



Programmable Controller CJ-series

Serial (RS-232C) Communications Connection Guide

OMRON Corporation Auto Focus Multi Code Reader V320-F / V420-F / V430-F-series

Network
Connection
Guide

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1. Related Manuals

The following manuals are related to this document.

To ensure system safety, make sure to always read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the manuals for each device which is used in the system.

Cat. No.	Model	Manual name
W472	CJ2H-CPU6□-EIP CJ2H-CPU6□ CJ2M-CPU□□	CJ-series CJ2 CPU Unit Hardware User's Manual
W473	CJ2H-CPU6□-EIP CJ2H-CPU6□ CJ2M-CPU□□	CJ-series CJ2 CPU Unit Software User's Manual
W336	CJ1W-SCU□1-V1 CJ1W-SCU□2	CJ-series Serial Communications Boards/Units Operation Manual
W446	CXONE-AL□□C-V4 / AL□□D-V4	CX-Programmer Operation Manual
W344	CXONE-AL□□C-V4 / AL□□D-V4	CX-Protocol Operation Manual
W474	CJ2□-CPU□□	CJ-series Instructions Reference Manual
Z432	V320-F/V330-F/V420-F/ V430-F Series	MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual
Z407	V320-F/V330-F/V420-F/ V430-F Series	Autofocus Multicode Reader MicroHAWK V320-F/V330-F/V420-F/V430-F Series User Manual for Communication Settings

2. Terms and Definitions

Term	Description/Definition
Protocol Macro	This function enables data send/receive with general-purpose external devices by storing the data send/receive procedure (Protocol) used with the general-purpose external devices in the Serial Communication Board or Unit and executing the PMCR instruction in the CPU Unit.
Protocol	The unit that comprises an independent communication processing for a specific general-purpose external device as a data send/receive procedure is called a "Protocol". A "protocol" consists of two or more sequences.
Sequence	A unit of independent communication processing that can be activated from the PMCR instruction on the ladder program. When activated, the steps in the sequence are executed sequentially.
Step	A unit to execute processing, which is send message, receive message, send and receive message, clear receive buffer, or step queuing. Up to 15 steps can be set in a sequence.
Send Message	A communication frame (command) sent to a general-purpose external device. It is called from a step in a sequence and sent to a general-purpose external device.
Receive Message	A communication frame (response) sent from a general-purpose external device. It is called from a step in a sequence and compared with data received from the general-purpose external device.
Reception Matrix	A reception matrix is used when it is impossible to uniquely identify communication frames (responses) sent from a general-purpose external device. In a reception matrix, more than one communication frame can be registered.
Case	A unit for registering multiple communication frames (responses) in a reception matrix. One communication frame is registered as one case. Up to 15 cases can be registered in a reception matrix.

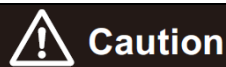
3. Restrictions and Precautions

- (1) Before building a system, understand the specifications of devices which are used in the system. Allow some margin for ratings and performance, and provide safety measures such as installing a safety circuit in order to minimize the risk in case of failure.
- (2) To ensure system safety, make sure to read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the manuals for each device which is used in the system.
- (3) The user is encouraged to confirm the standards and regulations that the system must conform to.
- (4) It is prohibited to copy, to reproduce, and to distribute a part or the whole of this document without the permission of OMRON Corporation.
- (5) The information contained in this document is current as of February 2023.
It is subject to change for improvement without notice.

The following notations are used in this document.



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



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



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.



Note

Additional information to read as required.

This information is provided to increase understanding or make operation easier.

Symbols



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.

4. Overview

This document describes the procedures for connecting the OMRON code reader products (V320-F/V420-F/V430-F Series) to a CJ Series Programmable Controller with a Serial Communications Unit (hereinafter referred to as PLC) via serial communications and for checking their connections.

Refer to *Section 6. Serial Communication Settings* and *Section 7. Connection Procedure* to understand the setting procedures and key points of setup to establish a serial communications connection.

Using the user program in the “CX-Programmer Project File” and the protocol data in the “CX-Protocol Project File” prepared in advance, use the “Read trigger” command for the code reader to check the serial communications connection.

Obtain the latest versions of the CX-Programmer Project File and CX-Protocol Project File in advance. Contact OMRON for information on how to obtain these files.

Name	Filename	Version
CX-Programmer Project File (Extension: cxp)	OMRON_V320_V420_V430_PMCR232C_V100.cxp	Ver. 1.00
CX-Protocol Project File (Extension: psw)	OMRON_V320_V420_V430_PMCR_V100.psw	Ver. 1.00

* Hereinafter, the CX-Programmer Project File is called “project file”.

The user program in a project file is called “ladder program” or “program”.

The CX-Protocol Project File is called “protocol macro data”.

Caution

The purpose of this document is to describe the wiring methods, communication settings, and setting procedures required to establish a connection for communications with applicable devices. In addition, the program used in this document is designed to check that the connection has been correctly performed (connection check). Since the program is not intended for permanent use on-site, full consideration is not given to functionality and performance. When configuring an actual system, please refer to the wiring methods, communication settings, and setting procedures described in this document to design and create a program that meets your purpose.



5. Applicable Devices and Support Tools

5.1. Applicable Devices

The applicable devices that can be connected are as follows:

Manufacturer	Name	Model	Version
OMRON	CJ2 CPU Unit	CJ2□-CPU□□	Same or later version as indicated in section 5.2.
OMRON	Serial Communications Unit	CJ1W-SCU□1-V1 CJ1W-SCU□2	
OMRON	Code reader	V320-F□□□□□□□-□□□ V420-F□□□□□□□-□□□ V430-F□□□□□□□-□□□	



Note

From among the above applicable devices, this document uses the devices listed in section 5.2 for the connection check. When using devices that are not described in section 5.2, check the connection according to this document.



Note

This document describes the procedures for establishing the communication connection of the device, and does not describe the operation, installation and wiring method of the device. For details on the above products (other than communication connection procedures), please refer to the instruction manual for the product or contact OMRON.



Precautions for Correct Use

The connection and connection check procedures described in this document use the devices listed in section 5.2, from among the above applicable devices.

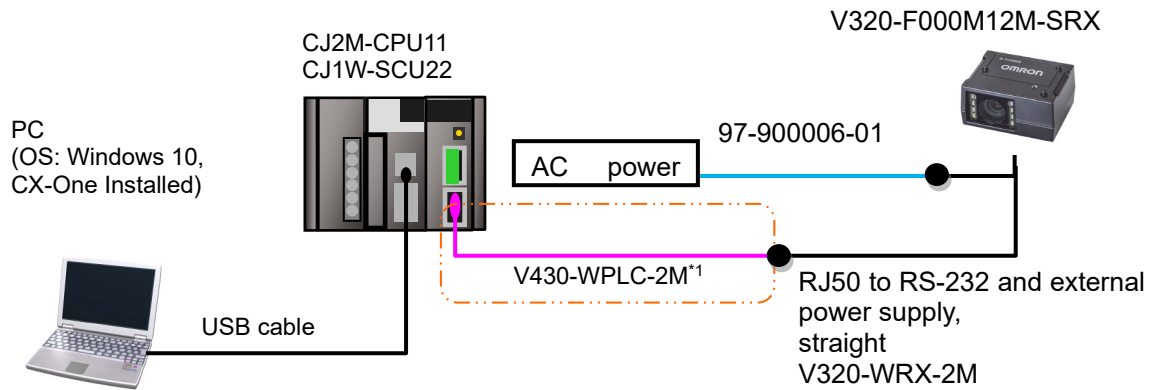
You cannot use devices with versions earlier than the versions listed in section 5.2.

To use models that are not listed in section 5.2. or versions that are later than those listed in section 5.2., check the differences in the specifications according to their instruction manuals before operating the devices.

5.2. Device Configuration

The system components required for reproducing the connection procedures described in this document are as follows.

- Configuration with V320-F



Manufacturer	Name	Model	Version
OMRON	CPU Unit	CJ2M-CPU11	Ver. 2.0
OMRON	Serial Communications Unit	CJ1W-SCU22	Ver. 2.0
OMRON	Power Supply Unit	CJ1W-PA202	
OMRON	CX-One	CXONE-AL□□C-V4 /AL□□D-V4	Ver. 4.□□
OMRON	CX-Programmer	(Included with CX-One)	Ver. 9.66
OMRON	CX-Protocol	(Included with CX-One)	Ver. 1.993
OMRON	CX-Programmer Project File (Ladder Program)	OMRON_V320_V420_V430_PMCR232C_V100.cxp	Ver. 1.00
OMRON	CX-Protocol Project File (Protocol macro data)	OMRON_V320_V420_V430_PMCR_V100.psw	Ver. 1.00
	PC (OS: Windows 10)		
	USB cable (USB 2.0-compliant B-type connector)		
OMRON	Code reader	V320-F000M12M-SRX	Ver. 2.1.0
OMRON	RJ50 to RS-232 and external power supply, straight	V320-WRX-2M	
OMRON	OMRON Programmable Controller (CS/CJ/NJ) RS-232C cable	V430-WPLC-2M*1	
OMRON	Power supply	97-900006-01	
	AC power supply		

*1. Refer to 6.2. Cable Wiring Diagram for how to prepare the RS-232C cable yourself.

5. Applicable Devices and Support Tools

WebLink cannot be used for RS-232C connection.

To use WebLink, the following system components for USB connection are required.

PC
(OS: Windows 10)



USB breakout cable
V420-WUB-1M

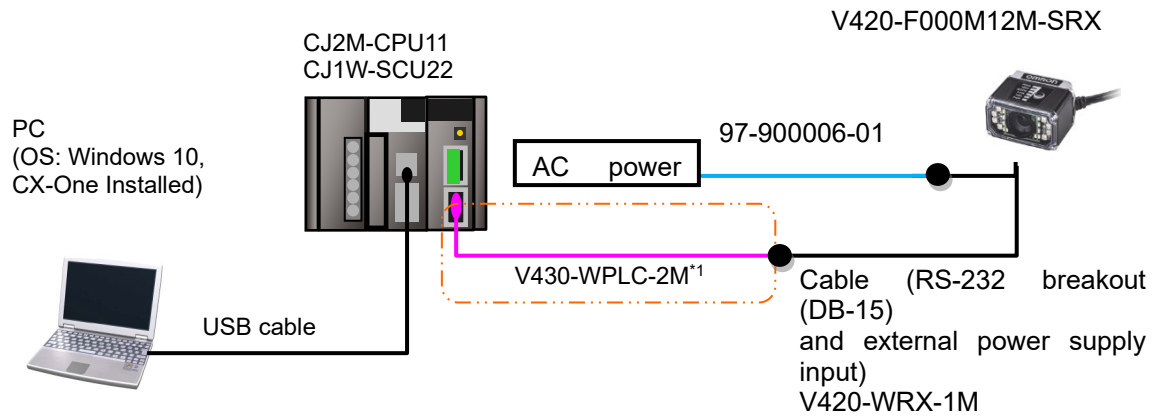
V320-F000M12M-SRX



V/F320-F adapter for all
V420-F cable accessories,
RJ50 to DB-15
V320-WR-1M

Manufacturer	Name	Model	Version
	PC (OS: Windows 10)		
OMRON	Code reader	V320-F000M12M-SRX	Ver. 2.1.0
OMRON	V/F320-F adapter for all V420-F cable accessories, RJ50 to DB-15	V320-WR-1M	
OMRON	USB breakout cable	V420-WUB-1M	

- Configuration with V420-F

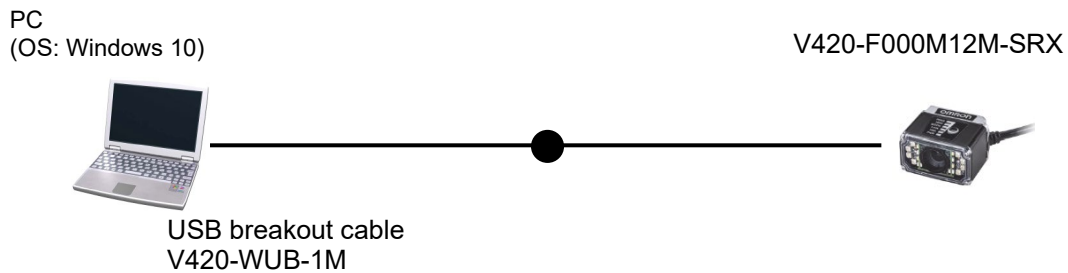


Manufacturer	Name	Model	Version
OMRON	CPU Unit	CJ2M-CPU11	Ver. 2.0
OMRON	Serial Communications Unit	CJ1W-SCU22	Ver. 2.0
OMRON	Power Supply Unit	CJ1W-PA202	
OMRON	CX-One	CXONE-AL□□C-V4 /AL□□D-V4	Ver. 4.□□
OMRON	CX-Programmer	(Included with CX-One)	Ver. 9.66
OMRON	CX-Protocol	(Included with CX-One)	Ver. 1.993
OMRON	CX-Programmer Project File (Ladder Program)	OMRON_V320_V420_V430_PMCR232C_V100.cxp	Ver. 1.00
OMRON	CX-Protocol Project File (Protocol macro data)	OMRON_V320_V420_V430_PMCR_V100.psw	Ver. 1.00
	PC (OS: Windows 10)		
	USB cable (USB 2.0-compliant B-type connector)		
OMRON	Code reader	V420-F000M12M-SRX	Ver. 2.1.0
OMRON	Cable (RS-232 breakout (DB-15) and external power supply input)	V420-WRX-1M	
OMRON	OMRON Programmable Controller (CS/CJ/NJ) RS-232C cable	V430-WPLC-2M*1	
OMRON	Power supply	97-900006-01	
	AC power supply		

*1. Refer to 6.2. *Cable Wiring Diagram* for how to prepare the RS-232C cable yourself.

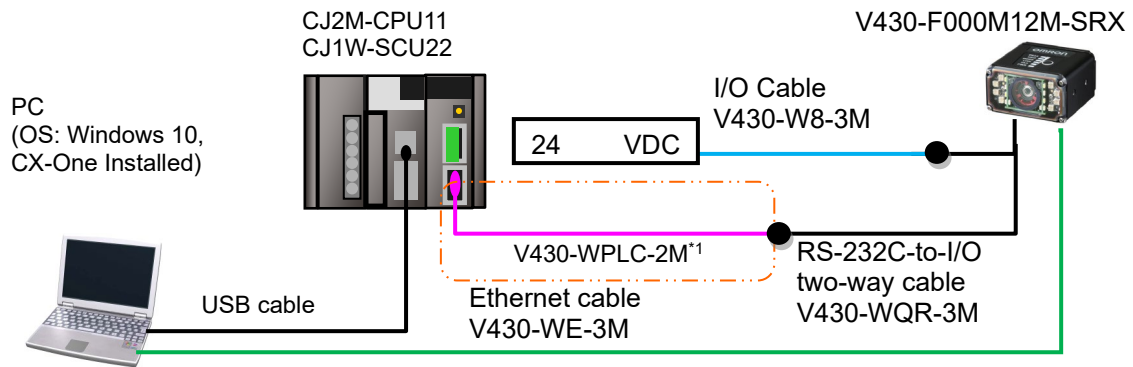
WebLink cannot be used for RS-232C connection.

To use WebLink, the following system components for USB connection are required.



Manufacturer	Name	Model	Version
	PC (OS: Windows 10)		
OMRON	Code reader	V420-F000M12M-SRX	Ver. 2.1.0
OMRON	USB breakout cable	V420-WUB-1M	

- Configuration with V430-F



Manufacturer	Name	Model	Version
OMRON	CPU Unit	CJ2M-CPU11	Ver. 2.0
OMRON	Serial Communications Unit	CJ1W-SCU22	Ver. 2.0
OMRON	Power Supply Unit	CJ1W-PA202	
OMRON	CX-One	CXONE-AL□□C-V4 /AL□□D-V4	Ver. 4.□□
OMRON	CX-Programmer	(Included with CX-One)	Ver. 9.66
OMRON	CX-Protocol	(Included with CX-One)	Ver. 1.993
OMRON	CX-Programmer Project File (Ladder Program)	OMRON_V430_PMCR232C_V100.cxp	Ver. 1.00
OMRON	CX-Protocol Project File (Protocol macro data)	OMRON_V430_PMCR_V100.psw	Ver. 1.00
	PC (OS: Windows 10)		
	USB cable (USB 2.0-compliant B-type connector)		
OMRON	Code reader	V430-F000M12M-SRX	Ver. 2.1.0
OMRON	RS-232C-to-I/O two-way cable	V430-WQR-3M	
OMRON	OMRON Programmable Controller (CS/CJ/NJ) RS-232C cable	V430-WPLC-2M*1	
OMRON	I/O Cable	V430-W8-3M	
OMRON	Ethernet cable	V430-WE-3M	
	24 VDC power supply		

*1. Refer to 6.2. *Cable Wiring Diagram* for how to prepare the RS-232C cable yourself.



