol data.	Set the ExecPMCR instruction input variable SeqNo to a value between 000 to 999 in decimal notation. Check whether the communications sequence number is correct.
			Bits 00 to 03 (Protocol macro error code) of *_P1(orP2)_PmrSta* are set to 4 hex (*Protocol data syntax error*).	The protocol data in the Unit is incorrect.	Use CX-Protocol to correct and transfer the protocol data.
			As ExecPMCR instruction execution conditions, the Network Communications Instruction Enabled Flag (*_Port_isAvailable*) is used as N.C.	The program is incorrect.	As ExecPMCR instruction execution conditions, set the Network Communications Instruction Enabled Flag (*_Port_isAvailable*) to an N.O.
			_P1(orP2)_Operating Sta (Port Operating Status) remains FALSE (*Port stopped*).	Protocol data is being transferred, or a SUM value error occurred.	Wait for the transfer of protocol data to finish or use CX-Protocol to transfer the protocol data.
		_P1(orP2)_PmrExecSta (Protocol Macro Executing Flag) is set to TRUE when the SendPMR instruction is executed, but data can not be properly sent or received.	Send processing is not executed.	The send wait time specified in communications sequence step units is too long.	Use CX-Protocol to check whether the send wait time is correctly set.
			_P1(orP2)_RmtBusySta (Remote Unit Busy) is set to TRUE (*Remote Unit busy*).	The CTS (CS) signal from the Remote Unit cannot be set to TRUE (the Remote Unit remains in busy status) because the transmission control parameter RS/CS Flow Control is set to "yes".	Release the Remote Unit busy status to enable the Local Unit CTS (CS) signal to set to TRUE.
			_P1(orP2)_PmrSeqWaitSta (Sequence Wait Flag) is set to TRUE (*Sequence wait status*).	Wait command can not be canceled.	Review the program so that *_P1(orP2)_PmrWaitRlsCmd* (Wait Release Switch) is changed to TRUE.
	The SD□/RD□ indicators do not flash at all. (Communications was not electrically established.)	*_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag) either is changed to ON momentarily when the ExecPMCR instruction is executed, or it is not changed to ON at all.	*_P1(orP2)_PmrAbtCmd* (Abort Switch) is force-set.	Abort Switch is force-set.	Release the Abort Switch.

Note 1 The System Settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

2 For details on the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

Error conditions				Cause	Remedy
Serial communications mode	**Indicator display**	**Status information, etc.**	**Confirmation of device variable for CJ-series Unit, etc.**		
Serial communications mode is set to protocol macro.	The SD□/RD□ indicators flash, but the Unit cannot perform communications.	*_P1(orP2)_PmrSeqAbtSta* (Sequence Abort Completion Flag) is set to TRUE.	The sequence is aborted (the step is interrupted).	Protocol macro data is not set correctly. The system settings such as the baud rate and frame format differ from those of the Remote Unit.	Use CX-Protocol transmission line trace to check whether the protocol data and System Settings are correct.
		_P1(orP2)_PmrExecSta (Protocol Macro Executing Flag) remains ON when the Exec PMCR instruction is executed without setting the monitoring time in sequence units.	The sequence is running and does not end (in receive status).		
		Send data was transmitted, but there is no response from the Remote Unit.	The contents of *_P1(orP2)_SysSetSta* (System Settings) do not match those of the Remote Unit.	The baud rate is outside the allowable range, or there are bit errors due to mismatched stop bits and so on.	Review the System Settings. Review the Remote Unit settings and the program (including the baud rate, frame format, and so on).
			• *_P1(orP2)_TransErr* (Transmission error) is set to TRUE. • The error for any of the *P1(orP2)_TransErrSt* a bits 0 to 14 is set to TRUE.	The wiring is faulty. The setting of the 2/4-wire switch for the RS-422A/485 port does not match the actual wiring. The wiring of adapters such as the NT-AL001 is faulty.	Check the wiring. Set the terminating resistance switch of the Unit and remote unit at the end to ON. Set the terminating resistance of other units to OFF.
			---	This is a hardware error.	Set bits 08 to 11 (*Serial communications mode*) of *_P1(orP2)_PortCfg* to F hex (Loopback Test), connect the connector wired for a loopback test, then set *_P1(orP2)_LbtTestTrigCmd* to TRUE to conduct a loopback test. The test data is reflected in *_P1(orP2)_PmrSta*. If an error occurs during the test, replace the Unit. (The loopback test result is also reflected in *_P1(orP2)_LbtSta*.)
	The SD□/RD□ indicators flash, but the Unit cannot perform communications or a communications error sometimes occurs.	A transmission error occurs.	• *_P1(orP2)_TransErrSta* (Transmission Error Status) is set to TRUE. • The error for any of bits 0 to 14 is set to TRUE.	The system settings such as the baud rate and frame format differ from those of the Remote Unit. The baud rate is outside the allowable range, or there are bit errors due to mismatched stop bits and so on.	Review the system settings. Review the Remote Unit settings and the program (including the baud rate, frame format, and so on).

Note 1 The System Settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

2 For details on the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

Error conditions				Cause	Remedy
Serial communications mode	**Indicator display**	**Status information, etc.**	**Confirmation of device variable for CJ-series Unit, etc.**		
Serial communications mode is set to protocol macro.	The SD□/RD□ indicators flash, but the Unit cannot perform communications or a communications error sometimes occurs.	A transmission error occurs.	The contents of **_P1(orP2)_SysSetSta* (System Settings) do not match those of the Remote Unit.	The Setup Area settings such as the baud rate and frame format differ from those of the Remote Unit. The baud rate is outside the allowable range, or there are bit errors due to mismatched stop bits and so on.	Review the Setup Area settings. Review the Remote Unit settings and the program (including the baud rate, frame format, and so on).
		Data is received through CX-Protocol transmission line trace, but the protocol macros behave as if no data is received.	---	Because response from the Remote Unit in half-duplex mode is received too fast, the data received from the time the data send processing was completed until the Send operation was completed is discarded.	Use full-duplex mode.
		The Remote Unit sometimes returns no response to sent data. The Unit receives responses by performing retries.	---	The transmission timing is too fast for the Remote Unit to receive data.	Set or increase the transmission wait time (time to await data transmission) in step units.
		A transmission error sometimes occurs.	• **_P1(orP2)_TransErr* (Transmission error) is set to TRUE. • The error for any of bits 0 to 14 is set to TRUE.	The wiring is faulty. The RS-422A/485 port terminating resistance setting is incorrect. Adapters such as the NT-AL001 are incorrectly wired, or the terminating resistance setting is incorrect.	• Check the wiring. • Set the terminating resistance switch of the Unit and remote unit at the end to ON. Set the terminating resistance of other units to OFF.
				A communications error frequently occurs due to noise and so on.	Use shielded twisted pair cables. House the communications cables in a different duct from those for power lines and so on. Review the operating environment to prevent noise problems. Program retry processing for communications if necessary.
	The RDY and ERC indicators flash (ERR/ALM).	---	**_Com_UnitPmrDatErr* (Protocol Data Error) is set to TRUE.	The protocol macro data SUM value is abnormal.	Use CX-Protocol to transfer the correct protocol data.
	The RDY indicator is lit and the ERC indicator flashes (ERR/ALM).	---	Bits 00 to 03 (Protocol macro error code) of **_P1(orP2)_PmrSta* are set to a value other than 0 hex. (An error occurred)	An error was detected in the protocol macros, which makes operation impossible.	Refer to *Remedy for Each ErrorIDEx Code*.

Note 1 The System Settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

2 For details on the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

Remedy for Each *ErrorIDEx* Code

The following table shows the measures to correct the errors indicated by the ExecPMCR instruction output variable *ErrorIDEx* (Communications Response Code).

Value	Error details	Remedy
16#00001106	The SeqNo values are the communications sequence numbers that are not registered.	Correct the communications sequence number or add a sequence by using CX-Protocol.
16#00002201	This instruction is being executed. TRUE corresponds to the value for Busy.	Add an N.C. for *_P1(orP2)_PmrExecSta* (Protocol Macro Executing Flag).
16#00002202	Execution is not possible because the protocol is being switched.	Add an N.C. for *_CJB_SCU**P1ChgSta* (Serial Communications Unit **, Port1 Settings Changing Flag)
16#00002401	A SUM error occurred with the protocol macro data, or the data is being transferred.	Use CX-Protocol to transfer the correct protocol macro (communications sequence) data.

Remedy for Each Protocol Macro Error Code

The following table shows the measures to correct the errors indicated in bits 00 to 03 (*Error code*) of **_P1(or P2)_PmrSta.*

Error code	Indicator	Error details	Cause	Remedy
0 Hex	No display	Normal	---	---
1 Hex	No display	Reserved	---	---
2 Hex	No display	Sequence number error	The communications sequence number specified in the Exec PMCR instruction's SeqNo operand which is not registered.	Correct the communications sequence number. Use CX-Protocol to register the specified communications sequence number.
3 Hex	ERC: Flashing ERR/ALM: Flashing	Data read/write range error	The data range of the specified area is exceeded when data is written to or read from the CPU Unit.	For operand specification: Check the in-out variable settings for the ExecPMCR instruction. For direct specification of link words: Use CX-Protocol to check the specified range.
4 Hex	ERC: Flashing ERR/ ALM: Flashing	Protocol data syntax error	There is a code that cannot be executed during protocol execution.	Check the following items and correct the problem. • Check whether the total specified number of link words in the area (O1, O2, I1, I2) exceeds 500 words. • The same area with link word specification is used by both ports 1 and 2. • A write instruction with constant specification is specified. • An interrupt notification is specified at the Unit. • There are more than 30 write attributes set for one message. • The length of a send/receive message is set to 0 bytes. • The length of a send/receive message is longer than the maximum send/receive message bytes setting. • No messages are registered for matrix reception. • Both RTS/CTS flow control and Xon/Xoff flow control are set for the same transmission line.

Note For details on the protocol macros, refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344).

9-3-4 Modbus-RTU Slave Mode

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator status	Status information, etc.			
Serial communications mode is not set to Modbus-RTU Slave Mode.	---	---	Bits 12 to 15 (*Serial communications mode*) of **_P1(orP2)_SysSetSta* are set to a value other than A hex.	Serial communications mode is not set correctly.	Set bits 08 to 11 (*Serial communications mode*) of **_P1(orP2)_PortCfg* to A hex (*Modbus-RTU Slave Mode*).
Serial communications mode is set to Modbus-RTU Slave Mode.	The SD□/RD□ indicators do not flash at all. (Communications were not electrically established.)	---	---	Cables are incorrectly connected. The RS-422A/485 port setting (2-wire or 4-wire) is incorrect. Adapters such as the NT-AL001 are incorrectly wired or set.	Check the wiring. Check the setting of the 2/4-wire switch. Wire all nodes by using the 4-wire method.
				Commands are not sent from the host.	Reset the serial port at the host, and rewrite the program.
				A hardware error occurred.	Set bits 08 to 11 (*Serial communications mode*) of **_P1(orP2)_PortCfg to Loopback Tast Mode* and conduct a loopback test by setting **_P1(orP2)_LbtTestTrigCmd* to TRUE. The test data is reflected in **_P1(orP2)_LbtSta*. If an error occurs during the test, replace the Unit.
	The RD□ indicators flash, but the response was not returned from the host. The SD□ indicator does not flash at all. (Communications were electrically established.)	There is no transmission error.	• **_P1(orP2)_TransErrSta* (Transmission Error Status) is set to 0000 hex. • The settings in **_P1(orP2)_SysSetSta* (System Setting) do not match the settings for those of the remote device.	**_P1(orP2)_MbsSlavAdrCfg* (Modbus-RTU Slave Address) of the Unit does not correspond to the settings for the remote device. The command format and data length of the data sent from the host are incorrect.	• Correct the setting in **_P1(orP2)_MbsSlavAdrCfg* (Modbus-RTU Slave Address). • Correct the command frame (destination Modbus slave address) and the program.

Note The system settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator status	Status information, etc.			
Serial communications mode is set to Modbus-RTU Slave Mode.	The RD□ indicators flash, but the response was not returned from the host. The SD□ indicator does not flash at all. (Communications were electrically established.)	There is no transmission error.	---	Cables are incorrectly connected. The RS-422A/485 port setting (2-wire or 4-wire) is incorrect. Adapters such as the NT-AL001 are incorrectly wired or set.	Check the wiring.
				This is a transmission circuit hardware error.	Conduct a loopback test to check the transmission lines. If an error occurs during the test, replace the Unit.
				The destination Modbus slave address in the command frame is set to 0, i.e., it is set for a broadcast.	Correct the destination Modbus slave address in the command frame.
		There is a transmission error.	*_P1(orP2)_TransErr* (Transmission error) is set to TRUE, or any of *_P1(orP2)_OverRunErr* (Overrun Error), *_P1(orP2)_FramingErr* (Framing Error), *_P1(orP2)_ParityErr* (Parity Error), *_P1(orP2)_FCSErr* (FCS Check Error) is set to TRUE.	The communications conditions and baud rate do not match the settings at the host.	Review the System Settings, the host's settings and program (such as commands and frame format) based on the response contents, and the transmission error codes in *_P1(orP2)_TransErrSta* (Transmission Error Status).
				There is noise interference.	Use shielded twisted-pair cables. Lay power lines separately by using ducts. Review the installation environment to reduce noise interference.
				There is an error in the CRC code appended to the host command frame.	Append the correct CRC code.

Note The system settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

Error conditions			Confirmation of device variable for CJ-series Unit, etc.	Cause	Remedy
Serial communications mode	Indicator status	Status information, etc.			
Serial communications mode is set to Modbus-RTU Slave Mode.	The RD□/SD□ indicators flash, and an error response was returned to the host.	There is no transmission error.	*_P1(orP2)_TransErrSta (Transmission Error Status) is set to 0000 hex.	A command was sent from the host with incorrect parameters.	Review the host's settings and program (such as parameter settings) based on the response contents.
		There is a transmission error.	*_P1(orP2)_TransErr (Transmission error) is set to TRUE, or any of *_P1(orP2)_OverRunErr (Overrun Error), *_P1(orP2)_FramingErr (Framing Error), *_P1(orP2)_ParityErr (Parity Error), *_P1(orP2)_FCSErr (FCS Check Error) is set to TRUE.	The communications conditions and baud rate do not match the settings at the host.	Review the System Settings, the host's settings and program (such as commands and frame format) based on the response contents, and the transmission error codes in *_P1(orP2)_TransErrSta (Transmission Error Status).
	The RD□/SD□ indicators flash, but sometimes there is no response returned.	There is a transmission error sometimes.	*_P1(orP2)_TransErr (Transmission error) is set to TRUE, or any of *_P1(orP2)_OverRunErr (Overrun Error), *_P1(orP2)_FramingErr (Framing Error), *_P1(orP2)_ParityErr (Parity Error), *_P1(orP2)_FCSErr (FCS Check Error) is set to TRUE.	The baud rate is outside the allowable range, and the stop bits do not match, which causes the bits to be out of alignment.	Review the System Settings. Review the host's settings and program (such as baud rate and frame format).
		There is a transmission error sometimes.	Terminating resistance switch (TERM ON/OFF) status	Cables are incorrectly connected. The RS-422A/485 port terminating resistance setting is incorrect. Adapters such as the NT-AL001 are incorrectly wired or the terminating resistance is incorrectly set.	Check the wiring. Turn ON the terminating resistance at two last locations (host side or Unit side). Turn OFF the terminating resistance of other Units.
		There is a transmission error sometimes.	*_P1(orP2)_TransErrSta (Transmission Error Statsu) is not set to 0000 hex.	Transmission errors occur that are caused by noise interference.	Use shielded twisted-pair cables. Lay power lines separately by using ducts. Review the installation environment to reduce noise interference. Programming retry processing for communications if necessary.

Note The system settings can not be changed unless the power supply is cycled, the Unit is restarted, or the port is restarted. Refer to *1-8 Basic Operating Procedure* for details.

9-4 Error Logs

The error log function records the errors detected in the Serial Communications Unit together with the time that the error occurred.

You can read or clear the recorded results (error logs) by using CX-Integrator. For the operation to confirm the error log by using CX-Integrator, refer to the *CX-Integrator Ver.2.□OPERATION MANUAL* (Cat. No. W464).

9-4-1 Error Log Data

Structure of Error Log Data

- **Error**

  Description of the error that occurred.

- **Detailed Information**

  Detailed information used in the troubleshooting of each error that occurred.

  For the error descriptions and detailed information, refer to *9-4-2 Error Contents and Details.*

- **Time of Error**

  The time the error occurred is recorded including the year (rightmost two digits), month, day, hour, minute and second.

Additional Information

The Serial Communications Unit uses the time information read from the CPU Unit.

If the time cannot be read from the CPU Unit, the time of the error in the error log will be recorded as all zeros.

If the built-in clock time is not set correctly, the time recorded in the error log will be incorrect. When the error log is read, the time will be irregular.

Error Log Data Storage Location

- **RAM Error Log Data**

  For every error that occurs, one record is logged in the RAM error log table in the Unit for up to 64 errors.

- **EEPROM Error Log Data**

  Records of errors that are particularly serious are logged in both the RAM error log table and the EEPROM error log table in the Unit when they occur. The contents of errors logged in the EEPROM error log table remain even if the power to the Unit is turned OFF or the Unit is restarted. The contents of the EEPROM error log table are automatically read to the RAM error log table when the Controller is reset. One record is logged in the EEPROM error log table for each error that occurs for up to 32 errors max.

  Once the stored data reaches the upper limit (64 records in the case of RAM or 32 records in the case of EEPROM), the oldest record will be deleted every time a new record is stored.

9-4-2 Error Contents and Details

Error code	Error contents	Details		Stored in EEPROM
		First byte	Second byte	
0001 Hex	CPU Unit watchdog timer error	Always 00 Hex	Always 00 Hex	Yes
0002 Hex	CPU Unit service monitoring error	Monitoring time (Unit: 1 ms)		Yes
0006 Hex	Other CPU Unit errors	Bit 11: The unit number is not included in the Unit Configuration in the CPU Unit. Other bits not used.		Yes
000F Hex	CPU Unit initial processing error	Always 00 Hex	Always 00 Hex	Yes
0011 Hex	CPU Unit initial processing error	Not fixed	Not fixed	Yes
0012 Hex	CPU Unit memory error	01 Hex: Read error 02 Hex: Write error	03 Hex: Routing tables 05 Hex: System Settings Data for the Unit	No
0108 Hex	Send not possible because Unit is not detected	Event Send/Receive Errors Commands: Send source network address < 80 Bit 15: OFF Bits 08 to 14: Send source network address Bits 00 to 07: Send source node address Send source network address ≥ 80 Bit 15: OFF Bits 08 to 14: 00 Bits 00 to 07: Send source network address Responses: Send destination network address < 80 Bit 15: ON Bits 08 to 14: Send destination network address Bits 00 to 07: Send destination node address Send destination network address ≥ 80 Bit 15: ON Bits 08 to 14: 00 Bits 00 to 07: Send destination network address		No
010B Hex	Send not possible due to CPU Unit error			No
010D Hex	Send not possible due to remote address setting error			No
010E Hex	Send not possible because routing tables are not set properly			No
0112 Hex	Send not possible due to header setting error			No
0117 Hex	Internal reception buffer full			No
0118 Hex	Illegal packet discarded			No
011B Hex	Parity error	01 Hex: Port 1 02 Hex: Port 2	Always 00 Hex	No
011C Hex	Framing error			No
011D Hex	Overrun error			No
011E Hex	FCS check error			No
021A Hex	Setting table logic error	Always 00 Hex	03 Hex: Routing tables 05 Hex: System Settings Data for the Unit	No

Error code	Error contents	Details		Stored in EEPROM
		First byte	Second byte	
0300 Hex	Parameter packet discarded	Same contents as event send/receive errors.		No
0301 Hex	Protocol macro operation error	01 Hex: Port 1 02 Hex: Port 2	Protocol macro error code	No
0302 Hex	Illegal protocol packet discarded.	01 Hex: Port 1 02 Hex: Port 2	Always 00 Hex	No
0601 Hex	Unit error	Check the operating environment.		Yes
0602 Hex	Special Unit Memory Error	01 Hex: Read error 02 Hex: Write error	06 Hex: Error log 07 Hex: Protocol data	No

9-4-3 Error Codes and Troubleshooting

Error code	Troubleshooting	Serial communications mode				
		Protocol Macro	Serial Gateway	No-protocol	Loop-back Test	Modbus-RTU Slave
0001 Hex	Replace the CPU Unit.	Yes	Yes	Yes	Yes	Yes
0002 Hex	Check the operating environment.	Yes	Yes	Yes	Yes	Yes
0006 Hex	Check the unit number setting. Recreate the Unit Configuration.	Yes	Yes	Yes	Yes	Yes
000F Hex	Check the operating environment.	Yes	Yes	Yes	Yes	Yes
0011 Hex	Check the operating environment.	Yes	Yes	Yes	Yes	Yes
0012 Hex	Check the relevant data.	Yes	Yes	Yes	Yes	Yes
0014 Hex	Check the operating environment.	Yes	Yes	Yes	Yes	Yes
0108 Hex	Check the unit number setting.	Yes	Yes	Yes	Yes	Yes
010B Hex	Refer to the CPU Unit's operation manual to eliminate the cause of the error. If the error persists, replace the CPU Unit.	Yes	Yes	Yes	Yes	Yes
010D Hex	Set the destination address in the routing tables.	Yes	Yes	Yes	Yes	Yes
010E Hex	Set the destination address in the routing tables.	Yes	Yes	Yes	Yes	Yes
0112 Hex	Make sure to use the command addresses.	No	No	No	No	No
0117 Hex	Increase the number of retries or correct the system so that communications do not jam.	Yes	Yes	Yes	Yes	Yes
0118 Hex	Check whether there is a node sending irregular data.	Yes	No	Yes	Yes	Yes
011B Hex	Correct the transmission method and baud rate settings. Check for noise interference.	No	Yes	Yes	No	Yes
011C Hex	Correct the transmission method and baud rate settings. Check for noise interference.	No	Yes	Yes	No	Yes
011D Hex	Correct the transmission method and baud rate settings.	No	Yes	Yes	No	Yes
011E Hex	Correct the transmission method and baud rate settings. Check for noise interference. Check whether the FCS calculation method is correct.	No	Yes	No	No	Yes
021A Hex	Reset the relevant table.	Yes	Yes	Yes	Yes	Yes
0300 Hex	Conduct a loopback test, and eliminate the cause of the error.	Yes	Yes	Yes	Yes	Yes
0301 Hex	Refer to the *Remedy for Each Protocol Macro Error Code* on page 9-21 to eliminate the cause of the error.	Yes	No	No	No	No
0302 Hex	A new command is received during command processing. Correct the applications at the host computer.	No	No	No	No	No
0601 Hex	Check the operating environment.	Yes	Yes	Yes	Yes	Yes
0602 Hex	Depending on the error details, delete the error log and transfer protocol macro data. If the error persists, replace the Unit.	Yes	Yes	Yes	Yes	Yes

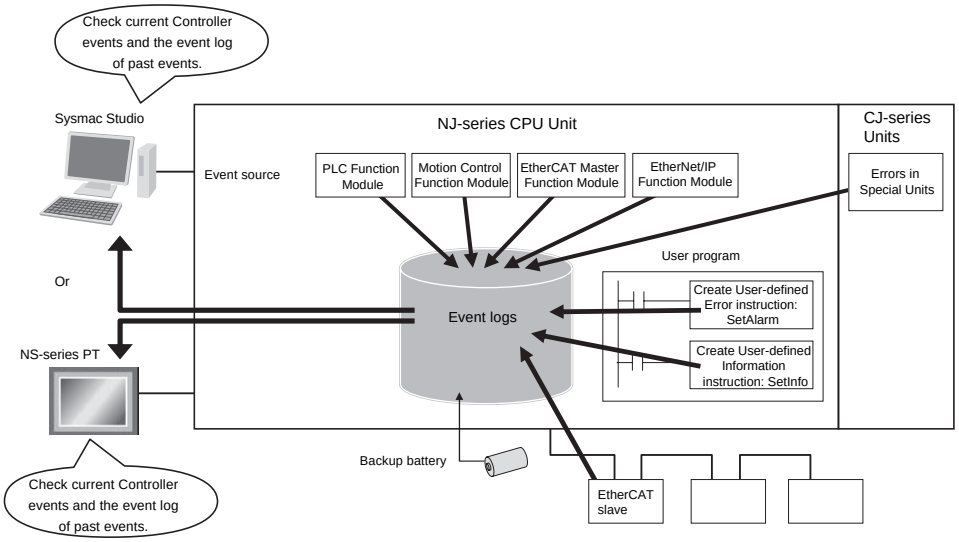
Error code	Troubleshooting	Serial communications mode				
		Protocol Macro	Serial Gateway	No-protocol	Loop-back Test	Modbus-RTU Slave
0111 Hex	Command too long	No	Yes	No	No	No
0122 Hex	Service cannot be executed in current serial communications mode and was discarded.	No	Yes	No	No	No
0107 Hex	There is no remote device.	No	Yes	No	No	No

9-5 Event Logs

9-5-1 Overview of the Event Logs

You use the same methods to manage all of the events that occur on the NJ-series Controller. (The events include errors and information.) You can use the Sysmac Studio or an NS-series PT to confirm current Controller events and the logs of events that have occurred. These logs are called event logs. Controller errors that occur for this Unit are also reported as events in the NJ-series CPU Unit.

Refer to the *NJ-series CPU Unit Software User's Manual* (Cat. No. W501) for details on the event logs in an *NJ-series CPU Unit.* Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for details on Controller errors, confirmation methods, and corrections.



To use an NS-series PT to check events, connect the PT to the built-in EtherNet/IP port on the CPU Unit.

9-5-2 Error Table

The errors that may occur for this Unit are listed below. Event levels are given in the table as follows:

Maj: Major fault level

Prt: Partial fault level

Min: Minor fault level

Obs: Observation

Info: Information

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for all of the event codes that may occur in an NJ-series Controller.

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
04740000 hex	Error Log Data Error	An error occurred in the error log data.	• There is a source of noise nearby. • Non-volatile memory failure			√			page 9-37
14800000 hex	Protocol Data Error	A protocol data checksum error has occurred.	• The communications connector with the CX-Protocol was disconnected or the power supply to the Controller was interrupted during transfer of the protocol data from the CX-Protocol. • The Serial Communications Unit failed.			√			page 9-37
34A40000 hex	System Setup Error	There is an error in the system settings for the Serial Communications Unit.	• There is an error in the system settings for the Serial Communications Unit.			√			page 9-38
04750000 hex	DTR Check Error	An error was found during the DTR check.	• Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.				√		page 9-38
04760000 hex	CTS Check Error	An error was found during the CTS check.	• Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.				√		page 9-39
54A80000 hex	Command Error	A command error occurred.	• The constant in the expected receive message that is set in the protocol macro is different from the constant in the message that was received.				√		page 9-40
54A90000 hex	Sequence Abort Completed	The sequence was ended by an Abort setting for the next processing or error processing.	• The protocol macro data is not set correctly. The baud rate, frame format, or other system setting does not agree with the remote node.				√		page 9-40

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	

54AA0000 hex	Protocol Macro Error	An error occurred in the protocol macro.	• Sequence No. Error: An unregistered number was specified for *SeqNo* (communications sequence number) of the ExecPMCR instruction (no indicators light).
			• Data read/write area exceeded error: The specified area range was exceeded when data was written to or read from the CPU Unit. (The ERC indicator and ERR/ALM indicator will flash.)
			• Protocol data syntax error: There was a code that cannot be executed during protocol execution. (The ERC indicator and ERR/ALM indicator will flash.)
			  • The total of the areas specified for link words O1, O2, I1, and I2 exceeded 500 words.
			  • The same link word is used by both ports 1 and 2.
			  • Writing was specified with a constant.
			  • Interrupt notification was specified for a Serial Communications Unit.
			  • Thirty one or more items were set for the write attribute data for one message.
			  • A length of 0 bytes was specified for a message that was sent or received.
			  • The length of a message to be sent or received exceeds the maximum send/receive bytes.
			  • A message is not registered for matrix reception.
			  • The transmission control is set to both RTS/CTS flow control and Xon/Xoff flow control.
							√		page 9-41

64A00000 hex	Tfs (Send Finished Monitoring Time) Exceeded	The time required to complete a send operation exceeded the Send Finished Monitoring Time.	• Noise • The monitor time is shorter than the actual completion time.				√		page 9-42
64A10000 hex	Tfr (Receive Finished Monitoring Time) Exceeded	The time required to complete a reception operation exceeded the Receive Finished Monitoring Time.	• Noise • The monitoring time is shorter than the actual completion time.				√		page 9-42
64A20000 hex	Tr (Receive Wait Monitoring Time) Exceeded	The receive waiting time exceeded the Receive Wait Monitoring Time.	• Noise • The monitoring time is shorter than the actual completion time.				√		page 9-43

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
64A30000 hex	FCS Check Error	One of the following errors occurred in the converted protocol at the serial gateway. • When converting to CompoWay/F command: BCC error • When converting to Modbus-RTU command: CRC error • When converting to Modbus-ASCII command: CRC error • When converting to Host Link FINS command: FCS error Protocol Macros • The check code attached to the received message does not match the check code that was calculated from the received message.	• Noise • There was a mistake in the CRC code that was attached to the command frame.				√		page 9-43
64A40000 hex	Timeout Error	A timeout error occurred.	• The steps in the communications sequence of a protocol macro are not progressing. • There is no remote device to receive the command. • The command frame is incorrect. • The remote device is not using the same serial communications settings. • Wiring is not correct or terminating resistance is not set correctly. • The remote device could not interpret the protocol command. • The response from the remote device was sent too soon. • The response timeout monitoring time of the serial gateway is too short. • The loopback test jig failed. • The communications circuits in the Serial Communications Units are faulty. • A serial gateway interrupted processing between protocol macro steps. • Noise occurred. • The Serial Communications Mode setting is incorrect.				√		page 9-44

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
64A50000 hex	Comparison Error	A comparison error occurred.	• Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.				√		page 9-46
64A60000 hex	Reception Overflow	More than the specified amount of receive data was received in No-protocol Mode.	• One or more bytes of data was received after the completion the reception.				√		page 9-46
64A70000 hex	Command Format Error	An illegal function code or address was specified in a received Modbus-RTU command.	• An illegal function code, address, or data was specified in a received Modbus-RTU command.				√		page 9-47

84680000 hex	Transmission Error	A transmission error occurred.	• One of the following errors occurred.
			  • Tfs (Send Finished Monitoring Time) Exceeded
			  • Tfr (Receive Finished Monitoring Time) Exceeded
			  • Tr (Receive Wait Monitoring Time) Exceeded
			  • FCS Check Error
			  • Command Error
			  • Timeout Error
			  • Overrun Error
			  • Framing Error
			  • Parity Error
							√		page 9-47

84690000 hex	Overrun Error	An overrun occurred.	• In Serial Gateway Mode or Protocol Macro Mode:
			  • The reception circuits in the Serial Communications Unit are faulty.
			  • A transmission error occurred due to noise or other factors.
			• No-protocol Mode:
			  • The reception buffer received more than 259 bytes of data before the SerialRcv/SerialRcvNoClear instruction was executed.
			• During Loopback Test
			  • Loopback test jig failure.
			  • Noise
			  • The communications circuits in the Serial Communications Unit are faulty.
							√		page 9-48

846A0000 hex	Framing Error	A frame error occurred.	• In Serial Gateway Mode or Protocol Macro Mode:
			  • The reception circuits in the Serial Communications Unit are faulty.
			  • A transmission error occurred due to noise or other factors.
			• During Loopback Test
			  • Loopback test jig failure.
			  • Noise
			  • The communications circuits in the Serial Communications Unit are faulty.
							√		page 9-49

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	

846B 0000 hex	Parity Error	A parity error occurred.	• In Serial Gateway Mode or Protocol Macro Mode:
			  • The reception circuits in the Serial Communications Unit are faulty.
			  • A transmission error occurred due to noise or other factors.
			• During Loopback Test
			  • Loopback test jig failure.
			  • Noise
			  • The communications circuits in the Serial Communications Unit are faulty.
							√		page 9-50

846C 0000 hex	Overrun Error, Framing Error, or Parity Error (Transmission Error)	An overrun error, framing error, or parity error occurred.	• The communications conditions and baud rate settings do not match the host. • Noise or other external interference. • The baud rate is outside the allowable range or there are bit errors due to different stop bit settings or other parameters. • The communications cable wiring is faulty. • Terminating resistance is not set correctly for the RS-422A/485 ports. • Wiring is faulty or terminating resistance is not set correctly on an NT-AL001 or other Adapter.				√		page 9-51
846D 0000 hex	Transmission Error (CRC Error)	A CRC error occurred.	• Noise • CRC calculation method does not match the device.				√		page 9-52

9-5-3 Error Descriptions

This section describes the information that is given for individual errors.

Controller Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

<table>
<tr><td>Event name</td><td colspan="3">Gives the name of the error.</td><td>Event code</td><td colspan="2">Gives the code of the error.</td></tr>
<tr><td>Meaning</td><td colspan="6">Gives a short description of the error.</td></tr>
<tr><td>Source</td><td colspan="2">Gives the source of the error.</td><td>Source details</td><td>Gives details on the source of the error.</td><td>Detection timing</td><td>Tells when the error is detected.</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Tells the level of influence on control.*1</td><td>Recovery</td><td>Gives the recovery method.*2</td><td>Log category</td><td>Tells which log the error is saved in.*3</td></tr>
<tr><td>Effects</td><td>User program</td><td>Tells what will happen to execution of the user program.*4</td><td>Operation</td><td colspan="3">Provides special information on the operation that results from the error (event).</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="6">Lists the variable names, data types, and meanings for system-defined variables that provide direct error notification, that are directly affected by the error, or that contain settings that cause the error.</td></tr>
<tr><td rowspan="2">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="6">Lists the possible causes, corrections, and preventive measures for the error.</td></tr>
<tr><td>Attached information</td><td colspan="6">This is the attached information that is displayed by the Sysmac Studio or an NS-series PT.</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">Provides precautions, restrictions, and supplemental information.</td></tr>
</table>

*1 One of the following:
Major fault: Major fault level
Partial fault: Partial fault level
Minor fault: Minor fault level
Observation
Information

*2 One of the following:
Automatic recovery: Normal status is restored automatically when the cause of the error is removed.
Error reset: Normal status is restored when the error is reset after the cause of the error is removed.
Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.
Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.
Depends on cause: The recovery method depends on the cause of the error.

*3 One of the following:
System: System event log
Access: Access event log

*4 One of the following:
Continues: Execution of the user program will continue.
Stops: Execution of the user program stops.
Starts: Execution of the user program starts.