Precautions for Correct Use

Obtain the latest versions of the project file and protocol macro data in advance.
Contact OMRON for information on how to obtain these files.



Precautions for Correct Use

Ensure that the CX-Programmer and CX-Protocol are updated to the versions specified in this section or higher. If you use a version other than the version specified in this section, there may be differences in the procedures in Section 7 and later. In that case, refer to the *CX-Programmer Operation Manual* (Cat. No. W446) or *CX-Protocol Operation Manual* (Cat. No. W344) to perform the equivalent procedures.



Note

The configuration may not be reproduced if the system component models or versions differ. Check your configuration and, if there is any difference in the models or versions, contact OMRON.



Note

This document assumes that the USB is used to connect the PLC. For information on how to install the USB driver, refer to the *CX-Programmer Operation Manual* (Cat. No. W446).



Note

Refer to the *Industrial Switching Hub W4S1 Series User Manual* (0969584-7) for power supply specifications that can be used for 24 VDC power supply (for the switching hub).



Note

Refer to the *MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual* (Cat. No. Z432) for the power supply specifications that can be used for 24 VDC power supply (for the code reader).

6. Serial Communications Settings

This section shows the specifications of the communication parameter settings, cable wiring, and other information provided in this document.



Note

You need to modify the program to use communication settings that are not described in this section. For more information on the program, please refer to *Section 9. Program*.

6.1. Serial Communications Settings

The serial communications settings are as follows.

Parameter name	SCU Unit*	Code reader
Unit number	0	---
Communications (connection) port	Port 2 (RS-232C)	---
Serial communications mode	Protocol macro	---
Data length	8 bits	8 bits (default)
Stop bit	1 bit	1 bit (default)
Parity	None	None (default)
Baud rate	9,600 bps (default)	9,600 bps
Protocol macro transmission method	Full-duplex	---
Header	---	None (default)
Footer	---	<CR+LF> (default)
Host port protocol	---	Point-to-point (default)

* SCU Unit: Serial Communications Unit



Precautions for Correct Use

It is assumed that the CJ1W-SCU22 Serial Communications Unit is used with the unit number is 0 and the communications (connection) port *Port 2*. If using other conditions to connect the Unit, refer to *Section 9. Program* and create a program by modifying the control data in the CIO Area and PMCR Instruction.

6.2. Cable Wiring Diagram

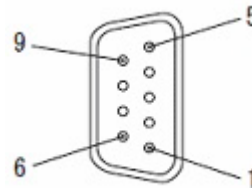
For details on cable wiring, refer to *Section 3 Installation and Connection* in the *CJ-series Serial Communications Boards/Units Operation Manual* (Cat. No. W336).

Check the connector shape and signal lines (pin assignment) before you prepare the cable.

■ Connector Shape and Signal Lines (Pin Assignment)

Applicable connector for CJ1W-SCU22: D-SUB 9-pin (Connector shape on CJ1W-SCU22 side: Female)

Pin No.	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	---

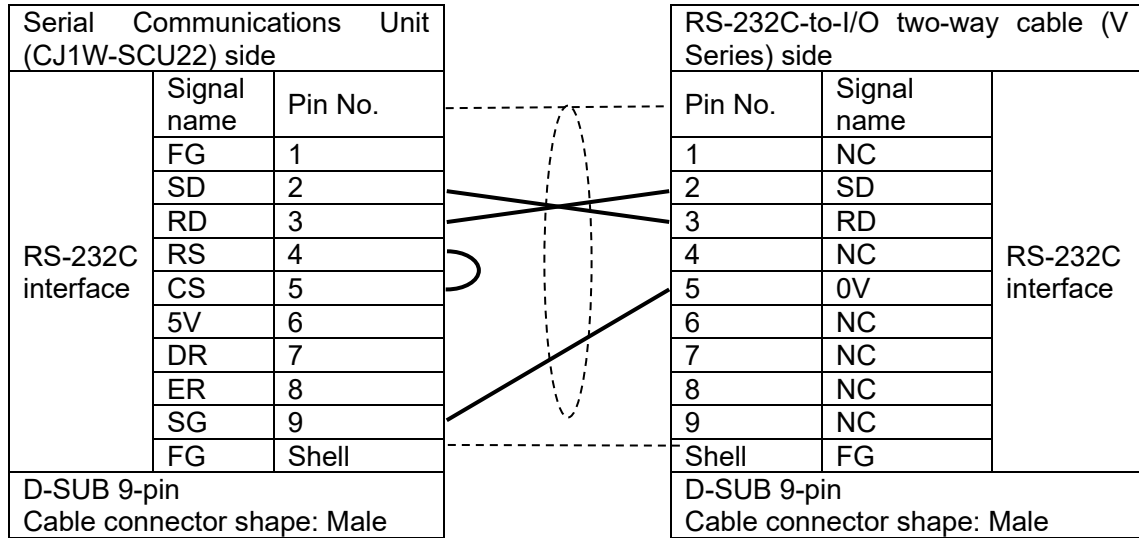


Applicable connector for V Series RS-232C cable: D-SUB 9-pin (Connector on V Series side: Female)

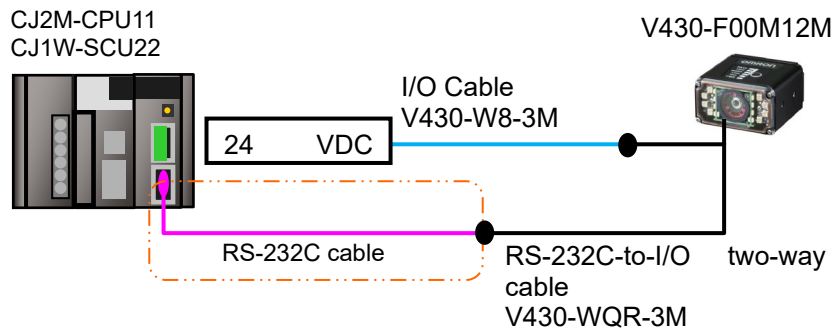
Pin No.	Signal name	Pin assignment
1	-	<p>A diagram of a D-SUB 9-pin female connector. The pins are arranged in a vertical row. Pin 2 is at the top, followed by pins 3 and 5, and pins 4, 6, 7, 8, and 9 below. The diagram shows the physical shape of the connector with the pin positions indicated by small circles and numbered labels.</p>
2	SD	
3	RD	
4	-	
5	0V	
6	-	
7	-	
8	-	
9	-	

■ RS-232C Cable Pin Assignment

Prepare the RS-232C cable with reference to the following wiring diagram.



For V430-F



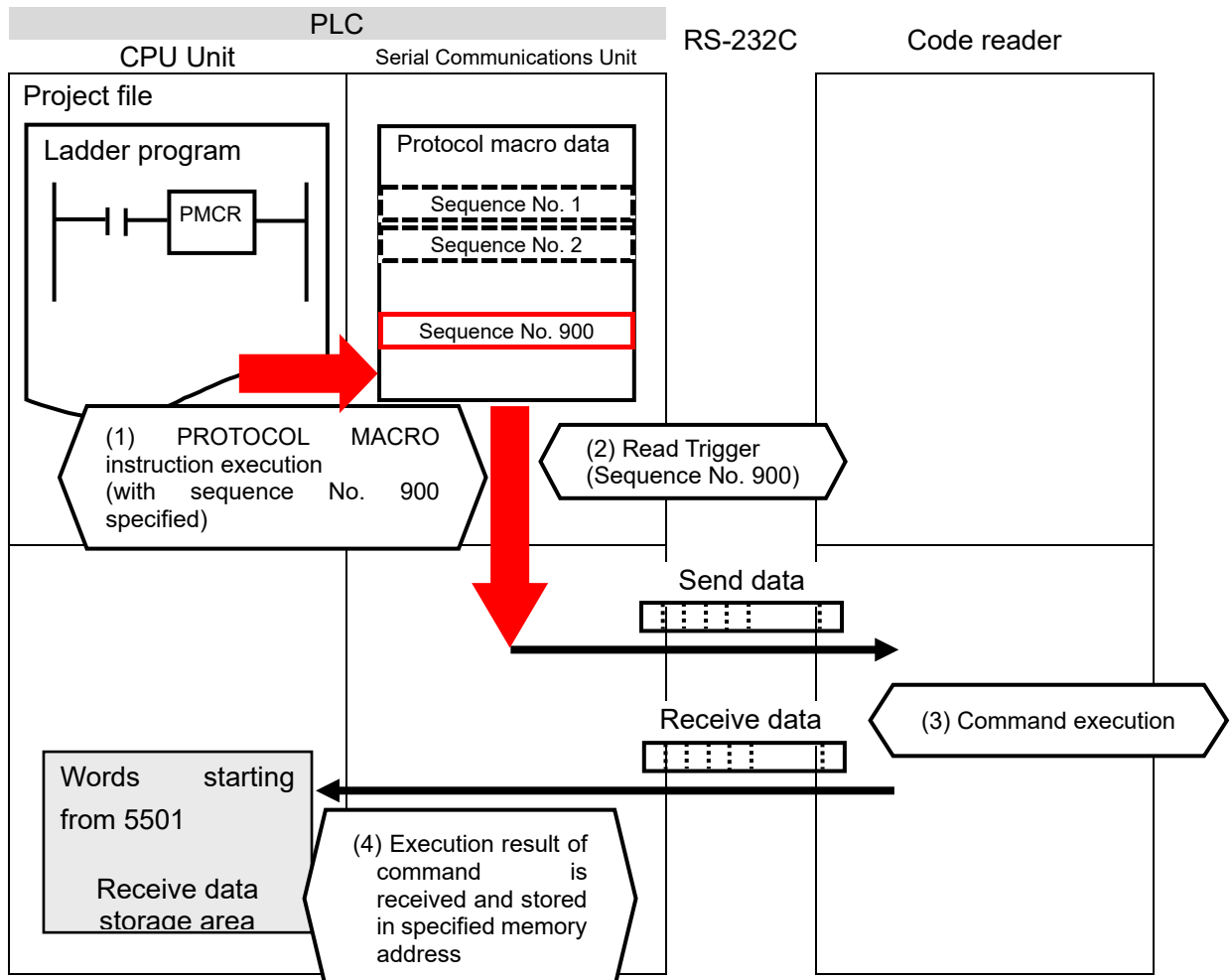
6.3. Example of Connection Check for Communications

In this document, an example of sending and receiving messages between the controller and the code reader using a ladder program and protocol macro data is given.

Between the PLC and the code reader, the “Execute Read (Sequence No. 900)” message is sent and received. An overview of the sequence operation is shown below.

- Sequence Operation Overview

- (1) In the ladder program, the PROTOCOL MACRO instruction (PMCR instruction) is executed with sequence No. 900 of the protocol macro data specified.
- (2) “Read trigger” command is selected from sequence No. 900 of the protocol macro data and sent to the code reader.
- (3) The code reader executes the command according to the data sent from the PLC.
- (4) The PLC receives the execution result of the command from the code reader and stores it in the specified memory address.



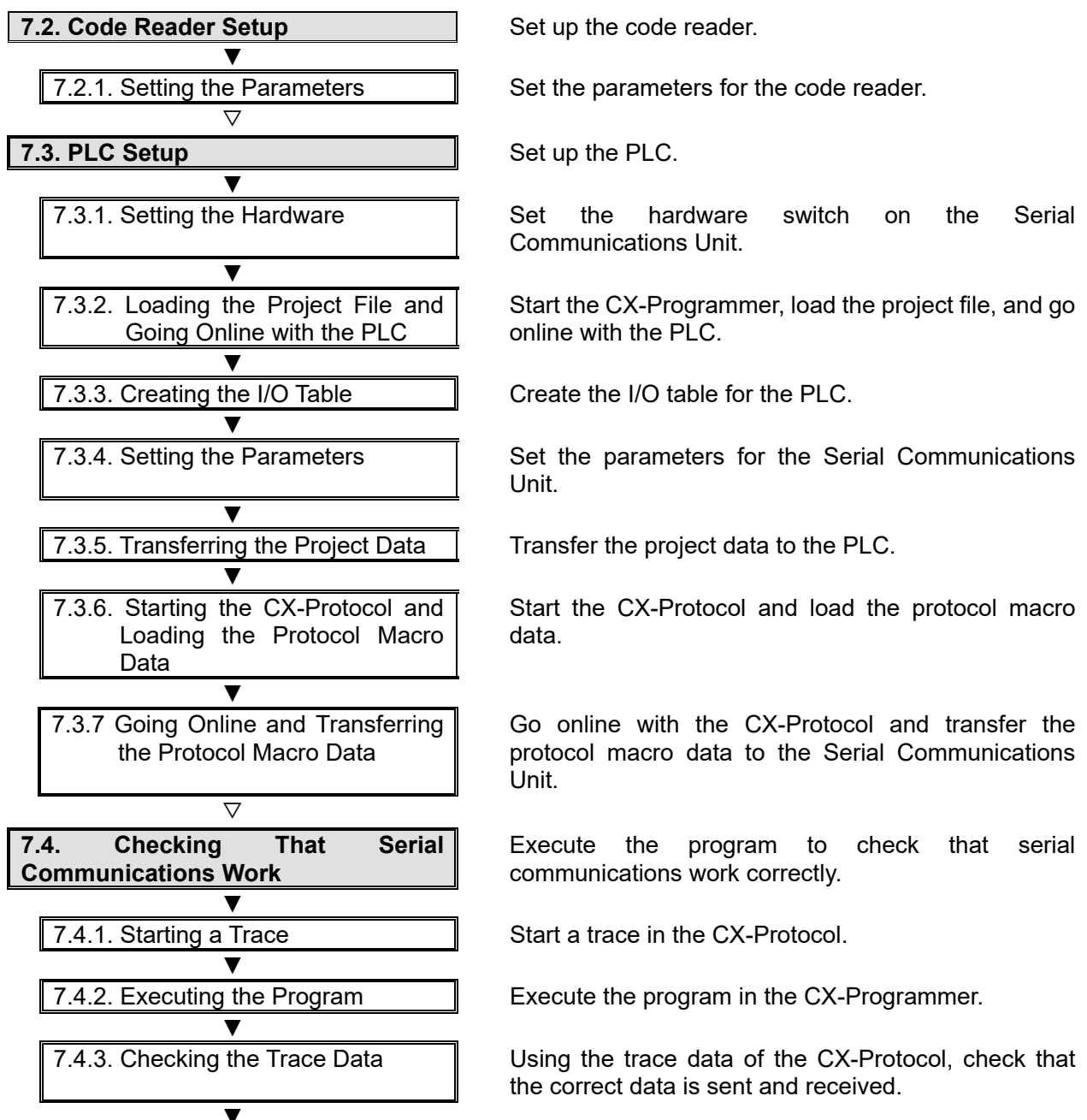
7. Connection Procedure

This section describes the procedures for connecting the code reader to the PLC for serial communications.

In this document, it is assumed that the PLC and the code reader use the factory default settings. For how to initialize the devices, refer to *Section 8. Initializing the System*.

7.1. Operation Flow

Use the following procedures to connect the code reader to the PLC for serial communications.



7.4.4. Checking the Receive Data

In the CX-Programmer, check that the correct data is written to the I/O memory of the PLC.

7.2. Code Reader Setup

Set up the code reader.



Precautions for Correct Use

Use a PC (personal computer) to set the parameters for the code reader.

Note that you may need to change the PC settings depending on the condition of your PC.

7.2.1. Setting the Parameters

Set the parameters for the code reader.

Set the IP address of your PC to 192.168.188.101 and its subnet mask to 255.255.0.0.

1 [Using V320-F/V420-F]

Establish a USB connection between the V320/V420 and the PC according the configuration shown on page 7 or page 9.

Once the connection is established, start the procedure from step 4.