Error Descriptions

Event name	Error Log Data Error			Event code	04740000 hex	
Meaning	An error occurred in the error log data.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	Continuously
Error attributes	Level	Minor fault	Recovery	Cycle the power supply.	Log category	System
Effects	User program	Continues.	Operation	The Unit will stop if the error was detected in the self check when the power supply was cycled or the Controller was reset. Operation continues if the error occurs during operation.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	There is a source of noise nearby.		Implement noise countermeasures.		Use the Unit away from sources of noise.	
	Non-volatile memory failure		If the above cause does not apply, replace the Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	Protocol Data Error			Event code	14800000 hex	
Meaning	A protocol data checksum error has occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	At power ON or Controller reset
Error attributes	Level	Minor fault	Recovery	Cycle the power supply or reset the Controller.	Log category	System
Effects	User program	Continues.	Operation	The Serial Communications Unit will not operate in Protocol Macro Mode. This error has no affect on operation in Host Link mode.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	The communications connector with the CX-Protocol was disconnected or the power supply to the Controller was interrupted during transfer of the protocol data from the CX-Protocol.		Transfer the protocol data again from the CX-Protocol.		Do not interrupt the power supply to the Controller during transfer of protocol data.	
	The Serial Communications Unit failed.		If this error occurs after transferring the protocol data again, replace the Serial Communications Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	System Setup Error		Event code	34A40000 hex		
Meaning	There is an error in the system settings for the Serial Communications Unit.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	At power ON or Controller reset
Error attributes	Level	Minor fault	Recovery	Cycle the power supply or reset the Controller.	Log category	System
Effects	User program	Continues.	Operation	Operation will be performed using the default setting for the baud rate if there is an error in the baud rate setting. Communications are not possible if there is an error in other system settings.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	There is an error in the system settings for the Serial Communications Unit.		Check the system settings for the Serial Communications Unit and correct any problems.		Make the correct system settings for the Serial Communications Unit.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	DTR Check Error		Event code	04750000 hex		
Meaning	An error was found during the DTR check.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	During loopback test
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Loopback test jig failure.		Correct any mistakes in wiring the loopback test jig.		Check the wiring of the loopback test jig.	
	Noise		Implement noise countermeasures.		Use the Unit away from sources of noise. Implement noise countermeasures.	
	The communications circuits in the Serial Communications Unit are faulty.		Replace the Unit.		None	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	CTS Check Error			Event code	04760000 hex	
Meaning	An error was found during the CTS check.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	During loopback test
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Loopback test jig failure.		Correct any mistakes in wiring the loopback test jig.		Check the wiring of the loopback test jig.	
	Noise		Implement noise countermeasures.		Use the Unit away from sources of noise. Implement noise countermeasures.	
	The communications circuits in the Serial Communications Unit are faulty.		Replace the Unit.		None	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	Command Error		Event code	54A8 0000 hex	
Meaning	A command error occurred.				
Source	PLC Function Module	Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.	
System-defined variables	Variable	Data type	Name		
	None	---	---		
Cause and correction	Assumed cause	Correction	Prevention		
	The constant in the expected receive message that is set in the protocol macro is different from the constant in the message that was received.	Correct the expected receive message that is set in the protocol macro or the message that is sent by the remote node so that the constant in the message is the same.	Set the system so that the expected receive messages that are set in the protocol macros agree with the messages that are sent by the remote nodes.		
Attached information	Attached information 1: Port number where error was detected				
Precautions/ Remarks	None				

Event name	Sequence Abort Completed		Event code	54A9 0000 hex	
Meaning	The sequence was ended by an Abort setting for the next processing or error processing.				
Source	PLC Function Module	Source details	CJ-series Unit	Detection timing	At protocol macro execution
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.	
System-defined variables	Variable	Data type	Name		
	None	---	---		
Cause and correction	Assumed cause	Correction	Prevention		
	The protocol macro data is not set correctly. The baud rate, frame format, or other system setting does not agree with the remote node.	Check if the protocol data and system settings are set correctly with a transmission line trace from the CX-Protocol.	Correctly set the protocol macro data. Make sure that the baud rate, frame format, and other system settings are the same as for the remote nodes.		
Attached information	Attached information 1: Port number where error was detected				
Precautions/ Remarks	None				

<table>
<tr><td>Event name</td><td colspan="3">Protocol Macro Error</td><td>Event code</td><td colspan="2">54AA0000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">An error occurred in the protocol macro.</td></tr>
<tr><td>Source</td><td colspan="2">PLC Function Module</td><td>Source details</td><td>CJ-series Unit</td><td>Detection timing</td><td>At protocol macro execution</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Observation</td><td>Recovery</td><td>---</td><td>Log category</td><td>System</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">Not affected.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="4">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="2">Sequence No. Error: An unregistered number was specified for SeqNo (communications sequence number) of the ExecPMCR instruction (no indicators light).</td><td colspan="2">Correct the communications sequence number. Register a sequence with the specified number from the CX-Protocol.</td><td colspan="2">Specify a registered sequence number.</td></tr>
<tr><td colspan="2">Data read/write area exceeded error: The specified area range was exceeded when data was written to or read from the CPU Unit. (The ERC indicator and ERR/ALM indicator will flash.)</td><td colspan="2">• For operand specification, review the SrcDat[ ] and DstDat[ ] arrays for the ExecPMCR instruction.
• If a link word or direct specification is used, review the specification range from the CX-Protocol.</td><td colspan="2">Do not exceed the specified area range when you write data to or read from the CPU Unit.</td></tr>
<tr><td colspan="2">Protocol data syntax error: There was a code that cannot be executed during protocol execution. (The ERC indicator and ERR/ALM indicator will flash.)
• The total of the areas specified for link words O1, O2, I1, and I2 exceeded 500 words.
• The same link word is used by both ports 1 and 2.
• Writing was specified with a constant.
• Interrupt notification was specified for a Serial Communications Unit.
• Thirty one or more items were set for the write attribute data for one message.
• A length of 0 bytes was specified for a message that was sent or received.
• The length of a message to be sent or received exceeds the maximum send/receive bytes.
• A message is not registered for matrix reception.
• The transmission control is set to both RTS/CTS flow control and Xon/Xoff flow control.</td><td colspan="2">Check to see if any of the conditions that are given as causes exits and correct any problems.</td><td colspan="2">Check to see if any of the conditions that are given as causes apply.</td></tr>
<tr><td>Attached information</td><td colspan="6">Attached information 1: Port number where error was detected</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">None</td></tr>
</table>

Event name	Tfs (Send Finished Monitoring Time) Exceeded		Event code	64A0 0000 hex	
Meaning	The time required to complete a send operation exceeded the Send Finished Monitoring Time.				
Source	PLC Function Module	Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level: Observation	Recovery	---	Log category	System
Effects	User program: Continues.	Operation	Not affected.		
System-defined variables	Variable	Data type	Name		
	None	---	---		
Cause and correction	Assumed cause	Correction	Prevention		
	Noise	Implement noise countermeasures.	Use the Unit away from sources of noise. Implement noise countermeasures.		
	The monitor time is shorter than the actual completion time.	Adjust the monitor time to match the actual completion time.	Adjust the monitor time to match the actual completion time.		
Attached information	Attached information 1: Port number where error was detected				
Precautions/ Remarks	None				

Event name	Tfr (Receive Finished Monitoring Time) Exceeded		Event code	64A1 0000 hex	
Meaning	The time required to complete a reception operation exceeded the Receive Finished Monitoring Time.				
Source	PLC Function Module	Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level: Observation	Recovery	---	Log category	System
Effects	User program: Continues.	Operation	Not affected.		
System-defined variables	Variable	Data type	Name		
	None	---	---		
Cause and correction	Assumed cause	Correction	Prevention		
	Noise	Implement noise countermeasures.	Use the Unit away from sources of noise. Implement noise countermeasures.		
	The monitoring time is shorter than the actual completion time.	Adjust the monitoring time to match the actual completion time.	Adjust the monitoring time to match the actual completion time.		
Attached information	Attached information 1: Port number where error was detected				
Precautions/ Remarks	None				

Event name	Tr (Receive Wait Monitoring Time) Exceeded			Event code	64A20000 hex	
Meaning	The receive waiting time exceeded the Receive Wait Monitoring Time.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Noise		Implement noise countermeasures.		Use the Unit away from sources of noise. Implement noise countermeasures.	
	The monitoring time is shorter than the actual completion time.		Adjust the monitoring time to match the actual completion time.		Adjust the monitoring time to match the actual completion time.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	FCS Check Error			Event code	64A30000 hex	
Meaning	One of the following errors occurred in the converted protocol at the serial gateway. • When converting to CompoWay/F command: BCC error • When converting to Modbus-RTU command: CRC error • When converting to Modbus-ASCII command: CRC error • When converting to Host Link FINS command: FCS error Protocol Macros • The check code attached to the received message does not match the check code that was calculated from the received message.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Noise		Implement noise countermeasures. Increase the setting for the number of resends in the device that sent the command. If required, perform retry processing for communications.		Use the Unit away from sources of noise. Implement noise countermeasures. Increase the setting for the number of resends in the device that sends the command. If required, perform retry processing for communications.	
	There was a mistake in the CRC code that was attached to the command frame.		Attach the correct CRC code.		Attach the correct CRC code.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

<table>
<tr><td>Event name</td><td colspan="3">Timeout Error</td><td>Event code</td><td colspan="2">64A4 0000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">A timeout error occurred.</td></tr>
<tr><td>Source</td><td colspan="2">PLC Function Module</td><td>Source details</td><td>CJ-series Unit</td><td>Detection timing</td><td>After serial communications start</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Observation</td><td>Recovery</td><td>---</td><td>Log category</td><td>System</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">Not affected.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="3">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="2">In Protocol Macro Mode (the SD□ indicator does not flash at all): The Serial Communications Unit received a command, but the step transition of the protocol macro communications sequence is suspended for one of the following reasons.
• The next step is a RECEIVE command.
• A WAIT command is presently in execution.</td><td colspan="2">Review the communications sequence. Or, program retry processing in the device that sent the command when response code 0204 hex is received. If necessary, adjust the Serial Gateway Send Start Timeout Monitoring Time in the *_P1_PmrSgwSendTimeoutCfg or *_P2_PmrSgwSendTimeoutCfg device variable.</td><td colspan="2" rowspan="2">Perform countermeasures in advance.</td></tr>
<tr><td colspan="2">In Serial Gateway Mode or Protocol Macro Mode (the SD□ indicator flashes, but the RD□ does not flash):
• There is no remote device to receive the command after conversion at the specified destination address.
• The sent command frame is illegal.
• The settings for the communications conditions and baud rate of the serial communications path do not match the remote device.
• The communications cable wiring is faulty or incorrect, the terminating resistance settings of the RS-424A/485 port are incorrect, or the adapter wiring or terminating resistance settings for the NT-AL001 are incorrect.
• The protocol of the sent command was unable to be interpreted by the remote device.
• Remote device hardware failure</td><td colspan="2">• Check the device at the specified destination address.
• Review the command frame to convert.
• Review the system settings and the settings of the remote device.
• Check the communications cable connections. Turn ON the terminating resistance (with the terminating resistance ON/OFF switch) at both ends (at the remote device or at the Unit).
• Check the command specifications of the remote device and conversion source.
• Replace the remote device.</td></tr>
</table>

Cause and correction	Assumed cause	Correction	Prevention
	In Serial Gateway Mode or Protocol Macro Mode (RD□/SD□ indicator flashes): • The response from the remote device was too fast, and the data received by the Serial Communications Unit was discarded. • The Serial Gateway Response Timeout Monitoring Time for the **_P1_PmrSgwRespTimeoutCfg* or **_P2_PmrSgwRespTimeoutCfg* device variable is too short.	• Delay the remote device response. • Set a longer Serial Gateway Response Timeout Monitoring Time in the **_P1_PmrSgwRespTimeoutCfg* or **_P2_PmrSgwRespTimeoutCfg* device variable.	Perform countermeasures in advance.
	During Loopback Test • Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.	• Correct any mistakes in wiring the loopback test jig. • Implement noise countermeasures. • Replace the Unit.	• Check the wiring of the loopback test jig. • Use the Unit away from sources of noise. Implement noise countermeasures.
	A serial gateway cannot interrupt processing between protocol macro steps.	Perform retry processing for sending commands or review the communications sequence.	Perform countermeasures in advance.
	If the message frame is corrupted due to noise, a response timeout occurred at the FINS send source if the **_P1_TimeoutErr* or **_P2_TimeoutErr* device variable is FALSE.	Check the noise conditions between nodes. Increase the setting for the number of resends in the device that sent the command. If required, perform retry processing for communications.	
	A no-protocol instruction was executed when No-protocol Mode was not set.	Set the serial communications mode to 3 hex (No-protocol Mode).	
Attached information	Attached information 1: Port number where error was detected		
Precautions/ Remarks	None		

Event name	Comparison Error			Event code	64A5 0000 hex	
Meaning	A comparison error occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	During Loopback Test
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Loopback test jig failure.		Correct any mistakes in wiring the loopback test jig.		Check the wiring of the loopback test jig.	
	Noise		Implement noise countermeasures.		Use the Unit away from sources of noise. Implement noise countermeasures.	
	The communications circuits in the Serial Communications Unit are faulty.		Replace the Unit.		None	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	Reception Overflow			Event code	64A6 0000 hex	
Meaning	More than the specified amount of receive data was received in No-protocol Mode.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	During No-protocol Mode
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	One or more bytes of data was received after the completion the reception.		Execute the SerialRcv/SerialRcvNo-Clear instruction again after the Reception Completed Flag changes to TRUE.		Review the communications period with the remote device.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	Command Format Error			Event code	64A70000 hex	
Meaning	An illegal function code or address was specified in a received Modbus-RTU command.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	During Modbus-RTU Slave Mode
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	An illegal function code, address, or data was specified in a received Modbus-RTU command.		Check the format of the Modbus-RTU command and correct the Modbus-RTU command at the device that sent the Modbus-RTU command.		Check the format of the Modbus-RTU command to create a Modbus-RTU command.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	Transmission Error			Event code	84680000 hex	
Meaning	A transmission error occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	One of the following errors occurred. • Tfs (Send Finished Monitoring Time) Exceeded • Tfr (Receive Finished Monitoring Time) Exceeded • Tr (Receive Wait Monitoring Time) Exceeded • FCS Check Error • Command Error • Timeout Error • Overrun Error • Framing Error • Parity Error		See which error occurs from the Sysmac Studio or an NS-series PT and take suitable measures.		Refer to the measures for the errors listed as causes to prevent the errors from occurring.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	In Protocol Macro Mode, this error does not occur if communications recover within the specified number of retries.					

<table>
<tr><td>Event name</td><td colspan="3">Overrun Error</td><td>Event code</td><td colspan="2">84690000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">An overrun occurred.</td></tr>
<tr><td>Source</td><td colspan="2">PLC Function Module</td><td>Source details</td><td>CJ-series Unit</td><td>Detection timing</td><td>After serial communications start</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Observation</td><td>Recovery</td><td>---</td><td>Log category</td><td>System</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">Not affected.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="4">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="2">In Serial Gateway Mode or Protocol Macro Mode:
• The reception circuits in the Serial Communications Unit are faulty.
• A transmission error occurred due to noise or other factors.</td><td colspan="2">• Perform a loopback test in the serial communications mode and check the transmission lines. If an error occurs during testing, replace the Serial Communications Unit.
• Implement noise countermeasures. Increase the setting for the number of resends in the device that sent the command. If required, perform retry processing for communications.</td><td colspan="2" rowspan="2">Perform countermeasures in advance.</td></tr>
<tr><td colspan="2">No-protocol Mode:
• The reception buffer received more than 259 bytes of data before the SerialRcv/SerialRcvNoClear instruction was executed.</td><td colspan="2">Cycle the power supply, reset the Controller, or restart the Unit and clear the receive buffer.</td></tr>
<tr><td colspan="2">During Loopback Test
• Loopback test jig failure.
• Noise
• The communications circuits in the Serial Communications Unit are faulty.</td><td colspan="2">• Correct any mistakes in wiring the loopback test jig.
• Implement noise countermeasures.
• Replace the Unit.</td><td colspan="2">• Check the wiring of the loopback test jig.
• Use the Unit away from sources of noise. Implement noise countermeasures.</td></tr>
<tr><td>Attached information</td><td colspan="6">Attached information 1: Port number where error was detected</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">After an overrun error occurs, you can return the Overrun Error Flag for the Serial Communications Unit to FALSE by cycling the power supply, resetting the Controller, restarting the Serial Communications Unit, or restarting the port.</td></tr>
</table>

Event name	Framing Error			Event code	846A0000 hex	
Meaning	A frame error occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	In Serial Gateway Mode or Protocol Macro Mode: • The reception circuits in the Serial Communications Unit are faulty. • A transmission error occurred due to noise or other factors.		• Perform a loopback test in the serial communications mode and check the transmission lines. If an error occurs during testing, replace the Serial Communications Unit. • Implement noise countermeasures. Increase the setting for the number of resends in the device that sent the command. If required, perform retry processing for communications.		Perform countermeasures in advance.	
	During Loopback Test • Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.		• Correct any mistakes in wiring the loopback test jig. • Implement noise countermeasures. • Replace the Unit.		• Check the wiring of the loopback test jig. • Use the Unit away from sources of noise. Implement noise countermeasures.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

Event name	Parity Error			Event code	846B 0000 hex	
Meaning	A parity error occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	In Serial Gateway Mode or Protocol Macro Mode: • The reception circuits in the Serial Communications Unit are faulty. • A transmission error occurred due to noise or other factors.		• Perform a loopback test in the serial communications mode and check the transmission lines. If an error occurs during testing, replace the Serial Communications Unit. • Implement noise countermeasures. Increase the setting for the number of resends in the device that sent the command. If required, perform retry processing for communications.		Perform countermeasures in advance.	
	During Loopback Test • Loopback test jig failure. • Noise • The communications circuits in the Serial Communications Unit are faulty.		• Correct any mistakes in wiring the loopback test jig. • Implement noise countermeasures. • Replace the Unit.		• Check the wiring of the loopback test jig. • Use the Unit away from sources of noise. Implement noise countermeasures.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	None					

<table>
<tr><td>Event name</td><td colspan="2">Overrun Error, Framing Error, or Parity Error (Transmission Error)</td><td>Event code</td><td colspan="2">846C0000 hex</td></tr>
<tr><td>Meaning</td><td colspan="5">An overrun error, framing error, or parity error occurred.</td></tr>
<tr><td>Source</td><td colspan="2">PLC Function Module</td><td>Source details</td><td>CJ-series Unit</td><td>Detection timing</td><td>During Modbus-RTU Slave Mode</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Observation</td><td>Recovery</td><td>---</td><td>Log category</td><td>System</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">Not affected.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td>Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td rowspan="4"></td><td colspan="2">The communications conditions and baud rate settings do not match the host.</td><td colspan="2">Review the system settings, host settings, and programming, including the command format and response format, based on *_P1_TransErrSta and *_P2_TransErrSta (Transmission Error Status).</td><td colspan="2" rowspan="4">Perform countermeasures in advance.</td></tr>
<tr><td colspan="2">Noise or other external interference.</td><td colspan="2">• Use shielded twisted-pair cables for the communications cables.
• Wire the communications cables in separate ducts from power lines.
• Check the environment for noise.
• If required, perform retry processing for communications.</td></tr>
<tr><td colspan="2">The baud rate is outside the allowable range or there are bit errors due to different stop bit settings or other parameters.</td><td colspan="2">• Review the system settings.
• Review the baud rate and other host settings, and the programming, including the command format and response format.</td></tr>
<tr><td colspan="2">• The communications cable wiring is faulty.
• Terminating resistance is not set correctly for the RS-422A/485 ports.
• Wiring is faulty or terminating resistance is not set correctly on an NT-AL001 or other Adapter.</td><td colspan="2">• Check the communications cable connections.
• Turn ON the terminating resistance (with the terminating resistance ON/OFF switch) at both ends (at the host).</td></tr>
<tr><td>Attached information</td><td colspan="5">Attached information 1: Port number where error was detected</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="5">You can check the number of transmission errors (i.e., overrun errors, framing errors, and parity errors) in the *_P1_MbsTxErrCnt and *_P2_MbsTxErrCnt device variables.</td></tr>
</table>

Event name	Transmission Error (CRC Error)			Event code	846D 0000 hex	
Meaning	A CRC error occurred.					
Source	PLC Function Module		Source details	CJ-series Unit	Detection timing	After serial communications start
Error attributes	Level	Observation	Recovery	---	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Noise		Implement noise countermeasures.		Use the Unit away from sources of noise. Implement noise countermeasures.	
	CRC calculation method does not match the device.		Correct the CRC calculation method in the user application to match the Modbus specifications.		Set the CRC calculation method in the user application to match the Modbus specifications.	
Attached information	Attached information 1: Port number where error was detected					
Precautions/ Remarks	You can check the number of transmission errors (i.e., CRC errors) in the **_P1_MbsCRCErrCnt* and **_P2_MbsCRCErrCnt* device variables.					

9-6 Cleaning and Inspection

Use the cleaning and inspection methods described here for regular maintenance of the devices.

9-6-1 Cleaning

To keep the Serial Communications Unit in optimum condition, regularly clean the Unit, as follows:

- Wipe the surface of the Unit with a soft, dry cloth.
- If you cannot remove any dirt with a dry cloth, moisten the cloth with a mild detergent diluted to 2%, and squeeze out any excess moisture before you wipe the Unit.
- Do not adhere materials, such as gum, vinyl, or tape to the Unit for long periods of time. This may cause scratches on the device. Remove any adhered materials when you clean the Unit.

Precautions for Correct Use

Never use benzene, paint thinner, or other volatile solvents, and do not use chemically treated cloths.

9-6-2 Inspection

To keep the Unit in optimum condition, you must perform regular inspections. Normally, inspect the devices once every six months or every year. Inspect the devices at more regular intervals when they are used in environments subject to high temperatures, high humidity, or high dust levels.

Materials for Inspection

Prepare the following materials before you perform any inspections.

Materials Required Daily

For daily inspection, a cross slot screwdriver, flat-blade screwdriver, tester (or digital voltmeter), industrial strength alcohol, and all-cotton cloth are required.

Materials Required Occasionally

For some inspections, a synchroscope, a pen oscilloscope, a temperature gage, and a hydroscope will be required.

Inspection Items

Inspect the following items to check whether the Unit is within the specified criterion during operation. If the installation and operating environment of the Unit is not within the criterion, improve the ambient operating environment and readjust the device.

Item	Details	Criterion	Inspection materials
Operating environment	Check the ambient temperature and the temperature of the control panel.	0 to 55°C	Temperature gage
	Check the ambient humidify and the humidity of the control panel.	10% to 90% RH (no condensation or icing)	Hydroscope
	Check for accumulated dust.	No dust	Visual inspection
Installation	Check that the Unit is mounted securely.	Securely mount the Unit.	---
	Check for loose screws on the communications cables.	Securely tighten screws.	Cross slot screwdriver
	Check for damaged communications cables.	Cables should be fully intact.	Visual inspection

9-7 Replacement Precautions

A malfunction of the Serial Communications Unit may affect the operation of remote communications devices, so be sure to perform repairs or replace the faulty Unit promptly. Prepare a spare Serial Communications Unit to replace a faulty one, so that you can restore functionality without delay.

9-7-1 Precautions when Replacing Unit

Observe the following precautions when you replace the Serial Communications Unit.

- Always turn OFF the power to the controller before you replace the Unit.
- Be sure to check that the replacement Unit is not defective.
- If the defective Unit is to be dispatched to the manufacturer for repair, be sure to include documentation that states the nature of the fault in as much detail as possible, and send this to your nearest OMRON branch or sales office.

If the contacts are defective, clean the contacts with a clean all-cotton cloth moistened with industrial-strength alcohol. Remove any cloth particles before you mount the Unit.

Precautions for Correct Use

Turn OFF the power to all serial external devices when you replace the Unit to prevent malfunctions.

9-7-2 Settings after Replacing Unit

After you replace the Serial Communications Unit, make sure that wiring and settings, such as hardware switch settings, the system settings, and protocol macro data are the same as the Unit that was replaced.

Precautions for Safe Use

- If the CPU Unit is to be replaced, transfer the data before you replace the Unit by using Sysmac Studio and start operation. If the relationship between the program and the status of variables with retained attributes is not maintained, unexpected malfunctions may result.
- The System Settings of the Serial Communications Unit are saved in device variables for CJ-series Unit of the CPU Unit. If the CPU Unit is to be replaced, either transfer the System Settings data before you replace the CPU Unit by using the Sysmac Studio or reset the System Settings.

9-7-3 Replacing the Unit

1. Turn OFF the power to the controller to which the Serial Communications Unit to be replaced is mounted, and to all external devices that are connected via a serial network.
2. Disconnect the communications cables connected to the Serial Communications Unit to be replaced, and also remove the Unit.
3. Before you mount the replacement Unit, set the following hardware switches to the same settings of the Unit that was mounted before.
   - Unit number setting switch
   - Terminating resistance switch (RS-422A/485 ports)
   - 2-wire or 4-wire switch (RS-422A/485 ports)
4. Turn ON the power of the CPU Unit to which the replacement Serial Communications Unit is mounted, and to all external devices that are connected via a serial network, and start system operation.
5. Check the indicators and status display and confirm that system operation is normal.

● Using protocols separately designed with CX-Protocol

1. Connect CX-Protocol to the CPU Unit to which the replacement Serial Communications Unit is mounted, and switch the operating mode to PROGRAM Mode.
2. Save the protocol macro data by using the CX-Protocol. Refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344) for details.
3. Turn OFF the power to the CPU Unit to which the Serial Communications Unit to be replaced is mounted, and to all external devices that are connected via a serial network.
4. Disconnect the communications cables connected to the Serial Communications Unit to be replaced, and also remove the Unit.
5. Before you mount the replacement Unit, set the following hardware switches to the same settings of the Unit that was mounted before.
   - Unit number setting switch
   - Terminating resistance switch (RS-422A/485 ports)
   - 2-wire or 4-wire switch (RS-422A/485 ports)
6. Turn ON the power of the CPU Unit to which the replacement Serial Communications Unit is mounted, and to all external devices that are connected via a serial network.
7. Switch the operating mode of the CPU Unit to PROGRAM Mode, and use the CX-Protocol to transfer the protocol macro data to the Unit. Refer to the *CX-Protocol Ver.1.9 OPERATION MANUAL* (Cat. No. W344) for details.
8. Switch the operating mode of the CPU Unit to RUN Mode, and start system operation.
9. Check the indicators and status display and confirm that system operation is normal.

A Standard System Protocol

This section provides details on the standard system protocols provided with the CX-Protocol and the Serial Communications Units.
By referring to the usage of protocol macros in 4-3, set the in-out variables for ExecPMCR instructions (Protocol Macro instructions) based on the send/receive data word allocations shown in the reference documents.

R-1 Reading Reference Documents R-3
R-1-1 Using Standard System Protocols R-3
R-1-2 Standard System Protocols R-6

R-2 CompoWay/F Master Protocol R-7
R-2-1 CompoWay/F R-7
R-2-2 Communications Specifications R-8
R-2-3 Transmission Procedure R-8
R-2-4 Command and Response Formats R-8
R-2-5 CompoWay/F Master Protocol Sequences R-12
R-2-6 CompoWay/F Message Frames and PMCR(260) Operands R-12
R-2-7 Send/Receive with ASCII Conversion and with Response R-13
R-2-8 Structure of the Protocol R-13
R-2-9 Connections R-38

R-3 Mitsubishi Computer Link Master (A-compatible 1C Frame, Model 1) R-41
R-3-1 Communications Specifications R-41
R-3-2 Command/Response Formats R-42
R-3-3 Command Frame Contents R-43
R-3-4 Mitsubishi Computer Link Master Protocol Sequences R-43
R-3-5 Structure of the Protocol R-43

R-4 V500/V520 Bar Code Reader Protocol R-65
R-4-1 Connections R-65
R-4-2 System Setting R-66
R-4-3 Protocol Configuration R-67

R-5 3Z4L Laser Micrometer Protocol R-78
R-5-1 Connections R-78
R-5-2 List of Operations with Laser Micrometer (5000/6000 Series) R-81
R-5-3 Protocol Configuration R-83

R-6 Hayes Modem AT Command Protocol R-117

R-6-1 Protocol Configuration R-117
R-6-2 Connections R-119
R-6-3 Compatible Modems R-119
R-6-4 Modem Settings R-120
R-6-5 Communication Errors R-125

R-1 Reading Reference Documents

The section below provides information on the standard system protocols provided with the CX-Protocol and the Serial Communications Units.

R-1-1 Using Standard System Protocols

Standard system protocols can be executed merely by specifying the sequences number to be executed in the second operand of PMCR(260) and settings the data described in the appendices in the proper format starting at the word specified with the third operand of PMCR(260). The data received as a response to executing the sequence will be automatically stored starting at the word specified with the fourth operand of PMCR(260).

● Procedure

1 Set the sequence number as a hexadecimal value in the second operand of PMCR(260).

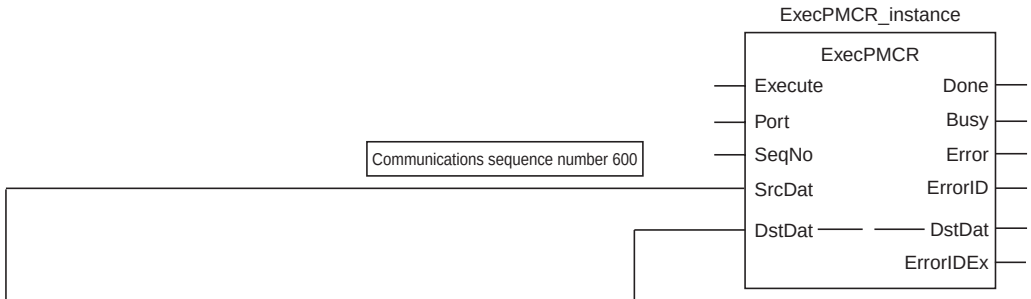
2 In the Send Data Word Allocation (3rd Operand), indicate the data format starting from the S Operand of the PMCR instruction. Set data of this format starting from S.

3 In the Receive Data Word Allocation (4th Operand), indicate the data format starting from the D Operand of the PMCR instruction. Data of this format will be stored starting from D.
If there is no particular specification, set 0000 Hex as the initial value in D+0.

Example

The following data would be used to execute sequence number 600 in the CompoWay/F Master Protocol for a transmission with ASCII conversion (no response).

NJ Series



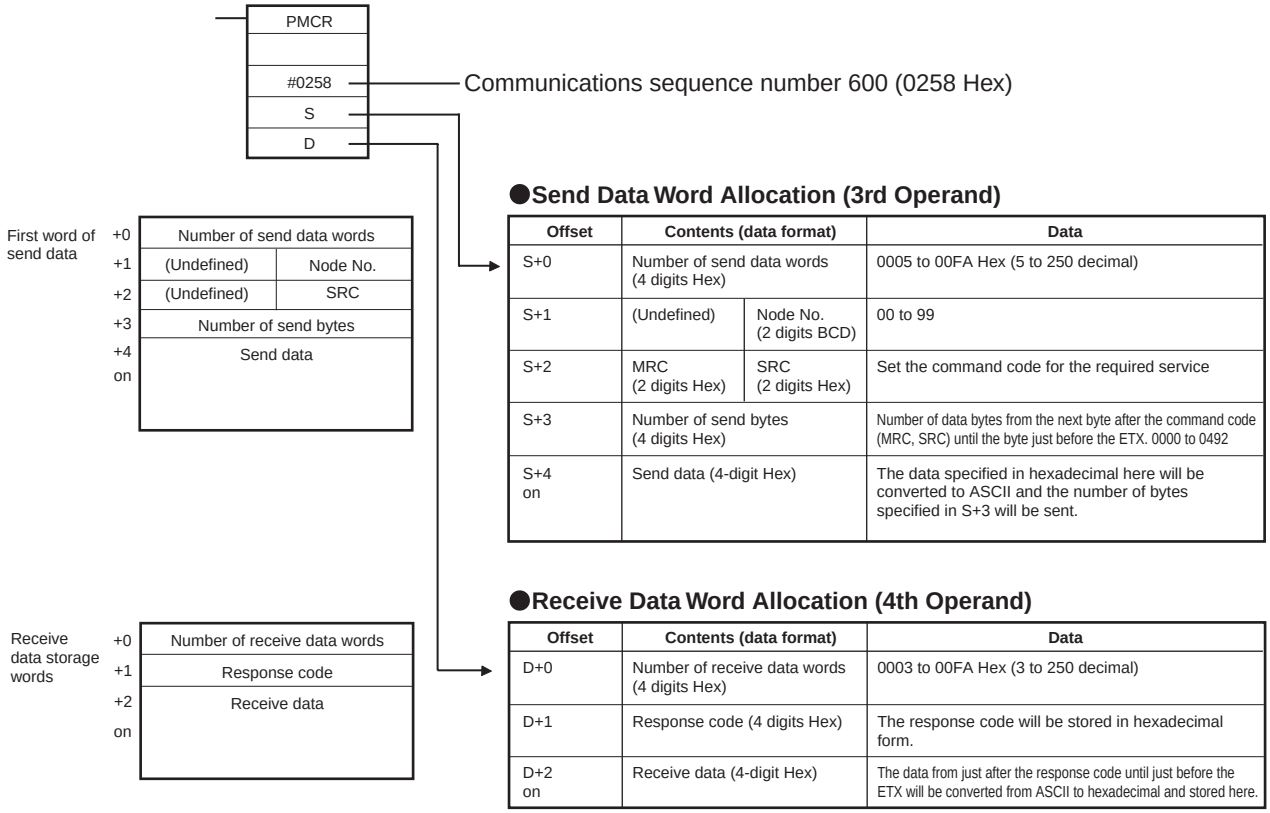
●Send Data Allocation (SrcDat [ ] of ExecPMCR instruction)

Offset	Contents (data format)		Data
SrcDat[0]	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
SrcDat[1]	(Undefined)	Node No. (2 digits BCD)	00 to 99
SrcDat[2]	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
SrcDat[3]	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code (MRC, SRC) until the byte just before the ETX. 0000 to 0492
SrcDat[4] on	Send data (4-digit Hex)		The data specified in hexadecimal here will be converted to ASCII and the number of bytes specified in S+3 will be sent.

●Receive Data Allocation (DstDat [ ] of ExecPMCR instruction)

Offset	Contents (data format)	Data
DstDat[0]	Number of receive data words (4 digits Hex)	0003 to 00FA Hex (3 to 250 decimal)
DstDat[1]	Response code (4 digits Hex)	The response code will be stored in hexadecimal form.
DstDat[2] on	Receive data (4-digit Hex)	The data from just after the response code until just before the ETX will be converted from ASCII to hexadecimal and stored here.

CS/CJ Series



●Send Data Word Allocation (3rd Operand)

Offset	Contents (data format)		Data
S+0	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
S+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
S+2	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
S+3	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code (MRC, SRC) until the byte just before the ETX. 0000 to 0492
S+4 on	Send data (4-digit Hex)		The data specified in hexadecimal here will be converted to ASCII and the number of bytes specified in S+3 will be sent.

●Receive Data Word Allocation (4th Operand)

Offset	Contents (data format)	Data
D+0	Number of receive data words (4 digits Hex)	0003 to 00FA Hex (3 to 250 decimal)
D+1	Response code (4 digits Hex)	The response code will be stored in hexadecimal form.
D+2 on	Receive data (4-digit Hex)	The data from just after the response code until just before the ETX will be converted from ASCII to hexadecimal and stored here.

Reading explanations of the standard system protocol

The explanations of the standard system protocol below assume use of the protocol with the CS/CJ Series.

If the NJ Series is used, change the licable items as specified below.

● Send Data Allocation

NJ Offset	Contents (data format)		Data	CS/CJ Offset
SrcDat[0]	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)	S+0
SrcDat[1]	(Undefined)	Node No. (2 digits BCD)	00 to 99	S+1
SrcDat[2]	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service	S+2
SrcDat[3]	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code (MRC, SRC) until the byte just before the ETX. 0000 to 0492	S+3
SrcDat[4] on	Send data (4-digit Hex)		The data specified in hexadecimal here will be converted to ASCII and the number of bytes specified in S+3 will be sent.	S+4 on

Receive Data Allocation

NJ Offset	Contents (data format)	Data	CS/CJ Offset
DstDat[0]	Number of receive data words (4 digits Hex)	0003 to 00FA Hex (3 to 250 decimal)	D+0
DstDat[1]	Response code (4 digits Hex)	The response code will be stored in hexadecimal form.	D+1
DstDat[2] on	Receive data (4-digit Hex)	The data from just after the response code until just before the ETX will be converted from ASCII to hexadecimal and stored here.	D+2 on

Difference between CS/CJ Series and NJ Series

	CS/CJ Series	NJ Series
Names of PLC Series	CS/CJ Series	NJ Series
Serial Communications Unit/Board	CS1W-SCB21-V1/-SCB41-V1/-SCU21-V1/-SCU31-V1 CJ1W-SCU21-V1/-SCU31-V1/-SCU41-V1 CJ1W-SCU22/-SCU32/-SCU42	CJ1W-SCU22/-SCU32/-SCU42
Instruction name	PMCR	ExecPMCR
Sequence No. setting	2nd operand	Input variable: SeqNo
Send data setting	3rd operand or operand S	Input variable: SrcDat
Receive data setting	4th operand or operand D	In-out variable: DstDat
First word of send data	S	Input variable: User-defined array variable set in SrcDat (Example: SendData [0:x])
Send data	S+0, S+1, onward	Input variable: Actual data area in the user-defined array variable set in SrcDat (Example: SendData [0], SendData [1], SendData [3], etc.)
First word of receive data	D	In-out variable: User-defined array variable set in DstDat (Example: RecvData [0:x])
Receive data	D+0, D+1, onward	In-out variable: Actual data area in the user-defined array variable set in DstDat (Example: RecvData [0], RecvData [1], RecvData [2], etc.)
Offset of send data	+0, +1, onward	Input variable: First element, second element, etc., of the array of the user-defined variable set in SrcDat
Offset of receive data	+0, +1, onward	In-out variable: First element, second element, etc., of the array of the user-defined variable set in DstDat

R-1-2 Standard System Protocols

The following 5 standard system protocols are provided with the CX-Protocol, Serial Communications Boards, and Serial Communications Unit.

Protocol name	Function
CompoWay/F Master	Protocol for sending CompoWay/F commands as a Master to OMRON CompoWay/F slave components and receiving responses.
Mitsubishi Computer Link Master	Protocol for sending Computer Link commands to Mitsubishi PLCs (Sequencer CPU) used as slaves and receiving responses.
V500/V520 Bar Code Reader	Protocol for controlling a Bar Code Reader via the Communications Board. Procedures for controlling the Bar Code Reader in remote mode, reading the data that has been read by the Bar Code Reader, and reading/writing operating parameters.
3Z4L Laser Micrometer	Protocol for controlling a Laser Micrometer via the Communications Board. Procedures for controlling the Laser Micrometer in remote mode, reading measured data, and writing/reading operating parameters.
Hayes modem AT commands	Protocol for controlling a Hayes modem (AT commands) via the Communications Board. Procedures for initialization of the modem, dialing, data transmission, switching to escape mode, and disconnecting the line.

R-2 CompoWay/F Master Protocol

The CompoWay/F Master Protocol is used to send CompoWay/F commands with the CS/CJ-series PLC serving as the host (master).

R-2-1 CompoWay/F

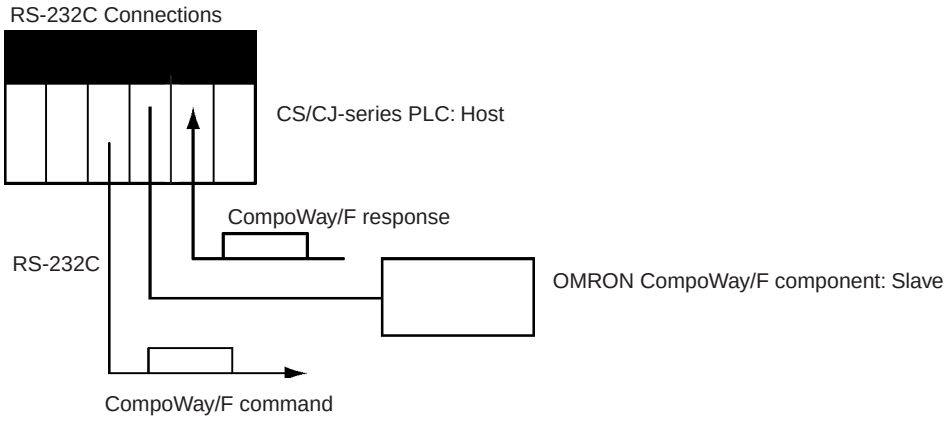
CompoWay/F is a united communication protocol used by OMRON's components for general-purpose serial communications. A host computer or a PLC can function as a host (master) to send CompoWay/F commands (message frames) to OMRON components, which function as slaves. The components will return responses to these commands. Using CompoWay/F commands, the host can read/write data, settings, and operating status to control the operation of the components.

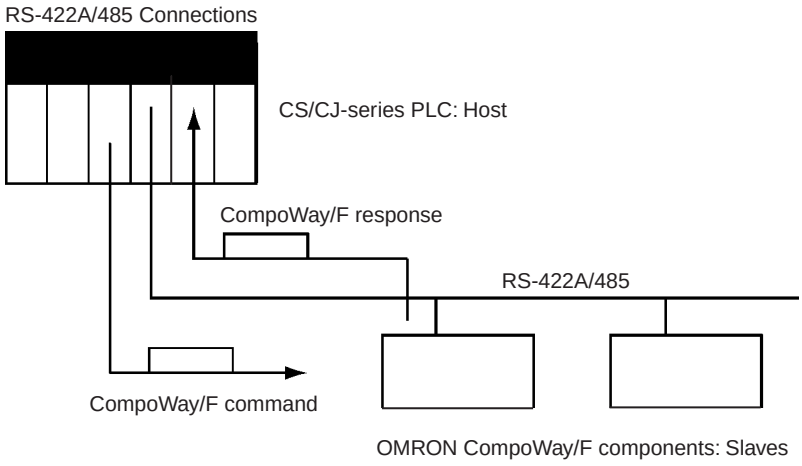
CompoWay/F has the following features.

- The same message frame format is used, eliminating the need for special protocols for each component. Just by changing commands, etc., serial communications with various components can be easily performed.

The CompoWay/F Master Protocol is provided as a standard system protocol to enable the CS/CJ-series PLC to execute read/write sequences for CompoWay/F commands.

System Configuration for Standard System Protocol



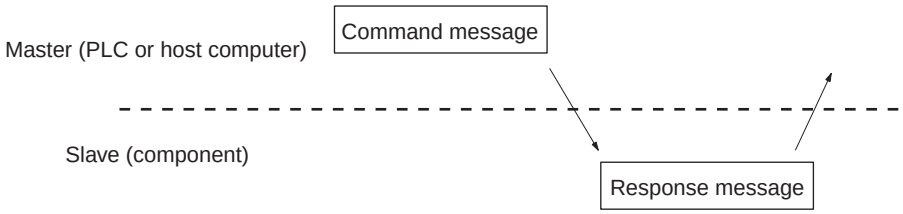


R-2-2 Communications Specifications

Item	Specification
Transmission path connections	Multipoint
Communications	RS-232C, RS-422A/485, 4-wire half-duplex, 2-wire half-duplex
Synchronization	Start-stop
Baud rate	1,200/2,400/4,800/9,600/19,200/38,400 bps Default: 9,600 bps
Transmitted code	ASCII
Data length	7 bits or 8 bits (Default: 7 bits) Note: A 7-bit code is used with 0 added to the beginning.
Stop bits	1 bit or 2 bits (Default: 2 bits)
Error detection	Vertical parity (none, even, or odd) (Default: Even) BCC (block check character)* *: Start-stop Sync Data Configuration for Protocol Macros LRC, 1 byte, equivalent to binary

R-2-3 Transmission Procedure

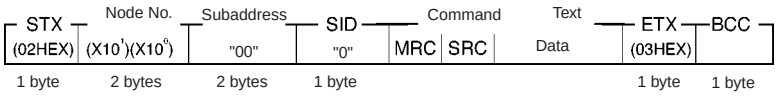
The PLC or host computer serving as the master sends a command and the component serving as the slave returns a response for the command message contained in the command. One response message is returned for each command message. The movement of command and response messages is shown below.



R-2-4 Command and Response Formats

Note In the following diagrams "Hex" indicates hexadecimal values. Values in quotation marks, such as "00" indicate ASCII characters.

Command Frame



Response Frame

Note **1** Data is not saved in the response if there is a command frame error (i.e., if the end code is not 00 or 0F).

2 Other values are possible for the subaddress and SID.

Command Frame Contents

Item		Meaning
STX		A code, 02 Hex, indicating the beginning of a communications frame (text). This code must always be set as the first byte.
Node number		The node number identifies the destination of the command frame. Specify "XX" to broadcast a transmission. There will be no response made to a broadcast.
Subaddress		Set "00" for most components. Other values must be set for special components.
SID		Set "0" for most components. Other values must be set for special components.
Command text		The body of the command. Refer to the command text for individual sequences.
	MRC and SRC	The command code specifies the service to be used. Refer to the command codes for individual sequences.
ETX		A code, 03 Hex, indicating the end of text.
BCC		The block check character (horizontal parity, 1 byte display). The character is an exclusive OR of all data from just after the STX to the ETX.

Response Frame Contents

Item		Meaning
STX		A code, 02 Hex, indicating the beginning of a communications frame (text). This code must always be set as the first byte.
Node number		The node number identifies the destination of the command frame. "XX" is specified to broadcast a transmission. There will be no response made to a broadcast.
Subaddress		"00" for most components. Other values must be set for special components.
End code (*)		The results of executing the command frame. Note: The response code (MRES and SRES) indicates the results for the command code; the end code indicates the results for the command frame. These are not the same.
Response text		The body of the response. Refer to the response text for individual sequences.
	MRES and SRES	The response code specifies the results of processing the service requested by the command code. Refer to the response codes for individual sequences.
ETX		A code, 03 Hex, indicating the end of text.
BCC		The block check character (horizontal parity, 1 byte display). The character is an exclusive OR of all data from just after the STX to the ETX.

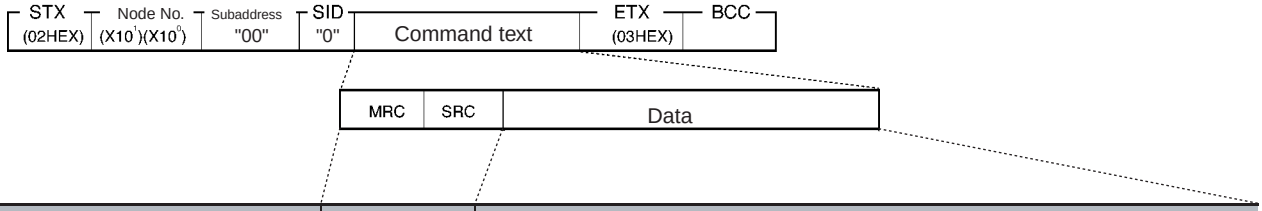
* The end codes are described in the following table.

End code	Name	Meaning
"00"	Normal end	The command frame was processed normally without any of the following errors.
"0F"	Command error	The specified command could not be executed. Refer to the response code for more information.
"10"	Parity error	A parity error was detected for one of the characters that was received.
"11"	Framing error	A framing error was detected for one of the characters that was received.
"12"	Overrun error	A overrun error was detected for one of the characters that was received.
"13"	BCC error	The BCC for the receive frame was incorrect.
"14"	Format error	An illegal command or illegal character was received in the command and text (characters other than ASCII 0 to 9 or A to F).
"16"	Subaddress error	The receive frame contained an illegal subaddress or header.
"18"	Frame length error	The receive frame was too long.

● Example

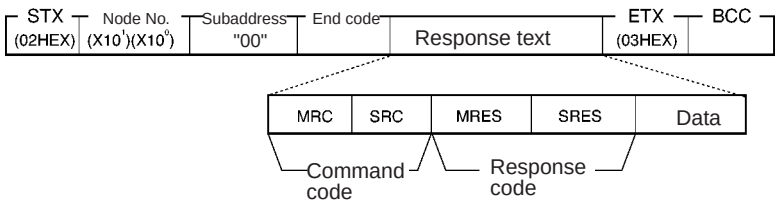
The command and response frames for a K3N□-series Intelligent Signal Processor are shown below.

Command Frame



Command	Command code		Data contents				
VARIABLE AREA READ	"01"	"01"	Variable type	Address	"00"	No. of elements	
VARIABLE AREA WRITE	"01"	"02"	Variable type	Address	"00"	No. of elements	Write data
PARAMETER AREA READ	"02"	"01"	Parameter type	Address	No. of elements		Write data
PARAMETER AREA WRITE	"02"	"02"	Parameter type	Address	No. of elements		
PROCESSOR STATUS READ	"05"	"03"					
CONTROLLER STATUS READ	"06"	"01"					
ECHOBACK TEST	"08"	"01"	Test data				
OPERATION COMMAND	"30"	"05"	Command code				

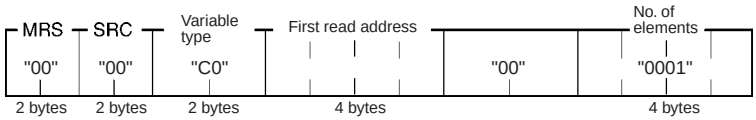
Response Frame



● Example: VARIABLE AREA READ

The following command and text is used to read the present value, maximum value, minimum value, and status of the Intelligent Signal Processor.

Command Text



1 Variable Type

Variable type	Contents
"C0"	Present value, maximum value, minimum value, status, and comparison value

2 First Read Address

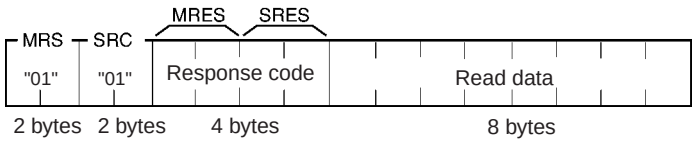
Specify the address of the data to be read in 4 digits Hex.

3 Number of Elements: 4 Digits Hex

Number of elements	Process
"0001"	Read the data and end normally.

Note If "0000" is specified, nothing will be read and a normal end will be returned. A parameter error will occur for any settings other than "0000" and "0001."

Response Text



1 Response Code: MRES, SRES

Response code	Meaning
"0000"	Normal end
"1001"	Command too long
"1002"	Command too short
"1100"	Parameter error
"1101"	Area type error
"1103"	First address range error
"2203"	Operating error

2 Read Data

The specified data is returned in 8 digits of hexadecimal data.

R-2-5 CompoWay/F Master Protocol Sequences

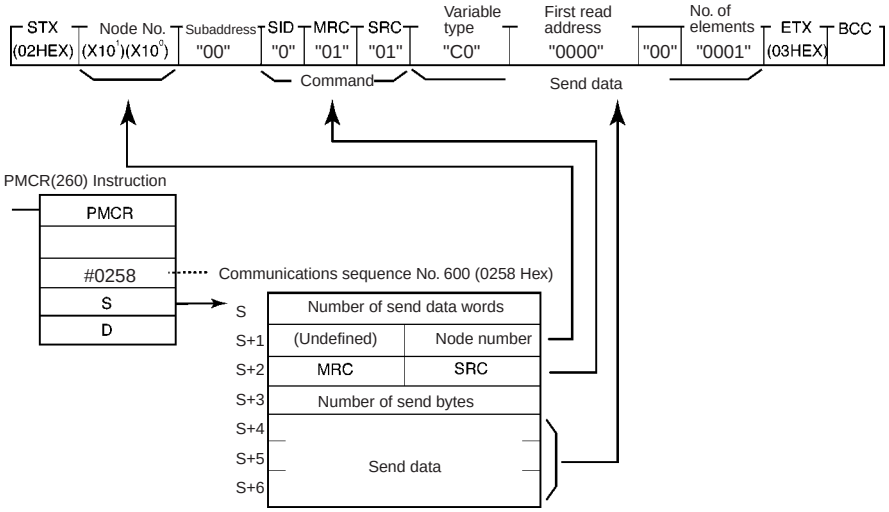
The CompoWay/F Master Protocol provides 18 communications sequences that can be used for the following:

- Converting to ASCII data or not converting to ASCII data
- Sending to a specified Unit or broadcasting
- Specifying with the command code or specifying with the subaddress and SID.

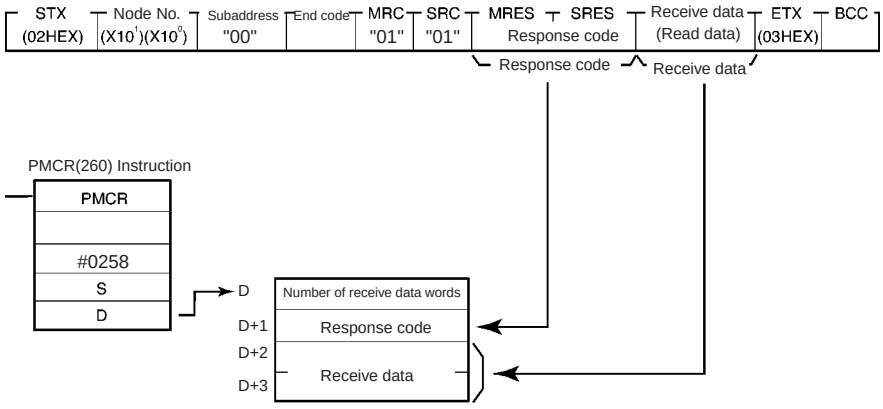
R-2-6 CompoWay/F Message Frames and PMCR(260) Operands

The relationship between the CompoWay/F command and response frames and the operands of PMCR(260) is shown below, using communications sequence No. 600 as an example.

Command Frame

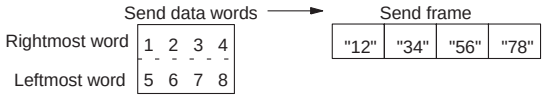
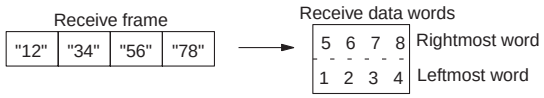
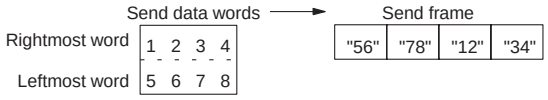
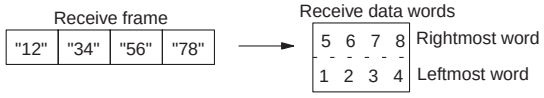
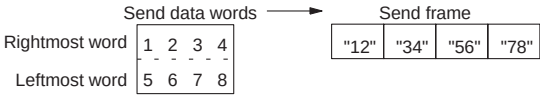
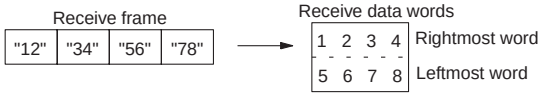


Response Frame



R-2-7 Send/Receive with ASCII Conversion and with Response

The following three communications sequences are available for send/receive with ASCII conversion and response.

Sequence No.	Send sequence	Receive sequence
600 (0258)	Send word order: Rightmost to leftmost 	Receive word order: Leftmost to rightmost 
606 (025E)	Send word order: Leftmost to rightmost 	Receive word order: Leftmost to rightmost 
607 (025F)	Send word order: Rightmost to leftmost 	Receive word order: Rightmost to leftmost 

R-2-8 Structure of the Protocol

The following table shows the structure of the CompoWay/F Master Protocol.

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
600 (0258)	Send with ASCII conversion, with response Send in order from rightmost to leftmost word. Receive in order from leftmost to rightmost word.	Converts the specified data beginning with the command code (MRC, SRC) to ASCII and sends it to the specified Unit. The response is converted to hexadecimal and stored starting at the specified word.	Yes	Yes
601 (0259)	Broadcast with ASCII conversion, no response	A broadcast version of sequence No. 600. No responses are received.	Yes	No
602 (025A)	Send with no conversion and with response	Sends specified data beginning with the command code to the specified Unit. The response is stored starting at the specified word. This is the same as sequence No. 600 without data conversion and can be used when conversion is not required.	Yes	Yes
603 (025B)	Broadcast with no conversion and no response	A broadcast version of sequence No. 602. No responses are received.	Yes	No
604 (025C)	General-purpose send with no conversion and with response	Sends specified data beginning with the subaddress and SID to the specified Unit. The response is stored starting at the specified word. This sequence can be used whenever it is necessary to specify the subaddress or SID.	Yes	Yes

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
605 (025D)	General-purpose broadcast with no conversion and no response	A broadcast version of sequence No. 604. No responses are received.	Yes	No
606 (025E)	Send/receive with ASCII conversion and with response Send: Leftmost to rightmost word order Receive: Leftmost to rightmost word order	Converts specified data beginning with the command code (MRC, SRC) into ASCII and sends it to the specified Unit. The response is converted into hexadecimal and stored starting at the specified word.	Yes	Yes
607 (025F)	Send/receive with ASCII conversion and with response Send: Rightmost to leftmost word order Receive: Rightmost to leftmost word order	Converts specified data beginning with the command code (MRC, SRC) into ASCII and sends it to the specified Unit. The response is converted into hexadecimal and stored starting at the specified word.	Yes	Yes
610 (0262)	Variable area read	Reads the contents of the specified number of elements from the address of the specified variable type from the specified node number and stores the data starting at the specified word.	Yes	Yes
611 (0263)	Variable area write	Writes the contents of the specified number of elements from the address of the specified variable type to the specified node number.	Yes	Yes
612 (0264)	Variable area broadcast send	Writes the specified number of elements from the address of the specified variable type using a broadcast.	Yes	No
613 (0265)	Variable area fill	Writes the same data from the address of the specified variable type to the specified node number.	Yes	Yes
614 (0266)	Variable area broadcast send	Writes the same data from the address of the specified variable type using a broadcast.	Yes	No
615 (0267)	Parameter area read	Reads the contents of the specified number of elements from the address of the specified parameter area from the specified node number and stores the data starting at the specified word.	Yes	Yes
616 (0268)	Parameter area write	Writes the contents of the specified number of elements from the address of the specified parameter area to the specified node number.	Yes	Yes
617 (0269)	Parameter area broadcast write	Writes the specified number of elements from the address of the specified parameter area using a broadcast address.	Yes	No
618 (026A)	Unit properties read	Reads the Controller/component model and communications buffer size from the specified node and stores the data starting at the specified word.	Yes	Yes
619 (026B)	Unit status read	Reads the Controller/component status from the specified node and stores the data starting at the specified word.	Yes	Yes

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
620 (026C)	Echoback test	Executes an echoback test at the specified node.	Yes	Yes
621 (026D)	Operation command	Remotely stops/starts operations of the device at the specified node number.	Yes	Yes

Note The hexadecimal equivalents of sequences numbers are given in parentheses.

Sequence No. 600 can be used for the normal CompoWay/F Master function (ASCII conversion, specified unit, and specification from command code).

Refer to the communications specifications for the OMRON CompoWay/F component to which the command is being sent and set the command code and required data starting at the words specified for the 3rd operand of PMCR(260), and execute the PMCR command.

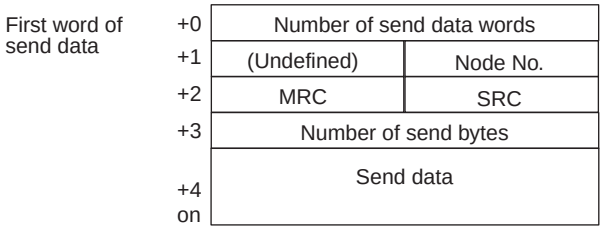
The relationship between the CompoWay/F command and response frames and the operands of PMCR(260) is described next.

Send with ASCII Conversion, with Response: (Sequence No. 600 (Hex 0258))

- Send word order: Rightmost to leftmost
- Receive word order: Leftmost to rightmost

This sequence converts the specified data beginning with the command code to ASCII and sends it to the specified Unit. The response is converted to hexadecimal and stored starting at the specified word.

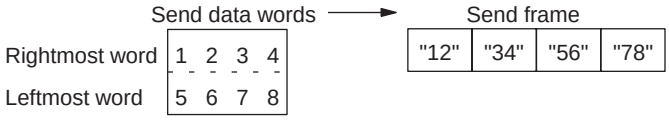
Send Data Word Allocation (3rd Operand of PMCR(260))



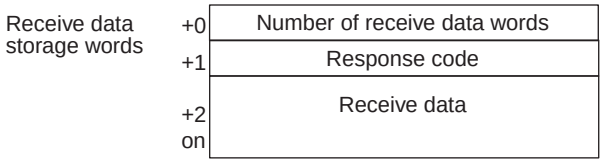
Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
+3	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code until the byte just before the ETX. 0000 to 03D8 Hex (0 to 984 decimal)
+4 on	Send data (4-digit Hex)		The data specified in hexadecimal here will be converted to ASCII and the number of send bytes specified in S+3 will be sent in order of rightmost to leftmost.

Set the number of send bytes to twice the number of bytes in memory. This is necessary because the data is converted to ASCII data before being sent.

Frames are created and sent starting from the rightmost to leftmost word of the address in I/O memory.

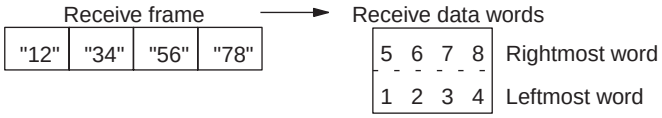


Receive Data Word Allocation (4th Operand of PMCR(260))

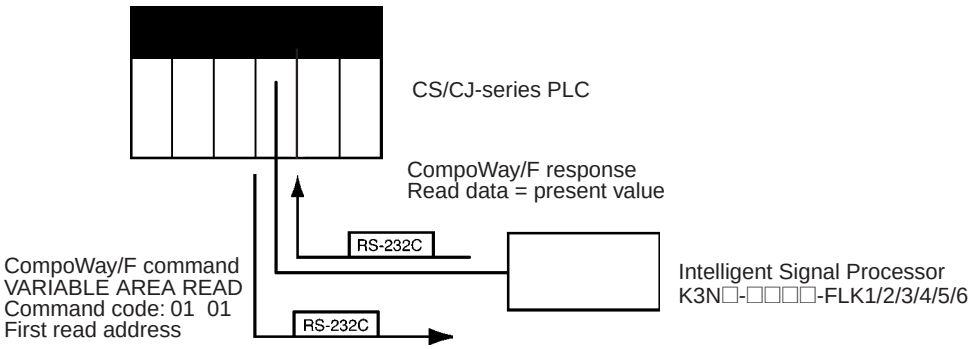


Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits Hex)	The response code of CompoWay/F command will be stored in hexadecimal form.
+2 on	Receive data (4-digit Hex)	The data from just after the response code until just before the ETX will be converted from ASCII to hexadecimal and stored here in order of leftmost to rightmost.

Received frames are stored starting from the leftmost to rightmost word of the address in I/O memory.



Example: The following example illustrates reading the present value from a K3N□-series Intelligent Signal Processor.



Sequence No. 600 (Send with ASCII Conversion, with Response) is used. The specified data beginning with the command code is converted ASCII and sent to the Intelligent Signal Processor with the specified node number. The response is converted to hexadecimal and stored starting at the specified word.

The command frame (command code 01 01) for reading the present value for a K3N□-□□□□-FLK1/2/3/4/5/6 Intelligent Signal Processor is shown below. The following data is specified in the operands for PMCR(260).

- Rightmost byte of S+1: Node number (2 digits BCD)
- S+2: Command code: MRC + SRC = "0101"
- S+4 on: Send data = Variable type + first read address + 00 + number of elements.

STX	Node No.		Subaddress	SID	Command code		Send data				ETX	BCC
					MRC	SRC	Variable type	First read address (Note)	Always 00	No. of elements		
(02 Hex)	($\times 10^1$)	($\times 10^1$)	00	0	01	01	C0	0000	00	0001	(03 Hex)	

Data in shaded portions is specified in the PMCR(260) instruction.

Note A first read address of 0000 specifies the present value. An address of 0001 specifies the maximum value; 0002, the minimum value; and 0003, the status.

The response frame is shown below. The response code and receive data are stored according to the operands for PMCR(260) as follows:

- D+1: Response code
- D+2 on: Receive data

STX	Node No.		Subad-dress	End code	Command code		Response code		Receive data	ETX	BCC
					MRC	SRC	(Note 1)		Read data (Note 2)		
(02 Hex)	($\times 10^1$)	($\times 10^1$)			01	01	00	00	0000	(03 Hex)	

Data in shaded portions is stored at the location specified by the operand in the PMCR(260) instruction.

Note 1 Response Codes

Response code	Meaning
"0000"	Normal end
"1001"	Command too long
"1002"	Command too short
"1100"	Parameter error
"1101"	Area type error
"1103"	First address range error
"2203"	Operating error

2 The read data is returned as 4-digit hexadecimal as follows: F0019999 to 00099999 Hex.

The 3rd and 4th operands of the PMCR(260) instruction are specified as follows.

Send Data Word Allocation (3rd Operand of PMCR(260))

Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0007 Hex
+1	(Undefined)	Node No. (2 digits BCD)	0000 Hex
+2	MRC (2 digits Hex)	SRC (2 digits Hex)	0101 Hex
+3	Number of send bytes (4 digits BCD)		000C Hex
+4	Send data (12 digits Hex)		C000 Hex
+5			0000 Hex
+6			0001 Hex

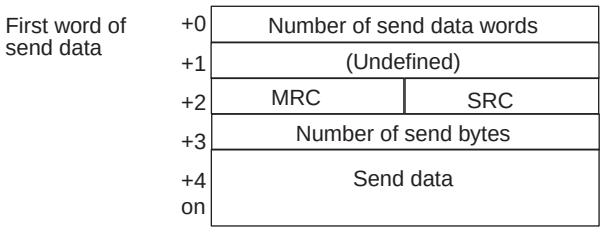
Receive Data Word Allocation (4th Operand of PMCR(260))

Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	Stored at reception (0004 Hex)
+1	Response code (4 digits Hex)	The response code will be stored in hexadecimal form. The normal end response code is 0000.
+2	Receive data (8 digits Hex)	The 4 bytes of read data is stored.
+3		

Broadcast with ASCII Conversion, No Response (Sequence No. 601 (Hex 0259))

This sequence converts the specified data beginning with the command code to ASCII and broadcasts it. No responses are received.

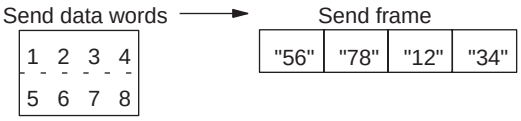
Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
+1	(Undefined) (0000 Hex)		---
+2	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
+3	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code until the byte just before the ETX. 0000 to 03D8 Hex (0 to 984 decimal)
+4 on	Send data (4-digit Hex)		The data specified in hexadecimal here will be converted to ASCII and the number of send bytes specified in S+3 will be sent.

Note 1 Set the number of send bytes to twice the number of bytes in memory. This is necessary because the data is converted to ASCII data before being sent.

2 When hexadecimal data is converted to ASCII data, data is sent starting from the send data word with the largest offset. This is done because user programs handle data in 4-byte units.



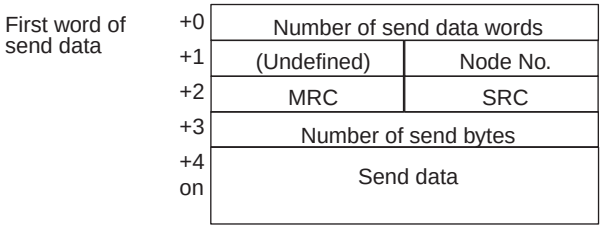
Receive Data Word Allocation (4th Operand of PMCR(260))

None. (Specify a dummy value for the operand, such as #0000.)

Send with No Conversion and with Response (Sequence No. 602 (Hex 025A))

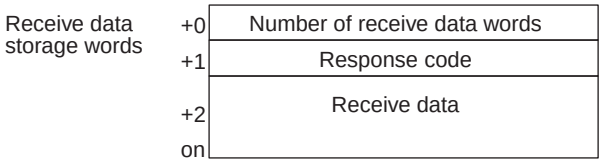
This sequence sends the specified data beginning with the command code to the specified Unit. The response is stored starting at the specified word. No conversions are performed on the send and receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
+3	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code until the byte just before the ETX. 0000 to 01EC Hex (0 to 492 decimal)
+4 on	Send data		The data specified in hexadecimal here is not converted and the number of send bytes specified in S+3 is sent.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

Receive Data Word Allocation (4th Operand of PMCR(260))

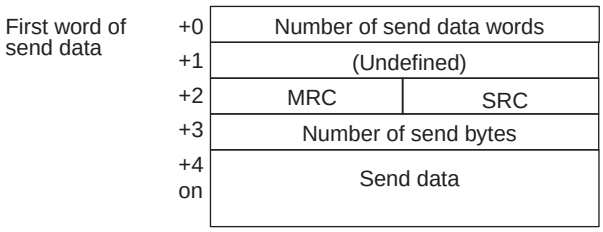


Offset	Contents (data format)		Data
+0	Number of receive data words (4 digits Hex)		0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits Hex)		The response code will be stored in hexadecimal form when the response code is other than 0000.
+2 on	Receive data (Hex)		The data from just after the response code until just before the ETX is stored here without conversion.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

Broadcast with No Conversion and No Response (Sequence No. 603 (Hex 025B))

This sequence broadcasts the specified data beginning with the command code. No responses are received and no conversions are performed on the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0005 to 00FA Hex (5 to 250 decimal)
+1	(Undefined)		---
+2	MRC (2 digits Hex)	SRC (2 digits Hex)	Set the command code for the required service
+3	Number of send bytes (4 digits Hex)		Number of data bytes from the next byte after the command code until the byte just before the ETX. 0000 to 01EC Hex (0 to 492 decimal)
+4 on	Send data		The data specified in hexadecimal here is not converted and the number of send bytes specified in S+3 is sent.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

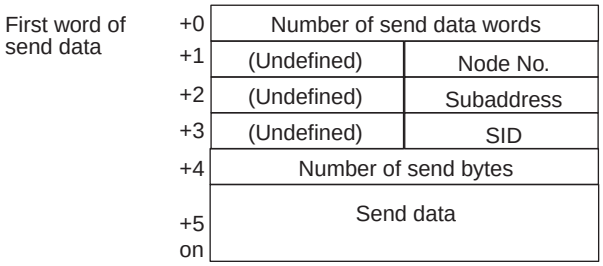
Receive Data Word Allocation (4th Operand of PMCR(260))

None. (Specify a dummy value for the operand, such as #0000.)

General-purpose Send with No Conversion and with Response (Sequence No. 604 (Hex 025C))

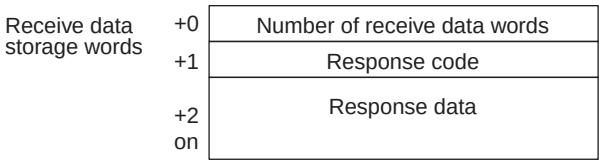
This sequence sends the specified data beginning with the subaddress and SID to the specified Unit. The response is stored starting at the specified word. No conversions are performed on the send and receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0006 to 00FA Hex (6 to 250 decimal)
+1	(Undefined) (00 Hex)	Node No. (2 digits BCD)	00 to 99
+2	(Undefined) (00 Hex)	Subaddress (2 digits Hex)	Specify the subaddress of the device being communicated with.
+3	(Undefined) (000 Hex)	SID (1 digit Hex)	Set the service ID of the required service (e.g., retries).
+4	Number of send bytes (4 digits Hex)		Number of data bytes from the MCR until the byte just before the ETX. 0000 to 01EA Hex (0 to 490 decimal)
+5 on	Send data		The data specified in hexadecimal here is not converted and the number of send bytes specified in S+5 is sent.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

Receive Data Word Allocation (4th Operand of PMCR(260))

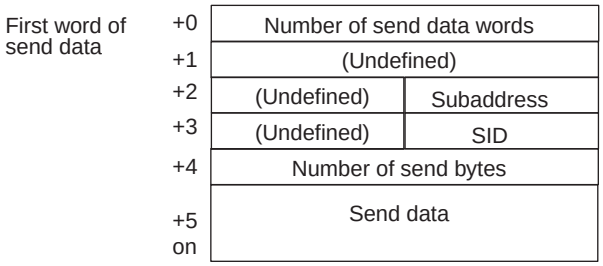


Offset	Contents (data format)		Data
+0	Number of receive data words (4 digits Hex)		0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits Hex)		The response code will be stored in hexadecimal form when the response code is other than 0000.
+2 on	Receive data		The data from just after the response code until just before the ETX is stored here without conversion.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

General-purpose Broadcast with No Conversion and No Response (Sequence No. 605 (Hex 025D))

This sequence broadcasts the specified data beginning with the subaddress and SID. No responses are received and no conversions are performed on the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0006 to 00FA Hex (6 to 250 decimal)
+1	(Undefined) (0000 Hex)		---
+2	(Undefined) (00 Hex)	Subaddress (2 digits Hex)	Specify the subaddress of the device being communicated with.
+3	(Undefined) (000 Hex)	SID (1 digit Hex)	Set the service ID of the required service (e.g., retries).
+4	Number of send bytes (4 digits Hex)		Number of data bytes from the MCR until the byte just before the ETX. 0000 to 01EA Hex (0 to 490 decimal)
+5 on	Send data		The data specified in hexadecimal here is not converted and the number of send bytes specified in S+5 is sent.
	+0	+1	
	+2	+3	
	+4	+5	
	+6 etc.		

Receive Data Word Allocation (4th Operand of PMCR(260))

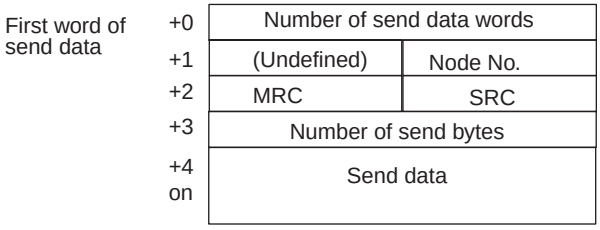
None. (Specify a dummy value for the operand, such as #0000.)

Send/Receive with ASCII Conversion, with Response: (Sequence No. 606 (Hex 025E))

- Send word order: Leftmost to rightmost
- Receive word order: Leftmost to rightmost

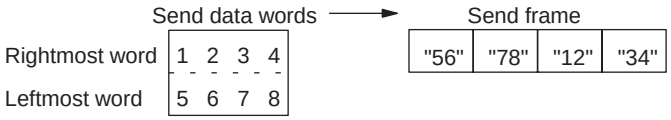
This sequence converts the specified data beginning with the command code (MRC, SRC) to ASCII and sends it to the specified Unit. The response is converted to hexadecimal and stored starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))

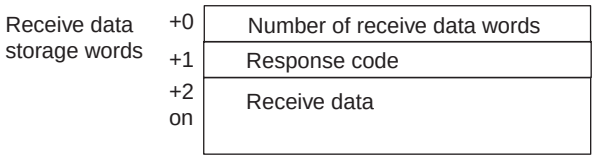


Offset	Contents (data format)		Data
+0	Number of send data words (4 digits Hex)		0005 to 00FA hex (5 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	MRC (2 digits hex)	SRC (2 digits hex)	Set the command code for the required service
+3	Number of send bytes (4 digits hex)		Number of data bytes from the next byte after the command code (MRC, SRC) until the byte just before the ETX. 0000 to 03D8 hex (0 to 984 decimal) Note: The data is converted to ASCII in the communications line, so the number of data bytes is doubled from S+4 and onwards.
+4 on	Send data (4 digits hex)		The data specified in hexadecimal here will be converted to ASCII and the number of send bytes specified in S+3 will be sent in word order from the leftmost to the rightmost word.

Set the number of send bytes to twice the number of bytes in memory. This is necessary because the data is converted to ASCII data before being sent. The frames are created and sent in order from the leftmost word to rightmost word of the I/O memory address.

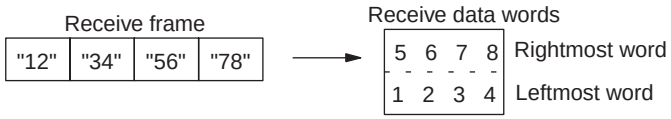


Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits hex)	0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code will be stored in hexadecimal code
+2 on	Receive data (4 digits hex)	The data from just after the response code until just before the ETX is converted from ASCII to hexadecimal and stored in order from the leftmost word to the rightmost word.

The received frames are stored in order from the leftmost word to rightmost word of the I/O memory address.

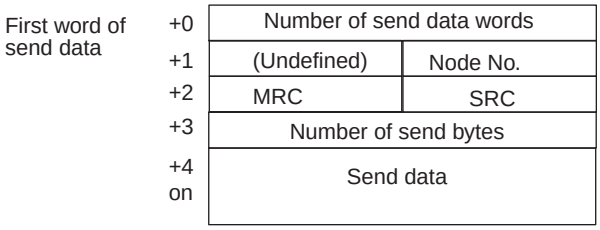


Send/Receive with ASCII Conversion with Response (Sequence No. 607 (Hex 025F))

- Send word order: Rightmost to leftmost
- Receive word order: Rightmost to leftmost

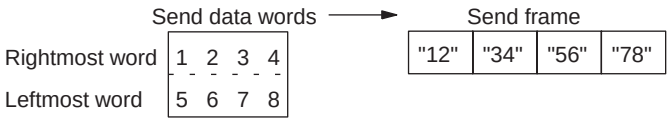
This sequence converts the specified data beginning with the command code (MRC, SRC) to ASCII and sends it to the specified Unit. The response is converted to hexadecimal and stored starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))

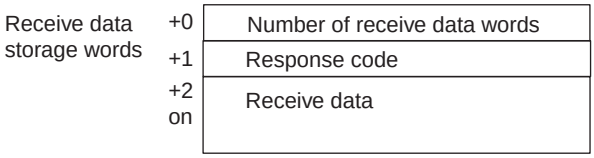


Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0005 to 00FA hex (5 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	MRC (2 digits hex)	SRC (2 digits hex)	Set the command code for the required service
+3	Number of send bytes (4 digits hex)		Number of data bytes from the next byte after the command code (MRC, SRC) until the byte just before the ETX. 0000 to 03D8 hex (0 to 984 decimal) Note: The data is converted to ASCII in the communications line, so the number of data bytes is doubled from S+4 and onwards.
+4 on	Send data (4 digits hex)		The data specified in hexadecimal here will be converted to ASCII and the number of send bytes specified in S+3 will be sent in word order from the rightmost to the leftmost word.

Set the number of send bytes to twice the number of bytes in memory. This is necessary because the data is converted to ASCII data before being sent. The frames are created and sent in order from the rightmost word to leftmost word of the I/O memory address.

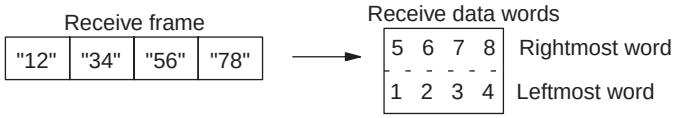


Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words	0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2 on	Receive data (4 digits hex)	The data from just after the response code until just before the ETX is converted from ASCII to hexadecimal and stored in order from the rightmost word to the leftmost word.

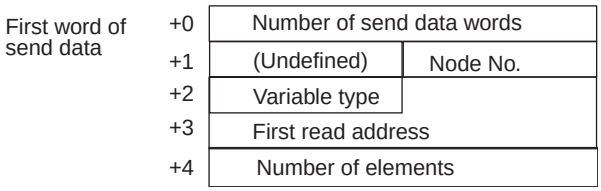
The received frames are stored in order from the rightmost word to leftmost word of the I/O memory address.



Variable Area Read (Sequence No. 610 (Hex 0262))

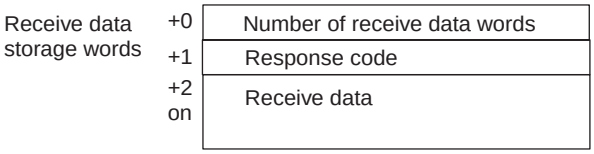
This sequence reads the contents of the specified number of elements from the address of the specified variable type from the specified node number and stores the data starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))



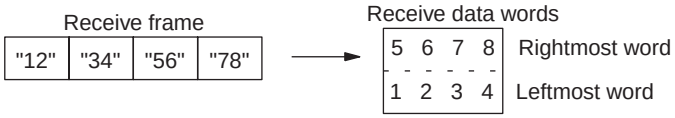
Offset	Contents (data format)		Data
+0	Number of send data words		Always 0005 hex (5 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Variable type (2 digits hex)		Set the area type (2 digits) and the first read address (6 digits). The leftmost 16 bits of the first read word specify the address and the rightmost 8 bits specify the bit location. Set the rightmost 8 bits to 00 when bit access is not required.
+3	First read address (6 digits BCD)		
+4	Number of elements (4 digits BCD)		Set the number of elements to read.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words	0003 to 00FA Hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2 on	Receive data (4 digits hex)	The read data is stored.

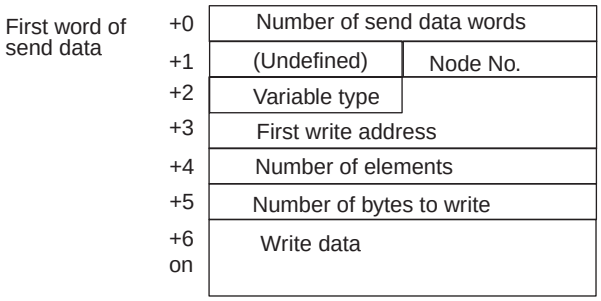
The received frames are stored in order from the leftmost word to the rightmost word of the I/O memory address.



Variable Area Write (Sequence No. 611 (Hex 0263))

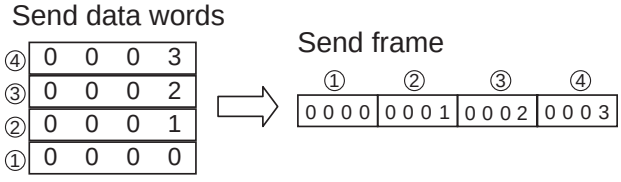
This sequence writes the contents of the specified number of elements from the address of the specified variable type to the specified node number.

Send Data Word Allocation (3rd Operand of PMCR(260))

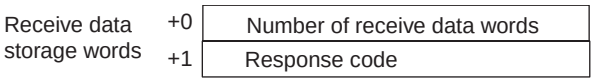


Offset	Contents (data format)		Data
+0	Number of send data words		0007 to 00FA hex (7 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Variable type (2 digits hex)		Set the area type (2 digits) and the first write address (6 digits). The leftmost byte of the first write address specifies the address and the rightmost byte specifies the bit location. Set the rightmost byte to 00 when bit access is not required.
+3	First write address (6 digits BCD)		
+4	Number of elements (4 digits BCD)		Set the number of elements to write.
+5	Number of bytes to write (4 digits hex)		Set the number of bytes to send in the communications line. Note: The data is converted to ASCII in the communications line, so the number of data bytes is doubled from S+6 and onwards.
+6 on	Write data		Set the data to write from the first write address.

Set the number of bytes to write to twice the number of send data in memory. This is necessary because the data is converted to ASCII data before being written. When hexadecimal data is converted to ASCII data, data in the first write address +0 and +1 is stored in I/O memory in order from the leftmost word to rightmost word and the data is sent starting from the send data word with the largest offset. This is done because user programs handle data in 2-word (4-byte) units.



Receive Data Word Allocation (4th Operand of PMCR(260))

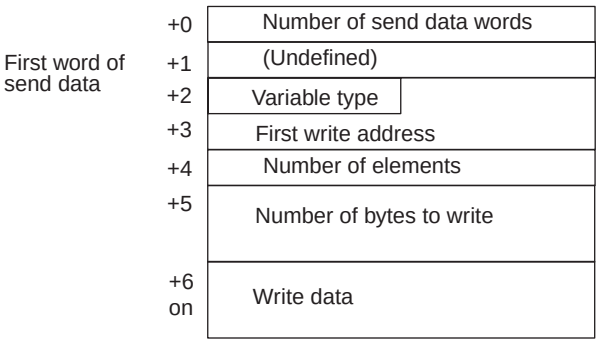


Offset	Contents (data format)	Data
+0	Number of receive data words	Always 0002 hex (2 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.

Variable Area Broadcast Send (Sequence No. 612 (Hex 0264))

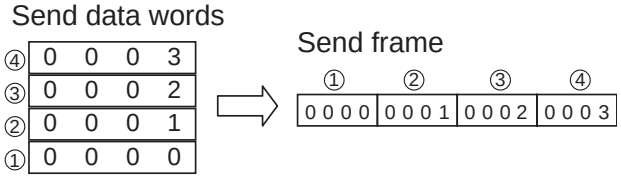
This sequence writes the specified number of elements from the address of the specified variable type using a broadcast.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words	0007 to 00FA hex (7 to 250 decimal)
+1	(Undefined)	---
+2	Variable type (2 digits hex)	Set the area type (2 digits) and the first write address (6 digits). The leftmost byte of the first write address specifies the address and the rightmost byte specifies the bit location. Set the rightmost byte to 00 when bit access is not required.
+3	First write address (6 digits BCD)	
+4	Number of elements (4 digits BCD)	Set the number of elements to write.
+5	Number of bytes to write (4 digits hex)	Set the number of bytes to write to send. Note: The data is converted to ASCII in the communications line, so the number of data bytes is doubled from S+6 and onwards.
+6 on	Write data	Set the data to write from the first write address.

Set the number of bytes to write to twice the number of send data in memory. This is necessary because the data is converted to ASCII data before being written. When hexadecimal data is converted to ASCII data, data in the first write address +0 and +1 is stored in I/O memory in order from the leftmost word to the rightmost word and the data is sent starting from the send data word with the largest offset. This is done because user programs handle data in 2-word (4-byte) units.



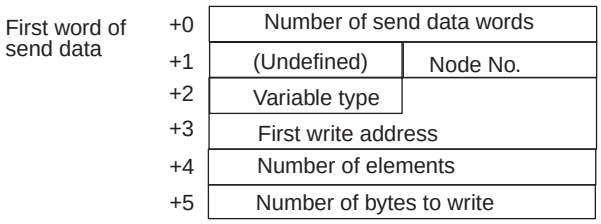
Receive Data Word Allocation (4th Operand of PMCR(260))

None. (Specify a dummy value for the operand, such as #0000.)