* To use V320/V420, you need to install the driver. For how to install the driver, refer to 2-2-3 *Connect to WebLink* in the *MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual* (Cat. No. Z432).

[Using V430-F]

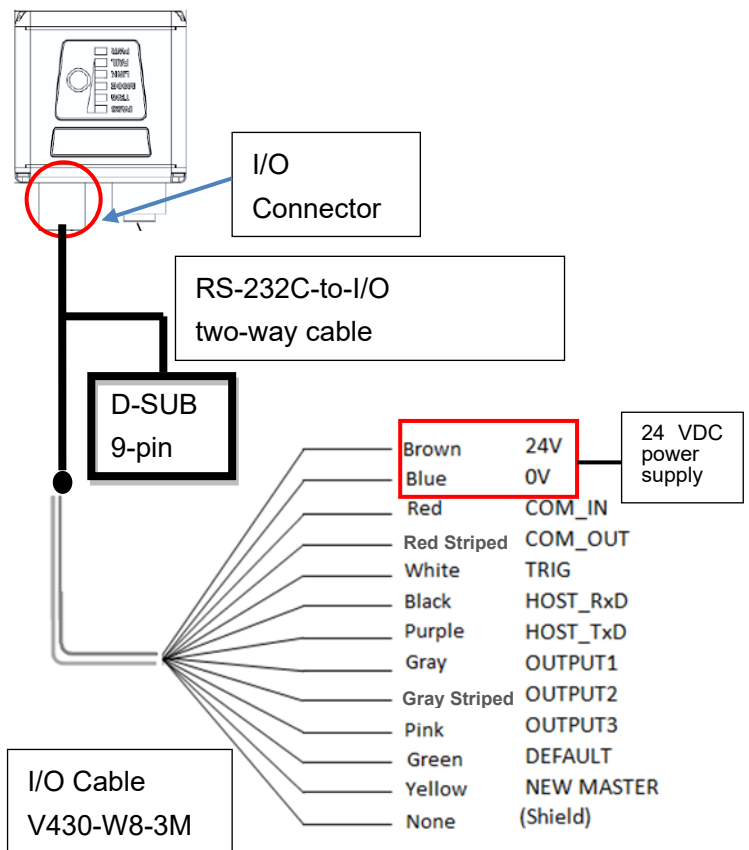
Connect the RS-232C-to-I/O two-way cable V430-WQR-3M to the I/O connector.

Then, connect the I/O connector of V430-WQR-3M to the I/O cable V430-W8-3M.

Connect the 24V and 0V wires of W430-W8-3M to a 24 VDC power supply.

* In this document, only the power supply wires of the I/O cable are connected and checked. Be careful not to short-circuit any other wires.

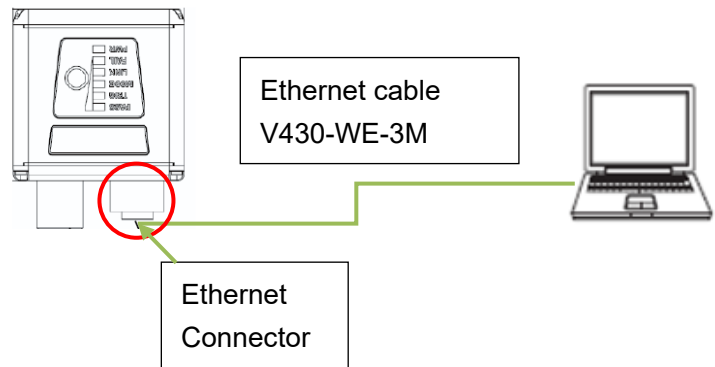
* Ground the shield wire as needed. For more information on grounding, please refer to Grounding in Appendices of the *MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual* (Cat. No. Z432).



2 [V430-F Series Only]

Connect the Ethernet connector on the code reader to the PC using the Ethernet cable V430-WE-3M.

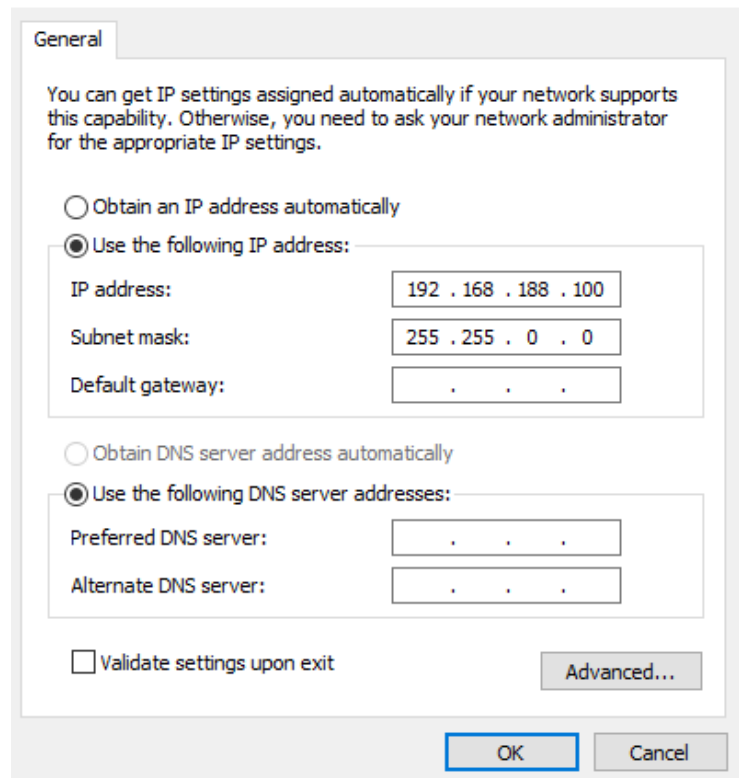
Turn ON the 24 VDC power supply.



3 [V430-F Series Only]

Set the IP Address of the PC.
For the IP address, enter *192.168.188.100*. For the subnet mask, enter *255.255.0.0*.

For how to open the screen shown on the right in Windows 7, please refer to step 4.

4 (1) From the Windows **Start Menu**, select **Control Panel – Network and Internet – Network and Sharing Center**.

(2) Click on **Local Area Connection**. The Local Area Connection **Status** Dialog Box is displayed. Click **Properties**.

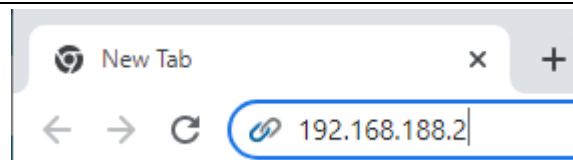
(3) In the **Local Area Connection Properties** Dialog Box, select *Internet Protocol Version 4 (TCP / IPv4)*, and click the **Properties** Button.

(4) Click the **OK** Button.

5 Start your browser and enter

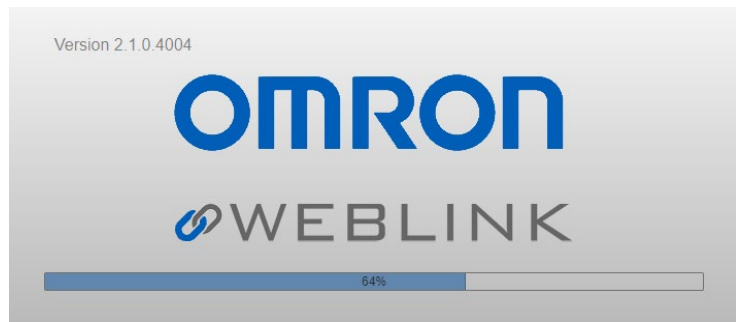
<http://192.168.188.2>.

“Google Chrome” is the recommended browser.



6 When the WebLink startup screen is displayed, go to step 8.

If you cannot access by WebLink, go to step 7.

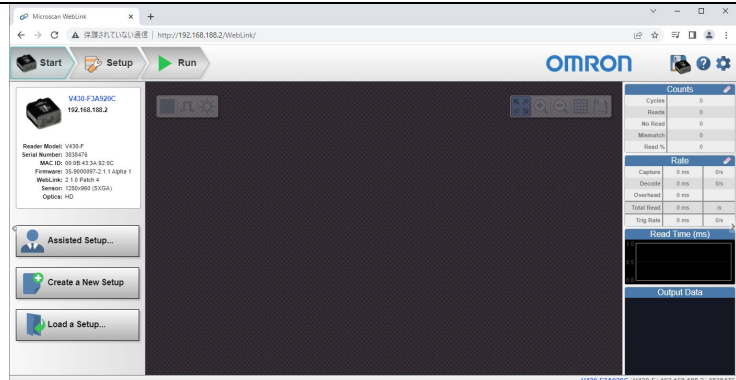


7 If the WebLink startup screen does not appear, it means that communications are not established between the code reader and the PC. Please check the following.

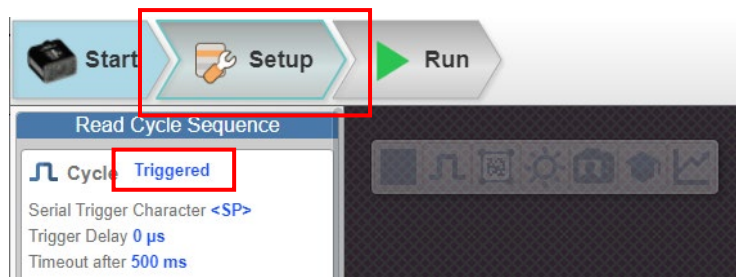
- The code reader and the PC have a proper physical (cable) connection.
 - Refer to steps 1 and 2 to check the connection.
- The IP Addresses of the PC and code reader are set correctly.
 - Refer to step 4 to set the IP address of the PC.

For other measures that can be taken, please refer to When unable to access by WebLink in Q&A in Appendices of the MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual (Cat. No. Z432).

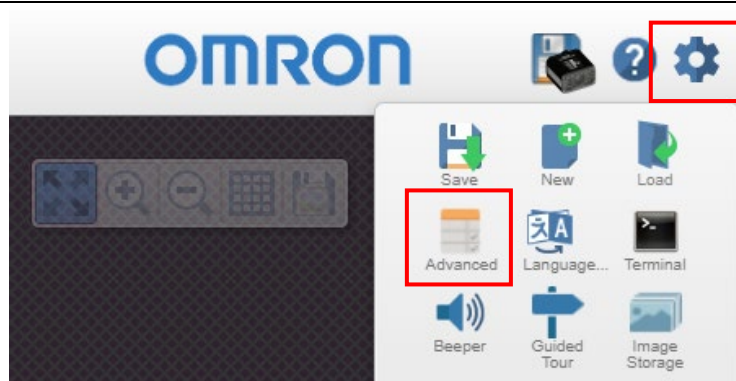
8 The WebLink screen appears.



9 Click on the **Setup** Tab and, in **Read Cycle Sequence**, set **Cycle** to *Triggered*.



10 Click on the gear icon on the upper right of the screen and select **Advanced**.



11 The Advanced Settings Screen appears.

Select the **Communications** Tab and check that the settings are as follows.

[RS232A]

Baud Rate: 9600

Parity: None

Stop Bits: 1

Data Length: 8

[Host Protocol]

Protocol Selection:

Point-to-Point

[Preamble]

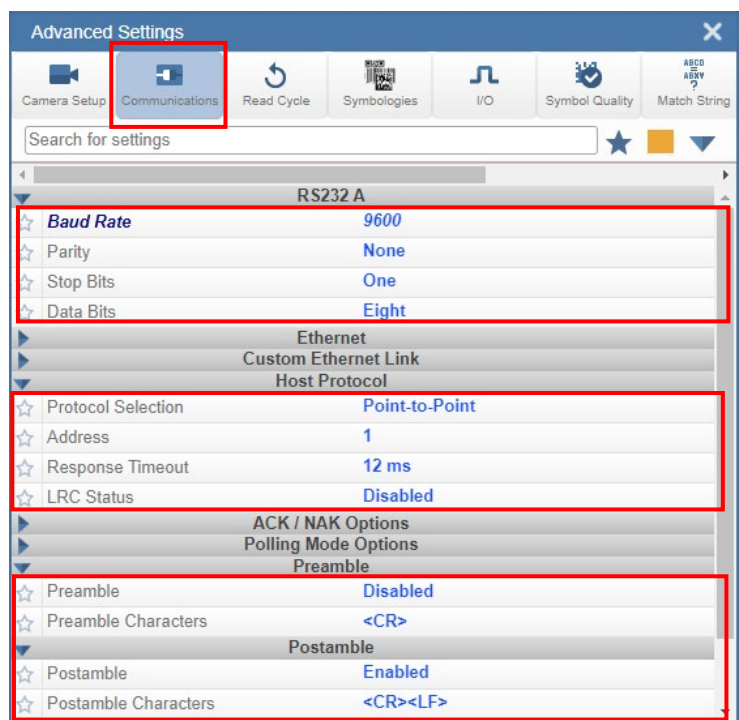
Preamble: Disabled

Postamble

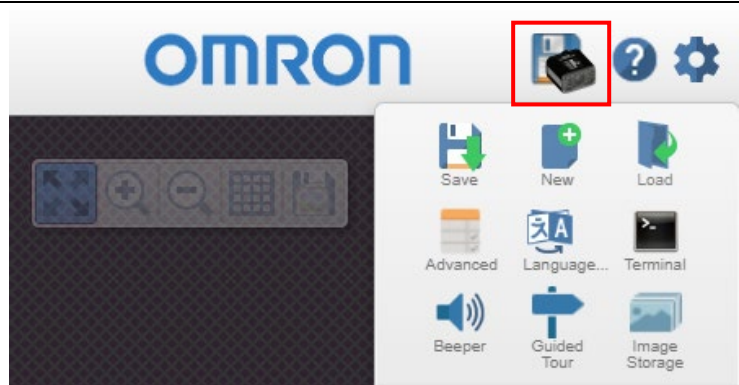
Postamble: Enabled

Postamble Characters:

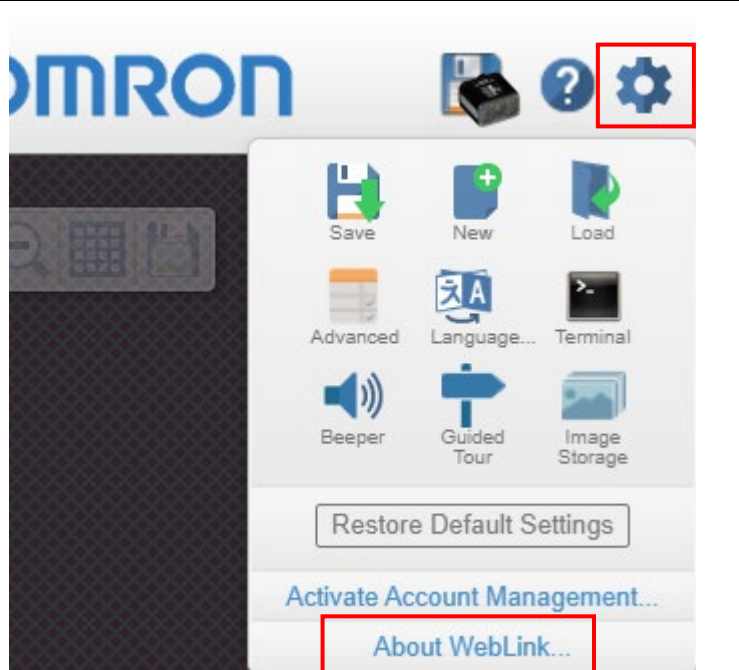
<CR><LF>



12 Click on the icon shown in the red frame to save the settings to the code reader.



13 Finally, check the version number of the code reader. Click on the gear icon on the upper right of the screen and select **About WebLink**.



- 14 **About WebLink** is displayed, so you can check the current version of the code reader.

Please update the code reader to the latest version if necessary.

About WebLink

OMRON

 **WEBLINK**

2.1.0 Patch 4

Reader Model V430-F
Serial Number 3838476
Part Number 7412-2000-1005-006
MAC ID 00:0B:43:3A:92:0C
Sensor 1280x960 (SXGA)
Firmware 35-9000097-2.1.1 Alpha 1
Boot 35-9000033-2.0.0 RC 2
Browser Chrome 101.0.4951.54
Operating System Windows 10
Screen Resolution 1920x1040

[Contact Us](#)

Done

7.3. PLC Setup

Set up the PLC.