Variable Area Fill (Sequence No. 613 (Hex 0265))

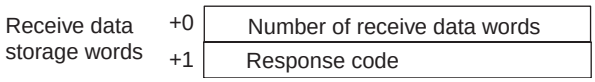
This sequence writes the same data from the address of the specified variable type to the specified node number.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		Always 0006 hex (6 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Variable type (2 digits hex)		Set the area type (2 digits) and the first write address (6 digits). The leftmost byte of the first write address specifies the address and the rightmost byte specifies the bit location. Set the rightmost byte to 00 when bit access is not required.
+3	First write address (6 digits BCD)		
+4	Number of elements (4 digits BCD)		Set the number of elements to write.
+5	Number of bytes to write (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260))

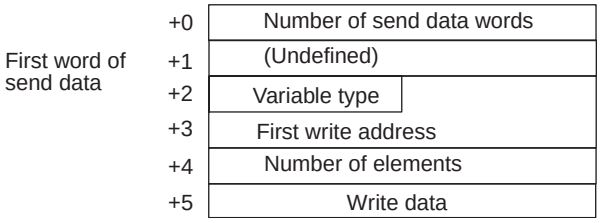


Offset	Contents (data format)	Data
+0	Number of receive data words	Always 0002 hex (2 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.

Variable Area Broadcast Send (Sequence No. 614 (Hex 0266))

This sequence writes the same data from the address of the specified variable type using a broadcast.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		Always 0006 hex (6 decimal)
+1	(Undefined)		---
+2	Variable type (2 digits hex)		Set the area type (2 digits) and the first write address (6 digits). The leftmost byte of the first write address specifies the address and the rightmost byte specifies the bit location. Set the rightmost byte to 00 when bit access is not required.
+3	First write address (6 digits BCD)		
+4	Number of elements (4 digits BCD)		Set the number of elements to write.
+5	Write data (4 digits hex)		Set the write data.

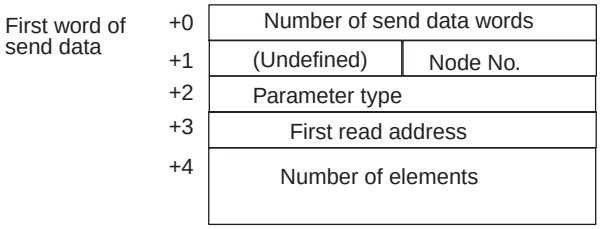
Receive Data Word Allocation (4th Operand of PMCR(260))

None. (Specify a dummy value for the operand, such as #0000.)

Parameter Area Read (Sequence No. 615 (Hex 0267))

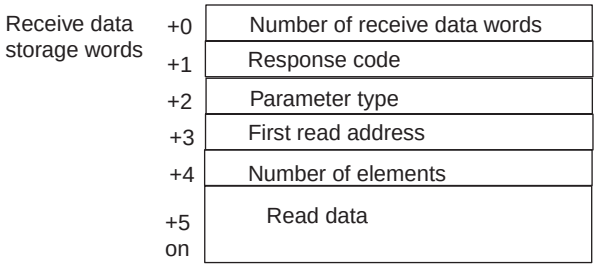
This sequence reads the contents of the specified number of elements from the address of the specified parameter area from the specified node number and stores the data starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))



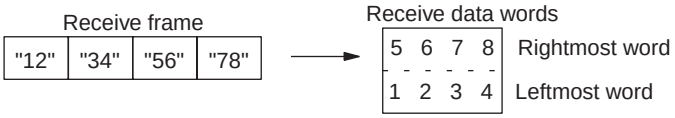
Offset	Contents (data format)		Data
+0	Number of send data words		Always 0005 hex (5 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Parameter type (4 digits hex)		Set the parameter type.
+3	First read address (4 digits hex)		Set the first read address.
+4	Number of elements (4 digits hex)		Set the number of elements to read. (The leftmost bit in the number of elements is always 1.)

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words	0006 to 00FA Hex (6 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2	Parameter type (4 digits hex)	The parameter type is stored in hexadecimal code.
+4	First read address (4 digits hex)	The first read address is stored in hexadecimal code.
+5 on	Read data (4 digits hex)	The read data is stored.

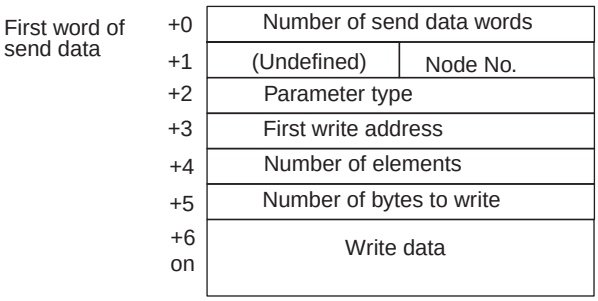
The received frames are stored in order from the leftmost word to the rightmost word of the I/O memory address.



Parameter Area Write (Sequence No. 616 (Hex 0268))

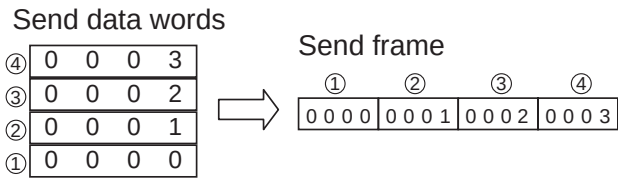
This sequence writes the contents of the specified number of elements from the address of the specified parameter area to the specified node number.

Send Data Word Allocation (3rd Operand of PMCR(260))

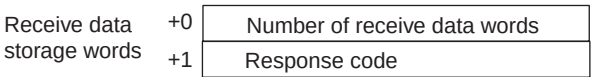


Offset	Contents (data format)		Data
+0	Number of send data words		0007 to 00FA Hex (7 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Parameter type (4 digits hex)		Set the parameter type.
+3	First write address (4 digits hex)		Set the first write address.
+4	Number of elements (4 digits hex)		Set the number of elements to write. (The leftmost bit in the number of elements is always 1.)
+5	Number of bytes to write (4 digits hex)		Set the number of bytes of write data to send in hexadecimal code.
+6 on	Write data		Set the data to write from the first write address.

Set the number of bytes to write to twice the of the actual number of send data bytes. This is necessary because the data is converted to ASCII data before being written. When hexadecimal data is converted to ASCII data, data in the first write address +0 and +1 is stored in I/O memory in order from the leftmost word to the rightmost word and the data is sent starting from the send data word with the largest offset. This is done because user programs handle data in 2-word (4-byte) units.



Receive Data Word Allocation (4th Operand of PMCR(260))

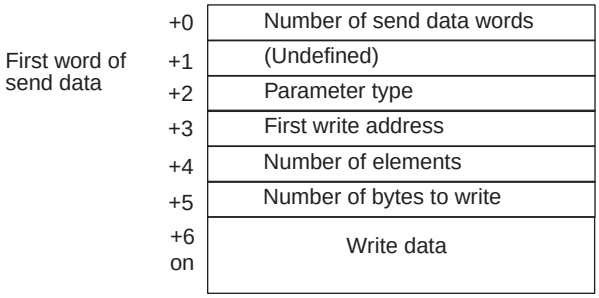


Offset	Contents (data format)	Data
+0	Number of receive data words	Always 0002 Hex (2 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.

Parameter Area Broadcast Send (Sequence No. 617 (Hex 0269))

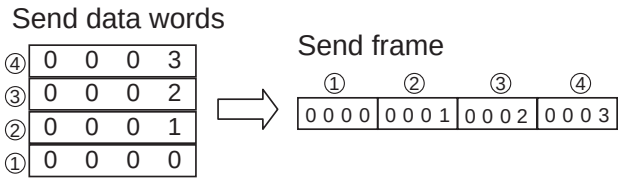
This sequence writes the specified number of elements from the address of the specified parameter area using a broadcast.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words	0007 to 00FA Hex (7 to 250 decimal)
+1	(Undefined)	---
+2	Parameter type (4 digits hex)	Set the parameter type in hexadecimal code.
+3	First write address (4 digits hex)	Set the first write address in hexadecimal code.
+4	Number of elements (4 digits hex)	Set the number of elements to write in hexadecimal code. (The leftmost bit in the number of elements is always 1.)
+5	Number of bytes to write (4 digits hex)	Set the number of bytes of write data to send in hexadecimal code.
+6 on	Write data	Set the data to write from the first write address.

Set the number of bytes to write to twice the of the actual number of send data bytes. This is necessary because the data is converted to ASCII data before being written. When hexadecimal data is converted to ASCII data, data in the first write address +0 and +1 is stored in I/O memory in order from the leftmost word to the rightmost word and the data is sent starting from the send data word with the largest offset. This is done because user programming handles data in 2-word (4-byte) units.



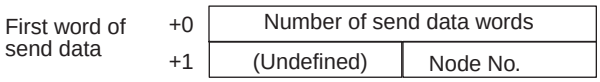
Receive Data Word Allocation (4th Operand of PMCR(260))

None. (Specify a dummy value for the operand, such as #0000.)

Unit Properties Read (Sequence No. 618 (Hex 026A))

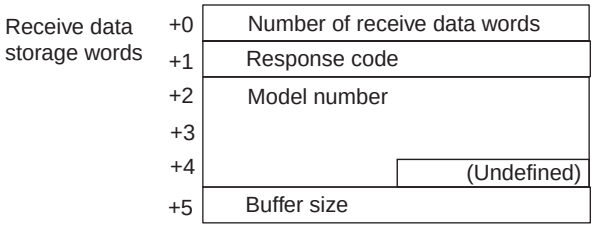
This sequence reads the Controller/component model and communications buffer size from the specified node and stores the data starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		Always 0002 hex (2 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99

Receive Data Word Allocation (4th Operand of PMCR(260))

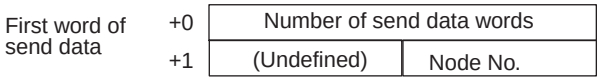


Offset	Contents (data format)		Data
+0	Number of receive data words		Always 0006 Hex (6 decimal)
+1	Response code (4 digits hex)		The CompoWay/F command response code is stored in hexadecimal code.
+2	Model number (10 digits hex)		The model number is stored in hexadecimal code.
+3			
+4		(Undefined)	
+5	Buffer size (4 digits hex)		The send/receive buffer size is stored in hexadecimal code.

Controller Status Read (Sequence No. 619 (Hex 026B))

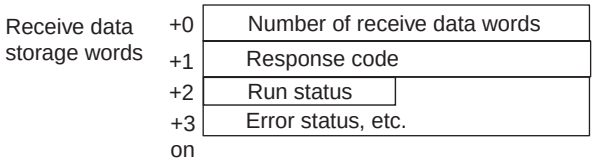
This sequence reads the Controller/component status from the specified node and stores the data starting at the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		Always 0002 hex (2 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99

Receive Data Word Allocation (4th Operand of PMCR(260))

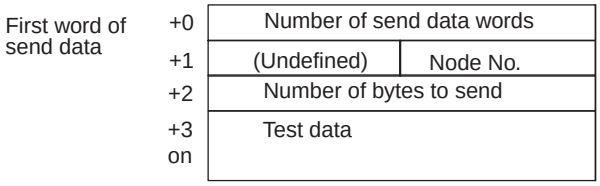


Offset	Contents (data format)	Data
+0	Number of receive data words	0003 to 00FA hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2	Run status (2 digits hex)	The run status, error status, and other status information is stored in hexadecimal code.
+3 on	Error status, etc.	

Echoback Test (Sequence No. 620 (Hex 026C))

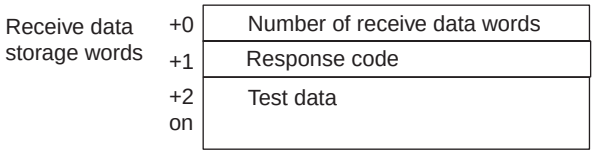
This sequence executes an echoback test at the specified node.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		0004 to 00FA Hex (4 to 250 decimal)
+1	(Undefined)	Node No. (2 digits BCD)	00 to 99
+2	Number of bytes to send (4 digits hex)		0001 to 007A Hex (1 to 122 decimal) Set the number of data bytes for the test.
+3 on	Test data		The test data is sent.

Receive Data Word Allocation (4th Operand of PMCR(260))

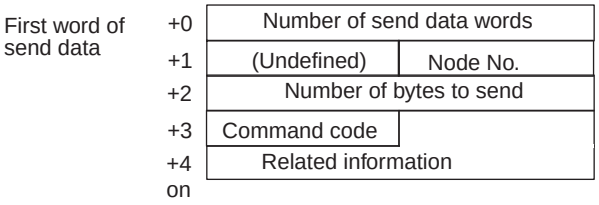


Offset	Contents (data format)	Data
+0	Number of receive data words	0003 to 00FA hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2 on	Test data	The test data is stored.

Operation Command (Sequence No. 621 (Hex 026D))

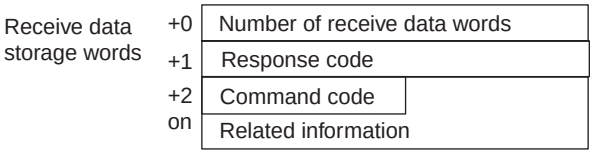
This sequence remotely stops/starts operations of the device at the specified node number.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words		0004 to 00FA Hex (4 to 250 decimal)
+1	(Undefined) (00 hex)	Node No. (2 digits BCD)	00 to 99
+2	Number of bytes to send (4 digits hex)		Set the number of bytes to send for related information (Set to 0002 hex when there is no related information.)
+3	Command code (2 digits hex)		Set the command code and related information.
+4 on	Related information		

Receive Data Word Allocation (4th Operand of PMCR(260))



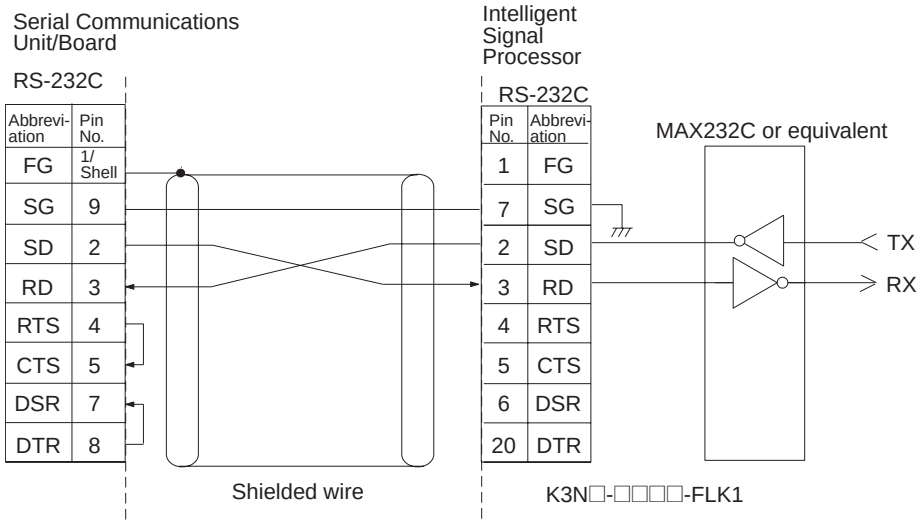
Offset	Contents (data format)	Data
+0	Number of receive data words	0003 to 00FA hex (3 to 250 decimal)
+1	Response code (4 digits hex)	The CompoWay/F command response code is stored in hexadecimal code.
+2	Command code (2 digits hex)	The command code and related information are stored.
+3 on	Related information	

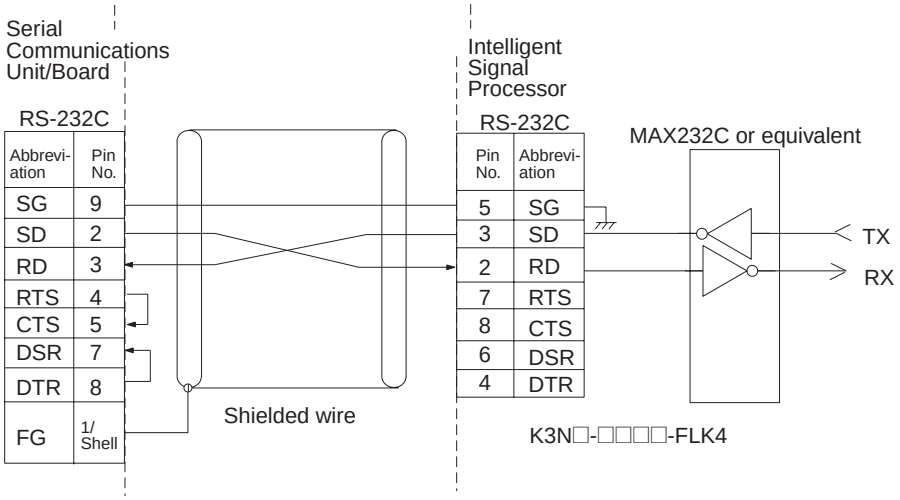
R-2-9 Connections

Connection methods between a Serial Communications Board or Unit and the K3N□-series Intelligent Signal Processor are shown below.

RS-232C

- RS-232C connections are one-to-one.
- The max. cable length is 15 m. Use OMRON RS-232C optical interface (Z3RN) when extending the transmission line beyond 15 m.
- Use shielded, twisted-pair cable.

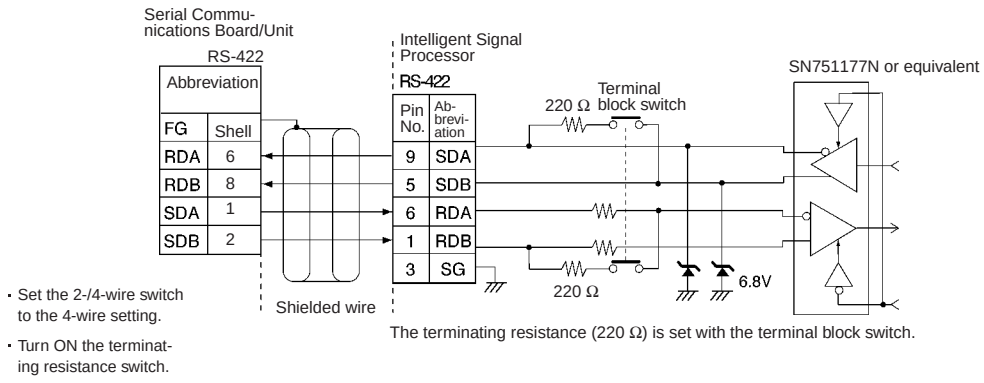




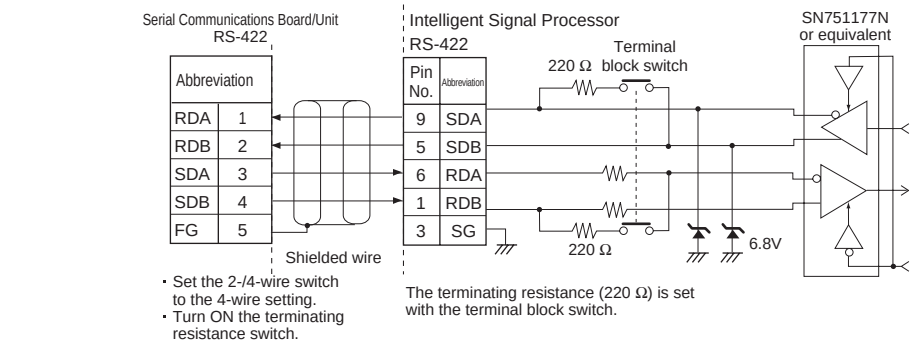
RS-422 4-wire Connections

- RS-422 connections can be one-to-one, or one-to-N when a 3G2A9-AL001 Link Adapter is used. A maximum of 32 Serial Communications Boards and Unit can be connected in one-to-N systems.
- The total cable length can be 500 m max.
- Use shielded, twisted-pair cable.
- Be sure to turn ON the terminating resistance switches only at the device at each end of the transmission line.

CJ1W-SCU□1-V1



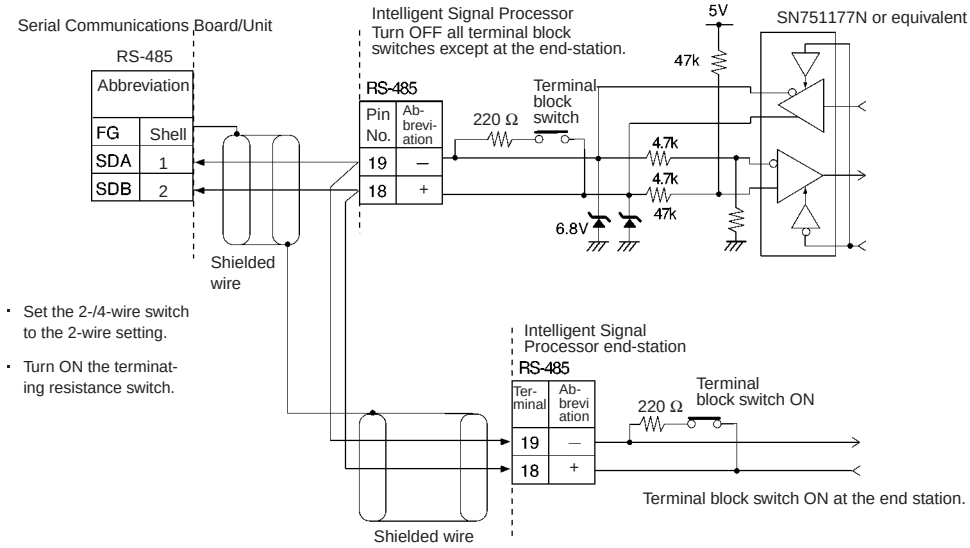
CJ1W-SCU□2



RS-485 2-wire Connections

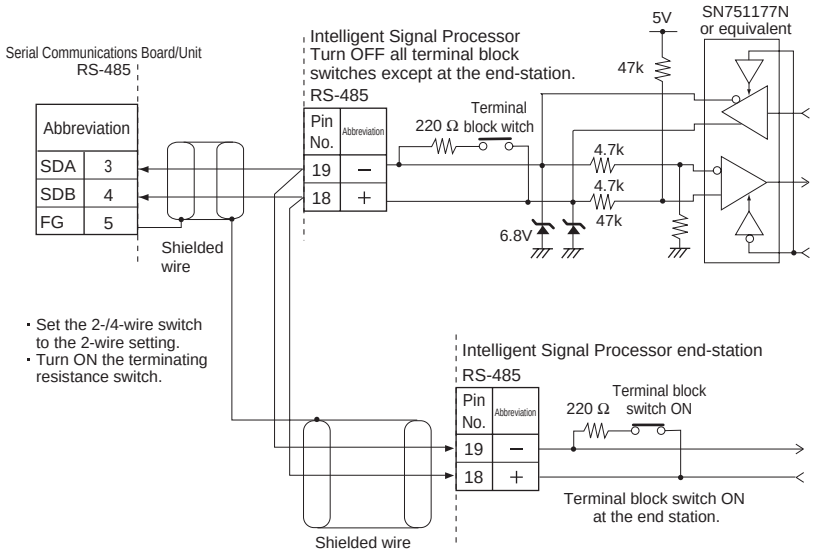
- RS-485 connections can be one-to-one or one-to-N. A maximum of 32 Serial Communications Units/Boards can be connected in one-to-N systems.
- The total cable length can be 500 m max.
- Use shielded, twisted-pair cable.
- Be sure to turn ON the terminating resistance switches only at the device at each end of the transmission line.

CJ1W-SCU□1-V1



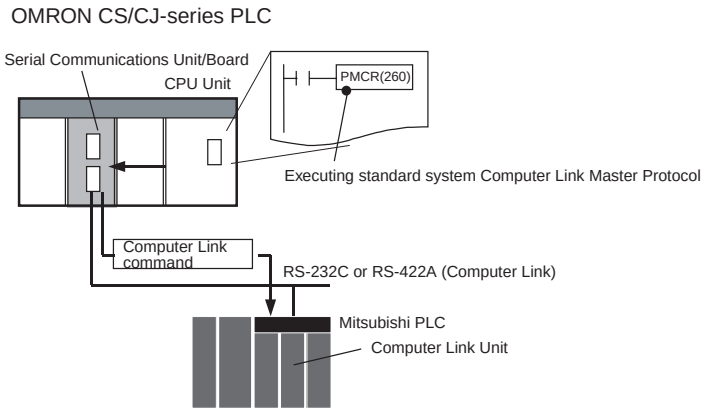
Note SYSMAC BUS Wired Remote I/O devices cannot be connected.

CJ1W-SCU□2



R-3 Mitsubishi Computer Link Master (A-compatible 1C Frame, Model 1)

The Mitsubishi Computer Link Master (A-compatible 1C frame, model 1) Protocol is used to send user-specified or specific (e.g., Device Memory Read/Write) Computer Link commands using the A-compatible 1C frame model 1 control protocol from a CS/CJ-series PLC (CPU Unit) connected through RS-232C or RS-422A to a Mitsubishi PLC (Sequencer CPU Module installed in a Computer Link Module). This protocol enables the OMRON PLC to be used as the host (master) to remotely execute RUN/STOP for or read/write the device memory of a Mitsubishi A/QnA/Q-series PLC that is connected either serially or on a MELSECNET/Ethernet network.



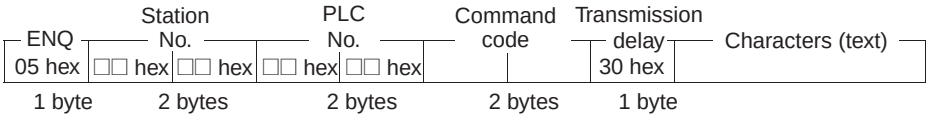
R-3-1 Communications Specifications

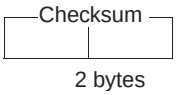
Item	Specifications
Protocol	Computer Link, A-compatible 1C frame, model 1
Transmission path connection	Multi-point
	Host (OMRON CS/CJ-series PLC): Mitsubishi Sequencer CPU Module 1:1, 1:n (n = 32 max), m:n (m+n = 32 max) Note 1: Specifying the PLC number enables access of the specified Sequencer CPU Module on the MELSECNET or Ethernet network. Note 2: Sending data using slave-initiated communications (on-demand function) from the Sequence CPU Unit to the Host is not supported.
Communications method	RS-232C, RS-422A (4-wire, half-duplex)
Synchronization method	Start-stop synchronization
Transmission code	ASCII
Data length	7, 8 bits Note: 8-bit units with "0" added to the beginning of the 7-bit code
Stop bits	1, 2 bits
Error detection method	Horizontal parity (none, 1 bit)

R-3-2 Command/Response Formats

Note In the following diagrams "hex" indicates hexadecimal values. Values in quotation marks, such as "00" indicate ASCII characters.

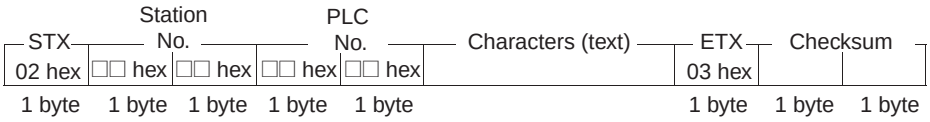
Command Frame



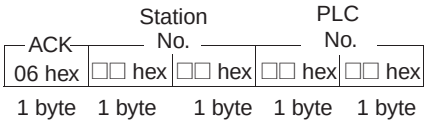


Response Frame

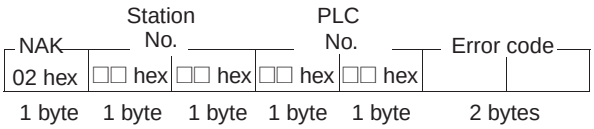
- Normal Response Type 1



- Normal Response Type 2



- Error Response



R-3-3 Command Frame Contents

Item	Contents
Control code	ENQ (05 hex) for A-compatible 1C frames, model 1.
Station No.	This number distinguishes the remote destination Computer Link Module. Setting range: 00 to 1 F hex (0 to 31 decimal), or FF hex (255 decimal) using global function. Set in 2 digits hexadecimal.
PLC No.	This number distinguishes the remote destination Sequencer CPU Module. Set in 2 digits hexadecimal. Accessing Sequencer CPU Module (local station) that is directly connected to the host using serial communications: All FF hex (255 decimal) Accessing Sequencer CPU Module (local station) on the MELSECNET or Ethernet network that is not directly connected to the host using serial communications:01 to 40 hex (1 to 64 decimal) or 00 hex (0 decimal).
Command code	Specify the processing command to read/write device memory and execute remote RUN/STOP of the Mitsubishi Sequencer CPU Module at the remote destination.
Transmission delay	This is the delay until a response is returned from the remote destination Computer Link Module. The Transmission delay is not supported by this protocol, and 0 hex (0 ms) is set in the command frame automatically.
Device type	Set the following device type characters in ASCII. All characters except T/C: X, Y, M, L, S, B, F, M, D, W, R, D T/C characters: TS (contact), TC (coil), CS (contact), CC (coil), TN (PV), CN (PV)
Device address	Specify the addresses for specified device types in hexadecimal.
Device points	Specify the number of bits for bit data and the number of words for word data in hexadecimal.

R-3-4 Mitsubishi Computer Link Master Protocol Sequences

The Mitsubishi Computer Link Master Protocol provides the following 19 communications sequences.

R-3-5 Structure of the Protocol

The following table shows the structure of the Mitsubishi Computer Link Master (A-compatible 1C frame, model 1) Protocol.

- Sending User-specified Commands

Sequence No. (HEX)	Communications sequence name	Computer Link command	Function
800 (0320)	Send/receive user-specified Computer Link commands with ASCII conversion	User-specified	Converts the text data of a user-specified Computer Link command into ASCII and sends to the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows). The response data is converted into hexadecimal and stored in the CS/CJ-series CPU Unit starting from the specified word.
801 (0321)	Send/receive user-specified Computer Link commands without conversion	User-specified	Sends the text data of a user-specified Computer Link command to the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows) without converting into ASCII. The response data is stored in the CS/CJ-series CPU Unit starting from the specified word without converting into hexadecimal.

- Sending Device Read/Write Commands Common to ACPU

Sequence No. (HEX)	Communications sequence name	Computer Link command	Device type	Function
802 (0322)	Device memory batch read as word data (all device types except T/C)	WR (Device memory batch read as word data)	Device other than Timer/Counter	Reads the word data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
803 (0323)	Device memory batch read as word data (T/C device type)		Timer/Counter (T, C)	Reads the word (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
804 (0324)	Device memory fill as word data (all device types except T/C)	WW (Device memory fill as word data)	Device other than Timer/Counter	Writes the word data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
805 (0325)	Device memory fill as word data (T/C device type)		Timer/Counter (T, C)	Writes the word (PV) data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
806 (0326)	Device memory batch read as bit data (all device types except T/C)	BR (Device memory batch read as bit data)	Device other than Timer/Counter	Reads the bit data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
807 (0327)	Device memory batch read as bit data (T/C device type)		Timer/Counter (T, C)	Reads the bit (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
808 (0328)	Device memory fill as bit data (all device types except T/C)	BW (Device memory fill as bit data)	Device other than Timer/Counter	Writes the bit data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
809 (0329)	Device memory fill as bit data (T/C device type)		Timer/Counter (T, C)	Writes the bit (PV) data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

- Sending Device Read/Write Commands Common to AnA/AnU CPU

Sequence No. (HEX)	Communications sequence name	Computer Link command	Device type	Function
810 (032A)	Device memory batch read as word data (all device types except T/C)	QR (Device memory batch read as word data)	Device other than Timer/Counter	Reads the word data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
811 (032B)	Device memory batch read as word data (T/C device type)		Timer/Counter (T, C)	Reads the word (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
812 (032C)	Device memory fill as word data (all device types except T/C)	QW (Device memory fill as word data)	Device other than Timer/Counter	Writes the word data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
813 (032D)	Device memory fill as word data (T/C device type)		Timer/Counter (T, C)	Writes the word (PV) data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
814 (032E)	Device memory batch read as bit data (all device types except T/C)	JR (Device memory batch read as bit data)	Device other than Timer/Counter	Reads the bit data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
815 (032F)	Device memory batch read as bit data (T/C device type)		Timer/Counter (T, C)	Reads the bit (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.
816 (0330)	Device memory fill as bit data (all device types except T/C)	JW (Device memory fill as bit data)	Device other than Timer/Counter	Writes the bit data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).
817 (0331)	Device memory fill as bit data (T/C device type)		Timer/Counter (T, C)	Writes the bit (PV) data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

- Sending Commands Common to ACPU

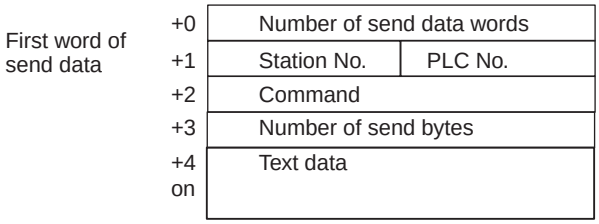
Sequence No. (HEX)	Communications sequence name	Computer Link command	Function
818 (0332)	Loopback test	TT (Loopback test)	Executes a loopback test at the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows). (E.g, if the data starting from the specified word + 3 is sent from the host, the Computer Link Module will return the data unchanged to the host.)

The values in parentheses are hexadecimal.

Send/Receive User-specified Computer Link Commands, with ASCII Conversion (Sequence No. 800 (Hex 0320)) Command Code: User-specified

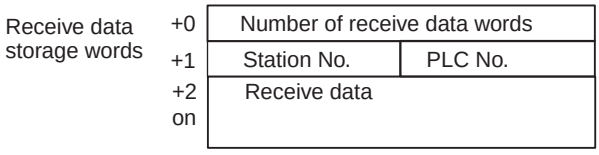
This sequence converts the text data of a user-specified Computer Link command into ASCII and sends to the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows). The response data is converted into hexadecimal and stored in the CS/CJ-series CPU Unit starting from the specified word.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0004 to 00FA hex (4 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Command (4 digits hex)		Specify the service command code to be used in ASCII.
+3	Number of send bytes (4 digits hex)		0000 to 007A hex (0 to 122 decimal) Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+4 onwards)
+4 on	Text data		Set the text data for the command. The specified hexadecimal data will be converted into ASCII and sent.

Receive Data Word Allocation (4th Operand of PMCR(260))

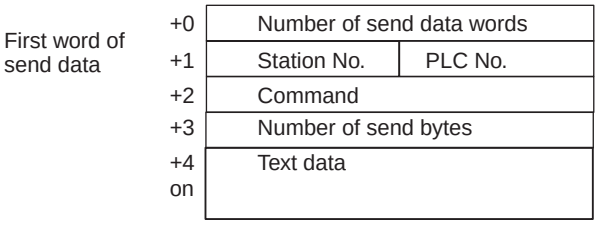


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 to 00FA hex (2 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Receive data (4 digits hex)		Any receive data is converted into hexadecimal and stored.

Send/Receive User-specified Computer Link Commands without Conversion (Sequence No. 801 (Hex 0321)) Command Code: User-specified

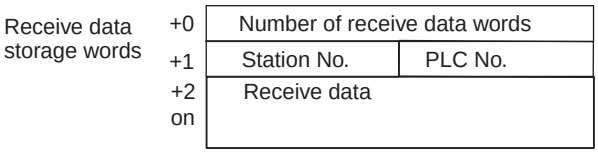
This sequence sends the text data of a user-specified Computer Link command to the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows) without converting into ASCII. The response data is stored in the CS/CJ-series CPU Unit starting from the specified word without converting into hexadecimal.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0004 to 00FA hex (4 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Command (4 digits hex)		Specify the service command code to be used in ASCII.
+3	Number of send bytes (4 digits hex)		0000 to 007A hex (0 to 122 decimal) Note: The hexidecimal data is sent as is on the communication line, so specify the actual number of bytes of text data in S+5 onwards.
+4 on	Text data		Specify the text data for the command. The specified hexadecimal data will be sent as is.

Receive Data Word Allocation (4th Operand of PMCR(260))

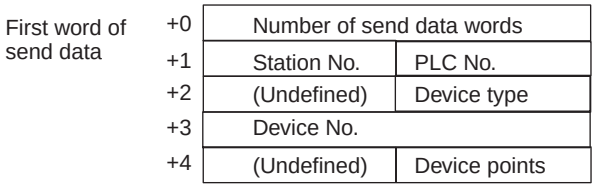


Offset	Contents (data format)		Data
+0	Number of receive data bytes		0002 to 00FA hex (2 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Receive data (4 digits hex)		Any receive data is converted into hexadecimal and stored.

Device Memory Batch Read as Word data (Any Device Type Except T/C) (Sequence No. 802 (Hex 0322)) (Command Code: WR)

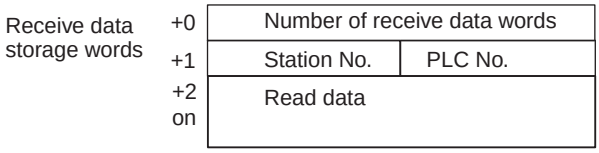
This sequence reads the word data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0005 hex (5 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (4 digits hex)		Set the first read address of the device to read.
+4	(Undefined)	Number of Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

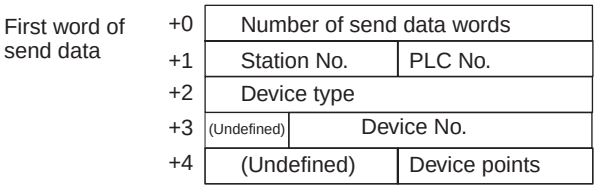


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (2 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Batch Read as Word Data (T/C Device Type) (Sequence No. 803 (Hex 0323)) (Command Code: WR)

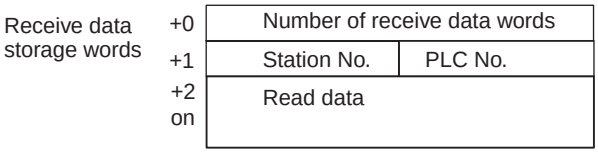
This sequence reads the word (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0005 hex (5 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	(Undefined)	Device No. (3 digits hex)	Set the first read address of the device to read.
+4	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

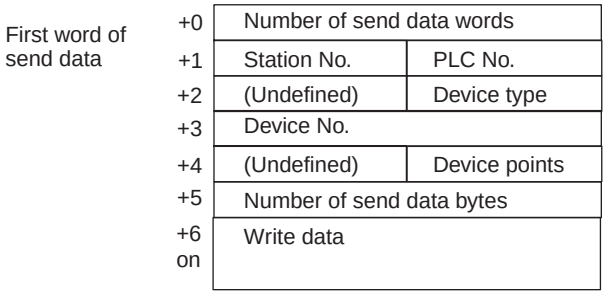


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (2 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Fill as Word Data (Any Device Type Except T/C) (Sequence No. 804 (Hex 0324)) (Command Code: WW)

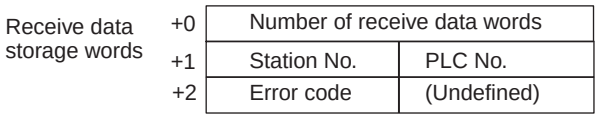
This sequence writes the word data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0007 to 00FA hex (7 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (4 digits hex)		Set the first write address of the write data.
+4	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+5	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+6 onwards)
+6 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260))

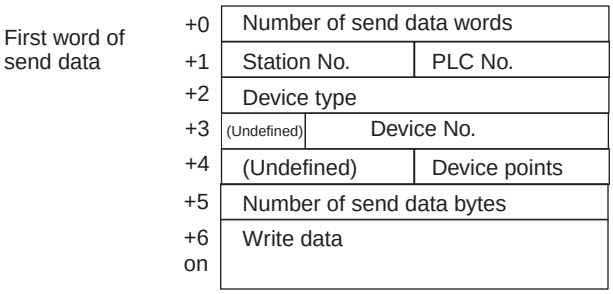


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Fill as Word Data (T/C Device Type) (Sequence No. 805 (Hex 0325)) (Command Code: WW)

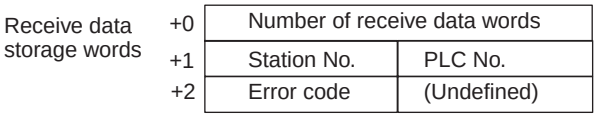
This sequence writes the word (PV) data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0007 to 00FA hex (7 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	(Undefined)	Device No. (3 digits hex)	Set the first write address of the write data.
+4	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+5	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+6 onwards)
+6 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260))

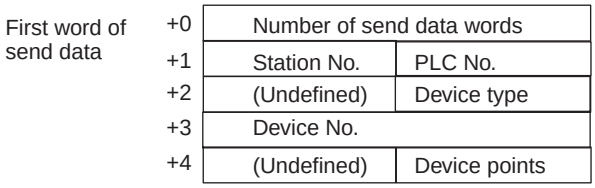


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Batch Read as Bit Data (All Device Types Except T/C) (Sequence No. 806 (Hex 0326)) (Command Code: BR)

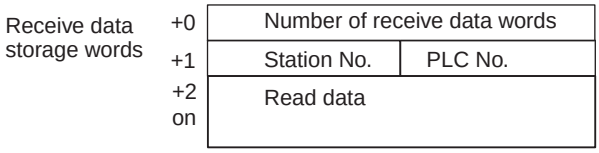
This sequence reads the bit data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0005 hex (5 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (4 digits hex)		Set the first read address of the device to read.
+4	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

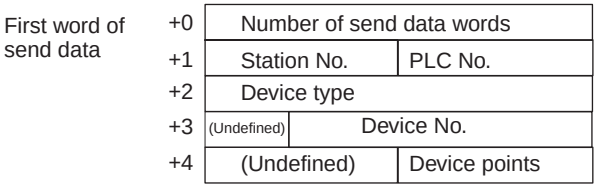


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Batch Read as Bit Data (T/C Device Type) (Sequence No. 807 (Hex 0327)) (Command Code: BR)

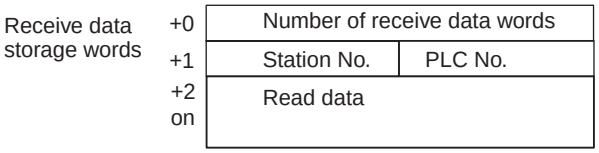
This sequence reads the bit (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0005 hex (5 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	(Undefined)	Device No. (3 digits hex)	Set the first read address of the device to read.
+4	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

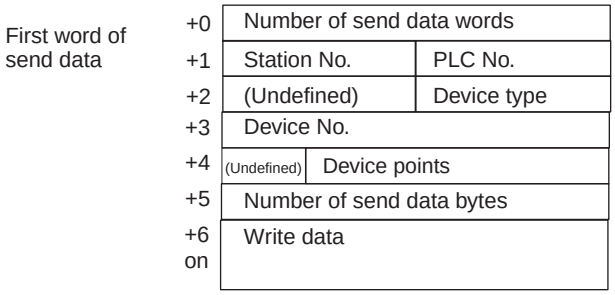


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Fill as Bit Data (All Device Types Except T/C) (Sequence No. 808 (Hex 0328)) (Command Code: BW)

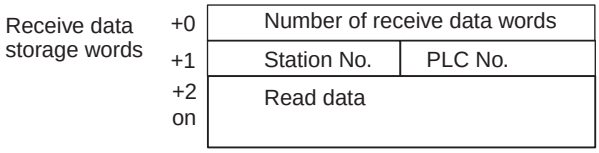
This sequence writes the bit data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0007 to 00FA hex (7 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (2 characters) in ASCII.
+3	Device No. (4 digits hex)		Set the first write address of the write data.
+4	(Undefined)	Device points (3 digits hex)	Set the device points to write.
+5	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+6 onwards)
+6 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260))

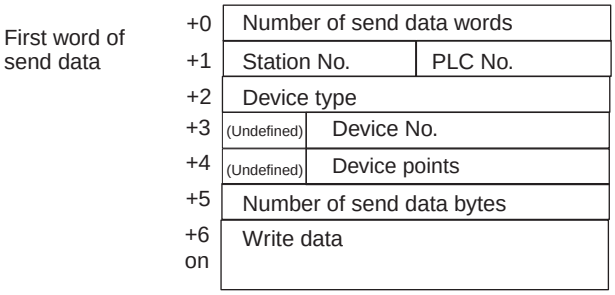


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexadecimal.

Device Memory Fill as Bit Data (T/C Device Type) (Sequence No. 809 (Hex 0329)) (Command Code: BW)

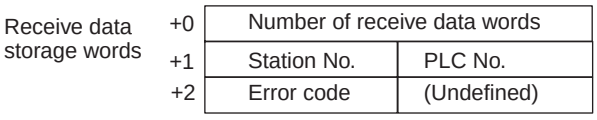
This sequence writes the bit (PV) data starting from the specified word + 6 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0007 to 00FA hex (7 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	(Undefined)	Device No. (3 digits hex)	Set the first write address of the write data.
+4	(Undefined)	Device points (3 digits hex)	Set the device points to write.
+5	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+6 onwards)
+6 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of receive data words		0002 hex or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Batch Read as Word Data (All Device Types Except T/C) (Sequence No. 810 (Hex 032A)) (Command Code: QR)

This sequence reads the word data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data

+0	Number of send data words	
+1	Station No.	PLC No.
+2	(Undefined)	Device type
+3	Device No.	
+4		(Undefined)
+5	(Undefined)	Device points

Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0006 hex (6 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (6 digits hex)		Set the first read address of the device to read.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

Receive data storage words

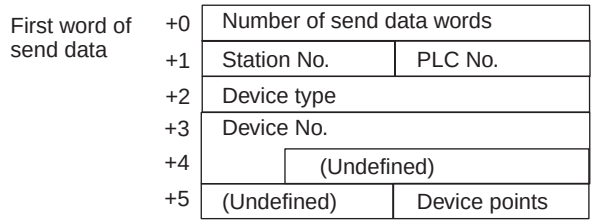
+0	Number of receive data words	
+1	Station No.	PLC No.
+2 on	Read data	

Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexadecimal.

Device Memory Batch Read as Word Data (T/C Device Type) (Sequence No. 811 (Hex 032B)) (Command Code: QR)

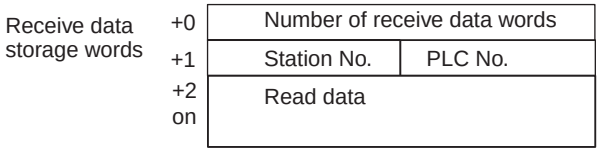
This sequence reads the word (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0006 hex (6 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	Device No. (5 digits hex)		Set the first read address of the device to read.
+4	(Undefined)		
+5	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

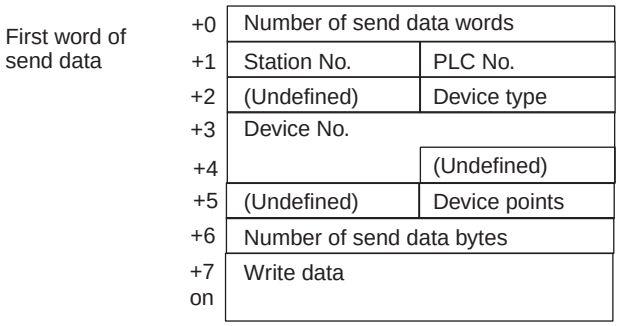


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Fill as Word Data (All Device Types Except T/C) (Sequence No. 812 (Hex 032C)) (Command Code: QW)

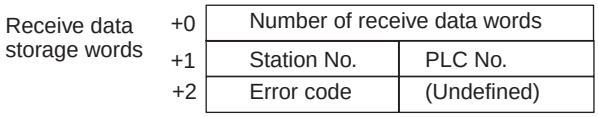
This sequence writes the word data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0008 to 00FA hex (8 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (6 digits hex)		Set the first write address of the write data.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+6	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+7 onwards)
+7 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260)

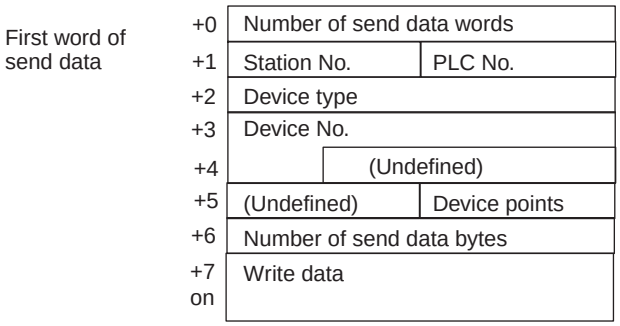


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 hex or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Fill as Word Data (T/C Device Type) (Sequence No. 813 (Hex 032D)) (Command Code: QW)

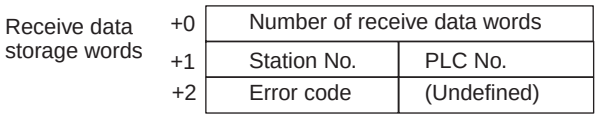
This sequence writes the word (PV) data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0008 to 00FA hex (8 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	Device No. (5 digits hex)		Set the first write address of the write data.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+6	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+7 onwards)
+7 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260)

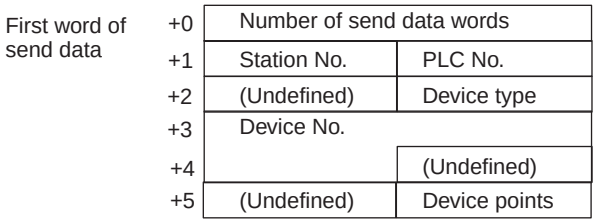


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 hex or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Batch Read as Bit Data (All Device Types Except T/C) (Sequence No. 814 (Hex 032E)) (Command Code: JR)

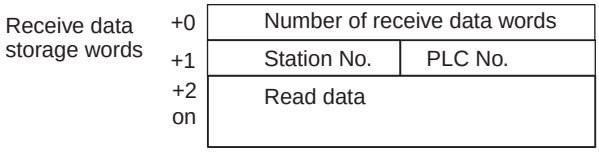
This sequence reads the bit data for the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0006 hex (6 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (6 digits hex)		Set the first read address of the device to read.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

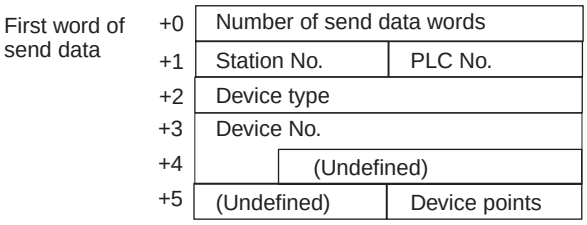


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexadecimal.

Device Memory Batch Read as Bit Data (T/C Device Type) (Sequence No. 815 (Hex 032F)) (Command Code: JR)

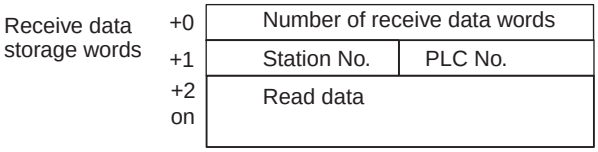
This sequence reads the bit (PV) data for the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows), converts the data into hexadecimal, and stores it starting from the specified word + 2 in the CS/CJ-series CPU Unit.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0006 hex (6 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (1 character) in ASCII.
+3	Device No. (5 digits hex)		Set the first read address of the device to read.
+4	(Undefined)		
+5	(Undefined)	Device points (2 digits hex)	Set the device points to read.

Receive Data Word Allocation (4th Operand of PMCR(260))

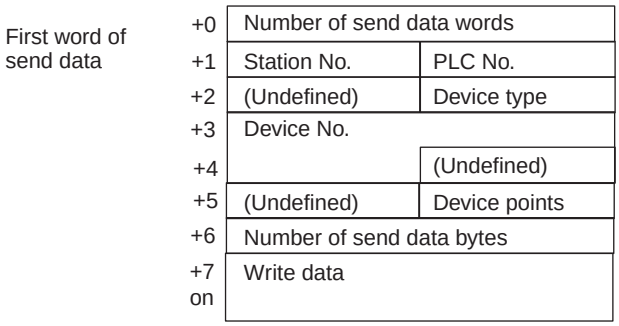


Offset	Contents (data format)		Data
+0	Number of receive data words		0003 to 00FA hex (3 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2 on	Read data (4 digits hex)		Stores the number read data converted into hexa-decimal.

Device Memory Fill as Bit Data (All Device Types Except T/C) (Sequence No. 816 (Hex 0330)) (Command Code: JW)

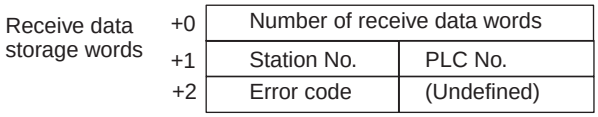
This sequence writes the bit data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (except T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0008 to 00FA hex (8 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Device type (2 digits hex)	Set the device type (1 character) in ASCII.
+3	Device No. (6 digits hex)		Set the first write address of the write data.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+6	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+7 onwards)
+7 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260)

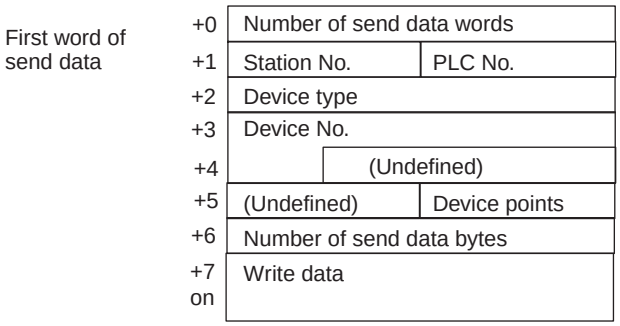


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 hex or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Device Memory Fill as Bit Data (T/C Device Type) (Sequence No. 817 (Hex 0331)) (Command Code: JW)

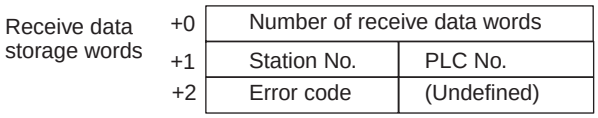
This sequence writes the bit (PV) data starting from the specified word + 7 in the CS/CJ-series CPU Unit to the number of device points starting from the specified device address for the specified device type (T, C) in the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows).

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		0008 to 00FA hex (8 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Device type (4 digits hex)		Set the device type (2 characters) in ASCII.
+3	Device No. (5 digits hex)		Set the first write address of the write data.
+4		(Undefined)	
+5	(Undefined)	Device points (2 digits hex)	Set the device points to write.
+6	Number of send data bytes (4 digits hex)		Specify the number of text data bytes for the communications line (i.e., twice the number of text bytes in S+7 onwards)
+7 on	Write data (4 digits hex)		Set the write data.

Receive Data Word Allocation (4th Operand of PMCR(260)

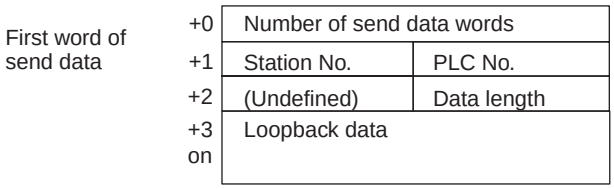


Offset	Contents (data format)		Data
+0	Number of receive data words		0002 hex or 0003 hex (2 or 3 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Error code (2 digits hex)	(Undefined)	Stores the error code converted to hexadecimal. No error code is stored for normal completion.

Loopback Test (Sequence No. 818 (Hex 0332)) (Command Code: TT)

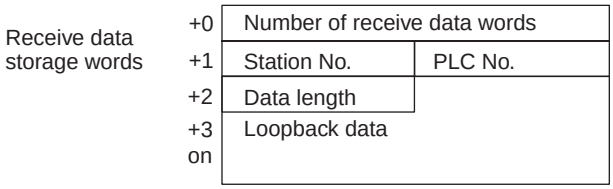
This sequence executes a loopback test at the Mitsubishi Computer Link Module with the specified station number (and the PLC number that follows). (E.g, if the data starting from the specified word + 3 is sent from the host, the Computer Link Module will return the data unchanged to the host.)

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)		Data
+0	Number of send data words (4 digits hex)		Always 0005 hex (5 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	(Undefined)	Data length (2 digits hex)	Set the number of bytes of loopback data in S+3 onwards.
+3 on	Loopback data		Set the loopback data to send.

Receive Data Word Allocation (4th Operand of PMCR(260)



Offset	Contents (data format)		Data
+0	Number of receive data words		0002 to 00FA hex (2 to 250 decimal)
+1	Station No. (2 digits hex)	PLC No. (2 digits hex)	Station No.: 00 to FF hex PLC No.: 00 to FF hex
+2	Data length (2 digits hex)		The data length for the loopback data is stored.
+3 on	Loopback data		The loopback data is stored unchanged.

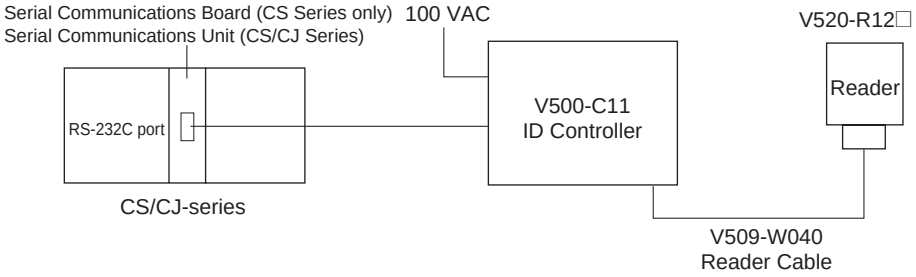
R-4 V500/V520 Bar Code Reader Protocol

The V500/V520 Bar Code Reader Protocol is used to remotely make various settings or control the Bar Code Reader connected the Serial Communications Unit/Board via RS-232C cable.

R-4-1 Connections

The connections for using the V500/V520 Bar Code Reader Protocol are shown below.

V500 Connections



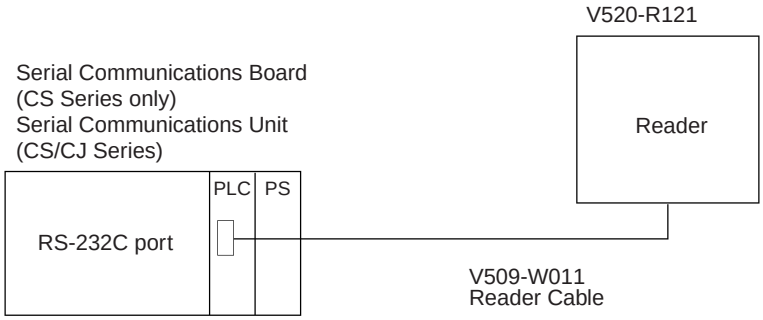
Serial Communications Unit/Board:
D-sub 9 pin female

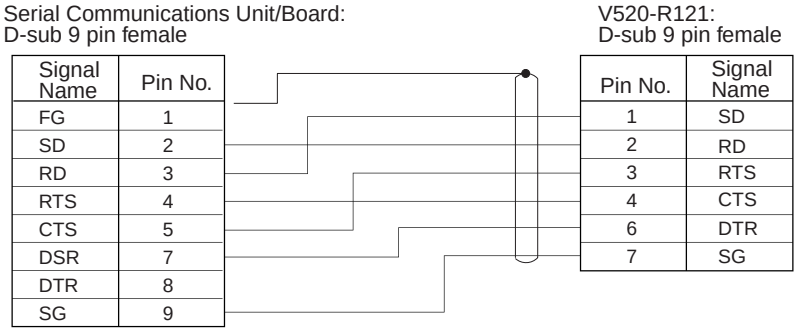
Signal Name	Pin No.
FG	1
SD	2
RD	3
RS	4
CS	5
DR	7
ER	8
SG	9

V500-C11:
D-sub 9 pin female

Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
7	DR
8	ER
9	SG

V520 Connections





Signal Name	Pin No.
FG	1
SD	2
RD	3
RTS	4
CTS	5
DSR	7
DTR	8
SG	9

Pin No.	Signal Name
1	SD
2	RD
3	RTS
4	CTS
6	DTR
7	SG

R-4-2 System Setting

Shown below are the system settings of the V500-C11 and V520-R121 when this protocol is used.

Additional Information

The portions enclosed by boxes are used for this protocol.

V500-C11

- **BCR Functions**

Read trigger	"READ SIGNAL INPUT", "ONLINE READ COMMAND"
Read control method	"SINGLE READ", "CONTINUOUS READ"

- **Host Interface**

Prefix	NONE, "STX"
Suffix	"ETX", "CR "
Bar code output	"OUTPUT", "NO OUTPUT"

V520-R121

Start code	NONE, "STX"
Stop code	"ETX", "CR"
Operation mode	External trigger, host trigger
Data output mode	1-shot, continuous

R-4-3 Protocol Configuration

The configuration of the V500/V520 Bar Code Reader Protocol is shown below.

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
350 (015E)	BCR read start	Instructs the Reader to start a BCR read.	No	No
351 (015F)	BCR read stop	Instructs the Reader to stop a BCR read.	No	No
352 (0160)	Data read	Data read by the Reader is received and saved in the receive words.	No	Yes
353 (0161)	Complete data read	Instructs the Reader to start a read. After the data read by the Reader is received and saved to the receive words, reading is stopped.	No	Yes
354 (0162)	BCR function write (V500)	Writes the operation mode and read functions.	Yes	No
355 (0163)	BCR function read (V500)	Reads the operation mode and read functions.	No	Yes
356 (0164)	Log data output request (V500)	Requests output of log data sent to host.	Yes	Yes
357 (0165)	Preset data set (V500)	Writes preset data.	Yes	No
358 (0166)	BCR connection confirmation (V500)	Confirms if the Reader is correctly set.	No	No
359 (0167)	Log data clear (V500)	Clear log data.	No	No
360 (0168)	Continuous data read (scan) (V500)	Performs the following operations repeatedly: starts reading, receives data read by the Reader, saves the data to the receive words by the scan method.	No	Yes
361 (0169)	Continuous data read (interrupt) (V500) (*)	Performs the following operations repeatedly: starts reading, receives data read by the Reader, saves the data to the receive words by the interrupt method (interrupt No.100).	No	Yes
362 (016A)	BCR initialize	Clears the log, confirms BCR connection, and sets BCRs.	Yes	No
363 (016B)	Continuous data read (scan) (V520)	Performs the following operations repeatedly: starts reading, receives data read by the Reader, saves the data to the receive words by the scan method.	No	Yes

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
364 (016C)	Continuous data read (interrupt) (V520) (*)	Performing the following operations repeatedly: starts reading, receives data read by the Reader, saves the data to the receive words by the interrupt method (interrupt No.100).	No	Yes
365 (016D)	General-purpose command 1	Used to send data of a specified data length, and receive only ACK as the receive data.	Yes	No
366 (016E)	General-purpose command 2	Used to send data of a specified data length, and receive ACK together with the return of other receive data. The frame format of the receive data, however, has to contain STX and ETX.	Yes	Yes

* Sequences No. 361 and No. 364 (Continuous Data Read with Interrupt) are not supported by the CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1) Serial Communications Units. A protocol syntax error will occur if an attempt is made to execute either sequence with the Serial Communications Unit.

Note The hexadecimal equivalents of sequences numbers are given in parentheses.

Ladder Interface Settings

YES: User settings are required for the 3rd and 4th operands of PMCR(260).

NO: Send word allocation: Set the constant 0000 for the 3rd operand (S).
Receive word allocation: Set the constant 0000 for the 4th operand (D).

BCR Read Start (Sequence No. 350 (Hex 015E))

This sequence instructs the Bar Code Reader to start reading.

Send Data Word Allocation 3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

BCR Read Stop (Sequence No. 351 (Hex 015F))

This sequence instructs the Bar Code Reader to stop reading.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

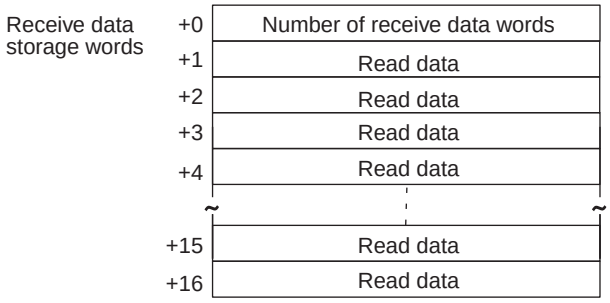
Data Read (Sequence No. 352 (Hex 0160))

This sequence receives read data and saves it to the receive data storage words.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	0002 to 0011 (2 to 17 decimal)
+1 to +16	Read data (ASCII)	30 ('0') to 39 ('9'), 41 ('A') to 5A ('Z'), 3F ('?') Up to 32 characters in ASCII

Additional Information

The reception wait time is not set for this sequence.

Complete Data Read (Sequence No. 353 (Hex 0161))

This sequence instructs the Bar Code Reader to start reading, receives the data read by the Bar Code Reader, stores the data in the receive data storage words, and then instructs the Reader to stop reading.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

It is similar to sequence No. 352 (Data read).

Additional Information

The reception wait time is not set for this sequence.

BCR Function Write (V500) (Sequence No. 354 (Hex 0162))

This sequence sets the operation mode and read functions in the Bar Code Reader.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data

+0	Number of send data words		
+1	Operation mode	In-zone control	
+2	Bar code type	(Undefined)	
+3	(Undefined)	Number of digits	
+4	Modulus check	(Undefined)	
+5	(Undefined)	Number of matches	Multistep labels
+6	Buzzer	Horizontal control	

Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0007 (fixed)
+1	Operation mode (ASCII 1 character)	41 ('A'): ONLINE *42 ('B'): ONLINE CONTROL
	In-zone control (ASCII 1 character)	*41 ('A'): ON 42 ('B'): OFF
+2	Bar code type (ASCII 1 character)	41 ('A'): JAN 42 ('B'): NW7 NORMAL 43 ('C'): NW7 SMALL 44 ('D'): NW7 HEX 45 ('E'): CODE39 NORMAL 46 ('F'): CODE39 ST/SP OUTPUT 47 ('G'): 2 of 5 (ITF) 48 ('H'): CODE128 49 ('I'): CODE93 4A ('J'): 2 of 5 (3BAR) 4B ('K'): 2 of 5 (5BAR)
+3	Number of digits (2 digits BCD)	00 to 32 00: Any number of digits allowed.
+4	Modulus check (ASCII 1 character)	41 ('A'): No-check 42 ('B'): Modulus 10 (all bar codes) 43 ('C'): Modulus 11 (except JAN) 44 ('D'): Modulus 16 (NW7 only) 45 ('E'): Modulus 43 (CODE39 only) 46 ('F'): Modulus 47 (CODE93 only) 47 ('G'): Modulus 103 (CODE128 only)
+5	Number of matches (1 digit BCD)	1 to 5
	Multistep labels (1 digit BCD)	1 to 4
+6	Buzzer (ASCII 1 character)	41 ('A'): ON for normal read 42 ('B'): ON for no-read 43 ('C'): OFF
	Polygon mode (ASCII 1 character)	41 ('A'): Normal (continuous rotating) 42 ('B'): In-zone startup

Note Selecting the values marked with asterisks is required for this protocol.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

BCR Function Read (V500) (Sequence No. 355 (Hex 0163))

This sequence reads the settings of functions in the Bar Code Reader.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

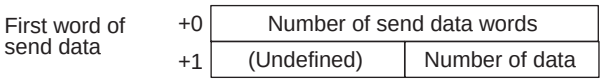
Receive data storage words				
	+0	Number of receive data words		
	+1	Operation mode	In-zone control	
	+2	Bar code type	(Undefined)	
	+3	(Undefined)	Number of digits	
	+4	Modulus check	(Undefined)	
	+5	(Undefined)	Number of matches.	Multistep labels.
	+6	Buzzer	Horizontal control	

Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	0007 (fixed)
+1	Operation mode (ASCII 1 character)	41 ('A'): ONLINE 42 ('B'): ONLINE CONTROL
	In-zone control (ASCII 1 character)	41 ('A'): ON 42 ('B'): OFF
+2	Bar code type (ASCII 1 character)	41 ('A'): JAN 42 ('B'): NW7 NORMAL 43 ('C'): NW7 SMALL 44 ('D'): NW7 HEX 45 ('E'): CODE39 NORMAL 46 ('F'): CODE39 ST/SP Output 47 ('G'): 2 of 5 (ITF) 48 ('H'): CODE128 49 ('I'): CODE93 4A ('J'): 2 of 5 (3BAR) 4B ('K'): 2 of 5 (5BAR)
+3	Number of digits (2 digits BCD)	00 to 32
+4	Modulus check (ASCII 1 character)	41 ('A'): No-check 42 ('B'): Modulus 10 (all bar codes) 43 ('C'): Modulus 11 (except JAN) 44 ('D'): Modulus 16 (NW7 only) 45 ('E'): Modulus 43 (CODE39 only) 46 ('F'): Modulus 47 (CODE93 only) 47 ('G'): Modulus 103 (CODE128 only)
+5	Number of matches (1 digit BCD)	1 to 5
	Multistep labels (1 digit BCD)	1 to 4
+6	Buzzer (ASCII 1 character)	41 ('A'): ON for normal read 42 ('B'): ON for no-read 43 ('C'): OFF
	Horizontal control mode (ASCII 1 character)	41 ('A'): Normal (continuous rotating) 42 ('B'): In-zone startup

Log Data Output Request (V500) (Sequence No. 356 (Hex 0164))

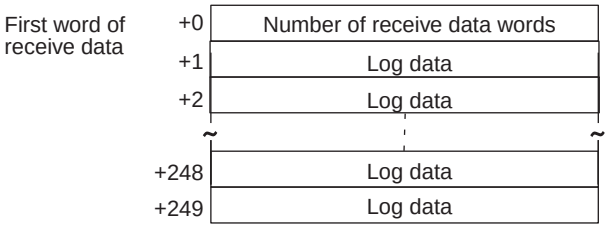
This sequence requests output of the log data sent to host.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Number of data (2 digits BCD)	01 to 99

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	0001 to 00FA (1 to 250 decimal)
+1 to +249	Log data (ASCII)	Log data with the number of designated data is stored including the separator GS (1D). If the log data (including separator) exceeds 498 bytes, only 498 bytes are stored.

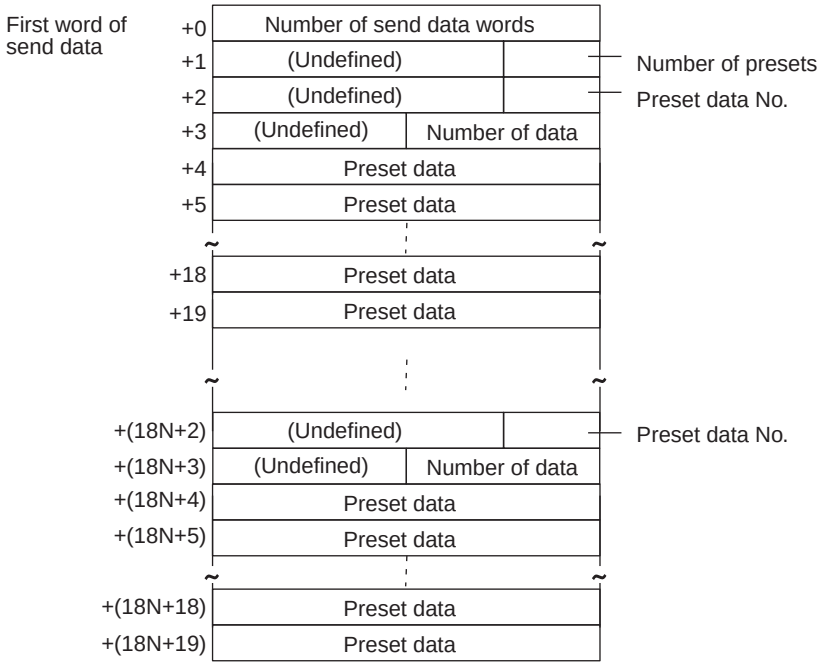
Additional Information

No retries are performed for this sequence.

Preset Data Set (V500) (Sequence No. 357 (Hex 0165))

This sequence sets preset data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	18N+2 (N is number of presets 1 to 5)
+1	Number of presets (1 digit BCD)	1 to 5
+2	Preset data No. (1 digit BCD)	1 to 5
+3	Data length (2 digits BCD)	01 to 32
+4 to +19	Preset data (ASCII)	Combination of the following ASCII characters and up to 32 characters maximum: 30 ('0') to 39 ('9') 41 ('A') to 5A ('Z'), 3F ('?') The area that is not used is undefined
+20 to +91		Store repeatedly the contents of words with offsets +2 to +19 the same number of times as the number of presets (N)

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

BCR Connection Confirmation (V500) (Sequence No. 358 (Hex 0166))

This sequence confirms whether the Bar Code Reader is connected correctly or not.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Log Data Clear (V500) (Sequence No. 359 (Hex 0167))

This sequence clears the log data.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Continuous Data Read (Scan) (V500) (Sequence No. 360 (Hex 0168))

This sequence performs the following operations repeatedly: Instructs the Bar Code Reader to start reading and receives the data read by the Bar Code Reader. The scan notification method is used for the receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

Receive data word allocation is similar to that of sequence No. 352 (Data read).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Bar Code Reader still keeps reading. Execute sequence No. 351 (BCR read stop) to end the sequence.
- The reception wait time is not set for this sequence.

Continuous Data Read (Interrupt) (V500) (Sequence No. 361 (Hex 0169))

This sequence performs the following operations repeatedly: Instruct the Bar Code Reader to start reading and receives the data read by the Bar Code Reader. The interrupt notification method is used for the receive data and the interrupt No. is 100.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation similar to that of sequence No. 352 (data read).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Bar Code Reader keeps reading. Execute sequence No. 351 (BCR read stop) to end the sequence.
- The reception wait time is not set for this sequence.

Precautions for Correct Use

Sequences No. 361 and No. 364 (Continuous Data Read with Interrupt) are not supported by the CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1) Serial Communications Units. A protocol macro syntax error will occur if an attempt is made to execute either sequence with a Serial Communications Unit.

BCR Initialize (V500) (Sequence No. 362 (Hex 016A))

This sequence clears the log data, confirms BCR connection and sets the BCR functions.

Send Data Word Allocation (3rd Operand of PMCR(260))

The send data word allocation is similar to that of sequence No. 354 (BCR Function Set).

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Continuous Data Read (Scan) (V520) (Sequence No. 363 (Hex 016B))

This sequence performs the following operations repeatedly: instructs the Bar Code Reader to start reading and receives the data read by the Bar Code Reader. The scan notification method is used for the receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 352 (Data Read).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the bar code still keeps reading. Execute sequence No. 351 (BCR Read Stop) to end the sequence.
- The reception wait time is not set for this sequence.

Continuous Data Read (Interrupt) (V520) (Sequence No. 364 (Hex 016C))

This sequence performs the following operations repeatedly: Instructs the Bar Code Reader to start reading and receives the data read by the Bar Code Reader. The interrupt notification method is used for the receive data and the interrupt No. is 100.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The send data word allocation is similar to that of sequence No. 352 (Data Read).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the bar code still keeps reading. Execute sequence No. 351 (BCR Read Stop) to end the sequence.
- The reception wait time is not set for this sequence.

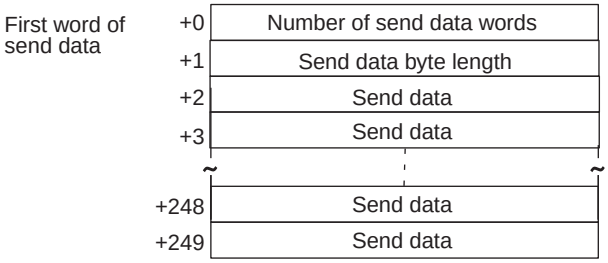
Precautions for Correct Use

- Sequences No. 361 and No. 364 (Continuous Data Read with Interrupt) are not supported by the CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1) Serial Communications Units. A protocol macro syntax error will occur if an attempt is made to execute either sequence with a Serial Communications Unit.

General-purpose Command 1 (Sequence No. 365 (Hex 016D))

This general-purpose command is used to send data with a specified data length, and receive back only ACK. STX and ETX are automatically attached to the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 to 00FA (3 to 250 decimal)
+1	Send data byte length (4 digits Hex)	0001 to 01F0 (1 to 496 decimal) The byte length of the send data excluding STX and ETX.
+2 to +249	Send data (ASCII)	Describe send data up to 496 bytes (max.) by ASCII.

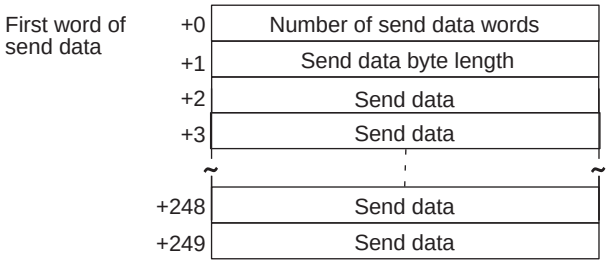
Receive Data Word Allocation (4th Operand of PMCR(260))

None.

General-purpose Command 2 (Sequence No. 366 (Hex 016E))

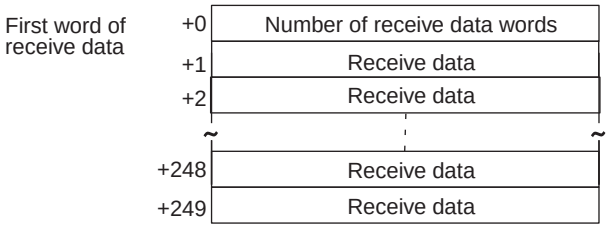
This general-purpose command is used to send data with a specified data length, and receive back ACK in addition to other receive data. The frame format of the receive data, however, has to contain STX and ETX. STX and ETX are automatically attached to the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 to 00FA (3 to 250 decimal)
+1	Send data byte length (4 digits Hex)	0001 to 01F0 (1 to 496 decimal) The byte length of the send data excluding STX and ETX.
+2 to +128	Send data (ASCII)	Set send data up to 496 bytes (max.) by ASCII.

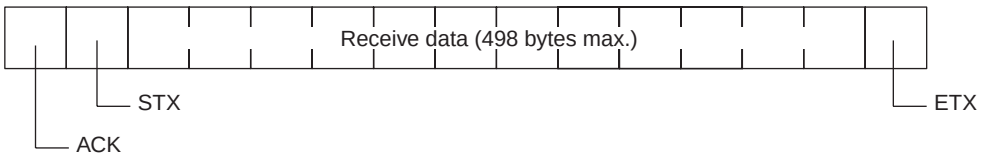
Receive Data Storage Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	0001 to 00FA (1 to 250 decimal)
+1 to +249	Receive data (ASCII)	Up to 498 bytes of ASCII receive data are stored.

Additional Information

Shown below is the receive data frame format. The reception data without ACK, STX, and ETX is stored.



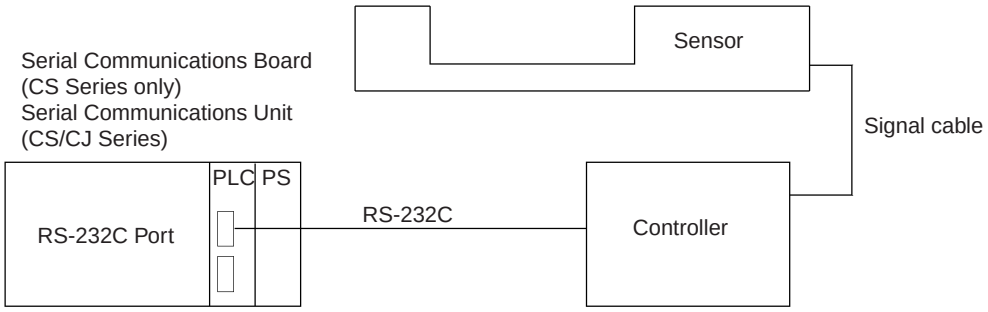
R-5 3Z4L Laser Micrometer Protocol

The 3Z4L Laser Micrometer Protocol is used to remotely make various settings or control the Laser Micrometer connected to the Serial Communications Unit/Board via RS-232C cable.

R-5-1 Connections

The connections for the 3Z4L Laser Micrometer Protocol are shown below.

RS-232C Connection



Serial Communications Unit/Board: D-sub 9 pin (female)

Signal name	Pin No.
FG	1
SD	2
RD	3
RTS	4
CTS	5
DSR	7
DTR	8
SG	9

Controller: D-sub 25 pin (female)

Pin No.	Signal name
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

DIP Switch Settings

Shown below are the settings of 3Z4L-3000, 3Z4L-4000-series DIP switches required to use the system protocol sequences.