7.3.1. Setting the Hardware

Set the hardware switch on the Serial Communications Unit.



Precautions for Correct Use

Turn OFF the power supply before setting the hardware.

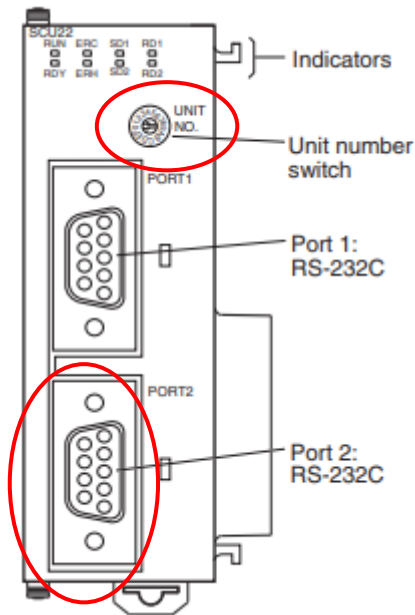
1 Confirm that the power supply to the PLC is OFF.

* If the power supply is ON, you may not be able to proceed with the subsequent steps of the procedure.

Check the position of the hardware switch on the front of the Serial Communications Unit as shown in the figure on the right.

Check the position of the "Port 2" (RS-232C) connector as shown in the figure on the right.

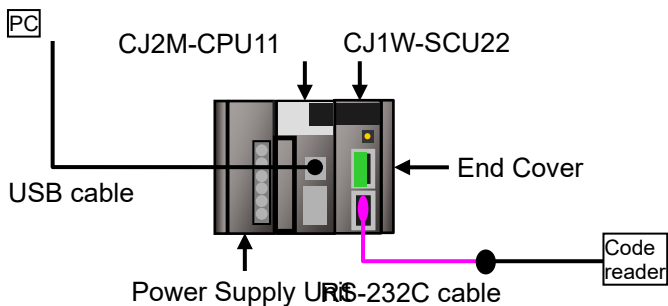
* It is assumed that "Port 2" of the Serial Communications Unit is used.



2 Set the Unit No. switch to "0". (The factory default unit number is "0".)



3 Connect the Serial Communications Unit to the PLC, as shown on the right. Connect the Serial Communications Unit and the code reader with an RS-232C cable. Connect the PLC to the PC with a USB cable.



7.3.2. Loading the Project File and Going Online with the PLC

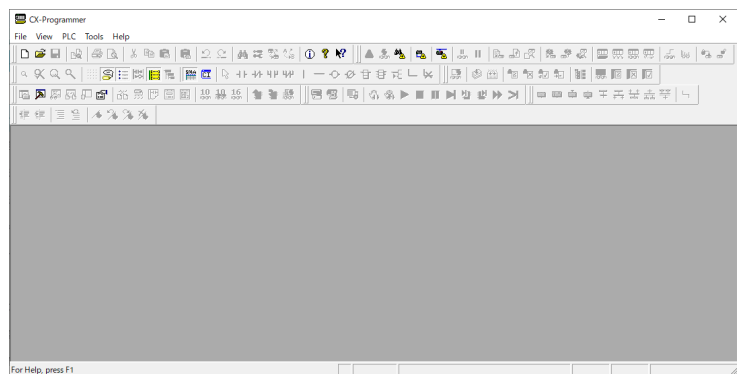
Start the CX-Programmer, load the project file, and go online with the PLC.

Install the CX-Programmer and USB driver on the PC beforehand.

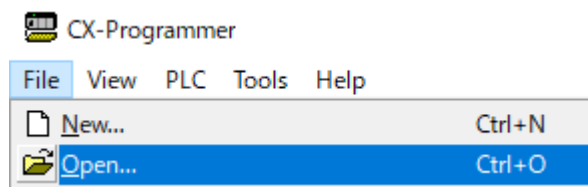
- 1** Make sure that the PC and PLC are connected with the USB cable, and turn ON the power supply to the PLC.

Start the CX-Programmer.

* If a user account control dialog box is displayed at startup, select the option to start.

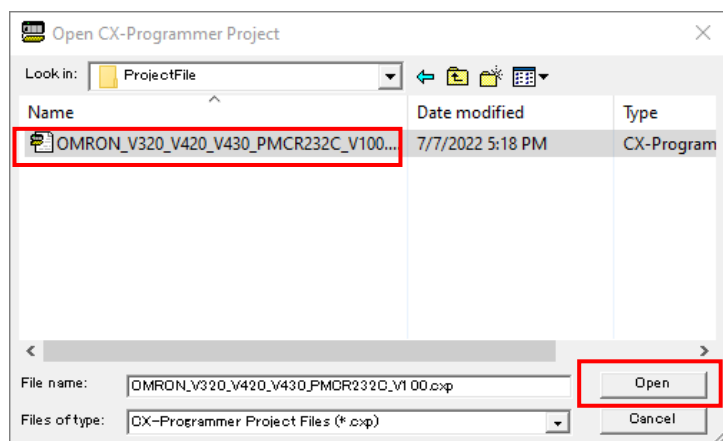


- 2** Select **Open** from the **File** Menu.

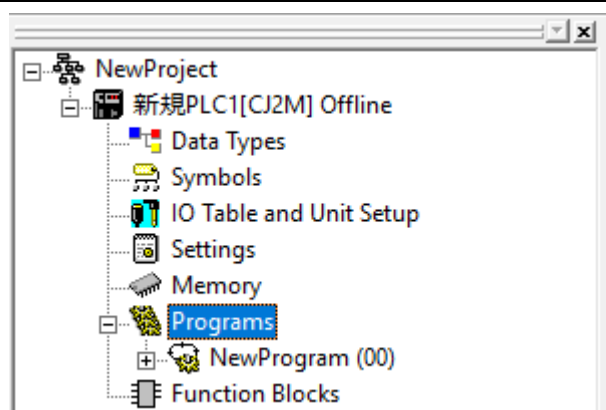


- 3** The **Open CX-Programmer Project** Dialog Box is displayed. Select **OMRON_V320_V420_V430_PMCR232C_V100.cxp** and click **Open**.

* Obtain the latest version of the project file from the OMRON website.

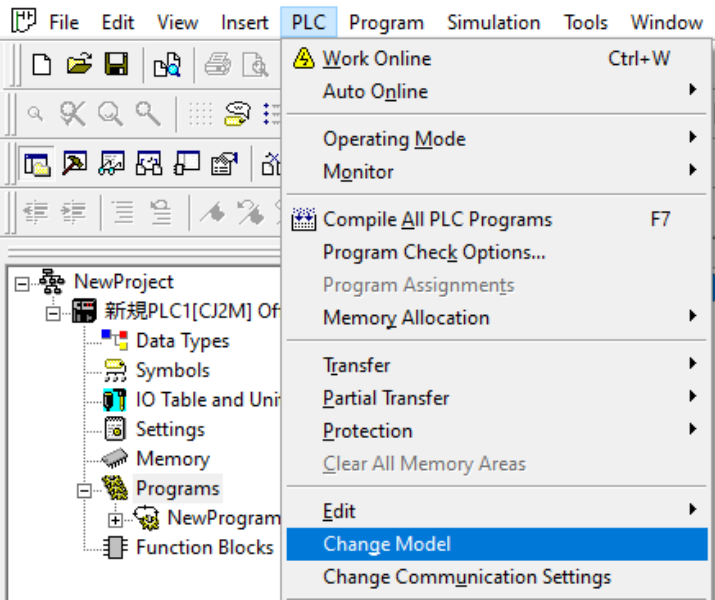


- 4** After the loading of the project file is completed, select **Programs** in the project workspace.



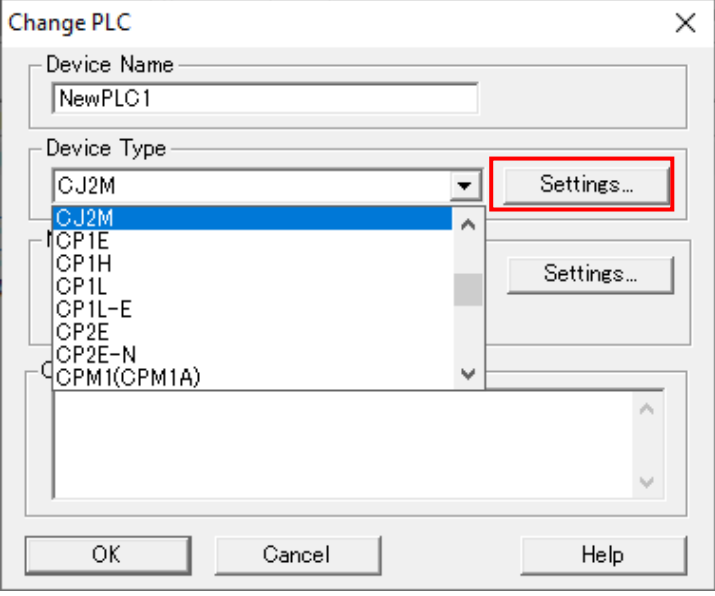
(Project workspace)

5 Select **Change Model** from the **PLC** Menu.



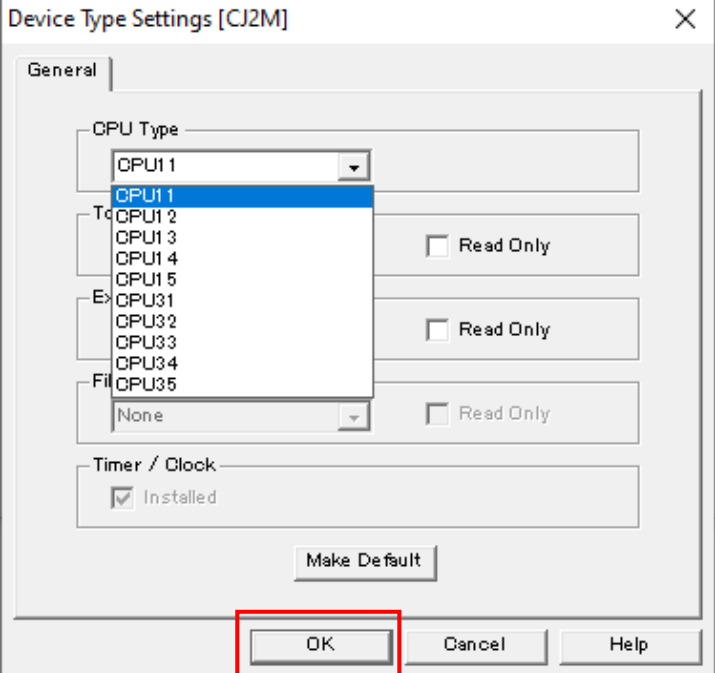
6 The **Change PLC** Dialog Box is displayed. Select the PLC type from the **Device Type** pull-down menu, and click **Settings**.

* In this document, **CJ2M** is used.



7 The **Device Type Settings** Dialog Box is displayed. Select the **CPU Type** from the **CPU Type** pull-down menu, and click **OK**.

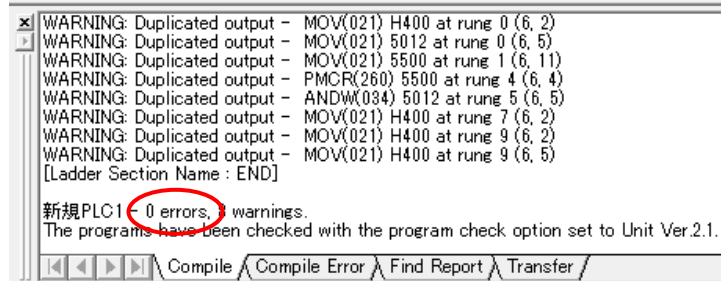
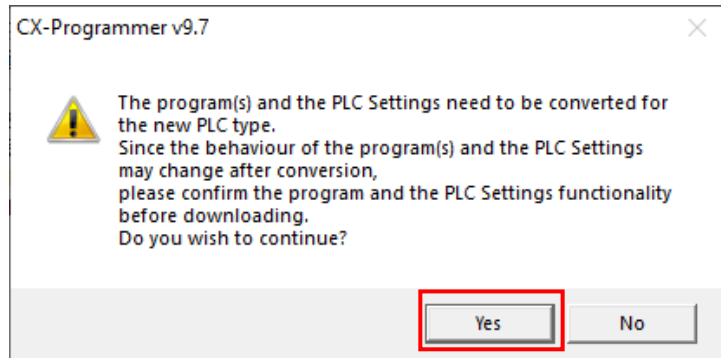
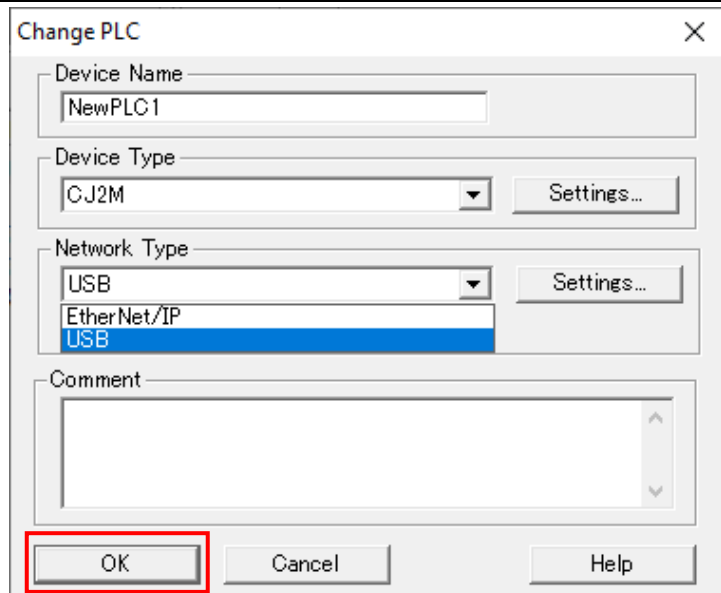
* In this document, **CPU11** is used.



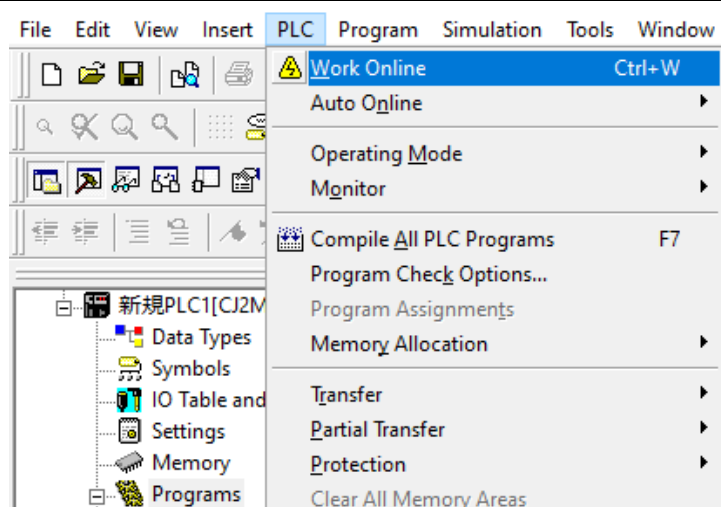
8 In the **Change PLC** Dialog Box, confirm that **USB** is selected in **Network Type**, and click **OK**.

* If **USB** is not selected in **Network Type**, select **USB** from the pull-down menu.

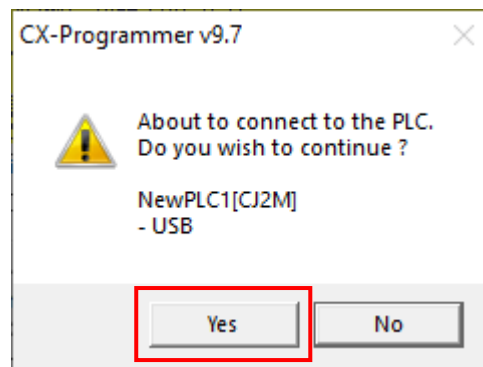
* If you change the PLC type in step 6 or CPU type in step 7, a confirmation dialog box as shown in the figure on the right will appear. Click **Yes**. Then, confirm that the program has been correctly converted (i.e., **0 errors** is shown). (Although the figure on the right shows **Duplicated output** warnings, there is no particular problem.)



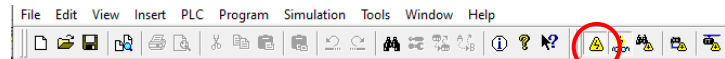
9 With **Programs** selected in the project workspace, select **Work Online** from the **PLC** Menu.