3Z4L-3000 Series

- **DIP Switch 1**

No.	Setting	Status
1	Baud rate	ON/OFF
2		ON/OFF
3	Handshaking procedure	ON/OFF
4	RS-232C interface use selection	ON/OFF
5		ON/OFF
6		ON/OFF

- **DIP Switch 2**

No.	Setting	Status
1	Selection for measurement section	ON/OFF
2		ON/OFF
3		ON/OFF
4		ON/OFF
5	Setting of minimum read value	ON/OFF
6		ON/OFF
7	Setting of transparent body measurement function	ON/OFF
8	Setting of simultaneous measurement function	ON/OFF

Set these settings according to the sensor connected.

Set these settings for 4 digits in the decimal portion.

- **DIP Switch 3**

No.	Setting	Status
1	Setting of measurement function by 2 measurement instruments	ON/OFF
2		ON/OFF
3		ON/OFF
4		ON/OFF
5	Error data exclusion function	ON/OFF
6	Multistep selection function	ON/OFF

This protocol does not support the error data exclusion function

3Z4L-4000 Series

- **DIP Switch 1**

No.	Setting	Status
1	Baud rate	ON/OFF
2		ON/OFF
3	Hand-shake procedure	ON/OFF
4	Delimiter	ON/OFF
5		ON/OFF
6	RS-232C interface use selection	ON/OFF
7		ON/OFF
8		ON/OFF

- **DIP Switch 2**

No.	Setting	Status
1	Selection for measurement section	ON/OFF
2		ON/OFF
3		ON/OFF
4		ON/OFF
5	Setting of minimum read value	ON/OFF
6		ON/OFF
7	Display unit	ON/OFF
8	External command setting	ON/OFF

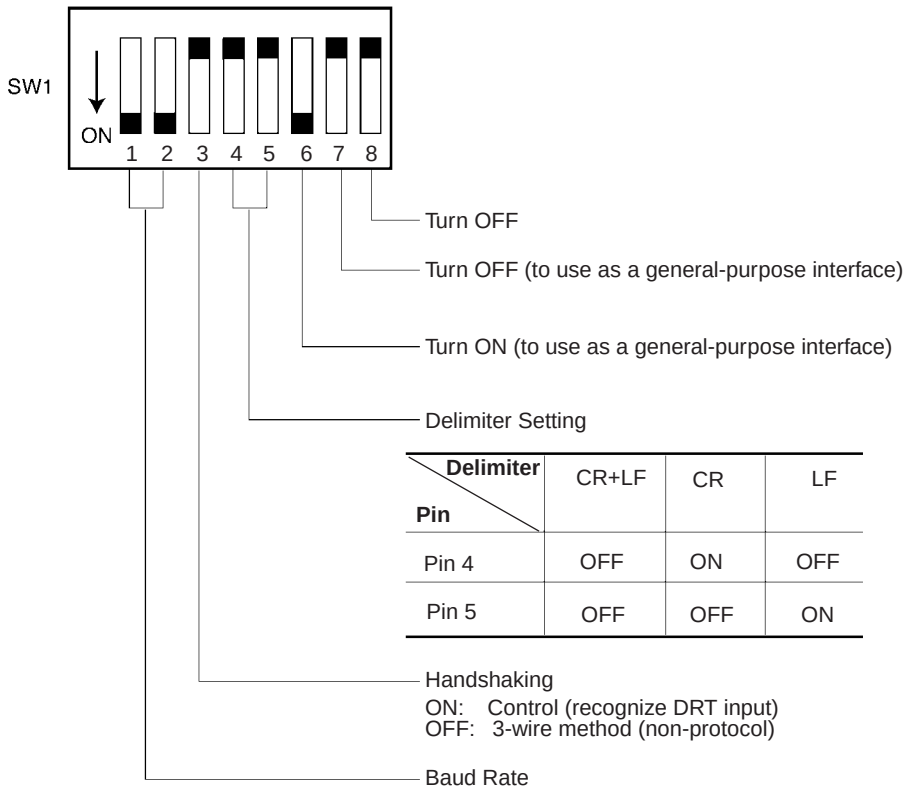
Set these settings according to the sensor connected.

Set these settings for 4 digits in the decimal portion.

Delimiter Control Code Setting

3Z4L-4000 Series

The delimiter control codes must be set on DIP switch SW1 for the 3Z4L-4000 Series. Turn off pins 4 and 5 to set the delimiter code control setting in the sequence to CR+LF. See the setting for CR+LF in the following diagram.

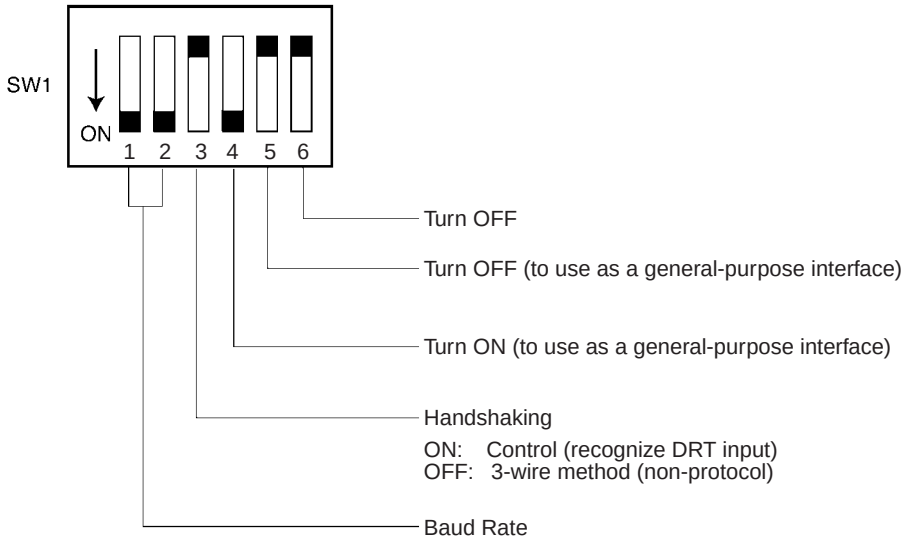


Delimiter / Pin	CR+LF	CR	LF
Pin 4	OFF	ON	OFF
Pin 5	OFF	OFF	ON

Baud rate / Pin	1200	2400	4800	9600
Pin 1	OFF	ON	OFF	ON
Pin 2	OFF	OFF	ON	ON

3Z4L-3000 Series

The delimiter control code does not need to be set on the DIP switch for the 3Z4L-3000 Series.



Baud rate / Pin	1200	2400	4800	9600
Pin 1	OFF	ON	OFF	ON
Pin 2	OFF	OFF	ON	ON

The High-speed 3Z4L-3000-series Meters must have the delimiter control codes set using the memory switches. Set both the send and receive codes to CR+LF.

R-5-2 List of Operations with Laser Micrometer (5000/6000 Series)

The configuration of the 3Z4L Laser Micrometer Protocol for the 5000 and 6000 Series is shown below.

Sequence No.	Communications sequence name	Operation	
		5000 Series	6000 Series
400 (0190)	3Z4L clear	Yes	Yes
401 (0191)	Memory switch set	No*1	No*1
402 (0192)	mm unit set	Yes	Yes
403 (0193)	E unit set	Yes	Yes
404 (0194)	Calibration set	No	No
405 (0195)	Calibration release	Yes	Yes
406 (0196)	Program number set (3000-series)	No*1	Yes
407 (0197)	Measurement condition set (3000-series)	No	No
408 (0198)	Measurement condition release (3000-series)	No	No
409 (0199)	Measurement condition list request (3000-series)	No	No
410 (019A)	Single run measurement start (3000-series)	No	Yes
411 (019B)	Zero run measurement start (3000-series)	Yes	Yes
412 (019C)	Continuous measurement start (scan) (3000-series)	No	Yes
413 (019D)	Continuous measurement start (interrupt) (3000-series)	No	Yes
414 (019E)	Measurement termination (3000-series)	No	Yes
415 (019F)	Data request (3000-series)	No	Yes

Sequence No.	Communications sequence name	Operation	
		5000 Series	6000 Series
416 (01A0)	Statistic processing execution (3000-series)	Yes	Yes
417 (01A1)	Statistic processing non-execution (3000-series)	Yes	Yes
418 (01A2)	All statistic memory clear (3000-series)	Yes	Yes
419 (01A3)	Statistic memory clear (3000-series)	Yes	Yes
420 (01A4)	Statistic result request (3000-series)	No	No
421 (01A5)	Memory switch set 1 (3000-series)	No*1	No*1
422 (01A6)	Memory switch set 2 (3000-series)	No*1	No*1
423 (01A7)	Simple AVG times set (3000-series)	Yes	Yes
424 (01A8)	AVG move interval set (3000-series)	Yes	Yes
425 (01A9)	AVG move (H) times set (3000-series)	Yes	Yes
426 (01AA)	AVG move (L) times set (3000-series)	Yes*2	No
427 (01AB)	Automatic detection set (3000-series)	No	No
428 (01AC)	Automatic detection release (3000-series)	Yes	Yes
429 (01AD)	Automatic detection list request (3000-series)	Yes	Yes
430 (01AE)	3Z4L initialize (3000-series)	Yes*3	Yes*3
431 (01AF)	Measurement condition set (4000-series)	No	No
432 (01B0)	Measurement condition release (4000-series)	No	No
433 (01B1)	Measurement condition list request (4000-series)	No	No
434 (01B2)	Single run measurement start (4000-series)	Yes	No
435 (01B3)	Deflection measurement start (4000-series)	Yes*4	No
436 (01B4)	Continuous measurement start (scan) (4000-series)	Yes	No
437 (01B5)	Continuous measurement start (interrupt) (4000-series)	Yes	No
438 (01B6)	Measurement termination (4000-series)	Yes	No
439 (01B7)	Data request (4000-series)	Yes	No
440 (01B8)	Forced positive zero (4000-series)	Yes	Yes
441 (01B9)	Forced negative zero (4000-series)	Yes	Yes
442 (01BA)	Forced zero release (4000-series)	Yes	Yes
443 (01BB)	3Z4L initialize (4000-series)	Yes*3	Yes*3
444 (01BC)	General-purpose command 1	Yes	Yes
445 (01BD)	General-purpose command 2	Yes	Yes
446 (01BE)	High calibration set	No	No
447 (01BF)	Low calibration set	No	No

The hexadecimal equivalents of sequences numbers are given in parentheses.

*1 Normal responses will be returned for these sequences for 5000-series and 6000-series Laser Micrometers, but no processing will be performed.

*2 This sequence will be processed the same as sequence No. 425 AVG move (H) times set for 5000-series Laser Micrometers.

*3 Memory switch settings will be ignored for these sequences for 5000-series and 6000-series Laser Micrometers.

*4 This sequence will be processed the same as sequence No. 411 Zero run measurement start for 5000-series Laser Micrometers.

R-5-3 Protocol Configuration

The configuration of the 3Z4L Laser Micrometer Protocol is shown below.

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
400 (0190)	3Z4L clear	Resets errors, data, analog output, decision result and places the Laser Micrometer into standby.	No	No
401 (0191)	Memory switch set	Sets memory switches and the area for the work position LED.	Yes	No
402 (0192)	mm unit set	Sets the display unit to mm.	No	No
403 (0193)	E unit set	Sets the display unit to E.	No	No
404 (0194)	Calibration set	Calibrates the Laser Micrometer. Calibration setting release.	Yes	No
405 (0195)	Calibration release	Releases the calibration of the Laser Micrometer.	No	No
406 (0196)	Program number set (3000-series)	Switches the program number to a specified number.	Yes	No
407 (0197)	Measurement condition set (3000-series)	Sets measurement conditions.	Yes	No
408 (0198)	Measurement condition release (3000-series)	Releases measurement conditions that have been set.	Yes	No
409 (0199)	Measurement condition list request (3000-series)	Requests the measurement conditions that have been set and other settings.	No	Yes
410 (019A)	Single run measurement start (3000-series)	When the sample measurement condition is from 1 to 999, performs a single run measurement and requests the measurement results.	No	Yes
411 (019B)	Zero run measurement start (3000-series)	If the sample measurement condition is zero, starts a zero run measurement.	No	No
412 (019C)	Continuous measurement start (scan) (3000-series)	Starts a continuous measurement. The scan notification method is used for receive data.	No	Yes
413 (019D)	Continuous measurement start (interrupt (*2)) (3000-series)	Starts a continuous measurement. The interrupt notification method is used for receive data.	No	Yes
414 (019E)	Measurement termination (3000-series)	Terminates a continuous measurement.	No	No (*1)
415 (019F)	Data request (3000-series)	Requests display data in the idle measurement status or the latch data generated by the measurement command.	No	Yes
416 (01A0)	Statistic processing execution (3000-series)	Lights the statistic processing LED and processes the statistics.	No	No
417 (01A1)	Statistic processing non-execution (3000-series)	Turns OFF the statistic processing LED. Statistics are not processed.	No	No
418 (01A2)	All statistic memory clear (3000-series)	Clears statistic processing memories of all programs.	No	No
419 (01A3)	Statistic memory clear (3000-series)	Clears statistic processing memories of program under display.	No	No
420 (01A4)	Statistic result request (3000-series)	Requests statistic processing result.	No	Yes
421 (01A5)	Memory switch set 1 (3000-series)	Sets memory switches.	Yes	No

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
422 (01A6)	Memory switch set 2 (3000-series)	Sets memory switches.	Yes	No
423 (01A7)	Simple AVG times set (3000-series)	Taking the simple average as the averaging method, sets the averaging times per measurement interval 4.	Yes	No
424 (01A8)	AVG move interval set (3000-series)	Taking the average move as the averaging method, sets the measurement interval number.	Yes	No
425 (01A9)	AVG move (H) times set (3000-series)	Taking the average move and high-speed data output as the averaging method, sets the averaging times per measurement interval 4.	Yes	No
426 (01AA)	AVG move (L) times set (3000-series)	Taking the average move and low-speed data output as the averaging method, sets the averaging times per measurement interval 4.	Yes	No
427 (01AB)	Automatic detection set (3000-series)	Sets work automatic detection function.	Yes	No
428 (01AC)	Automatic detection release (3000-series)	Releases the settings of work automatic detection function.	No	No
429 (01AD)	Automatic detection list request (3000-series)	Requests the settings of work automatic detection function.	No	Yes
430 (01AE)	3Z4L initialize (3000-series)	Clears the 3Z4L, sets the mm unit, sets the memory switches, does not processes statistics, and clears all statistic memory in sequence.	Yes	No
431 (01AF)	Measurement condition set (4000-series)	Sets measurement conditions.	Yes	No
432 (01B0)	Measurement condition release (4000-series)	Releases measurement conditions that have been set.	Yes	No
433 (01B1)	Measurement condition list request (4000-series)	Requests the measurement conditions that have been set and other settings.	No	Yes
434 (01B2)	Single run measurement start (4000-series)	When the sample measurement condition is from 1 to 999, performs a single run measurement and requests the measurement results.	No	Yes
435 (01B3)	Deflection measurement start (4000-series)	Starts a deflection measurement.	No	No
436 (01B4)	Continuous measurement start (scan) (4000-series)	Starts a continuous measurement. The scan notification method is used for receive data.	No	Yes
437 (01B5)	Continuous measurement start (interrupt (*2)) (4000-series)	Starts a continuous measurement. The interrupt notification method is used for receive data.	No	Yes
438 (01B6)	Measurement termination (4000-series)	Terminates continuous measurement.	No	No (*1)
439 (01B7)	Data request (4000-series)	Requests measurement data in the idle measurement status or the latch data generated by the measurement command.	No	Yes
440 (01B8)	Forced positive zero (4000-series)	Sets the forced zero direction to positive (+).	No	No
441 (01B9)	Forced negative zero (4000-series)	Sets the forced zero direction to negative (–).	No	No

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
442 (01BA)	Forced zero release (4000-series)	Releases the forced zero direction.	No	No
443 (01BB)	3Z4L initialize (4000-series)	Clears the 3Z4L, sets the mm unit, and clears the switches unit settings in sequence.	Yes	No
444 (01BC)	General-purpose command 1	Used to send data of a specified data length, and receive only OK as the receive data.	Yes	No
445 (01BD)	General-purpose command 2	Used to send data of a specified data length, and receive data other than OK.	Yes	Yes
446 (01BE)	High calibration set	Sets the Laser Micrometer's high calibration.	Yes	No
447 (01BF)	Low calibration set	Sets the Laser Micrometer's low calibration.	Yes	No

*1 Depends on the measurement contents.

*2 Interrupt notification is only supported by the serial communications board (CS1W-SCB21-V1/SCB41-V1). (A protocol syntax error will occur with the Serial Communications Units (CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1)).
Do not set an EM bank as the receive storage word for interrupt notification. A protocol syntax error will occur if an EM bank is set.

Note The hexadecimal equivalents of sequences numbers are given in parentheses.

Ladder Interface Settings

YES: User settings are required for the 3rd and 4th operands of PMCR(260).

NO: Send word allocation: Set the constant 0000 for the 3rd operand (S).
Receive word allocation: Set the constant 0000 for the 4th operand (D).

3Z4L Clear (Sequence No. 400 (Hex 0190))

This sequence resets errors, data, analog output, and decision result, and puts the Laser Micrometer into standby.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Memory Switch Set (Sequence No. 401 (Hex 0191))

This sequence sets memory switches and the area for the work position LED.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data					
+0	Number of send data words				
+1	W	X	Y	Z	
+2	(Undefined)			V	

Offset	Contents (data format)	Data	
		3000-series	4000-series
+0	Number of send data words (4 digits Hex)	0003 (fixed)	0003 (fixed)
+1	w (1 digit BCD)	Using buzzer sound: 0 to 3	Number of digits for extinguishing indicator: 0 to 2
	x (1 digit BCD)	Automatic latch release time: 0 to 9	I/O IF RUN Input: 0 or 1
	y (1 digit BCD)	Using print timer, the setting for simultaneous measurement: 0 to 3 (high-speed), 0 to 1 (other)	Display of Err–0: 0 or 1
	z (1 digit BCD)	Display of the comma for 1/1000s digit, number of display digits: 0 to 5 (high-speed), 0 to 3 (other)	Averaging method: 0 to 2 (high-speed), 0 (other)
+2	v (1 digit BCD)	Measurement interval 4: 0 to 6	Use of comma: 0 or 1

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

mm Unit Set (Sequence No. 402 (Hex 0192))

This sequence sets the display unit to mm.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

This sequence can be used for the 3Z4L-4000 Series only when pin 8 on DIP switch SW2 is turned ON.

E Unit Set (Sequence No. 403 (Hex 0193))

This sequence sets the display unit to E.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

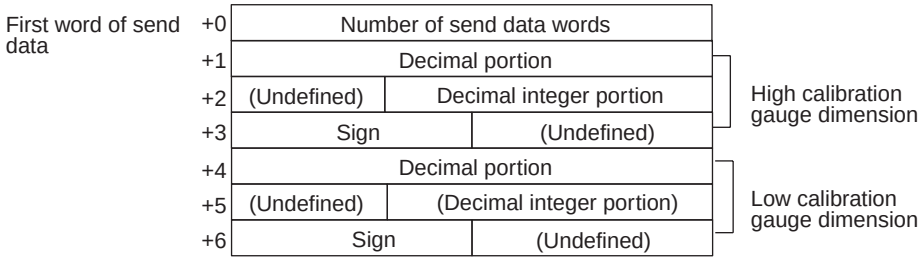
Additional Information

This sequence can be used for the 3Z4L-4000 Series only when pin 8 on DIP switch SW2 is turned ON.

Calibration Set (Sequence No. 404 (Hex 0194))

This sequence calibrates the Laser Micrometer.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data	
+0	Number of send data words (4 digits Hex)	0007 (fixed)	
+1	HC gauge dimension (Decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +1: 4567 +2: 0123 +3: 2D00
+2	HC gauge dimension (integer portion) (3 digits BCD)	000 to 999	
+3	HC gauge dimension (Sign) (ASCII 1 character)	if +: 20(' ') if –: 2D('–')	
+4 to +6	LC gauge dimensions	Same as HC gauge dimensions	

Additional Information

- Use sequences No. 446 (High calibration set) and No. 447 (Low calibration set) to calibrate the Laser Micrometer. If this sequence (No. 404) is used, both the high and low calibration gauges must be set, and the high calibration and low calibration gauges cannot be exchanged.
- The HC gauge dimension and LC gauge dimension must be set with 3 digits for the integer portion and 4 digits for the decimal portion.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Calibration Release (Sequence No. 405 (Hex 0195))

This sequence releases the calibration of the Laser Micrometer.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

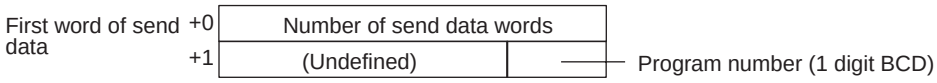
Additional Information

In this sequence, you cannot separately release both high and low calibration.

Program Number Set (3000-series) (Sequence No. 406 (Hex 0196))

This sequence switches the program number to a specified number.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Program number (1 digit BCD)	0 to 9

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

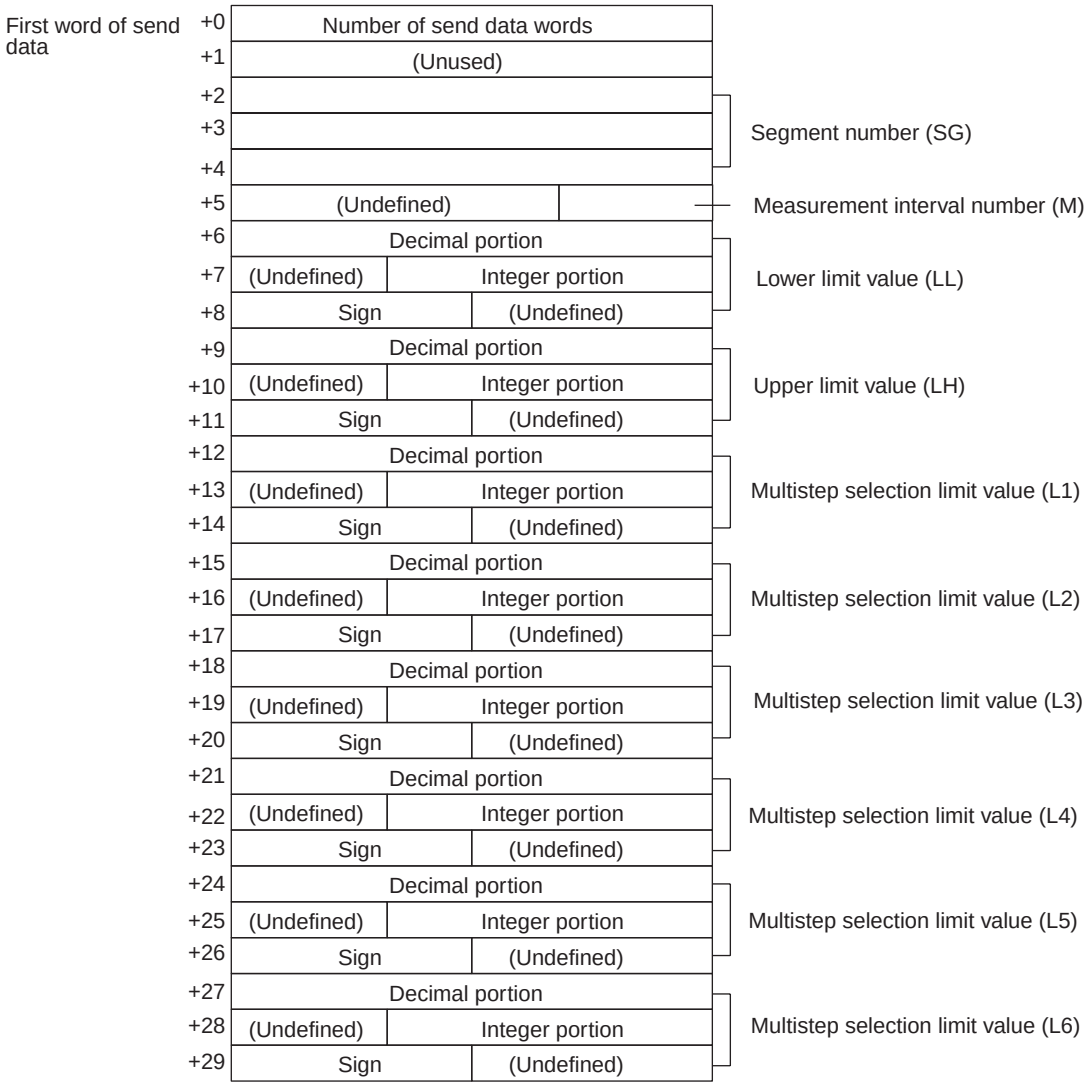
Additional Information

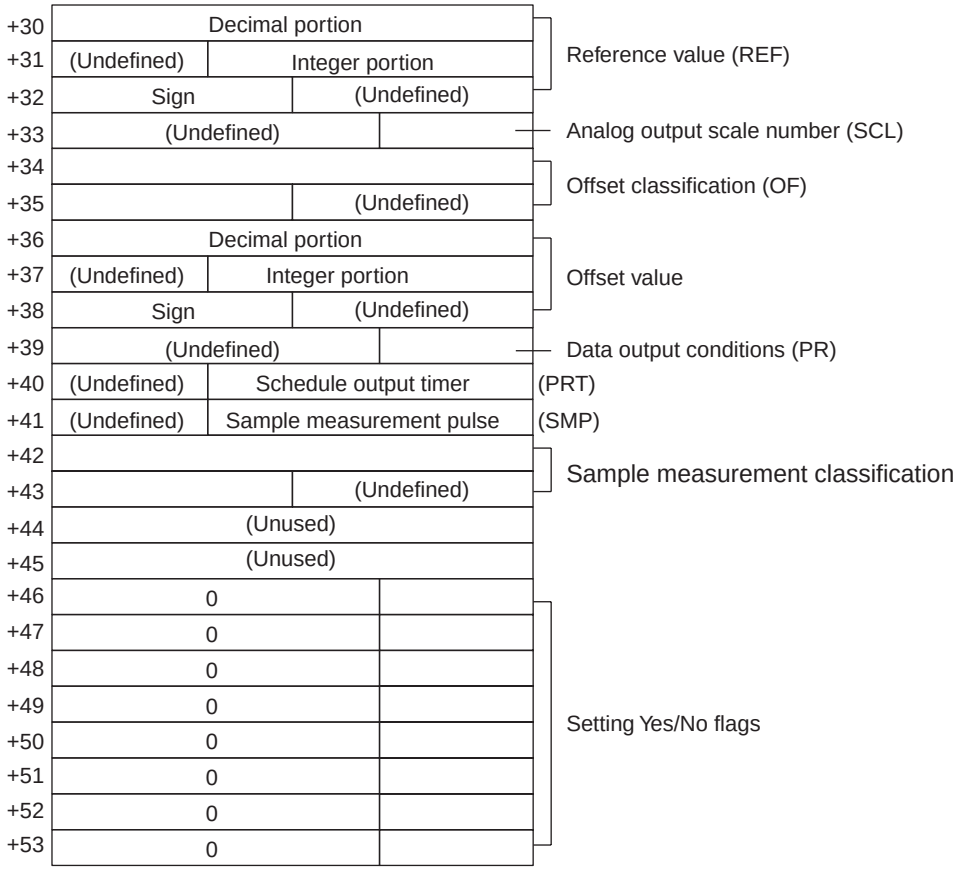
Retry processing is not performed for this sequence.

Measurement Condition Set (3000-series) (Sequence No. 407 (Hex 0197))

This sequence sets measurement conditions. Conditions to be set can be selected by setting Yes/No flags.

Send Data Word Allocation (3rd Operand of PMCR(260))





Offset	Contents (data format)	Data	
+0	Number of send data words (4 digits Hex)	0036 (0054 decimal) (fixed)	
+1	Unused	Undefined	
+2 to +4	Segment number (ASCII 6 characters)	Combination of 31('1') to 36('6'), 20(' ')	
+5	Measurement interval number (1 digit BCD)	1 to 4	
+6	Lower limit value (decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +6: 4 5 6 7 +7: 0 1 2 3 +8: 2 D 0 0
+7	Lower limit value (Integer portion) (3 digits BCD)	000 to 999	
+8	Lower limit value (Sign) (ASCII 1 character)	if +: 20(' ') if –: 2D('–')	
+9 to +11	Upper limit value	Same as lower limit values	
+12 to +14	Multistep selection limit value (L1)	Same as lower limit values	
+15 to +17	Multistep selection limit value (L2)	Same as lower limit values	
+18 to +20	Multistep selection limit value (L3)	Same as lower limit values	
+21 to +23	Multistep selection limit value (L4)	Same as lower limit values	
+24 to +26	Multistep selection limit value (L5)	Same as lower limit values	

Offset	Contents (data format)	Data
+27 to +29	Multistep selection limit value (L6)	Same as lower limit values
+30 to +32	Reference value	Same as lower limit values
+33	Analog output scale number (1 digit BCD)	1 to 3
+34 to +35	Offset classification (ASCII 3 characters)	4F4620 ("OF"), 4F4D20 ("OM")
+36 to +38	Offset value	Same as lower limit values
+39	Data output conditions (1 digit BCD)	0 to 6
+40	Scheduled output timer (3 digits BCD)	000 to 999
+41	Sample measurement pulse (3 digits BCD)	000 to 999
+42 to +43	Sample measurement classification (ASCII 3 characters)	415647 ("AVG"), 4D4158 ("MAX") 4D494E ("MIN"), 524E47 ("RNG")
+44 to +45	Unused	Undefined
+46	Yes/No for segment setting (1 digit BCD)	Set: 1 (SG) Don't set: 0
+47	Yes/No for measurement interval number setting (1 digit BCD)	Set: 1 (M) Don't set: 0
+48	Yes/No for upper/lower limit value setting (1 digit BCD)	Set: 1 (LL,LH) Don't set: 0
+49	Yes/No for multistep selection limit value (1 digit BCD)	Set: 1 (L1,L2,L3,L4,L5,L6) Don't set: 0
+50	Yes/No for reference setting (1 digit BCD)	Set: 1 (REF,SCL) Don't set: 0
+51	Yes/No for offset value setting (1 digit BCD)	Set: 1 (OF or OM) Don't set: 0
+52	Yes/No for data output condition setting (1 digit BCD)	Set: 1 (PR,PRT) Don't set: 0
+53	Yes/No for sample measurement pulse setting (1 digit BCD)	Set: 1 (SMP, MAX or MIN or RNG or AVG) Don't set: 0

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- This sequence cannot be used to set the error lower limit (EL), error upper limit (EH), error exclusion counter (CNT) of the error data exclusion function (centerless grinder function).
- The following settings must be made together with this sequence; they cannot be set separately.
  Lower limit, upper limit
  Multistep selection limit
  Reference value, analog output scale number
  Data output conditions, scheduled print timer
- The limit value, reference value, and offset value can be set to 3 digits for the integer portion and to 4 digits for the decimal portion.

Measurement Condition Release (3000-series) (Sequence No. 408 (Hex 0198))

This sequence releases the measurement conditions that have been set.

Send Data Word Allocation (3rd Operand of PMCR(260))

Send data word allocation is similar to that of sequence No. 407 (Measurement Condition Set). However, only the setting Yes/No flags at +46 to +53 from the send data leading word can be used.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- The following conditions are used when the measurement conditions are released: Segment becomes 1, measurement interval becomes 1, the number of sample measurement pulses becomes 1.
- The following conditions cannot be released with this sequence: error lower limit (EL), error upper limit (EH), error exclusion counter (CNT) of the error data exclusion function (centerless grinder function).
- The following settings cannot be released separately using this sequence.
  Lower limit, Upper limit
  Multistep selection limit
  Reference value, analog output scale number
  Data output conditions, scheduled print timer

Measurement Condition List Request (3000-series) (Sequence No. 409 (Hex 0199))

This sequence requests the measurement condition settings that have been set and other settings.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

First word of send data	+0	Number of receive data words		
	+1	(Undefined)		Program number (P)
	+2			Segment number (SG)
	+3			
	+4			
	+5	(Undefined)		Measurement interval number (M)
	+6	Decimal portion		Lower limit value (LL)
	+7	(Undefined)	Integer portion	
	+8	Sign	(Undefined)	
	+9	Decimal portion		Upper limit value (LH)
	+10	(Undefined)	Integer portion	
	+11	Sign	(Undefined)	
	+12	Decimal portion		Multistep selection limit value (L1)
	+13	(Undefined)	Integer portion	
	+14	Sign	(Undefined)	
	+15	Decimal portion		Multistep selection limit value (L2)
	+16	(Undefined)	Integer portion	
	+17	Sign	(Undefined)	
	+18	Decimal portion		Multistep selection limit value (L3)
	+19	(Undefined)	Integer portion	
	+20	Sign	(Undefined)	
	+21	Decimal portion		Multistep selection limit value (L4)
	+22	(Undefined)	Integer portion	
	+23	Sign	(Undefined)	
	+24	Decimal portion		Multistep selection limit value (L5)
	+25	(Undefined)	Integer portion	
	+26	Sign	(Undefined)	
	+27	Decimal portion		Multistep selection limit value (L6)
	+28	(Undefined)	Integer portion	
	+29	Sign	(Undefined)	
	+30	Decimal portion		Reference value (REF)
	+31	(Undefined)	Integer portion	
	+32	Sign	(Undefined)	
	+33	(Undefined)		Analog output scale number (SCL)
	+34			Offset classification (OF)
	+35		(Undefined)	
	+36	Decimal portion		Offset value (LH)
	+37	(Undefined)	Integer portion	
	+38	Sign	(Undefined)	
	+39			Data output condition (PR)
	+40	(Undefined)	Scheduled output timer	(PRT)
	+41	(Undefined)	Sample measurement pulse	(SMP)
	+42			Sample measurement classification
	+43		(Undefined)	
	+44			Statistical processing calculation classification
	+45		(Undefined)	

Offset	Contents (data format)	Data	
+0	Number of receive data words (4 digits Hex)	002E (0046 decimal) (fixed)	
+1	Program number (1 digit BCD)	0 to 9	
+2 to +4	Segment number (ASCII 6 characters)	Combination of 31('1') to 36('6'), 20(' ')	
+5	Measurement interval number (1 digit BCD)	1 to 4	
+6	Lower limit value (Decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +6: 4 5 6 7 +7: 0 1 2 3 +8: F 0 0 0
+7	Lower limit value (Integer portion) (3 digits BCD)	000 to 999	
+8	Lower limit value (Sign) (BIN)	If +: 0 If – : F	
+9 to +11	Upper limit value	Same as lower limit values	
+12 to +14	Multistep selection limit value (L1)	Same as lower limit values	
+15 to +17	Multistep selection limit value (L2)	Same as lower limit values	
+18 to +20	Multistep selection limit value (L3)	Same as lower limit values	
+21 to +23	Multistep selection limit value (L4)	Same as lower limit values	
+24 to +26	Multistep selection limit value (L5)	Same as lower limit values	
+27 to +29	Multistep selection limit value (L6)	Same as lower limit values	
+30 to +32	Reference value	Same as lower limit values	
+33	Analog output scale number (1 digit BCD)	1 to 3	
+34 to +35	Offset classification (ASCII 3 characters)	4F4620 ("OF"), 4F4D20 ("OM")	
+36 to +38	Offset value	Same as lower limit values	
+39	Data output condition (1 digit BCD)	0 to 6	
+40	Scheduled output timer (3 digits BCD)	000 to 999	
+41	Sample measurement pulse (3 digits BCD)	000 to 999	
+42 to +43	Sample measurement classification (ASCII 3 characters)	415647 ("AVG"), 4D4158 ("MAX") 4D494E ("MIN"), 524E47 ("RNG")	
+44 to +45	Statistical processing calculation classification (ASCII 3 characters)	535420 ("ST"), 4E5354 ("NST")	

Additional Information

This sequence cannot be used to request the lower limit (EL), error upper limit (EH), error exclusion counter (CNT) of the error data exclusion function (centerless grinder function).

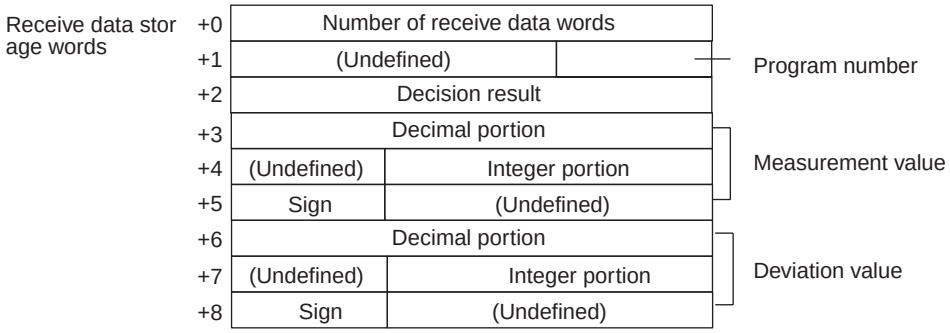
Single Run Measurement Start (3000-series) (Sequence No. 410 (Hex 019A))

When the sample measurement condition is from 1 to 999, this sequence performs a single run measurement and requests the measurement results.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data	
+0	Number of receive data words (4 digit Hex)	With no reference setting: 0006 With reference setting: 0009	
+1	Program number (1 digit BCD)	0 to 9	
+2	Decision result (ASCII 2 characters)	With no limit setting: 0000 With limit setting: 2B4E ("+N"), 4F4B ("OK"), 2D4E ("–N")	
+3	Measurement value (decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +3: 4 5 6 7 +4: 0 1 2 3 +5: F 0 0 0
+4	Measurement value (integer portion) (3 digits BCD)	000 to 999	
+5	Measurement value (Sign) (BIN)	If +: 0 If –: F	
+6 to +8	Deviation value	Same as measurement value *The deviation will be stored in this area only when reference setting is made.	

Zero Run Measurement Start (3000-series) (Sequence No. 411 (Hex 019B))

If the sample measurement condition is zero, a zero run measurement is started.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

The zero run measurement keeps measuring until sequence No. 414 (Measurement Termination) is executed.

Continuous Measurement Start (Scan) (3000-series) (Sequence No. 412 (Hex 019C))

A continuous measurement is started. The scan notification method is used for the receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 410 (Single Run Measurement Start).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Laser Micrometer still keeps measuring. Execute sequence No. 414 (Measurement Termination) to end the sequence.

Continuous Measurement Start (Interrupt) (3000-series) (Sequence No. 413 (Hex 019D))

A continuous measurement is started. The interrupt notification method is used for the receive data and the interrupt No. is 101.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 410 (Single Run Measurement Start).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Laser Micrometer still keeps measuring. Execute sequence No. 414 (Measurement Termination) to end the sequence.

Precautions for Correct Use

Sequences No. 413 and No. 437 (Continuous Measurement Start with Interrupt) not supported by the CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1) Serial Communications Units. A protocol syntax error will occur if an attempt is made to execute either sequence with a Serial Communications Unit.
Do not set an EM bank as the receive storage word for interrupt notification. A protocol syntax error will occur if an EM bank is set.

Measurement Termination (3000-series) (Sequence No. 414 (Hex 019E))

This sequence terminates a continuous measurement.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

For continuous measurement: Not available

For Zero Run Measurement:

The receive data word allocation is similar to that of sequence No. 410 (Single Run Measurement Start).

Additional Information

This sequence may be aborted if it is executed during continuous measurements. Measurements will be terminated even if the sequence is aborted. This occurs because this sequence was executed while the Laser Micrometer was sending measurement results. The chances that the sequence will be aborted are higher if the scheduled data output value is set to a lower value.

Data Request (3000-series) (Sequence No. 415 (Hex 019F))

This sequence requests display data in the idle measurement status or the latch data generated by the measurement command.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 410 (Single Run Measurement Start).