- 10** A dialog box as shown in the figure on the right appears. Click **Yes**.



- 11** Confirm that the CX-Programmer is online with the PLC.



- * The CX-Programmer is online if the  icon appears to be depressed.



Note

If you cannot go online with the PLC, check the physical cable connections, etc.
If the physical cable connections are correct, return to step 5 and check the settings in steps 6 to 8. For details, refer to the *CX-Programmer Operation Manual* (Cat. No. W446).



Note

Some of the dialog boxes shown in this document may not be displayed depending on the environment settings of the CX-Programmer. For details on the environment settings of the CX-Programmer, refer to the *CX-Programmer Operation Manual* (Cat. No. W446).

This document assumes that the check box for **Confirm all operations affecting the PLC** is selected.

7.3.3. Creating the I/O Table

Create the I/O table for the PLC.

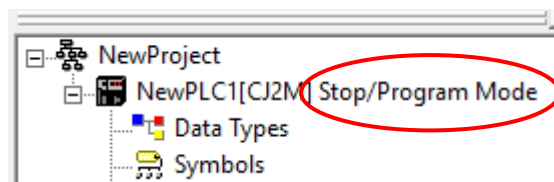
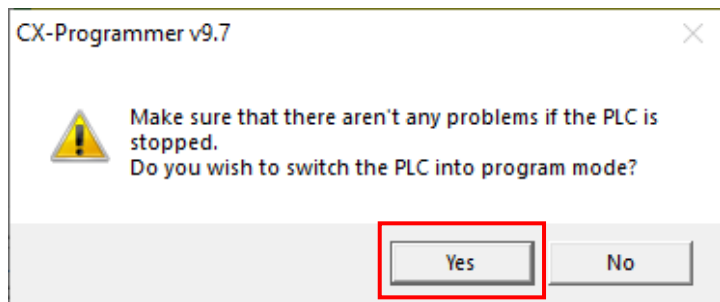
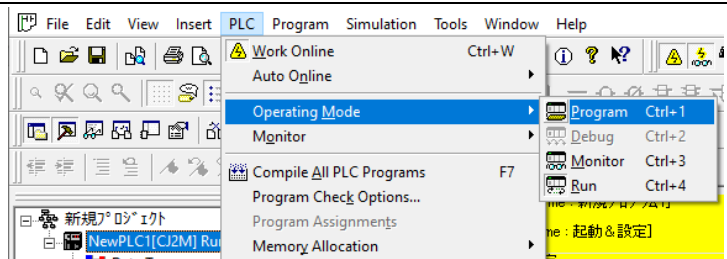
1 If the PLC Operating Mode is set to either **Run** or **Monitor**, follow steps (1) to (3) to change it to **Program**.

(1) In the CX-Programmer, select **Operating Mode – Program** from the **PLC** Menu.

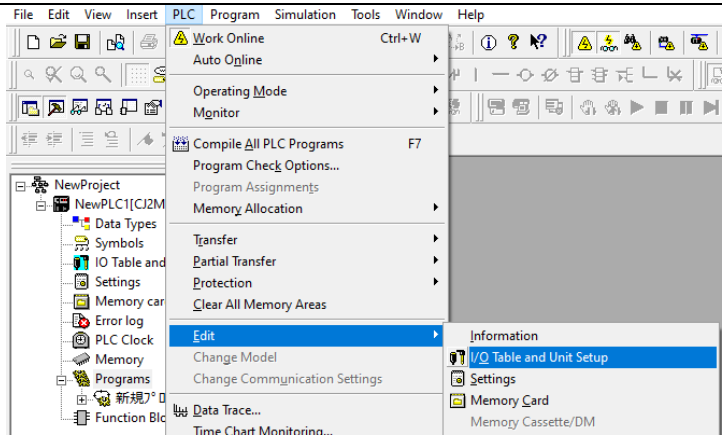
(2) A dialog box as shown in the figure on the right appears. Click **Yes**.

For information on how the dialog box is displayed, refer to *Note* on the previous page.

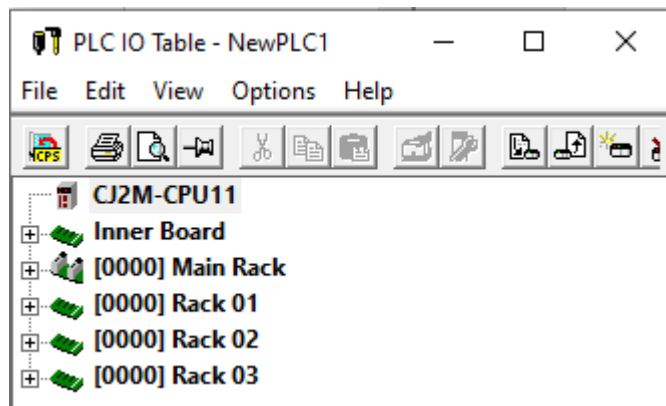
(3) Confirm that **Program Mode** is displayed to the right of the PLC model in the CX-Programmer's project tree. (See the figure on the right.)



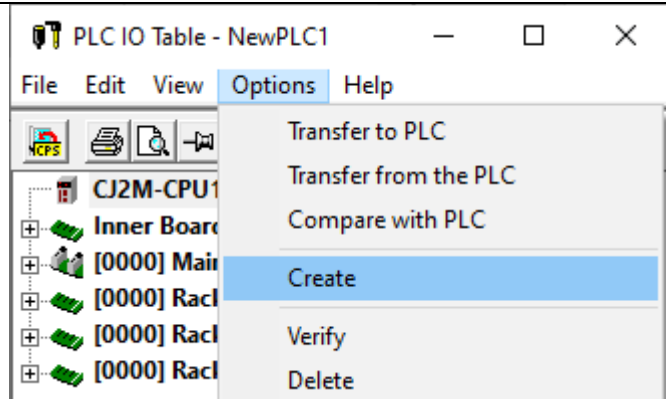
2 In the CX-Programmer, select **Edit – I/O Table and Unit Setup** from the **PLC** Menu.



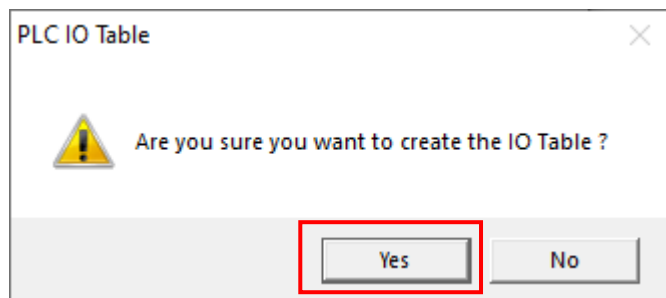
The **PLC IO Table** Window is displayed.



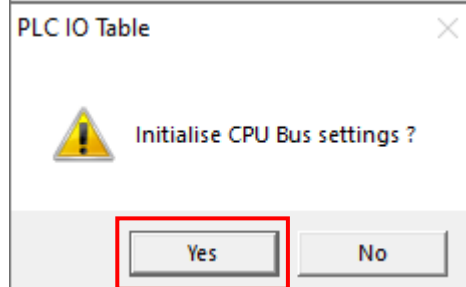
3 In the **PLC IO Table** Window, select **Create** from the **Options** Menu.



A dialog box as shown in the figure on the right appears. Click **Yes**.



A dialog box as shown in the figure on the right appears. Click **Yes**.



- 4** The **Transfer from PLC** Dialog Box is displayed. Select the check boxes for **IO Table** and **SIO Unit Parameters** and click **Transfer**.

Transfer from PLC

Select the transfer target data and press the [Transfer] button. Comment information is deleted if IO Table is transferred.

IO Table
 SIO Unit Parameters

Transfer

Cancel

When the transfer is completed, the **Transfer Results** Dialog Box appears.

Check the messages in this dialog box to confirm that the transfer process is successfully completed.

The figure on the right shows **Transfer Success: 1 Unit** **Transfer Unsuccessful: 0 Unit**, which means I/O table creation is successfully completed.

Click **OK**.

Transfer from PLC

Transferring...



Cancel

Transfer Results

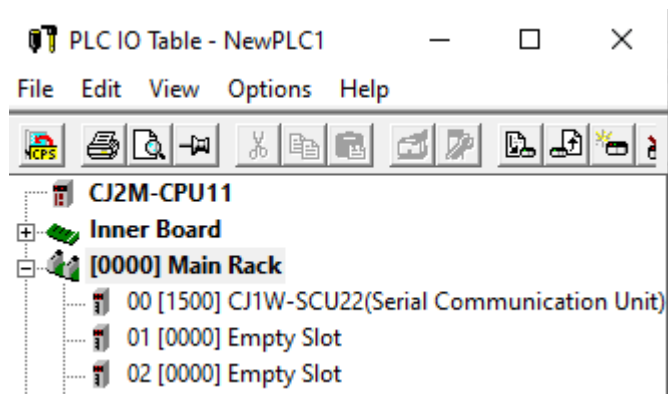
<IO Table>
Transfer Success
 <Special Units settings>
 CPU Bus Unit00: Transfer Success
Transfer Success:1 Unit Transfer Unsuccessful:0 Unit

OK

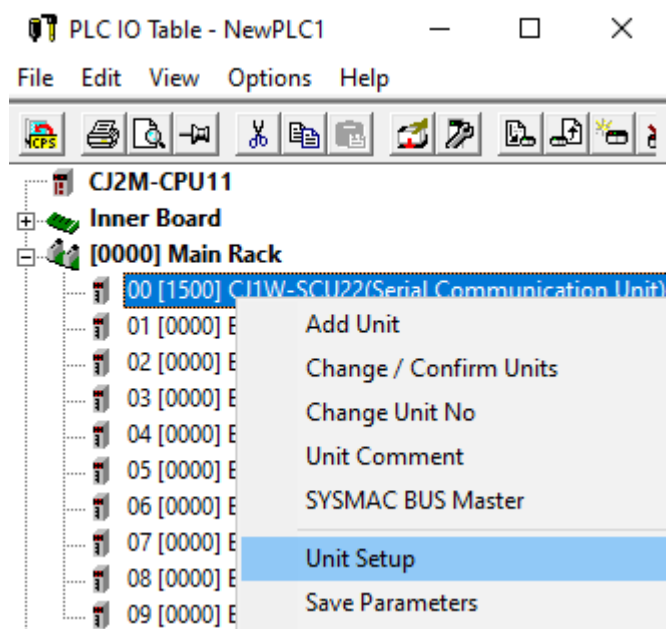
7.3.4. Setting the Parameters

Set the parameters for the Serial Communications Unit.

- 1 In the **PLC IO Table** Window, double-click **[0000] Main Rack** to open the tree.

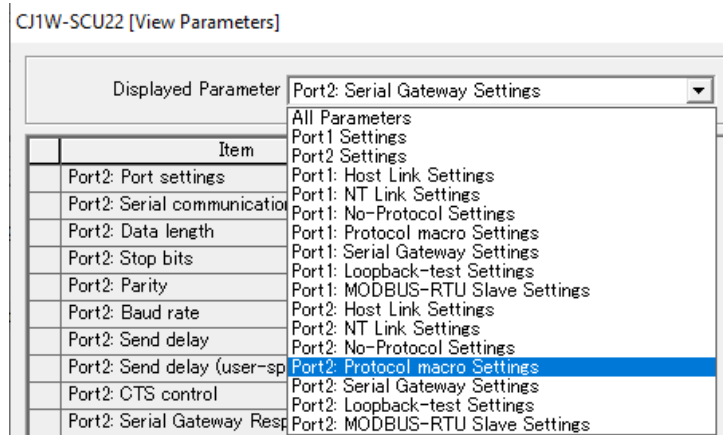


- 2 Right-click **00[1500]CJ1W-SCU22** and select **Unit Setup** from the menu.



- 3 The **View Parameters** Dialog Box is displayed. In **Displayed Parameter**, select **Port2: Protocol macro Settings**.

* It is assumed that “Port 2” of the Serial Communications Unit is used.



4 The settings of **Port2: Protocol macro Settings** are listed as shown on the right. (The figure on the right shows the default settings.)

Displayed Parameter Port2: Protocol macro Settings		
Item	Set Value	Unit
Port2: Port settings	Defaults	
Port2: Serial communications mode	Host Link(default)	
Port2: Data length	7 bits	
Port2: Stop bits	2 bits	
Port2: Parity	Even	
Port2: Baud rate	Default(9600bps)	
Port2: Serial Gateway Response timeout	0	ms
Port2: Serial Gateway send start timeout	0	ms
Port2: Protocol macro Transmission meth	Full-duplex	
Port2: Clearing/holding the contents of th	Clear	
Port2: Link word specification data excha	On-request I/O refre	
Port2: Maximum number of bytes in proto	200	Byte

5 As the set value for **Port settings**, select **User settings**.

Displayed Parameter Port2: Protocol macro Settings		
Item	Set Value	Unit
Port2: Port settings	Defaults	
Port2: Serial communications mode	Defaults	
Port2: Data length	User settings	
Port2: Stop bits	2 bits	
Port2: Parity	Even	
Port2: Baud rate	Default(9600bps)	
Port2: Serial Gateway Response timeout	0	ms
Port2: Serial Gateway send start timeout	0	ms
Port2: Protocol macro Transmission meth	Full-duplex	
Port2: Clearing/holding the contents of th	Clear	
Port2: Link word specification data excha	On-request I/O refre	
Port2: Maximum number of bytes in proto	200	Byte

6 In the same way as in step 5, set the parameters as follows.

- Serial communications mode: Protocol macro
- Data length: 8 bits
- Stop bits: 1 bit
- Parity: None
- Baud rate: Default (9600bps)
- Protocol Macro Transmission method: Full-duplex

* For other parameters, leave the default settings.

Click **Transfer [PC to Unit]**.

CJ1W-SCU22 [View Parameters]

Displayed Parameter Port2: Protocol macro Settings

Item	Set Value	Unit
Port2: Port settings	User settings	
Port2: Serial communications mode	Protocol macro	
Port2: Data length	8 bits	
Port2: Stop bits	1 bit	
Port2: Parity	None	
Port2: Baud rate	Default(9600bps)	
Port2: Serial Gateway Response timeout	0	ms
Port2: Serial Gateway send start timeout	0	ms
Port2: Protocol macro Transmission meth	Full-duplex	
Port2: Clearing/holding the contents of th	Clear	
Port2: Link word specification data excha	On-request I/O refre	
Port2: Maximum number of bytes in proto	200	Byte

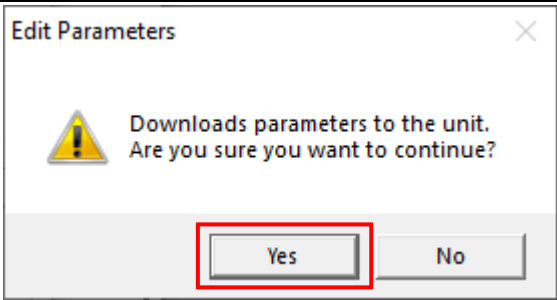
Help
For settings below 200, use 200, for setting above 1000, use 1000.

<Default>0
<Min>0
<Max>1000
<Address>D30019
<Type>Unsigned decimal

Transfer[Unit to PC] **Transfer[PC to Unit]** Compare Restart

Set Defaults OK Cancel

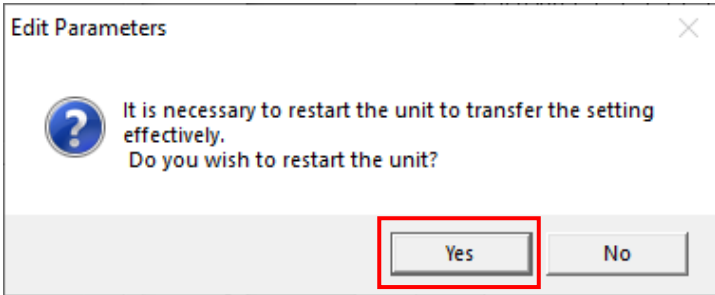
7 A dialog box as shown in the figure on the right appears. Click **Yes**.