Statistic Processing Execution (3000-series) (Sequence No. 416 (Hex 01A0))

This sequence lights the statistic processing LED and implements the statistic processing.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Statistic Processing Non-execution (3000-series) (Sequence No. 417 (Hex 01A1))

This sequence turns the statistic processing LED off and does not carry out the statistic processing.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

All Statistic Memory Clear (3000-series) (Sequence No. 418 (Hex 01A2))

This sequence clears statistic processing memories of all programs.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Statistic Processing Memory Clear (3000-series) (Sequence No. 419 (Hex 01A3))

This sequence clears statistic processing memories of the program under display.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

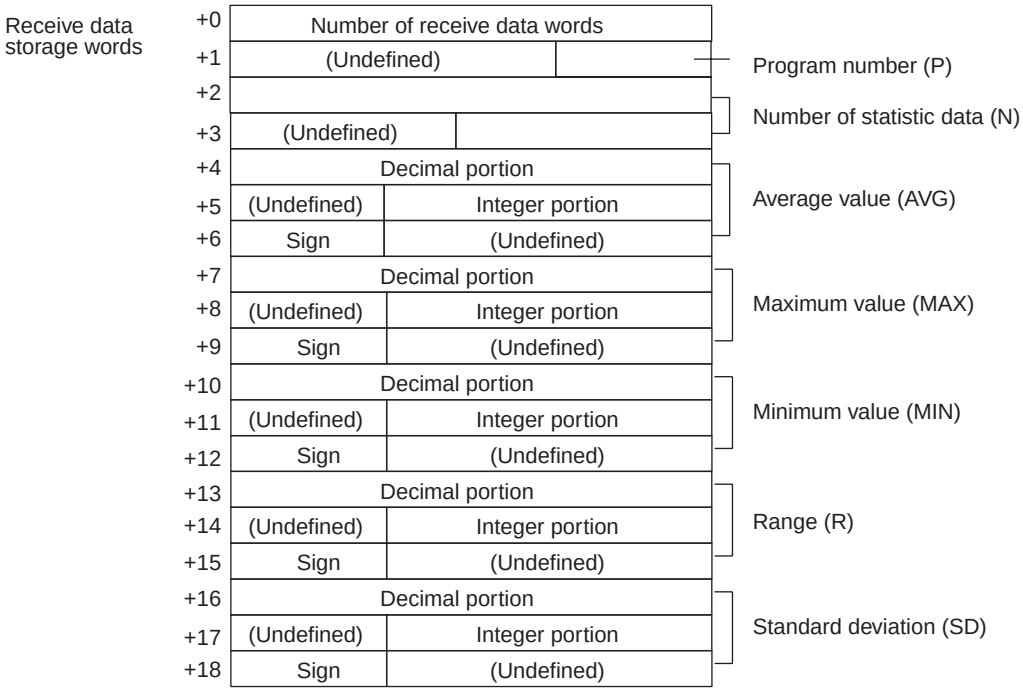
Statistic Result Request (3000-series) (Sequence No. 420 (Hex 01A4))

This sequence requests the statistic processing results.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data	
+0	Number of receive data words (4 digits Hex)	0013 (0019 decimal) (fixed)	
+1	Program number (1 digit BCD)	0 to 9	
+2 to +3	Number of statistic data (6 digits BCD)	000000 to 999999	
+4	Average value (decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +4 4 5 6 7 +5 0 1 2 3 +6 F 0 0 0
+5	Average value (integer portion) (4 digits BCD)	000 to 999	
+6	Average value (Sign) (BIN)	If +: 0 If –: F	
+7 to +9	Maximum value	Same as average value	
+10 to +12	Minimum value	Same as average value	
+13 to +15	Range	Same as average value	
+16 to +18	Standard deviation	Same as average value	

Additional Information

The number of digits of the Decimal portion is fixed to 4 digits. If a deviation calculation results in a value with 5 decimal places, it will be stored with one digit overflowing into the integer portion.
Examples: The value -0.1234 is stored as follows:
Area of decimal portion: 1234; Area of integer portion: 0000; Sign area: F000
The value -0.12345 is stored as follows:
Area of decimal portion: 2345; Area of integer portion: 0001; Sign area: F000

Memory Switch Set 1 (3000-series, High-speed Type) (Sequence No. 421 (Hex 01A5))

This sequence sets memory switches.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data					
+0	Number of send data words				
+1	W	X	Y	Z	
+2	(Undefined)			V	

Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 (fixed)
+1	w (1 digits BCD)	0: For single run or zero run measurement start displaying '---.' 1: For single run or zero run measurement start displaying the previous measured value
	x (1 digit BCD)	0: Perform single run measurement to the RUN signal of I/O IF 1: Repeat measurement while the RUN signal of I/O IF is input
	y (1 digit BCD)	*0: RS-232C Delimiter CR+LF 1: RS-232C Delimiter CR 2: RS-232C Delimiter LF
	z (1 digit BCD)	0: RS-232C no parity check 1: RS-232C odd parity check 2: RS-232C even parity check
+2	v (1 digit BCD)	0: Displaying 'Err-0' 1: Displaying '0'

Note Settings marked with asterisks are required for this protocol.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- Memory switches cannot be set when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.
- The setting (y, z) of RS-232C takes effect when the power supply is turned back ON.

Memory Switch Set 2 (3000-series, High-speed Type) (Sequence No. 422 (Hex 01A6))

This sequence sets memory switches.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data					
+0	Number of send data words				
+1	W	X	Y	Z	
+2	(Undefined)			V	

Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 (fixed)
+1	w (1 digit BCD)	0: Work automatic detection is not performed 1: Work automatic detection is performed Diameter detection method (1 scan) 2: Work automatic detection is performed Diameter detection method (8 scan) 3: Work automatic detection is performed Position detection method (1 scan)
	x (1 digit BCD)	For expansion 0 (fixed)
	y (1 digit BCD)	For expansion 0 (fixed)
	z (1 digit BCD)	For expansion 0 (fixed)
+2	v (1 digit BCD)	*0: Error data exclusion function is not used 1: Error data exclusion function is used

Note Settings marked with asterisks are required for this protocol.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

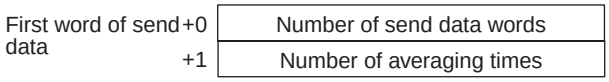
Additional Information

Memory switches cannot be set when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

Simple AVG Times Set (3000-series, High-speed Type) (Sequence No. 423 (Hex 01A7))

This sequence uses the simple average as the averaging method and sets the averaging times per measurement interval 4.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Number of averaging times (4 digits BCD)	1 to 2048

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

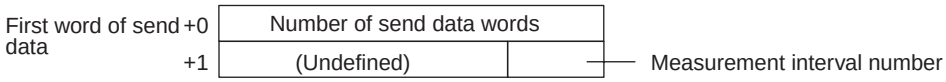
Additional Information

This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

AVG Move Interval Set (3000-series, High-speed Type) (Sequence No. 424 (Hex 01A8))

This sequence uses the average move as the averaging method and sets the measurement interval number.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Measurement interval number (1 digit BCD)	1 to 4

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

AVG Move (H) Times Set (3000-series, High-speed Type) (Sequence No. 425 (Hex 01A9))

This sequence uses the average move and high-speed data output as the averaging method and sets the averaging times per measurement interval 4.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data	+0	Number of send data words
	+1	Number of averaging times

Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Number of averaging times (4 digits BCD)	16 to 2048 (32 to 2048 for 5000/6000 Series)

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

AVG Move (L) Times Set (3000-series, High-speed Type) (Sequence No. 426 (Hex 01AA))

This sequence uses the average move and low-speed data output as the averaging method and sets the averaging times per measurement interval 4.

Send Data Word Allocation (3rd Operand of PMCR(260))

First word of send data	+0	Number of send data words
	+1	Number of averaging times

Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0002 (fixed)
+1	Number of averaging times (4 digits BCD)	32 to 2048

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.
- This sequence will be processed the same as sequence No. 425 AVG move (H) times set for 5000-series Laser Micrometers.

Automatic Detection Set (3000-series, High-speed Type) (Sequence No. 427 (Hex 01AB))

This sequence sets the work automatic detection function.

Send Data Word Allocation (3rd Operand of PMCR(260))

Receive data storage words

+0	Number of send data words		
+1	(Undefined)	The number of measuring times	
+2	Invalid time		
+3	Decimal portion		Detection lower limit
+4	(Undefined)	Integer portion	
+5	Sign	(Undefined)	
+6	Decimal portion		Detection upper limit
+7	(Undefined)	Integer portion	
+8	Sign	(Undefined)	

Offset	Contents (data format)	Data	
+0	Number of send data words (4 digits Hex)	0009 (fixed)	
+1	Number of measurements (3 digits BCD)	001 to 999	
+2	Invalid time (4 digits BCD)	0001 to 9999	
+3	Detection lower limit (decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +3: 4 5 6 7 +4: 0 1 2 3 +5: 2 D 0 0
+4	Detection lower limit (integer portion) (3 digits BCD)	000 to 999	
+5	Detection lower limit (Sign) (ASCII 1 character)	If +: 20 (' ') If –: 2D ('–')	
+6 to +8	Detection upper limit	Same as detection lower limit	

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.
- The detection lower and upper limit must be set with 3 digits for the integer portion and 4 digits for the decimal portion.

Automatic Detection Release (3000-series, High-speed Type) (Sequence No. 428 (Hex 01AC))

This sequence releases the setting of work automatic detection function.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

Automatic Detection List Request (3000-series, High-speed Type) (Sequence No. 429 (Hex 01AD))

This sequence requests the settings of work automatic detection function.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

Receive data storage words

+0	Number of receive data words		
+1	(Undefined)	The number of measuring times	
+2	Invalid time		
+3	Decimal portion		Detection lower limit
+4	(Undefined)	Integer portion	
+5	Sign	(Undefined)	
+6	Decimal portion		Detection upper limit
+7	(Undefined)	Integer portion	
+8	Sign	(Undefined)	

Offset	Contents (data format)	Data	
+0	Number of receive data words (4 digits Hex)	0009 (fixed)	
+1	The number of measuring times (3 digits BCD)	000 to 999	
+2	Invalid time (4 digits BCD)	0001 to 9999	
+3	Detection lower limit (decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +3: 4567 +4: 0123 +5: F000
+4	Detection lower limit (integer portion) (3 digits BCD)	000 to 999	
+5	Detection lower limit (Sign) (BIN)	If +: 0 If –: F	
+6 to +8	Detection upper limit	Same as detection lower limit	

Additional Information

This sequence cannot be used when DIP switch SW3, pin 5 of the Laser Micrometer is not turned ON.

3Z4L Initialize (3000-series) (Sequence No. 430 (Hex 01AE))

This sequence clears the 3Z4L, sets the mm unit, sets memory switches, does not process statistics, and clears the statistic memory in sequence.

Send Data Word Allocation (3rd Operand of PMCR(260))

The send data word allocation is similar to that of sequence No. 401 (Memory Switch Set)

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

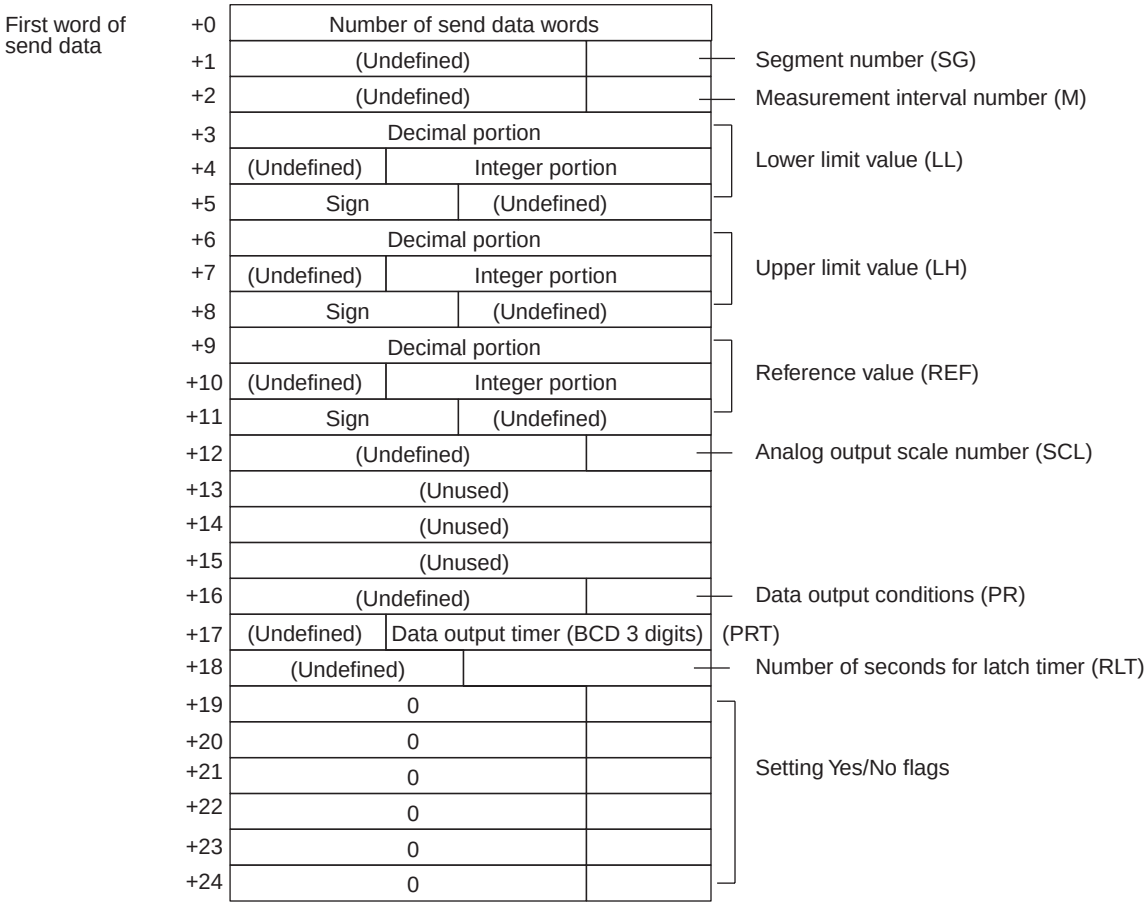
Additional Information

Memory switch settings will be ignored for this sequence for 5000-series and 6000-series Laser Micrometers.

Measurement Condition Set (4000-series) (Sequence No. 431 (Hex 01AF))

This sequence sets measurement conditions. Conditions to be set can be selected by setting Yes/No flags.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data	
+0	Number of send data words (4 digits Hex)	0019 (0025 decimal) (fixed)	
+1	Segment number (1 digit BCD)	1 to 5	
+2	Measurement interval number (1 digit BCD)	1 to 7	
+3	Lower limit value (Decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +3 4 5 6 7 +4 0 1 2 3 +5 2 D 0 0
+4	Lower limit value (integer portion) (3 digits BCD)	000 to 999	
+5	Lower limit value (Sign) (ASCII 1 character)	If +: 20 (' ') If –: 2D ('–')	
+6 to +8	Upper limit value	Same as lower limit value	
+9 to +11	Reference value	Same as lower limit value	
+12	Analog output scale number (1 digit BCD)	0 to 3	
+13 to +15	Unused		
+16	Data output conditions (1 digit BCD)	0 to 6	
+17	Data output timer value (3 digits BCD)	000 to 999	
+18	Number of seconds for latch timer (2 digits BCD)	00 to 99	
+19	Yes/No for segment setting (1 digit BCD)	Set: 1(SG) Don't set: 0	
+20	Yes/No for measurement interval number setting (1 digit BCD)	Set: 1(M) Don't set: 0	
+21	Yes/No for upper/lower limit value setting (1 digit BCD)	Set: 1(LL, LH) Don't set: 0	
+22	Yes/No for reference setting (1 digit BCD)	Set: 1(REF, SCL) Don't set: 0	
+23	Yes/No for data output condition setting (1 digit BCD)	Set: 1(PR, PRT) Don't set: 0	
+24	Yes/No for latch timer setting (1 digit BCD)	Set: 1(RLT) Don't set: 0	

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- The following settings must be made together with this sequence; they cannot be set separately.
  Lower limit, upper limit
  Reference value, analog output scale number
  Data output conditions, data output timer
- The limit value and reference value can be set to 3 digits for the integer portion and to 4 digits for the decimal portion.

Measurement Condition Release (4000-series) (Sequence No. 432 (Hex 01B0))

This sequence clears the measurement conditions that have been set.

Send Data Word Allocation (3rd Operand of PMCR(260))

The send data word allocation is similar to that of sequence No. 431 (Measurement Condition Set). However, only the setting Yes/No flags at +19 to +24 from the send data leading word can be used.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- The following conditions are used when the measurement conditions are released: Segment becomes 1 and the measurement interval becomes 1.
- The following settings cannot be cleared separately using this sequence. They all must be cleared at the same time.
  Lower limit, Upper limit
  Data output conditions, Scheduled print timer
- The scale (SCL) and data output timer (PRT) cannot be cleared.
- This sequence can be used for the 3Z4L-4000 Series only when pin 8 on DIP switch SW2 is turned ON.

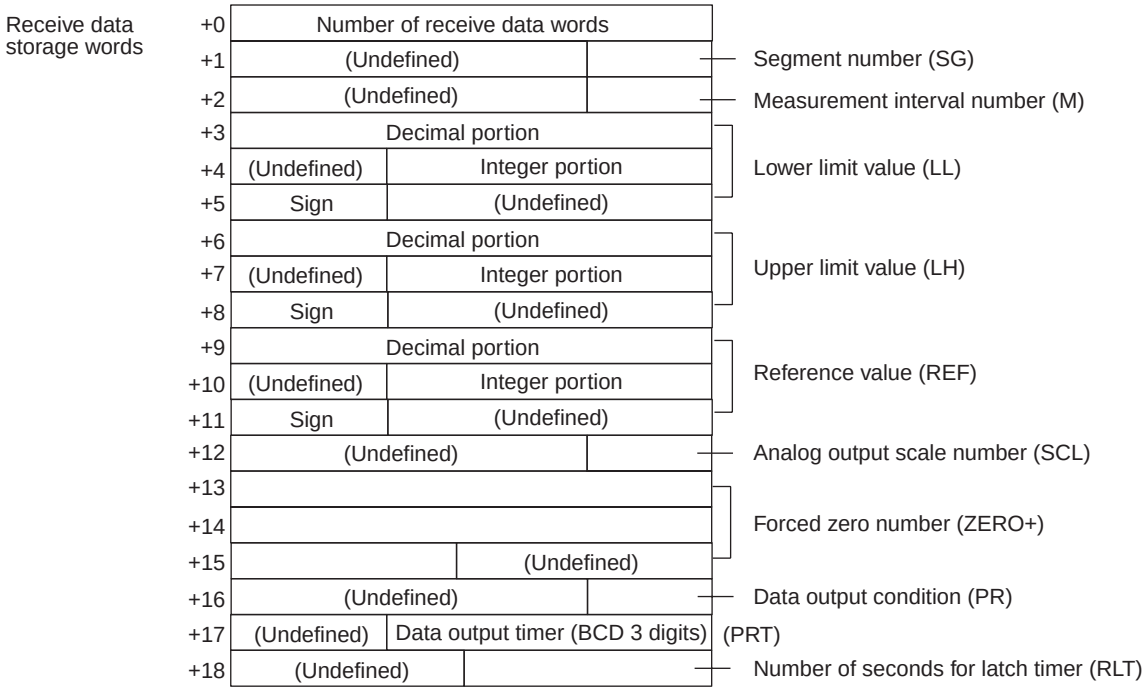
Measurement Condition List Request (4000-series) (Sequence No. 433 (Hex 01B1))

This sequence requests the measurement condition settings that have been set and other settings.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data	
+0	Number of receive data words (4 digits Hex)	0013 (0019 decimal) (fixed)	
+1	Segment number (1 digit BCD)	1 to 5	
+2	Measurement interval number (1 digit BCD)	1 to 7	
+3	Lower limit value (Decimal portion) (4 digits BCD)	0000 to 9999	**Example** –123.4567 +3: 4567 +4: 0123 +5: F000
+4	Lower limit value (Integer portion) (3 digits BCD)	000 to 999	
+5	Lower limit value (Sign) (BIN)	If +: 0 If –: F	
+6 to +8	Upper limit value	Same as lower limit value	
+9 to +11	Reference value	Same as lower limit value	
+12	Analog output scale number (1 digit BCD)	0 to 3	
+13 to +15	Forced zero number (ASCII 5 characters)	5A45524F2B ("ZERO+") 4E4F524D20 ("NORM ") 5A45524F2D ("ZERO–")	
+16	Data output condition (1 digit BCD)	0 to 6	
+17	Data output timer value (3 digits BCD)	000 to 999	
+18	Number of seconds for latch timer (2 digits BCD)	00 to 99	

Additional Information

This sequence can be used for the 3Z4L-4000 Series only when pin 8 on DIP switch SW2 is turned ON.

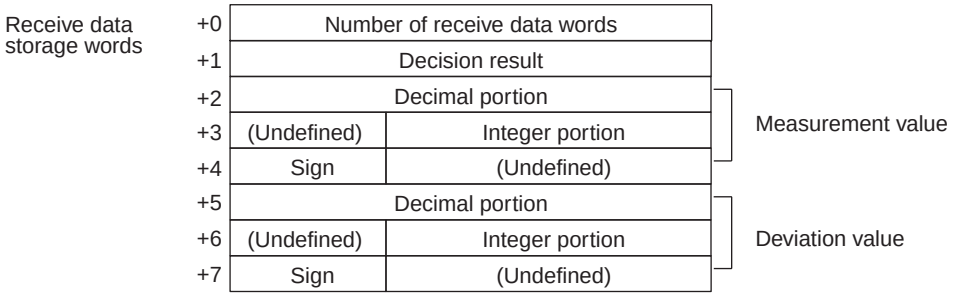
Single Run Measurement Start (4000-series) (Sequence No. 434 (Hex 01B2))

When the sample measurement condition is from 1 to 999, this sequence performs a single run measurement and requests the measurement results.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits Hex)	With no reference setting: 0005 With reference setting: 0008
+1	Decision result (ASCII 2 characters)	With no limit setting: 0000 With limit setting: 2B4E ("+N"), 4F4B ("OK"), 2D4E ("–N")
+2	Measurement value (decimal portion) (4 digits BCD)	0000 to 9999
+3	Measurement value (integer portion) (3 digits BCD)	000 to 999
+4	Measurement value (Sign) (BIN)	If +: 0 If –: F
+5 to +7	Deviation value	Same as measurement value *The deviation will be stored in this area only when reference setting is made.

Example –123.4567

+2	4567
+3	0123
+4	F000

Deflection Measurement Start (4000-series) (Sequence No. 435 (Hex 01B3))

This sequence starts a deflection measurement.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- The deflection measurement keeps measuring until sequence No. 438 (Measurement Termination) is executed.
- This sequence will be processed the same as sequence No. 411 Zero run measurement start for 5000-series Laser Micrometers.

Continuous Measurement Start (Scan) (4000-series) (Sequence No. 436 (Hex 01B4))

This sequence starts a continuous measurement. The scan notification method is used for the receive data.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 434 (Single Run Measurement Start).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Laser Micrometer still keeps measuring. Execute sequence No. 438 (Measurement Termination) to end the sequence.

Continuous Measurement Start (Interrupt) (4000-series) (Sequence No. 437 (Hex 01B5))

This sequence starts a continuous measurement. The interrupt notification method is used for the receive data and the interrupt No. is 101.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 434 (Single Run Measurement Start).

Additional Information

- Since this sequence repeats itself within the sequence, once it is executed, it remains in the execution state until cancelled.
- Even if execution is cancelled, the Laser Micrometer still keeps measuring. Execute sequence No. 438 (Measurement Termination) to end the sequence.

Precautions for Correct Use

- Sequences No. 413 and No. 437 (Continuous Measurement Start with Interrupt) are not supported by the CS1W-SCU□□(-V1) and CJ1W-SCU□□(-V1) Serial Communications Units. A protocol syntax error will occur if an attempt is made to execute either sequence with a Serial Communications Unit.
  Do not set an EM bank as the receive storage word for interrupt notification. A protocol syntax error will occur if an EM bank is set.

Continuous Measurement Termination (4000-series) (Sequence No. 438 (Hex 01B6))

This sequence terminates continuous measurement.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

For continuous measurement: None.

For Deflection Measurement:
The receive data word allocation is similar to that of sequence No. 434 (Single Run Measurement Start).

Additional Information

This sequence may be aborted if it is executed during continuous measurements. Measurements will be terminated even if the sequence is aborted. This occurs because this sequence was executed while the Laser Micrometer was sending measurement results. The chances that the sequence will be aborted are higher if the scheduled data output value is set to a lower value.

Data Request (4000-series) (Sequence No. 439 (Hex 01B7))

This sequence requests display data in the idle measurement status or latch data generated by the measurement command.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

The receive data word allocation is similar to that of sequence No. 434 (Single Run Measurement Start).

Forced Positive Zero (4000-series) (Sequence No. 440 (Hex 01B8))

This sequence sets the forced zero direction to positive (+)

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Forced Negative Zero (4000-series) (Sequence No. 441 (Hex 01B9))

This sequence sets the forced zero direction to negative (–)

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Forced Zero Release (4000-series) (Sequence No. 442 (Hex 01BA))

This sequence releases the forced zero direction.

Send Data Word Allocation (3rd Operand of PMCR(260))

None.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

3Z4L Initialize (4000-series) (Sequence No. 443 (Hex 01BB))

This sequence clears the 3Z4L, sets the mm unit, and sets memory switches in sequence.

Send Data Word Allocation (3rd Operand of PMCR(260))

The send data word allocation is similar to that of sequence No. 401 (Memory Switch Set).

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

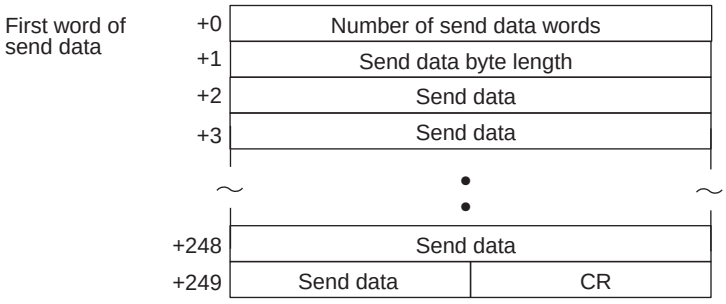
Additional Information

Memory switch settings will be ignored for this sequence for 5000-series and 6000-series Laser Micrometers.

General-purpose Command 1 (4000-series) (Sequence No. 444 (Hex 01BC))

This general-purpose command is used to send data with a specified data length, and receive back only OK. The terminator (CR) is automatically attached to the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 to 00FA (3 to 250 decimal)
+1	Send data byte length (4 digits Hex)	0001 to 01F0 (1 to 496 decimal) The number of bytes of send data excluding the terminator (CR)
+2 to +249	Send data (ASCII)	Send data up to 496 bytes maximum

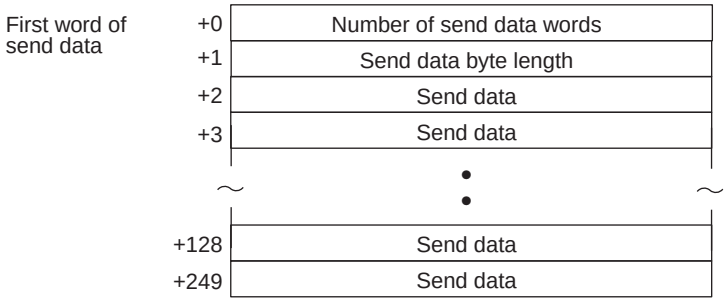
Receive Data Word Allocation (4th Operand of PMCR(260))

None.

General-purpose Command 2 (4000-series) (Sequence No. 445 (Hex 01BD))

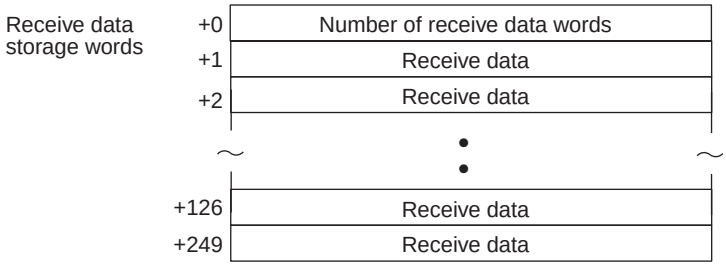
This general-purpose command is used to send data with a specified data length, and receive back receive data other than OK. The terminator (CR) is automatically attached to the send data.

Send Data Word Allocation (3rd Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of send data words (4 digits Hex)	0003 to 00FA (3 to 250 decimal)
+1	Send data byte length (4 digits Hex)	0001 to 01F0 (1 to 496 decimal) The number of bytes of send data excluding the terminator (CR)
+2 to +249	Send data (ASCII)	Send data up to 496 bytes maximum Specify in ASCII.

Receive Data Word Allocation (4th Operand of PMCR(260))



Offset	Contents (data format)	Data
+0	Number of receive data words (4 digits BCD)	0001 to 00FA (1 to 250 decimal)
+1 to +249	Receive data (ASCII)	Receive data up to 498 bytes maximum Stored in ASCII.

High Calibration Set (Sequence No. 446 (Hex 01BE))

This sequence sets the Laser Micrometer's high calibration.

Send Data Word Allocation (3rd Operand of PMCR(260))

The allocation is similar to that of sequence No. 404 (Calibration Set) except that the LC gauge dimension in words +4 to +6 are not used.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- Use sequences No. 446 (High calibration set) and No. 447 (Low calibration set) to calibrate the Laser Micrometer. If sequence No. 404 (Calibration Set) is used, both the high and low calibration gauges must be set, and the high calibration and low calibration gauges cannot be exchanged.
- The HC gauge dimension must be set with 3 digits for the integer portion and 4 digits for the decimal portion.

Low Calibration Set (Sequence No. 447 (Hex 01BF))

This sequence sets the Laser Micrometer's low calibration.

Send Data Word Allocation (3rd Operand of PMCR(260))

The allocation is similar to that of sequence No. 404 (Calibration Set) except that the HC gauge dimension in words +1 to +3 are not used.

Receive Data Word Allocation (4th Operand of PMCR(260))

None.

Additional Information

- Use sequences No. 446 (High calibration set) and No. 447 (Low calibration set) to calibrate the Laser Micrometer. If sequence No. 404 (Calibration Set) is used, both the high and low calibration gauges must be set, and the high calibration and low calibration gauges cannot be exchanged.
- The LC gauge dimension must be set with 3 digits for the integer portion and 4 digits for the decimal portion.

R-6 Hayes Modem AT Command Protocol

The Hayes Modem AT Command Protocol is used to remotely make various settings or control a Hayes modem connected to the Serial Communications Unit/Board via RS-232C cable.

R-6-1 Protocol Configuration

The configuration of the Hayes Modem AT Command Protocol is shown below.

Sequence No.	Communications sequence name	Function	Ladder interface	
			Send word allocation	Receive word allocation
550 (0226)	Initialize modem (general-purpose)	Initializes the modem connected to the Serial Communications Unit/Board. The initialization command is set in the words specified for the 3rd operand of PMCR(260).	Yes	No
560 (0230) 570 (023A) 580 (0244)	Initialize modem (specialized)	Initializes certain OMRON Modems.	No	No
561 (0231) 571 (023B) 581 (0245)	Dial	Dials from the modem connected to the Serial Communications Unit/Board. AT commands and telephone numbers are set in the words specified for the 3rd operand of PMCR(260). This sequence can be used only for certain OMRON modems.	Yes	No
552 (0228)	Password	After the line is connected, the password sent from the other exchange is verified to confirm that the line is connected to the desired exchange. The normal value of a password is set in the words specified for the 3rd operand of PMCR(260).	Yes	No
553 (0229)	Data send/receive (general purpose sequence)	Sends arbitrary data to the exchange to which the line is connected. Send data is set in the words specified for the 2nd operand of PMCR(260). Receive data is stored in the words specified for the 4th operand of PMCR(260).	Yes	Yes
554 (022A)	Escape	Shifts the modem to escape mode (the condition in which command input is available during data communications). The escape code is fixed to "+++"	No	No
555 (022B)	Hang up	After shifting to escape mode, the line is disconnected.	No	No
562 (0232) 572 (023C) 582 (0246)	Initialize and dial	Executes continuously from initialization to dialling operations for certain OMRON Modems.	Yes (*1)	No
590 (024E)	Escape to hang up	Executes continuously from shifting to the escape mode to hanging up.	No	No

*1 Refer to sequences No. 561, No. 571, and No. 581 for dialing operations.

Note The hexadecimal equivalents of sequences numbers are given in parentheses.

Ladder Interface Settings

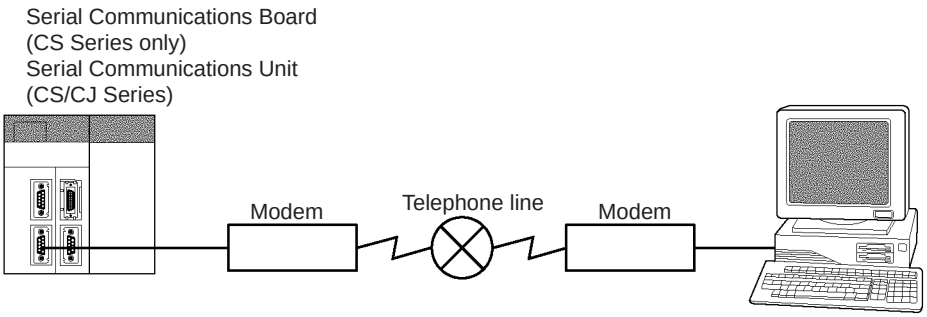
YES: User settings are required for the 3rd and 4th operands of PMCR(260).

NO: Send word allocation: Set the constant #0000 for the 3rd operand (S).
Receive word allocation: Set the constant #0000 for the 4th operand (D).

R-6-2 Connections

The connections when using the Hayes Modem AT Command Protocol is shown below.

RS-232C Connection

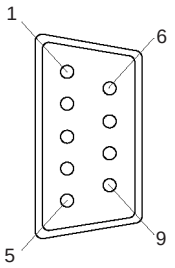


Modem: D-sub 25-pin (female)

1	FG
2	SD
3	RD
4	RTS
5	CTS
6	DSR
7	SG
8	CD
9	
10	
11	
12	
13	
14	
15	ST2
16	
17	RT
18	
19	
20	DTR
21	
22	CI
23	
24	ST1
25	

Serial Communications Board/Unit D-sub 9-pin (female)

1	FG
2	SD
3	RD
4	RTS
5	CTS
6	5V
7	DSR
8	DTR
9	SG



R-6-3 Compatible Modems

Although most of the sequences in this protocol can be used regardless of modem, the sequences Initialize Modem (specialized) and Dial can be used only for the following Modems:

- MD24FB10V (OMRON Modem)
- MD144FB5V (OMRON Intelligent Modem): No longer manufactured
- ME1414BIII, ME2814BII (OMRON FAX/DATA Modem)

For other modems, perform a modem initialization using the sequence No. 550, Initialize modem (general-purpose) and dial using the sequence No. 553, Data Send/Receive (general purpose sequence).

R-6-4 Modem Settings

When this protocol is used, it is required that the modem connected to the Serial Communications Unit/Board be initialized to the following conditions:

Command echo	No
Result code display format	Numeric format
Speed display, busy/dialling tone detection at connection	Baud rate display enabled, busy and dialling tone detection enabled.
Error correction data compression display	Error correction/data compression display enabled
MNP setting	Error correction provided (auto-reliable mode)
MNP class setting	MNP class 4
V.42 compression, Error correction	Not enabled
Flow control between terminal modems	Not enabled
ER signal control	Always ON
Escape code	+

Additional Information

- It is recommended that, in addition to the above settings, the abort timer should be set so that communications are cut off if a communications error happened due to incidents such as cable disconnection between the Serial Communications Unit/Board and modem. The abort timer is set to 10 minutes for the modem initialization (specialized) (Sequences No. 560, No. 570, No. 580: Initialize Modem (Specialized)). Refer to modem's manual for further information about abort timers.
- The data format of the modem (baud rate, data length, parity, stop bit) is set by AT commands issued from a device connected to the modem. Its settings should conform to communications conditions of the device which issues AT commands. Therefore when communications are made between the modem and Serial Communications Unit/Board, it is required that communications conditions should be set by issuing AT commands from the Serial Communications Unit/Board.
- Modem settings become invalid if the power supply is turned off and must be set again. However, a memory backup function can be used to protect settings so that even after the power supply to the modem is turned off, it can communicate with the previous setting conditions. Refer to the modem manual for how to save settings.

For Initialize Modem (specialized), the modem initialization command is built in as message data. However, for Initialize Modem (general-purpose), the command must be specified in the send data for PMCR(260). The PMCR instruction operand and send data word settings are specified below for when Initialize Modem (general-purpose) (Sequence No. 550) is executed.

OPR 1	(Communications port settings)
OPR 2	#0226 (Sequence No. 550)
OPR 3	Address S for first word containing initialization command character string
OPR 4	None (Set #0000)

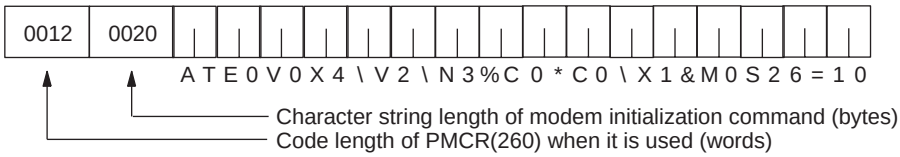
S+0	Number of words from address set for operand 2 to end of data	4 digits Hex
S+1	Number of bytes for send data (initialization command)	4 digits Hex
S+2 : S+n	Send data (initialization command) (Fill data to left for odd numbers of bytes)	ASCII

Setting Example for Modem Initialization Command

- MD24FB10V Using Sequence #550 (OMRON)

The following command is set in the words specified by the 3rd operand of PMCR(260).

ATE0V0X4\V2\N3%C0*C0\X1&M0S26=10



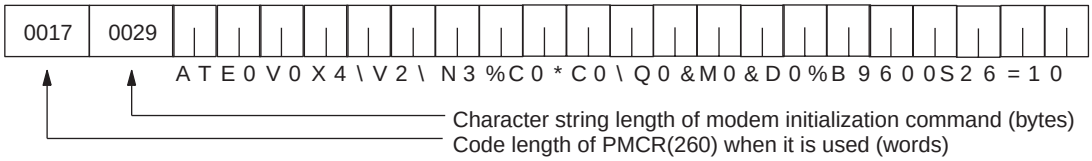
Additional Information

Turn ON pin 4 of DIP switches SW3 for this Modem (ER signal always ON).

MD144FB5V (OMRON, No longer manufactured.)

The following command is set in the words specified by the second operand of PMCR(260).

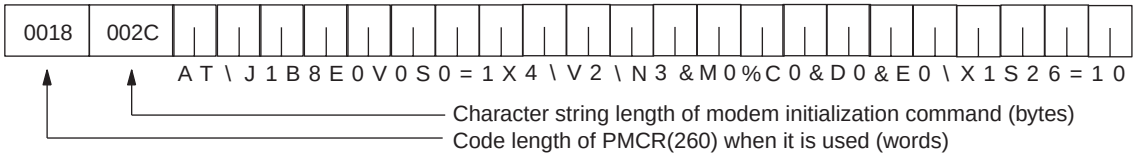
ATE0V0X4\V2\N3%C0*C0\Q0&M0&D0%B9600S26=10



ME1414BIII/ME2814BII (OMRON)

The following command is set in the words specified by the second operand of PMCR(260).

AT\J1B8E0V0S0=1X4\V2\N3&M0%C0&D0&E0\X1S26=10



Additional Information

Turn ON DIP switch SW3 in the rear of the Modem.

Dial (Sequences No. 561 (Hex 0231), No. 571 (Hex 023B), and No. 581 (Hex 0245))

To dial a telephone numbers for the OMRON ME1414BIII/ME2814BII Modems using sequences No. 561, 571, 581, set the dialling command and telephone number in the words specified by the 3rd operand of PMCR(260). However, for other Modems, make the following settings for the sequence No. 553, Data Send/Receive (general purpose sequence).

This is an example of telephone number settings for the above mentioned 4 OMRON Modems.

Operand and Send Data Word Settings of PMCR(260)

OPR 2	MD24FB10V MD144FB5V ME1414BIII/ME2814BII	#0231 #023B #0245
OPR 3	First address S of send data (dialling operation)	
OPR 4	None (Set #0000)	

S+0	Number of words from address set for operand 2 to end of data	4 digits Hex
S+1	Number of bytes of send data (dialling operation)	4 digits Hex
S+2 : S+n	Send data (dialling operation) (Fill data to left for odd numbers of bytes)	ASCII

Setting Example

If telephone number is 03-0123-4567

000A	0010	4154	4454	3033	2D30	3132	332D	3435	3637
		AT	DT	03	–0	12	3–	45	67

Character string length of dialling operation sent to modem (bytes)
Code length of PMCR(260) when it is used (words)

Additional Information

- This example uses a tone line. Change ATDT to ATDP for pulse lines.
- Fill the telephone number to the left in the words if the character string length of the dialling operation is an odd number of bytes.