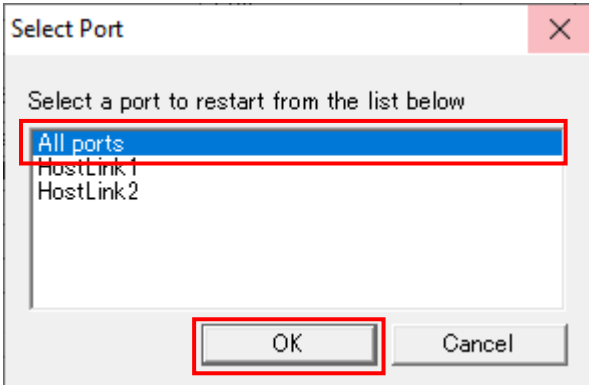
Confirm that the transfer is successfully completed as shown on the right, and then click **Close**.



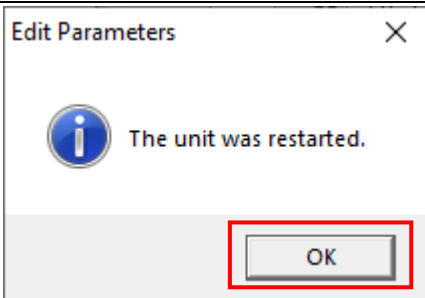
8 A dialog box as shown in the figure on the right appears. Click **Yes**.



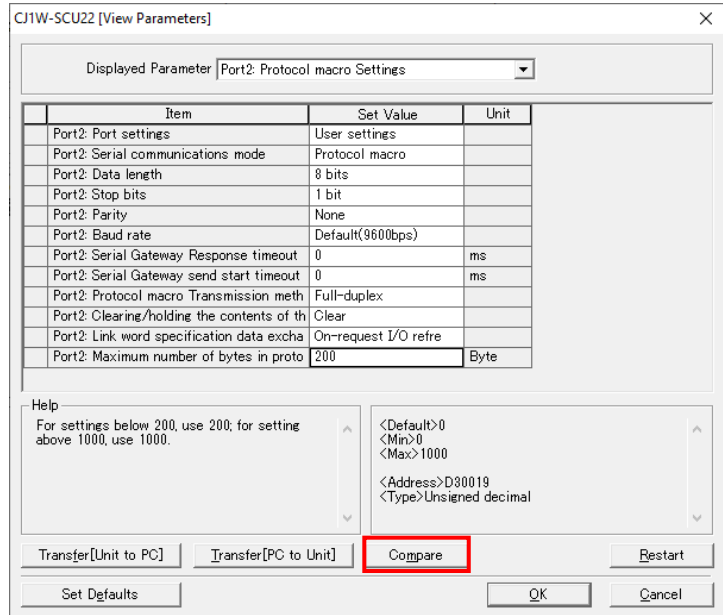
The **Select Port** Dialog Box is displayed. Select **All ports** and click **OK**.



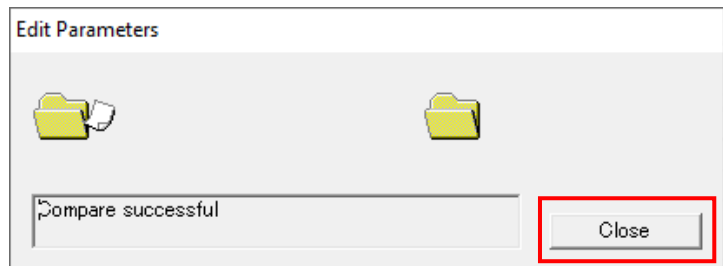
9 A dialog box as shown in the figure on the right appears. Click **OK**.



10 In the **View Parameters** Dialog Box, click **Compare**.

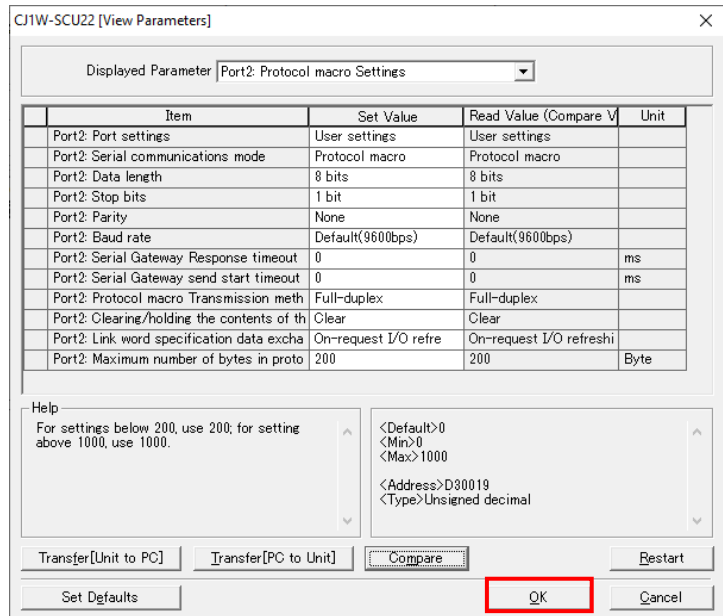


11 Confirm that the comparison is successful as shown on the right, and then click **Close**.



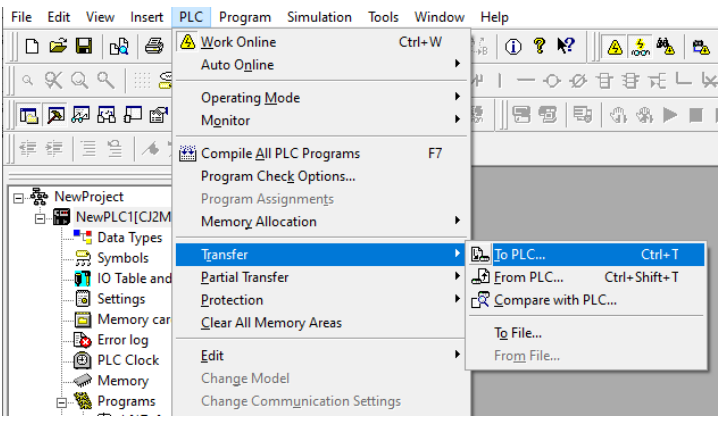
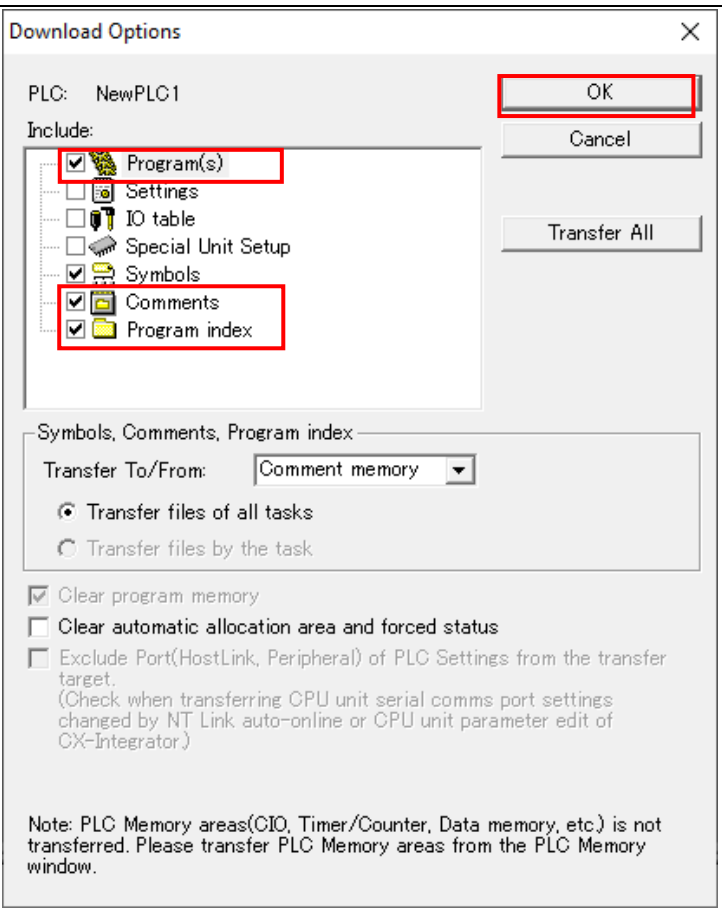
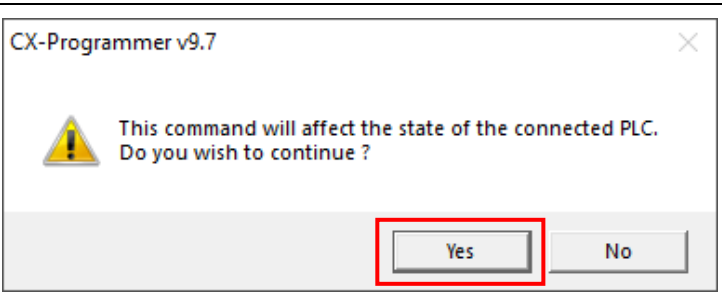
12 In the **View Parameters** Dialog Box, click **OK**.

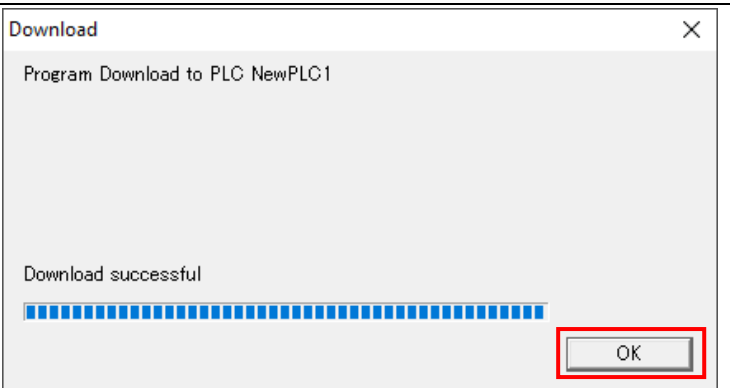
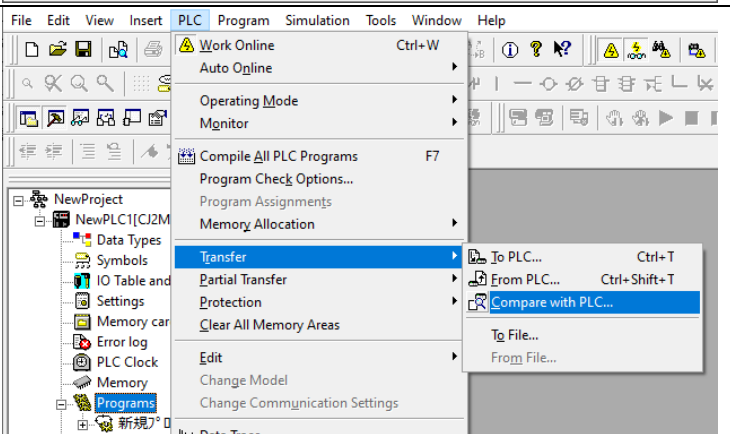
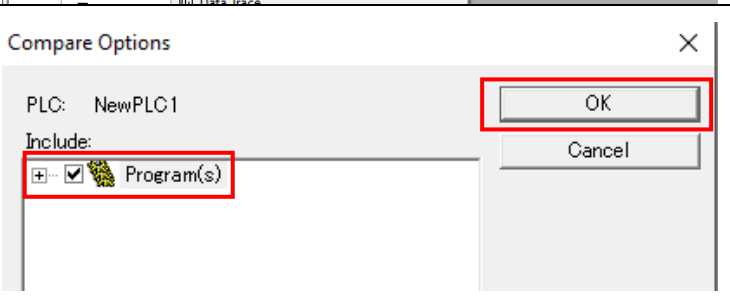
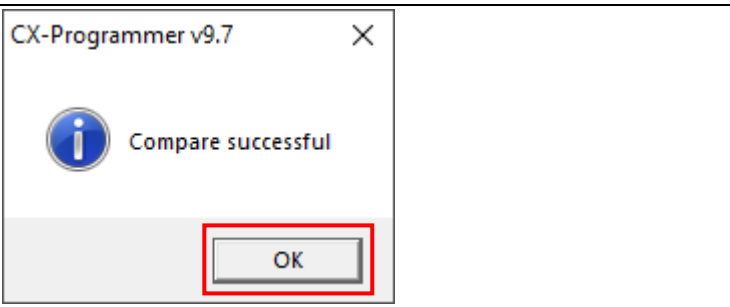
Close the **Edit Parameters** Dialog Box and the **PLC IO Table** Window,



7.3.5. Transferring the Project Data

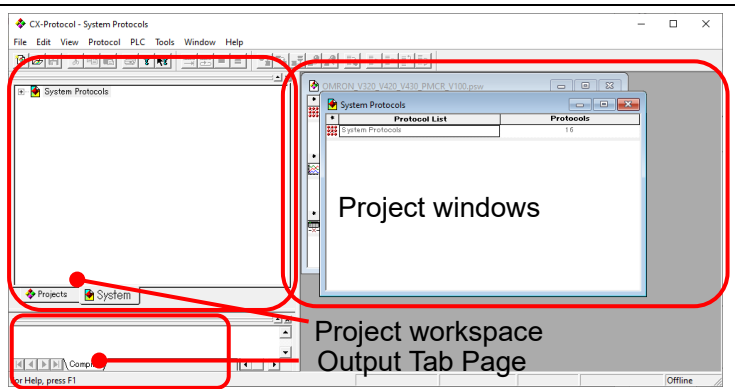
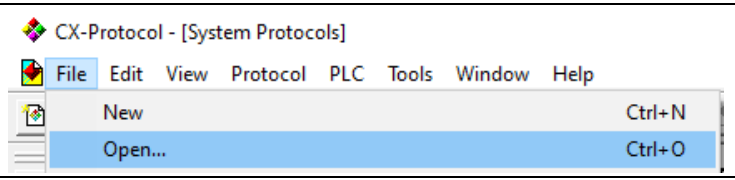
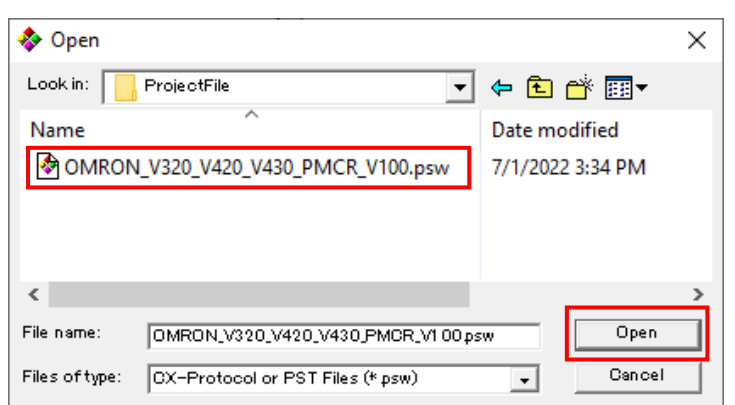
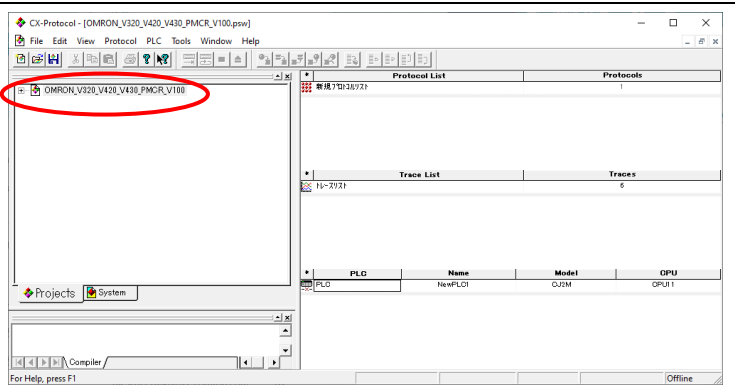
Transfer the project data to the PLC.

<p>1 In the CX-Programmer, select Programs in the project workspace, and select Transfer – To PLC from the PLC Menu.</p>	 <p>The screenshot shows the CX-Programmer interface with the 'PLC' menu open. The 'Transfer' option is highlighted, and its sub-menu is visible, showing 'To PLC...' (Ctrl+T) as the selected option. Other options in the sub-menu include 'From PLC...' (Ctrl+Shift+T), 'Compare with PLC...', 'To File...', and 'From File...'.</p>
<p>2 Select the check boxes for Program(s), Comments, and Program index, and click the OK Button.</p> <ul style="list-style-type: none"> * Do not select IO table and Special Unit Setup since you have set these data in 7.3.3. and 7.3.4. * Comments and Program index may not be shown depending on the PLC model. If so, transfer the project data with only Program(s) selected. 	 <p>The 'Download Options' dialog box is shown for PLC 'NewPLC1'. The 'Include' section has three items checked: 'Program(s)', 'Comments', and 'Program index'. The 'OK' button is highlighted with a red box. Below the 'Include' section, there are options for 'Transfer To/From' (set to 'Comment memory'), 'Transfer files of all tasks' (selected), and 'Clear program memory' (checked). A note at the bottom states: 'Note: PLC Memory areas(CIO, Timer/Counter, Data memory, etc.) is not transferred. Please transfer PLC Memory areas from the PLC Memory window.'</p>
<p>3 A dialog box as shown in the figure on the right appears. Click Yes.</p>	 <p>The warning dialog box 'CX-Programmer v9.7' contains a yellow warning icon and the text: 'This command will affect the state of the connected PLC. Do you wish to continue?'. The 'Yes' button is highlighted with a red box.</p>

<p>4 Confirm that the download is successfully completed as shown on the right, and then click OK.</p>	
<p>5 Select Programs in the project workspace, and select Transfer – Compare with PLC from the PLC Menu.</p>	
<p>6 Select the check box for Program(s), and click the OK Button.</p>	
<p>7 Confirm that Compare successful is displayed as shown on the right, and click the OK Button.</p>	

7.3.6. Starting the CX-Protocol and Loading the Protocol Macro Data

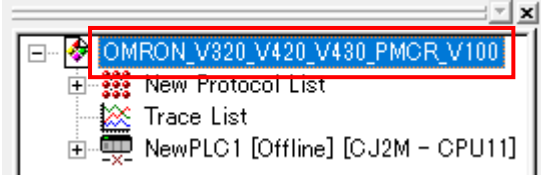
Start the CX-Protocol and load the protocol macro data.

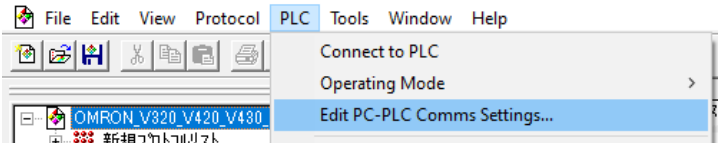
<p>1 Start the CX-Protocol.</p>	 <p>(CX-Protocol)</p>
<p>2 Select Open from the File Menu.</p>	
<p>3 The Open Dialog Box is displayed. Select OMRON_V320_V420_V430_P MCR_V100.psw and click Open.</p> <p>* Obtain the latest version of the protocol macro data from the OMRON website.</p>	
<p>4 The protocol macro data is loaded and displayed in the project workspace and project windows.</p>	

7.3.7. Going Online and Transferring the Protocol Macro Data

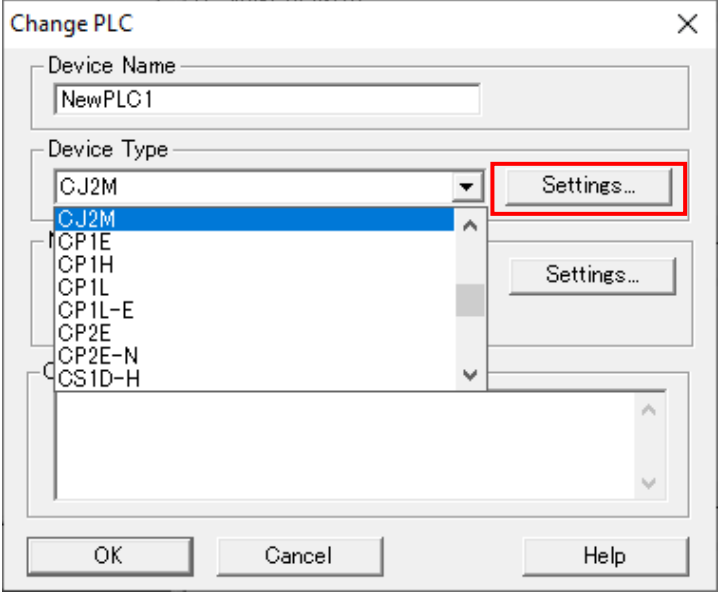
Go online with the CX-Protocol and transfer the protocol macro data to the Serial Communications Unit.

- 1** Double-click **OMRON_V320_V330_V430_P MCR_V100** in the project workspace to open the tree.

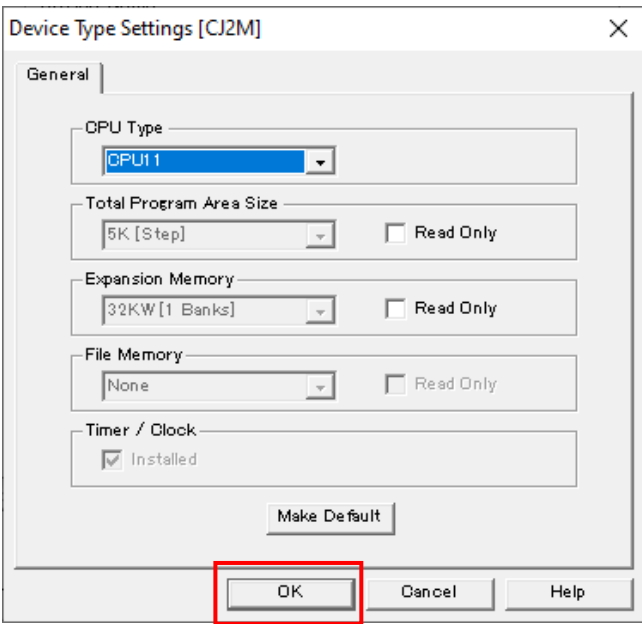

- 2** Select **Edit PC-PLC Comms Settings** from the **PLC** Menu.

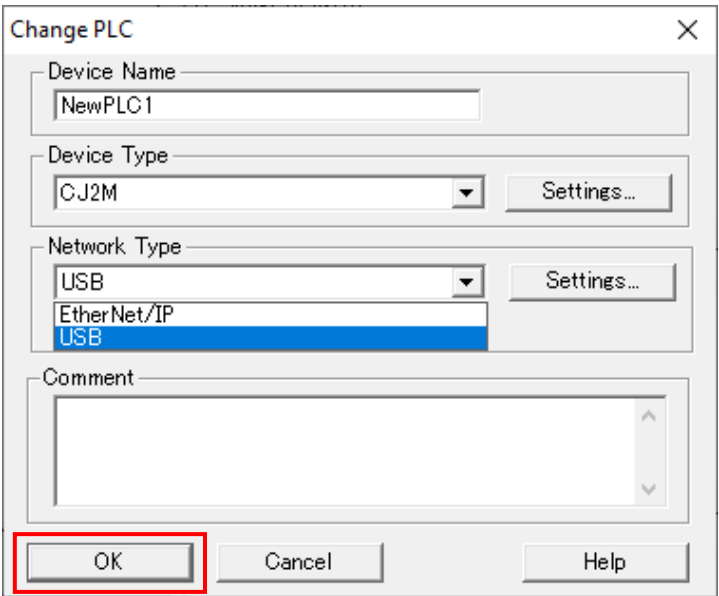
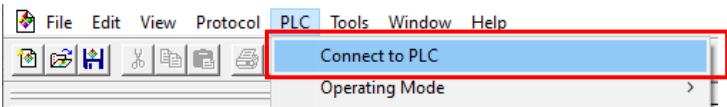
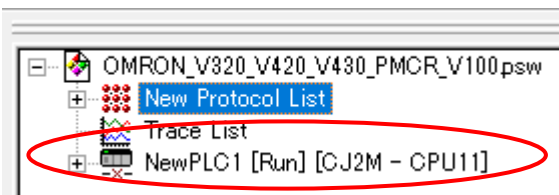
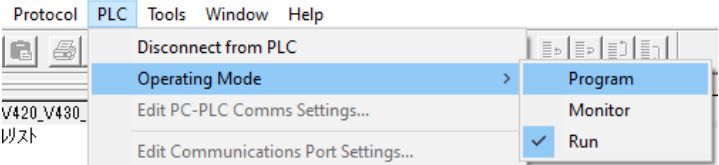
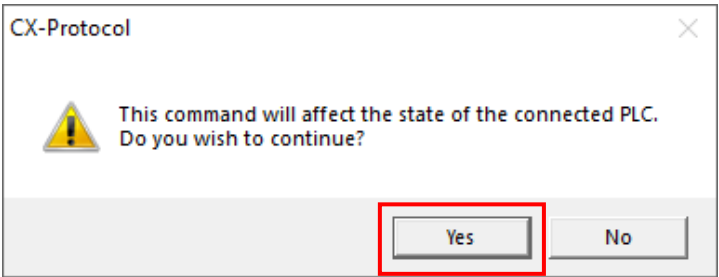
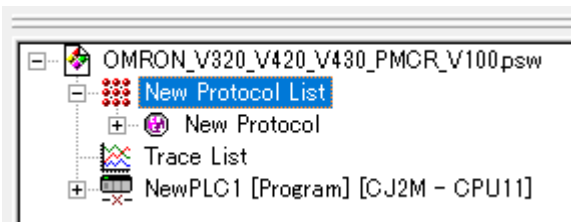

- 3** The **Change PLC** Dialog Box is displayed. Select the PLC type from the **Device Type** pull-down menu, and click **Settings**.

* In this document, **CJ2M** is used.


- 4** The **Device Type Settings** Dialog Box is displayed. Select the CPU type from the **CPU Type** pull-down menu, and click **OK**.

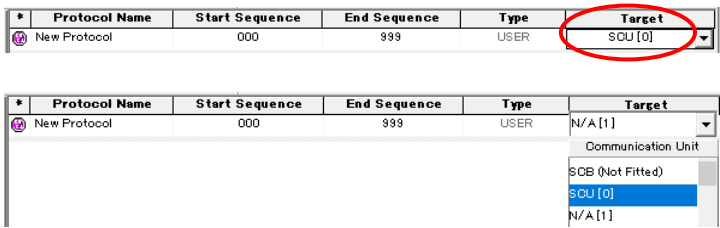
* In this document, **CPU11** is used.



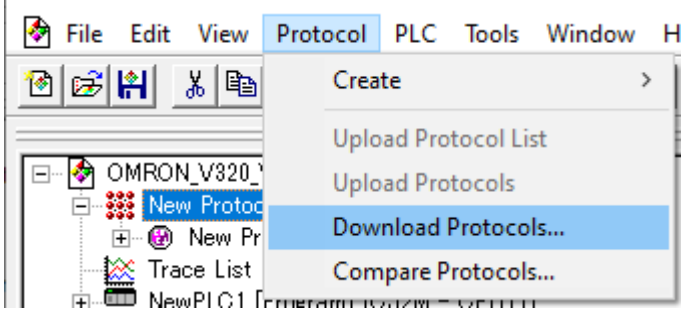
- 5** In the **Change PLC** Dialog Box, confirm that **USB** is selected in **Network Type**, and click **OK**.
- * If **USB** is not selected in **Network Type**, select **USB** from the pull-down menu.
- 
- The 'Change PLC' dialog box is shown with the following fields: Device Name (NewPLC1), Device Type (CJ2M), Network Type (USB), and Comment. The 'OK' button is highlighted with a red box.
- 6** Select **Connect to PLC** from the **PLC** Menu.
- 
- The 'PLC' menu is shown with 'Connect to PLC' highlighted by a red box.
- 7** Confirm that the operating mode indication of the PLC icon in the project workspace has changed from **Offline** to **Program**, which means that the CX-Protocol is online with the PLC.
- * If the indication is **Monitor** or **Run**, perform steps 8 to 9 below to change to **Program**.
- 
- The project workspace shows the 'New PLC1 [Run] [CJ2M - CPU11]' icon circled in red.
- 8** If the operating mode indication of the PLC is **Monitor** or **Run**, select **Operating Mode - Program** from the **PLC** Menu.
- 
- The 'PLC' menu is shown with 'Operating Mode' expanded and 'Program' selected.
- 9** A dialog box as shown in the figure on the right appears. Click **Yes**.
- Confirm that the mode indication has changed to **Program**, as described in step 7.
- 
- The 'CX-Protocol' dialog box displays a warning: 'This command will affect the state of the connected PLC. Do you wish to continue?' The 'Yes' button is highlighted with a red box.
- 10** Double-click **New Protocol List** in the project workspace to open the tree.
- 
- The project workspace shows the 'New Protocol List' icon highlighted in blue.

11 A project window as shown on the right is displayed. Confirm that **SCU [0]** is entered in **Target**.

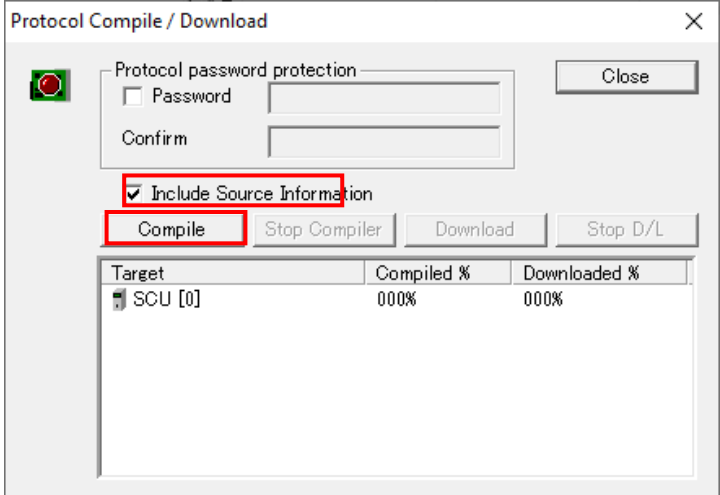
* If **SCU [0]** is not entered, select **SCU [0]** as shown on the right.



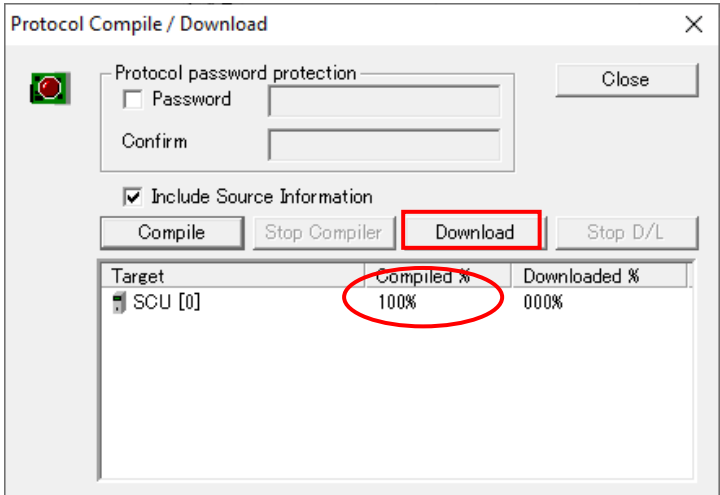
12 With **New Protocol List** selected, select **Download Protocols** from the **Protocol** Menu.



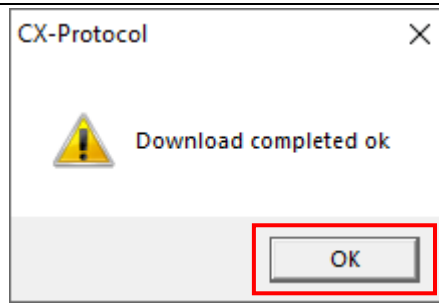
13 The dialog box on the right is displayed. Select the check box for **Include Source Information**, and click **Compile**.



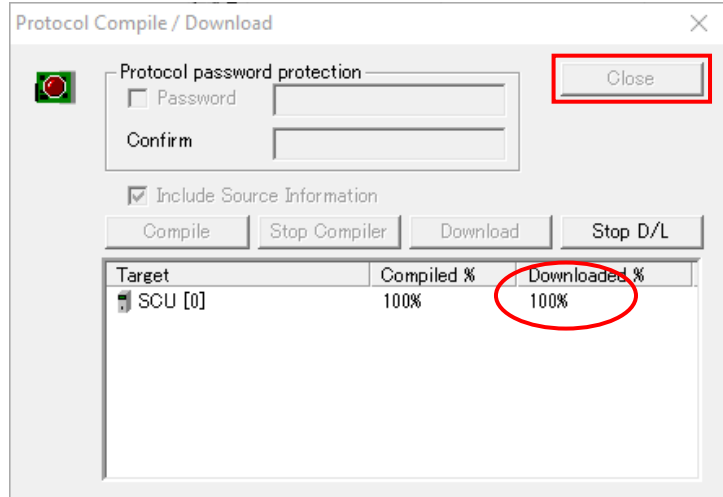
14 The compile process is complete when **Compiled%** shows **100%** in the dialog box on the right. Confirm that the compile process is successfully completed as shown on the right, and then click **Download**.