0008	000B	4154	4454	3031	2D32	3334	3500
		AT	DT	01	–2	34	5□

Character string length of dialling operation sent to modem (bytes)
Code length of PMCR(260) when it is used (words)

Password (Sequence No. 552 (Hex 0228))

A password can be verified by executing sequence No. 552 of this protocol. It is required to set in advance the value of the password in the words specified by the third operand of PMCR(260).

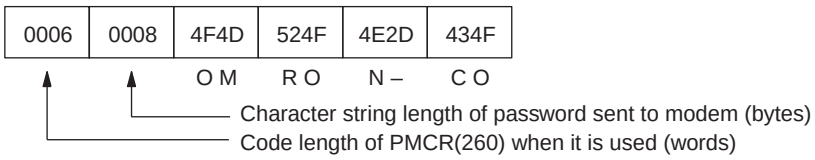
Operand and Send Data Word Settings of PMCR(260)

OPR 2	#0228
OPR 3	Address S of first word where the password is set
OPR4	None (Set #0000)

S+0	Number of words from address set for operand 3 to end of data	4 digits Hex
S+1	Number of bytes of comparison data (normal value of password)	4 digits Hex
S+2 : S+n	Comparison value (password normal value) (Fill data to left for odd numbers of bytes)	ASCII

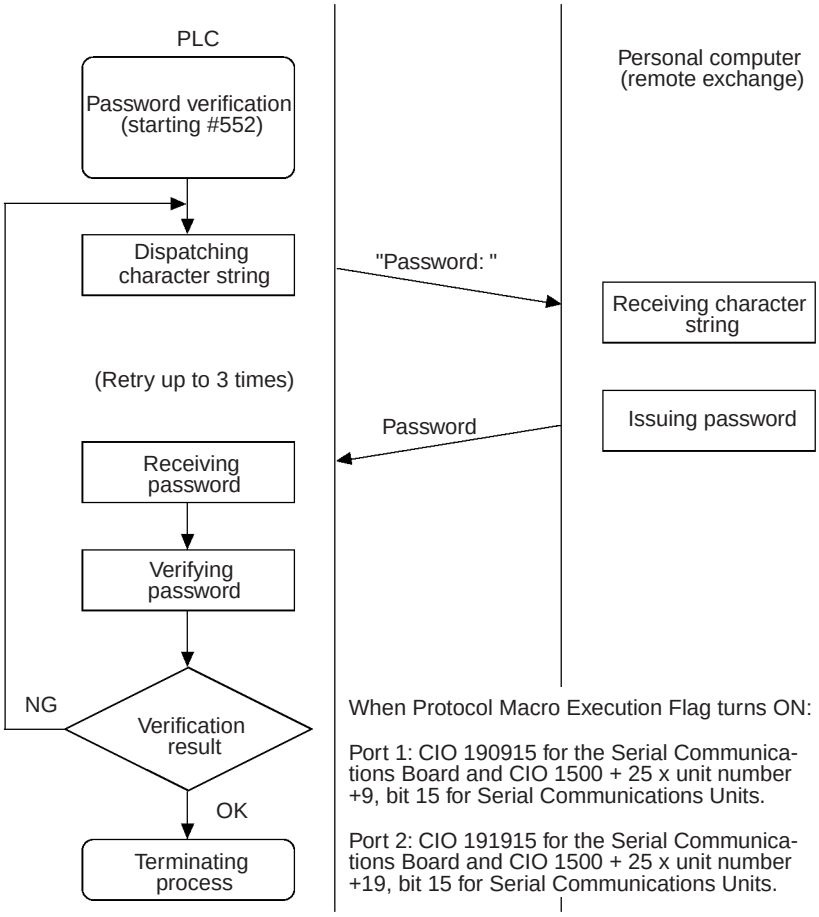
Setting Example

When password is OMRON-CO.



Password Verification Operation

The number of retries is 3 for password verification.



Data Send/Receive (Sequence No. 553 (Hex 0229))

Data Send/Receive can be executed using sequence No. 553. The send data sent to another exchange is set in the words specified by the 3rd operand of PMCR(260). Data received by the PLC is stored in the words specified by the 4th operand of PMCR(260).

Operand and Send/Receive Data Word Settings of PMCR(260)

OPR 2	#0229
OPR 3	First address C1 of the words where send data is set
OPR 4	First address C2 of the words where receive data is stored

- **Send Data Words**

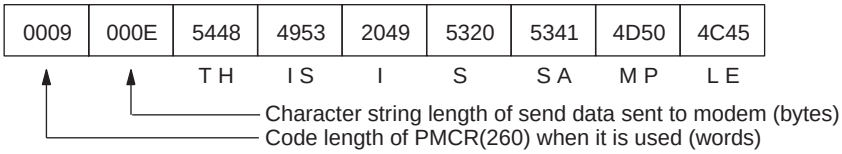
C1+0	Number of words from address set for operand 2 to end of data	4 digits Hex
C1+1	Number of bytes of send data	4 digits Hex
C1+2 : C1+n	Send data (dialling operation) (Fill data to left for odd numbers of bytes)	ASCII

- **Receive Data Storage Words**

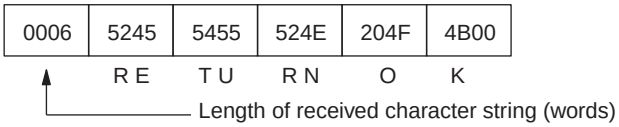
C2+0	Number of bytes of receive data	4 digits Hex
C2+1 : C2+n	Receive data (dialling operation) (Fill data to left for odd numbers of bytes)	ASCII

Setting Example

When send data is THIS IS SAMPLE.



A maximum of 200 bytes (including the CR) can be received. When the received data is RETURN OK, the content stored in the receive words is as follows:



Additional Information

An error will occur if the reception data is not received within 90 seconds after the data is sent.

Escape (Sequence No. 554 (Hex 022A))

Shifting to the escape mode can be made using sequence No. 554. No setting is necessary for this sequence.

Additional Information

The character string to shift the online mode to the escape mode (i.e., the escape code) is '+' for modem settings.

Hang Up (Sequence No. 555 (Hex 022B))

The hang up command (to disconnect the line) can be executed using sequence No. 555. No setting is necessary for this sequence.

R-6-5 Communication Errors

Three result codes are monitored after an AT command is sent to the modem. When a result code is returned, it will be checked. If the code is not the normal result code ("OK", "CONNECT 9600/REL4", "CONNECT 2400/REL4", in words), after a fixed time of waiting to send, the following retry processing will be repeated 2 times to send the AT command again and waiting for another result code.

The receive monitoring time and send wait time for each sequence are shown below.

Sequence No.	Sequence name	Receive monitoring time	Send wait time for retries
550 (0226)	Initialize modem (general-purpose)	10 s	1 s
560 (0230)	Initialize modem (specialized)	10 s	1 s
570 (023A)			
580 (0244)			
561 (0231)	Dial	90 s	90 s
571 (023B)			
581 (0245)			
552 (0228)	Password	None	3 s
553 (0229)	Data send/receive (general-purpose)	90 s	None
554 (022A)	Escape	10 s	1.5 s (after first try)
555 (022B)	Hang up	10 s	1.5 s (after first try)
562 (0232)	Initialize and dial	90s	Initializing: 1 s Dialling: 90 s
572 (023C)			
582 (0246)			
590 (024E)	Escape to hang up	10 s	1.5 s (after first try)

Note The hexadecimal equivalents of sequences numbers are given in parentheses.

App

Appendices

A-1 Differences in Available Functions Depending on the CPU Unit (NJ or CJ Series) A-2
A-1-1 Functional Differences A-2
A-1-2 Differences in Methods for Access from a User Program A-3
A-2 Version Information A-12

A-1 Differences in Available Functions Depending on the CPU Unit (NJ or CJ Series)

Some of the specifications when a Serial Communications Unit is connected to a CJ-series CPU Unit are different from the specifications when the Serial Communications Unit is connected to an NJ-series CPU Unit. A list of these differences is provided below.

A-1-1 Functional Differences

There are differences in function support, function names, and specifications between when a Serial Communications Unit is connected to a CJ-series CPU Unit and when the Serial Communications Unit is connected to an NJ-series CPU Unit.

Unsupported Functions

The following function cannot be used when the Serial Communications Unit is connected to an NJ-series CPU Unit.

- Interrupt notification

Functions with Different Names

The names of the following functions are different between when a Serial Communications Unit is connected to a CJ-series CPU Unit and when the Serial Communications Unit is connected to an NJ-series CPU Unit. The corresponding names are listed in the following table.

Item	Serial Communications Unit connected to a CJ-series CPU Unit	Serial Communications Unit connected to an NJ-series CPU Unit
Backup functions	Simple backup function	SD Memory Card backup function*
	Backup with PLC backup tool	Sysmac Studio Controller backup function*

* An NJ-series CPU Unit with unit version 1.03 or later and Sysmac Studio version 1.04 or higher are required.

Functions with Different Specifications

The following specification is different between when a Serial Communications Unit is connected to a CJ-series CPU Unit and when the Serial Communications Unit is connected to an NJ-series CPU Unit. Be sure to use this function in the correct operating mode for your CPU Unit.

Item	Serial Communications Unit connected to a CJ-series CPU Unit	Serial Communications Unit connected to an NJ-series CPU Unit
Protocol Macro tracing	Tracing operates when the CPU Unit is in MONITOR mode.	Tracing operates when the CPU Unit is in RUN mode. The NJ-series CPU Units support the following tasks.

A-1-2 Differences in Methods for Access from a User Program

If this Unit is used with an NJ-series CPU Unit, the user program uses device variables for CJ-series Unit that specify the AT specification for the memory used for CJ-series Unit to use the Serial Communications Unit functions.

Corresponding information regarding words, bit positions and device variables for CJ-series Unit when a CJ-series CPU Unit is used is shown below.

The following shows the relationship between the start addresses of the words allocated in CIO Area or in DM Area and Unit numbers.
Start address of the CPU Bus Unit CIO area: n = 1500 + Unit number × 25 (Unit number: 0 to 15)
Start address of the CPU Bus Unit DM area: m = D30000 + Unit number × 100 (Unit number: 0 to 15)

CPU Bus Unit Words Allocated in CIO Area

Device variables for CJ-series Unit for Software Switches and statuses are allocated to this area as AT specification.

The CIO Area between words n to n+8 and words n+10 to n+18 are used by all communications modes.
The CIO Area between words n+9 to n+14 and words n+19 to n+24 are individually defined for each communications mode. Use them according to the definition in the communications mode to be used.

Example:

- Protocol Macro Mode

  The device variable for CJ-series Unit that corresponds to bit 15 of n+9 is *_ *P1_PmrExecSta* (Protocol Macro Executing Flag).

- Loopback Test Mode

  The device variable for CJ-series Unit that corresponds to bit 15 of n+9 is *_ *P1_LbtErrSta* (Error).

The CIO Area Used by All Communications Modes

Words n to n+8 and words n+10 to n+18

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n		15 to 08	*_P2_SoftSw		Port 2: Software Switch
		15	---		Reserved
		14	*_P2_LbtTestTrigCmd		Port 2: Loopback Test Switch (Loopback Tests)
		13	---		Reserved
		12	*_P2_SgwDsblCmd		Port 2: Serial Gateway Prohibit Switch (Protocol Macros)
		11	*_P2_PmrAbtCmd		Port 2: Abort Switch (Protocol Macros)
		10	*_P2_Pmr1ShotTraceCmd		Port 2: One-shot Trace Switch (Protocol Macros)
		09	*_P2_PmrContTraceCmd		Port 2: Continuous Trace Switch (Protocol Macros)
		08	*_P2_PmrWaitRlsCmd		Port 2: Wait Release Switch (Protocol Macros)
		07 to 00	*_P1_SoftSw		Port 1: Software Switch
		07	---		Reserved
		06	*_P1_LbtTestTrigCmd		Port 1: Loopback Test Switch (Loopback Tests)
		05	---		Reserved
		04	*_P1_SgwDsblCmd		Port 1: Serial Gateway Prohibit Switch (Protocol Macros)
		03	*_P1_PmrAbtCmd		Port 1: Abort Switch (Protocol Macros)
		02	*_P1_Pmr1ShotTraceCmd		Port 1: One-shot Trace Switch (Protocol Macros)
		01	*_P1_PmrContTraceCmd		Port 1: Continuous Trace Switch (Protocol Macros)
		00	*_P1_PmrWaitRlsCmd		Port 1: Wait Release Switch (Protocol Macros)
n+1		15 to 00	*_Com_UnitSta		Serial Communication Unit Status
		15 to 02	---		Reserved
		01	*_Com_UnitLogMemErr		Error Log EEPROM Error
		00	*_Com_UnitPmrDatErr		Protocol Data Error
n+2		15 to 00	---		Reserved
n+3		15 to 00	---		Reserved
n+4		15 to 00	---		Reserved

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+5	n+15	15 to 00	*_P1_SysSetSta	*_P2_SysSetSta	System Settings
		15 to 12	Bit 15 to 12 of *_P1_SysSetSta	Bit 15 to 12 of *_P2_SysSetSta	Serial Communications Mode
		11 to 08	Bit 11 to 8 of *_P1_SysSetSta	Bit 11 to 8 of *_P2_SysSetSta	Baud Rate
		07 to 05	---	---	Reserved
		04	*_P1_StartBitSta	*_P2_StartBitSta	Start Bits
		03	*_P1_DatBitSta	*_P2_DatBitSta	Data Length
		02	*_P1_StopBitSta	*_P2_StopBitSta	Stop Bits
		01	*_P1_ParityYNSta	*_P2_ParityYNSta	Parity (Yes/No)
		00	*_P1_ParityBitSta	*_P2_ParityBitSta	Parity (Even/Odd)
n+6	n+16	15 to 00	*_P1_HwSetSta	*_P2_HwSetSta	Hardware Settings
		15	*_P1_Ser485Sta	*_P2_Ser485Sta	RS-422/485 Setting Status
		14	*_P1_Ser232Sta	*_P2_Ser232Sta	RS-232C Setting Status
		13	*_P1_TermSta	*_P2_TermSta	Terminating Resistance Setting Status
		12 to 02	---	---	Reserved
		01	*_P1_SysSetupErr	*_P2_SysSetupErr	System Setup error
		00	*_P1_OperatingSta	*_P2_OperatingSta	Port Operating Status
n+7	n+17	15 to 00	*_P1_TransCtlSta	*_P2_TransCtlSta	Communications Status
		15 to 11	---	---	Reserved
		10	*_P1_RmtBusySta	*_P2_RmtBusySta	Remote Unit Busy
		09	---	---	Reserved
		08	*_P1_LclBusySta	*_P2_LclBusySta	Local Unit Busy
		07	*_P1_SigERSta	*_P2_SigERSta	ER signal
		06	*_P1_SigDRSta	*_P2_SigDRSta	DR signal
		05	---	---	Reserved
		04	*_P1_SigCSSta	*_P2_SigCSSta	CS signal
		03	*_P1_SigRSSta	*_P2_SigRSSta	RS signal
		02 to 00	---	---	Reserved

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+8	n+18	15 to 00	*_P1_TransErrSta	*_P2_TransErrSta	Transmission Error Status
		15	*_P1_TransErr	*_P2_TransErr	Transmission error
		14	*_P1_TfsErr	*_P2_TfsErr	Tfs (Send Finished Monitoring Time) Exceeded
		13	*_P1_TfrErr	*_P2_TfrErr	Tfr (Receive Finished Monitoring Time) Exceeded
		12	*_P1_TrErr	*_P2_TrErr	Tr (Receive Wait Monitoring Time) Exceeded
		11 to 08	Bit 11 to 08 of *_P1_TransErrSta	Bit 11 to 08 of *_P2_TransErrSta	Retry Count
		07	*_P1_FCSErr	*_P2_FCSErr	FCS Check Error
		06	*_P1_CmdErr	*_P2_CmdErr	Command Error
		05	*_P1_TimeoutErr	*_P2_TimeoutErr	Timeout Error
		04	*_P1_OverRunErr	*_P2_OverRunErr	Overrun Error
		03	*_P1_FramingErr	*_P2_FramingErr	Framing Error
		02	*_P1_ParityErr	*_P2_ParityErr	Parity Error
		01, 00	---	---	Reserved

The CIO Area defined individually for each Communications Mode

Words n+9 to n+14 and words n+19 to n+24

- Protocol Macro Mode

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+9	n+19	15 to 00	*_P1_PmrSta	*_P2_PmrSta	Protocol Macro Operating Status
		15	*_P1_PmrExecSta	*_P2_PmrExecSta	Protocol Macro Executing Flag
		14	*_P1_PmrStepErr	*_P2_PmrStepErr	Step End Error (Step Error Processing Executing Flag (*))
		13	*_P1_PmrAbtSta	*_P2_PmrAbtSta	Abort Flag
		12	*_P1_PmrTracingSta	*_P2_PmrTracingSta	Tracing Flag
		11	*_P1_PmrSeqEndSta	*_P2_PmrSeqEndSta	Sequence End Completion Flag
		10	*_P1_PmrSeqAbtSta	*_P2_PmrSeqAbtSta	Sequence Abort Completion Flag
		09	*_P1_PmrSeqWaitSta	*_P2_PmrSeqWaitSta	Sequence Wait Flag
		08	*_P1_PmrSgwProhSta	*_P2_PmrSgwProhSta	Serial Gateway Prohibited Flag (Protocol Macros)
		07 to 04	---	---	Reserved
		03 to 00	Bit 03 to 00 of *_P1_PmrSta	Bit 03 to 00 of *_P2_PmrSta	Protocol Macro Operating Status
n+10	n+20	15 to 00	*_P1_PmrCommSeqNoSta	*_P2_PmrCommSeqNoSta	Communications Sequence No.
n+11	n+21	15 to 00	*_P1_PmrExecNoSta	*_P2_PmrExecNoSta	Executed Step and Case No.
		15 to 12	---	---	Reserved
		11 to 08	*_P1_PmrStepNoCodeSta	*_P2_PmrStepNoCodeSta	Executed Step No. (Code)
		07 to 04	---	---	Reserved
		03 to 00	*_P1_PmrRcvCaseNoCodeSta	*_P2_PmrRcvCaseNoCodeSta	Executed Reception Case No. (Code)
n+12	n+22	15 to 00	*_P1_PmrRcvCaseNoFlgSta	*_P2_PmrRcvCaseNoFlgSta	Executed Reception Case No. Storage Flag
n+13	n+23	15 to 00	*_P1_PmrStepNoFlgSta	*_P2_PmrStepNoFlgSta	Executed Step No. Storage Flag
n+14	n+24	15 to 00	*_P1_PmrRepCntSta	*_P2_PmrRepCntSta	Repeat Counter
n+14	n+24	15 to 08	*_P1_PmrSetRepCntSta	*_P2_PmrSetRepCntSta	Repeat Counter Setting Value
n+14	n+24	07 to 00	*_P1_PmrCurRepCntSta	*_P2_PmrCurRepCntSta	Repeat Counter Present Value

* Names used in CJ-Series

- Loopback Test

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+9	n+19	15 to 00	*_P1_LbtSta	*_P2_LbtSta	Loopback Test Status
		15	*_P1_LbtErrSta	*_P2_LbtErrSta	Error
		14 to 09	---	---	Reserved
		08	*_P1_LbtDRErr	*_P2_LbtDRErr	DTR Check Error
		07	*_P1_LbtCSErr	*_P2_LbtCSErr	CTS Check Error
		06	---	---	Reserved
		05	*_P1_LbtTimeoutErr	*_P2_LbtTimeoutErr	Timeout Error
		04	*_P1_LbtParityErr	*_P2_LbtParityErr	Parity Error
		03	*_P1_LbtOverRunErr	*_P2_LbtOverRunErr	Overrun Error
		02	*_P1_LbtFramingErr	*_P2_LbtFramingErr	Framing Error
		01	---	---	Reserved
		00	*_P1_LbtCmpErr	*_P2_LbtCmpErr	Comparison Error
n+10	n+20	15 to 00	*_P1_LbtTestCntSta	*_P2_LbtTestCntSta	Test Execution Count
n+11	n+21	15 to 00	*_P1_LbtTestErrCntSta	*_P2_LbtTestErrCntSta	Test Error Count
n+12 to n+14	n+22 to n+24	15 to 00	---	---	Reserved

- No-protocol Mode

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+9	n+19	15 to 00	*_P1_NopSta	*_P2_NopSta	No-protocol Mode Status
		15 to 08	---	---	Reserved
		07	*_P1_NopRcvOvfSta	*_P2_NopRcvOvfSta	Reception Overflow Flag
		06	*_P1_NopRcvCompleteSta	*_P2_NopRcvCompleteSta	Reception Completed Flag
		05	*_P1_NopSerialSendExecSta	*_P2_NopSerialSendExecSta	SerialSend Executing Flag (TXDU Executing Flag (*))
n+10	n+20	15 to 00	*_P1_NopRcvCntSta	*_P2_NopRcvCntSta	Reception Counter (Number of Receive Data Bytes)

* Names used in CJ-Series

- Modbus-RTU Slave Mode

n = CIO 1500 + 25 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
n+9	n+19	15 to 00	*_P1_MbsCmdRxCntSta	*_P2_MbsCmdRxCntSta	Number of Normally Received Commands
n+10	n+20	15 to 00	*_P1_MbsRespTxCntSta	*_P2_MbsRespTxCntSta	Number of Normally Sent Responses
n+11	n+21	15 to 00	*_P1_MbsTxErrCnt	*_P2_MbsTxErrCnt	Number of Overrun Errors, Framing Errors, and Parity Errors (Transmission Errors)
n+12	n+22	15 to 00	*_P1_MbsCRCErrCnt	*_P2_MbsCRCErrCnt	Number of CRC Errors (Transmission Errors)
n+13	n+23	15 to 00	*_P1_MbsCmdErrCnt	*_P2_MbsCmdErrCnt	Number of Command Format Errors (Illegal Function Codes and Illegal Addresses)
n+14	n+24	15 to 00	---	---	Reserved

DM Area Words Allocated to CPU Bus Unit

m = D30000 + 100 × unit number (word)

CJ-series I/O memory Address			NJ-Series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
m	m+10	15 to 00	*_P1_PortCfg	*_P2_PortCfg	Port Settings
		15	*_P1_SerSetCfg	*_P2_SerSetCfg	User-specified Setting Inclusion
		14 to 12	---	---	Reserved
		11 to 08	Bits 08 to 11 of *_P1_PortCfg	Bits 08 to 11 of *_P2_PortCfg	Port Settings
		07 to 05	---	---	Reserved
		04	*_P1_StartBitCfg	*_P2_StartBitCfg	Start Bits
		03	*_P1_DatBitCfg	*_P2_DatBitCfg	Data Length
		02	*_P1_StopBitCfg	*_P2_StopBitCfg	Stop Bits
		01	*_P1_ParityYNCfg	*_P2_ParityYNCfg	Parity Yes/No
		00	*_P1_ParityBitCfg	*_P2_ParityBitCfg	Parity Even/Odd
m+1	m+11	15 to 08	---	---	Reserved
		07 to 00	*_P1_BaudrateCfg	*_P2_BaudrateCfg	Baud Rate
m+2	m+12	15 to 00	*_P1_SendDelayCfg	*_P2_SendDelayCfg	Send Delay Settings
		15	*_P1_SendDelaySetCfg	*_P2_SendDelaySetCfg	Send Delay Time
		14 to 00	Bit 14 to 00 of *_P1_SendDelayCfg	Bit 14 to 00 of *_P2_SendDelayCfg	Send Delay Settings
m+3	m+13	15 to 00	*_P1_HlkCfg	*_P2_HlkCfg	Host-Link Protocol Setting
		15	*_P1_HlkCTSCtlCfg	*_P2_HlkCTSCtlCfg	CTS Control
		14	*_P1_HlkProcCfg	*_P2_HlkProcCfg	1: N/1:1 Protocol Setting
		13 to 11	---	---	Reserved
		10 to 08	Bits 08 to 10 of *_P1_HlkCfg	Bits 08 to 10 of *_P2_HlkCfg	Host-Link Protocol Setting
		07 to 00	*_P1_HlkUnitNoCfg	*_P2_HlkUnitNoCfg	Host Link Unit Number

m = D30000 + 100 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
m+4	m+14	15 to 08	*_P1_NopStartCodeCfg	*_P2_NopStartCodeCfg	No-protocol Start Code
		07 to 00	*_P1_NopEndCodeCfg	*_P2_NopEndCodeCfg	No-protocol End Code
m+5	m+15	15 to 00	*_P1_NopCfg	*_P2_NopCfg	No-protocol Settings
		15 to 13	---	---	Reserved
		12	*_P1_NopStartCodeYNCfg	*_P2_NopStartCodeYNCfg	No-protocol Start Code Inclusion Setting
		11 to 10	---	---	Reserved
		09	*_P1_NopCRLFCfg	*_P2_NopCRLFCfg	No-protocol CR+LF Specification Setting
		08	*_P1_NopEndCodeYNCfg	*_P2_NopEndCodeYNCfg	No-Protocol End Code Inclusion Setting
		07 to 00	*_P1_NopRcvDatSzCfg	*_P2_NopRcvDatSzCfg	Number of Received Data Bytes in No-protocol Mode
m+6	m+16	15 to 08	*_P1_MbsSlavAdrCfg	*_P2_MbsSlavAdrCfg	Modbus-RTU Slave Address
		07 to 03	---	---	Reserved
		02 to 00	*_P1_NtlMaxUnitNoCfg	*_P2_NtlMaxUnitNoCfg	1:N NT Links Maximum Unit Number
m+7	m+17	15 to 00	*_P1_PmrSgwTimeoutCfg	*_P2_PmrSgwTimeoutCfg	Serial Gateway Timeout Monitoring Time Setting
		15 to 08	*_P1_PmrSgwRespTimeoutCfg	*_P2_PmrSgwRespTimeoutCfg	Serial Gateway Response Timeout Monitoring Time
		07 to 00	*_P1_PmrSgwSendTimeoutCfg	*_P2_PmrSgwSendTimeoutCfg	Serial Gateway Send Start Timeout Monitoring Time
m+8	m+18	15 to 00	*_P1_PmrTransCfg	*_P2_PmrTransCfg	Protocol macro Transmission Settings
		15	*_P1_PmrTransTypCfg	*_P2_PmrTransTypCfg	Protocol macro Transmission method
		14 to 04	---	---	Reserved
		03	*_P1_PmrRBufClrCfg	*_P2_PmrRBufClrCfg	Clearing/Holding the Contents of the Reception Buffer in Full-duplex Mode
		02	*_P1_PmrLkChAccessCfg	*_P2_PmrLkChAccessCfg	Link Word Specification Data Exchange Method (Link Word Specification Data Exchange Method Timing (*))
		01 to 00	---	---	Reserved
m+9	m+19	15 to 00	*_P1_PmrMaxDatSzCfg	*_P2_PmrMaxDatSzCfg	Maximum Number of Bytes in Protocol Macro Send/Receive Data

* Names used in CJ-Series

m = D30000 + 100 × unit number (word)

CJ-series I/O memory Address			NJ-series device variable for CJ-series Unit		
Word No.		Bit No.	Variable name		Meaning
Port 1	Port 2		Port 1	Port 2	
m+20	m+30	15 to 08	---	---	Reserved
		07 to 00	*_P1_MbsCoilsAreaCfg	*_P2_MbsCoilsAreaCfg	Coils Allocation Area
m+21	m+31	15 to 00	*_P1_MbsRegAreaCfg	*_P2_MbsRegAreaCfg	Modbus-RTU Settings
		15 to 08	*_P1_MbsInRegAreaCfg	*_P2_MbsInRegAreaCfg	Input Registers Allocation Area
		07 to 00	*_P1_MbsHdRegAreaCfg	*_P2_MbsHdRegAreaCfg	Holding Registers Allocation Area
m+22 to m+24	m+32 to m+34	15 to 00	---	---	Reserved
m+25	m+35	15 to 00	*_P1_NopIrqCfg	*_P2_NopIrqCfg	No-protocol Interrupt Notification Settings
		15 to 08	*_P1_NopIrqTskNoCfg	*_P2_NopIrqTskNoCfg	External Interrupt Task Number
		07 to 05	---	---	Reserved
		04	*_P1_NopIrqYNCfg	*_P2_NopIrqYNCfg	External Interrupt Task Starting Setting
		03 to 01	---	---	Reserved
		00	*_P1_NopRBufClrCfg	*_P2_NopRBufClrCfg	Reception Buffer Clear
m+26 to m+29	m+36 to m+39	15 to 00	---	---	Reserved

A-2 Version Information

This section gives the functions that were added or changed for each unit version of the CPU Unit.

● Additions and Changes to Functional Specifications

The following table gives the unit version of the Serial Communications Units, the unit version of the CPU Units and the Sysmac Studio version for each addition or change to the functional specifications.

Function Specifications	Addition/change	Reference	Unit version of Serial Communications Unit	Unit version of CPU Unit	Sysmac Studio version
SerialRcvNo-Clear instruction	Addition	Section 6	2.1	1.03	1.04

Index

Index

Numerics

2-wire or 4-wire Switch [WIRE] 1-28, 2-6
2-wire/4-wire 3-7
3Z4L 4-2, R-78
5V 2-4, 3-5

A

Abort Switch (Protocol Macros) 2-23, 4-22
Allocated DM Area A-9
Allocation Areas for Coils 7-7
Applicable Connector 2-5, 2-6, 3-25
Assumed cause 9-31
AT specification 2-10
AT specification destination 2-8
Auxiliary Area 7-3, 7-13

B

Basic Operating Procedure 1-23
Baud rate 1-15, 1-20, 2-17, 4-14, 5-6, 6-6, 7-6, 8-5
Bits 1-29, 2-34, 8-3

C

CIO area 7-3, 7-13, A-3
Clearing/Holding the Contents of the Reception Buffer in Full-duplex Mode 2-19, 4-14, 4-18
Coils Allocation Area 7-6
Command Error 9-31, 9-40
Command Format Error 9-34, 9-47
Communications condition 1-25, 3-8
Communications distance 1-15, 1-20
Communications sequence 4-4, 4-10
Comparison Error 9-34, 9-46
CompoWay/F 5-2, 5-33
CompoWay/F Master R-7
CompoWay/F Slave Component 5-23
Connection 3-9
Connection configuration 1-15
Connector Pin Layout 2-4, 2-6, 3-5
Continuous I/O refreshing 2-19, 4-11, 4-18
Continuous Trace Switch 2-23
Continuous Trace Switch (Protocol Macros) 4-22
Controller error 9-30
Controller reset 1-14, 2-14, 4-23
Converting to CompoWay/F 5-23
Converting to Modbus-ASCII 5-28
Converting to Modbus-RTU 5-26
CPU Unit service monitoring error 9-2, 9-26
CPU Unit watchdog timer error 9-26
CPU Unit WDT error 9-2
Create Device Variable 1-24, 2-12
CS 2-4, 3-5
CS signal 2-26
CTS (CS) signal 4-19
CTS Check Error 9-31, 9-39
CTS Control 2-18, 2-20, 2-21, 5-6, 6-6
CX-Integrator 9-25
CX-Protocol 1-6, 4-2

D

Data Exchange Method for Link Words 4-18
Data exchange with the CPU Unit 2-8
Data Length 2-16, 4-13, 5-5, 6-5, 8-4
Device name 1-24, 2-12
Device variable for CJ-series Unit 2-8, 2-10, 2-12
Diagnostic 1-21, 7-20
Dimensions 2-7
Direct Designation 1-32
Direct setting 1-15
DM 7-3, 7-13
DM area A-3
DR 2-4, 3-5
DR signal 2-4, 2-26
DstDat 1-30, 4-41
DTR Check Error 9-31, 9-38

E

E5□N 1-30, 4-2, 4-8
Edit Special Unit Settings 1-23, 1-24, 2-10
EM 7-3, 7-13
End code 1-20, 6-2
ER 2-4, 3-5
ER signal 1-9, 2-26
ERC 9-2
ERH 9-2
Error Log Data Error 9-31, 9-37
Event 9-30
Event code 9-31
Event level 9-30
Event Log 9-30
Event name 9-31
ExecPMCR instruction 1-6, 1-15, 4-2, 4-40
Executing Loopback Test 8-2

F

FCS Check Error 9-33, 9-43
FG 2-4, 3-5
Framing Error 9-34, 9-49

H

Half-duplex/Full-duplex 1-23

Hayes Modem AT Command R-117
Holding 7-3, 7-13
Holding Registers Allocation Area 7-6

I

I/O Map 2-12, 2-14
I/O port 2-10, 2-14
Indicator 2-3
Input Registers Allocation Area 7-6

L

Link word setting 1-15
Link Word Specification Data Exchange Method 2-19, 4-14
Loopback Test 1-6
Loopback Test Switch 2-23, 8-2

M

Maximum Number of Bytes in Protocol Macro Send/Receive Data 4-15, 4-18
Maximum number of data exchange words 1-15
Memory used for CJ-series Unit 1-8, 1-21, 2-8
Messages (communications frame structure) 1-20
Mitsubishi Computer Link Master R-41
Modbus data model 7-3, 7-7
Modbus- RTU Slave Address 7-6
Modbus-ASCII 5-2, 5-36
Modbus-RTU 5-2, 5-34
MODBUS-RTU Settings 7-6
Modbus-RTU Slave 7-2
Modbus-RTU Slave Address 7-7, 9-22
Modbus-RTU Slave Mode 1-7
Modbus-RTU Slave OMRON Device 5-26

N

Network address 5-24, 5-28
Network Communications Instruction Enabled Flag 1-30, 1-33, 1-34
Node address 5-24, 5-28
No-Protocol CR + LF Specification 2-21, 6-7
No-protocol End Code 2-21, 6-6
No-Protocol End Code Inclusion 2-21, 6-7
No-protocol Mode 1-7
No-Protocol Settings 2-21, 6-6
No-protocol Start Code 2-21, 6-6
No-Protocol Start Code Inclusion 2-21, 6-6
NT-AL001 ..... 1-10, 3-8
Number of Command Format Errors 7-12
Number of CRC Errors 7-12
Number of mountable Units 1-14
Number of Normally Received Commands 7-12
Number of Normally Sent Responses 7-12
Number of receive data bytes during reception ... 1-20, 6-3
Number of Receive Data Bytes in No-protocol Mode 2-21, 6-7

O

One-shot Trace Switch 2-23, 4-22
On-request I/O Refreshing 2-19, 4-10, 4-18
Operand setting 1-15
Operation Data 2-10, 2-14
Overrun Error 9-34, 9-48
Overrun Error, Framing Error, or Parity Error (Transmission Error) 9-35, 9-51

P

Parity 2-17, 4-14, 5-6, 6-6, 7-5, 8-4
Parity (Even/Odd) 2-17, 4-14, 5-6, 6-6, 7-5, 8-4
Parity Error 9-35, 9-50
PMCR(260) R-3
Port Settings 2-16, 4-13, 5-5, 6-5, 7-5, 8-4
Port Settings Changing Flag 1-29, 4-21, 5-8, 6-8, 7-8
Port1/Port2 ..... 1-14, 2-2
Power OFF retention 2-10
Processing When a Sequence Ends Abnormally 4-53
Protocol Data Error 4-24, 9-31, 9-37
Protocol Macro 1-6, 4-2
Protocol Macro Error 9-32, 9-41
Protocol Macro Transmission Method 2-18, 4-14, 4-16
Protocol macro Transmission Settings 2-18, 4-14

R

RD 2-4, 3-5
RD1/2 ..... 2-3, 8-3
RDA/B 2-6, 3-5
RDY 9-2
Read Coils 1-21, 7-3, 7-14
Read Discrete Inputs 1-21, 7-3, 7-15
Read Holding Registers 1-21, 7-3, 7-16
Read Input Registers 1-21, 7-3, 7-17
Receive counter 1-20, 6-3
Receive Data Area 1-32, 4-42, 4-52
Reception buffer clear timing 1-20, 6-3
Reception Overflow 9-34, 9-46
Recommended cable 2-5, 2-6, 3-19, 3-20
Recommended RS-232C Wiring Example 3-19
Recommended RS-422A/485 Wiring Example 3-20
Response timeout monitoring 1-19, 5-4, 5-31
RS 2-4, 3-5
RS signal 2-26
RS/CS Flow Control 4-19
RS-232C 2-4, 3-4
RS-422A/485 ..... 2-5, 3-4
RTS (RS) signal 4-19
RUN 9-2

S

SD1 8-3
SD1/2 ..... 2-3, 8-3
SDA/B 2-6, 3-5
Send Data Area 1-32, 4-42

Send delay 1-19, 5-4
Send delay function 5-32
Send Delay Settings 2-18, 2-20, 2-21, 5-6, 6-6
Send Delay Time 2-18, 2-20, 2-21, 5-6, 6-6
Send Start Timeout Monitoring 1-19, 5-4, 5-31
SendCmd instruction 5-14
SeqNo 4-40
Sequence Abort Completed 9-31, 9-40
Sequence number 4-2, R-3
Serial Communications instruction 2-8
Serial communications port 1-14
Serial Communications Unit 1-3, 1-4
Serial Communications Unit Port Settings Changing Flag 2-34
Serial Gateway 1-6, 5-2
Serial Gateway Prohibit Switch (Protocol Macros) 2-23, 4-22, 5-9, 5-14
Serial Gateway Response Timeout Monitoring Time 2-18, 2-20, 4-14, 5-6
Serial Gateway Send Start Timeout Monitoring Time 2-18, 2-20, 4-14, 5-6
Serial Gateway Timeout Monitoring Time Settings 2-18, 2-20, 4-14, 5-6
Serial Port I/O instruction 6-2
SerialRcv or SerialRcvNoClear instruction 1-34, 6-2
SerialSend 1-34, 6-2
SG 2-4, 3-5
Soft Switches 2-23, 4-22
Software switch 2-8, 2-14
Specifying Link Word 1-32
Specifying Operand 1-32
SrcDat 1-30, 4-41
Standard system protocol 4-2, R-3
Start Bits 2-16, 4-13, 5-5, 6-5, 8-4
Start code 1-20, 6-2
Status 1-14, 2-8, 2-12
Stop Bits 2-16, 4-13, 5-5, 6-5, 8-4
Sysmac Studio 1-23, 6-12
System Settings data 2-10
System Setup Error 9-31, 9-38
System-defined variable 2-8, 2-11, 2-34

T

TER1/2 2-3
TERM:Terminating resistance ON/OFF switch 1-28
Terminating resistance 1-28
Terminating Resistance Switch [TERM] 2-6
Tfr (Receive Finished Monitoring Time) Exceeded 9-32, 9-42
Tfs (Send Finished Monitoring Time) Exceeded 9-32, 9-42
Time reception buffer cleared 4-17
Timeout Error 5-31, 9-33, 9-44
Tr (Receive Wait Monitoring Time) Exceeded 9-32, 9-43
Transmission control parameter 1-15, 4-5
Transmission Error 9-34, 9-47
Transmission Error (CRC Error) 9-35, 9-52
Transmission Error Status 4-29, 7-12

U

Unit address 5-24, 5-28
Unit Configuration 1-24, 2-12
Unit No. Switch 2-3
Unit number 1-14, 1-26, 2-3, 3-2
Unit number setting switch 1-26, 9-56
Unit with the same unit number 9-2
Use No-protocol Mode 6-2
User program 2-11, 4-42
User-defined variable 2-8, 2-11, 2-13
User-specified Setting Inclusion 2-16, 4-13, 5-5, 6-5, 7-5, 8-4

V

V500/V520 ..... 4-2, R-65

W

Wait Release Switch (Protocol Macros) 2-23, 4-22
WIRE: 2-wire or 4-wire selector switch 1-28
Work 7-3, 7-13
Write Multiple Coils 1-21, 7-3, 7-20
Write Multiple Registers 1-21, 7-3, 7-21
Write Single Coil 1-21, 7-3, 7-18
Write Single Register 1-21, 7-3, 7-19

OMRON Corporation **Industrial Automation Company**
Tokyo, JAPAN
Contact: www.ia.omron.com

Regional Headquarters
OMRON EUROPE B.V.
Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC
One Commerce Drive Schaumburg,
IL 60173-5302 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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