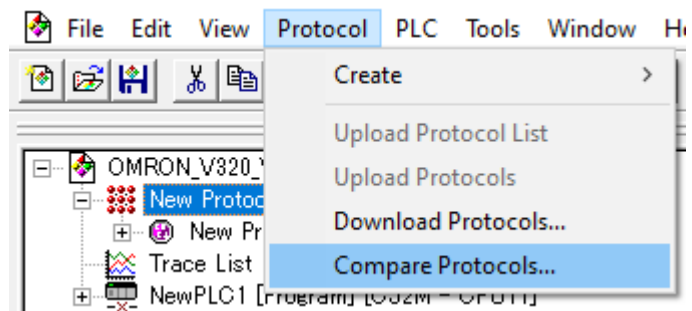
15 A dialog box as shown in the figure on the right appears. Click **OK**.



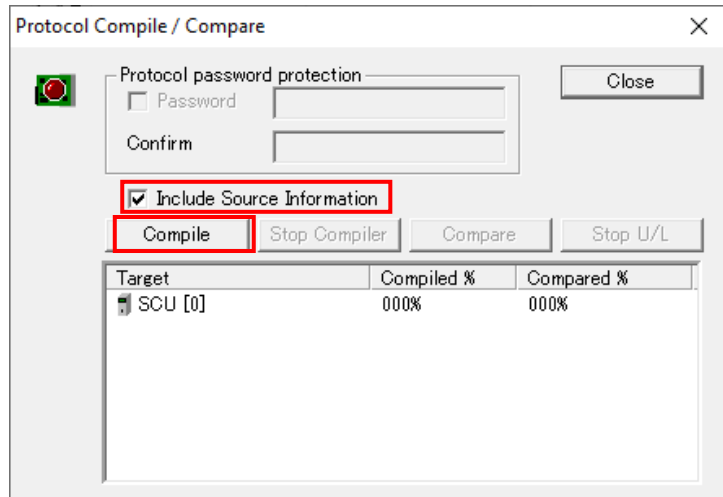
16 Confirm that **Downloaded %** shows **100%** in the dialog box on the right, and click **Close**.



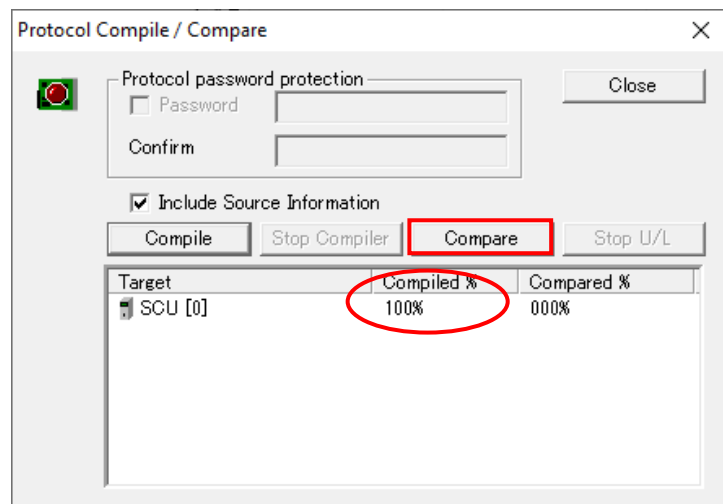
17 With **New Protocol List** selected, select **Compare Protocols** from the **Protocol** Menu.



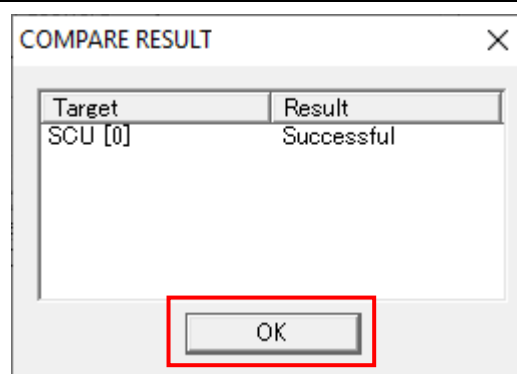
18 The dialog box on the right is displayed. Select the check box for **Include Source Information**, and click **Compile**.



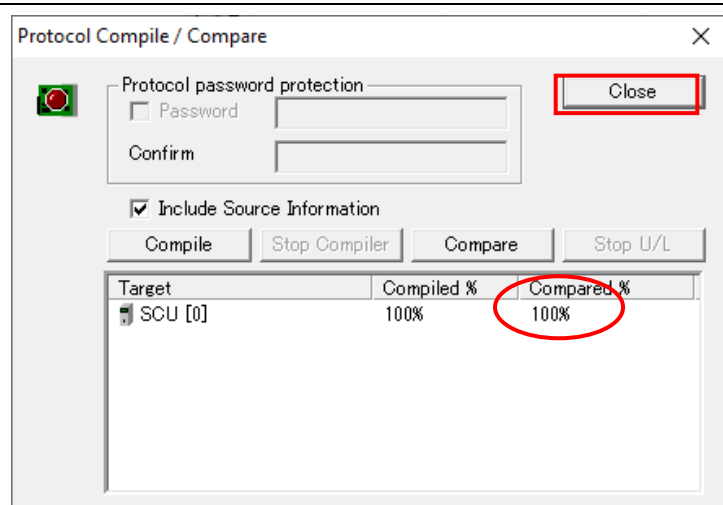
- 19** The compile process is complete when **Compiled%** shows **100%** in the dialog box on the right. Confirm that the compile process is successfully completed as shown on the right, and then click **Compare**.



- 20** A dialog box as shown in the figure on the right appears. Click **OK**.



- 21** Confirm that **Compared %** shows **100%** in the dialog box on the right, and click **Close**.



7.4. Checking That Serial Communications Work

Execute the program to check that serial communications work correctly.

Caution

Sufficiently confirm safety before you perform continuity/current value monitoring in the Ladder Section Window or current value monitoring in the Watch Window. Incorrectly operating shortcut keys to execute force-set/reset or set/reset may cause malfunction of devices connected to Output Units, regardless of the operating mode of the CPU Unit.



Precautions for Correct Use

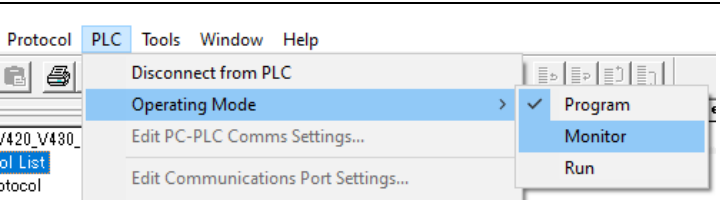
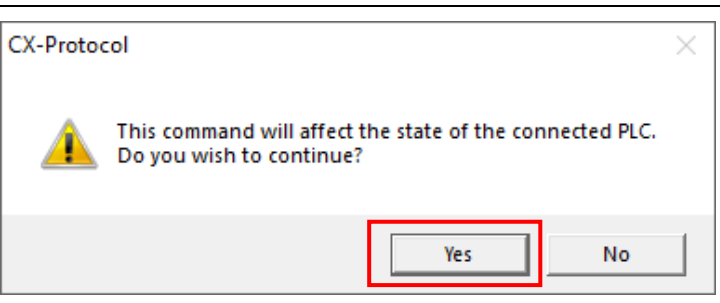
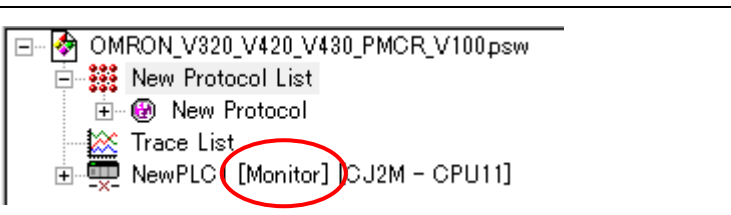
This document assumes that the code reader is used in the factory default settings. Be sure to initialize the code reader according to 8.2. *Initializing the Code Reader* if it is not in the factory default settings.

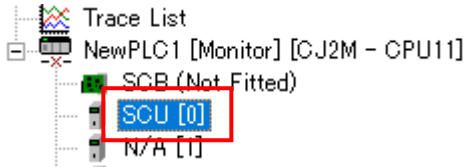
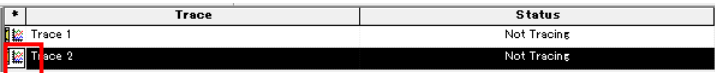
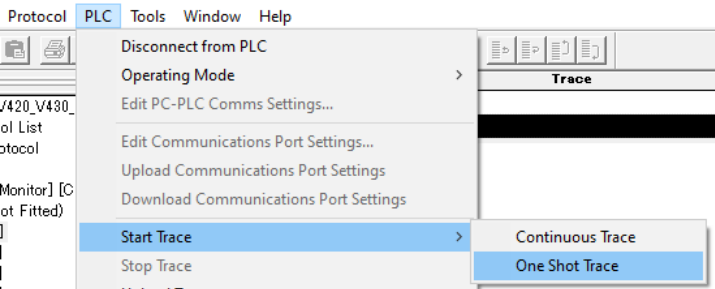

Precautions for Correct Use

Before performing the following steps, confirm that the RS-232C cable is connected securely. If it is not connected, first turn OFF the power supply to each device and then connect the RS-232C cable.

7.4.1. Starting a Trace

Start a trace in the CX-Protocol.

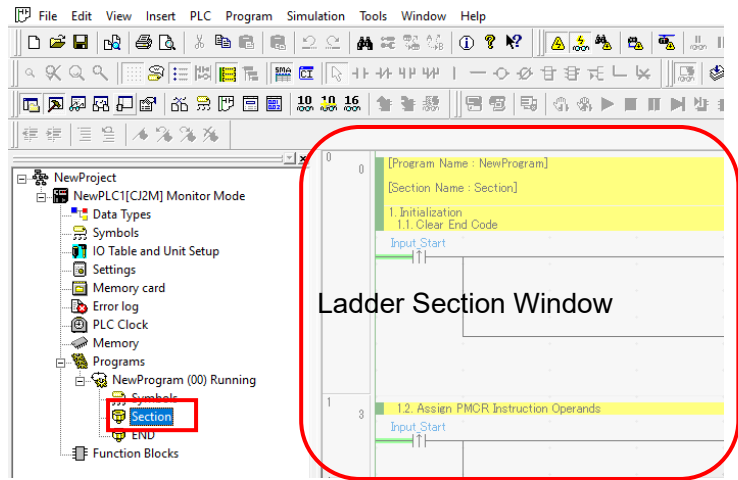
<p>1</p>	<p>In the CX-Protocol, select Operating Mode – Run from the PLC Menu.</p>	
<p>2</p>	<p>A dialog box as shown in the figure on the right appears. Click Yes.</p>	
<p>3</p>	<p>Confirm that the operating mode indication has changed to Monitor, and double-click NewPLC1.</p>	

- 4** The tree structure under **NewPLC1** is open. Select the Serial Communications Unit (**SCU[0]**) in the figure on the right.
- 
- 5** In the project window, select the **Trace 2** icon (📄).
(Confirm that **Trace 2** is highlighted as shown on the right.)
- * **Trace 2** corresponds to the “Port 2” of the Serial Communications Unit.
- 
- 6** Select **Start Trace – One Shot Trace** from the **PLC** Menu.
- 
- 7** In the project window, confirm that the status of **Trace 2** has changed to **One-shot Trace Running**.
- 

7.4.2. Executing the Program

Execute the program in the CX-Programmer.

- 1 In the CX-Programmer, open the tree structure under **Programs** in the project workspace, and double-click **Section1**. In the Ladder Section Window, the ladder diagram for **Section1** is displayed.

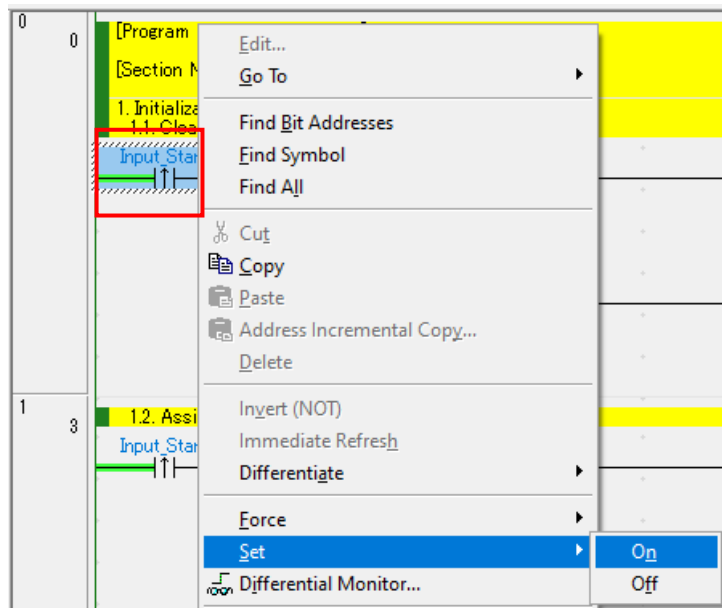


- 2 This document uses a barcode as shown in the right figure as an example of reading. Set the code reader to the position where it can read the barcode in the right figure.



- 3 In the Ladder Section Window, right-click *Input_Start* and select **set/reset – set** from the menu.

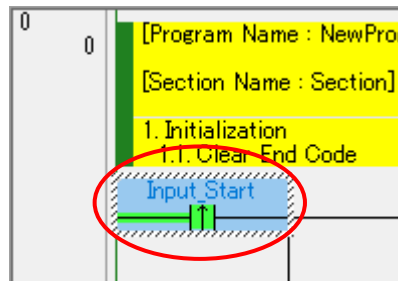
* Any contact is acceptable as long as it is *Input_Start*. (In the figure on the right, you are operating the *Input_Start* contact in Block 0.)



4 Confirm that the *Input_Start* contact is ON.

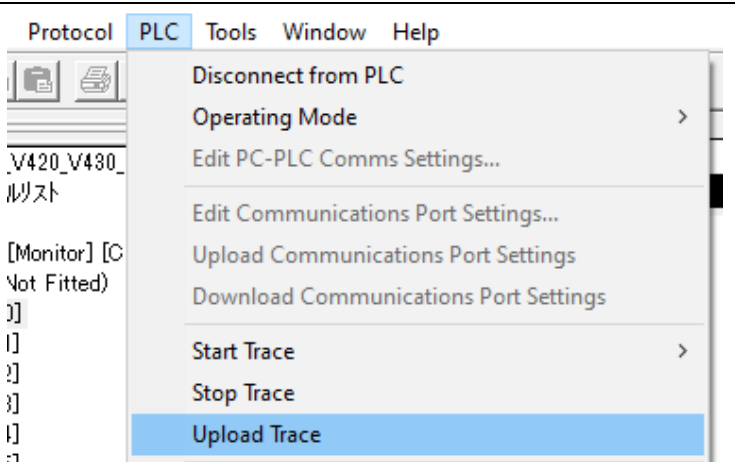
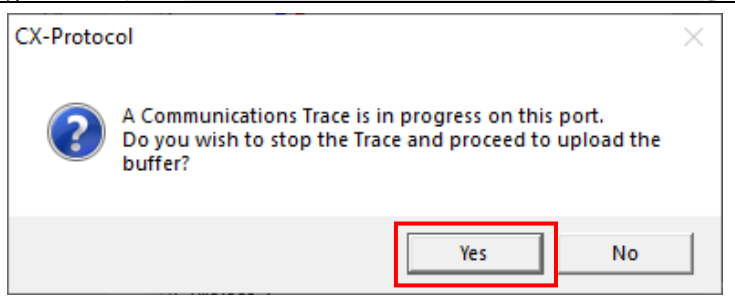
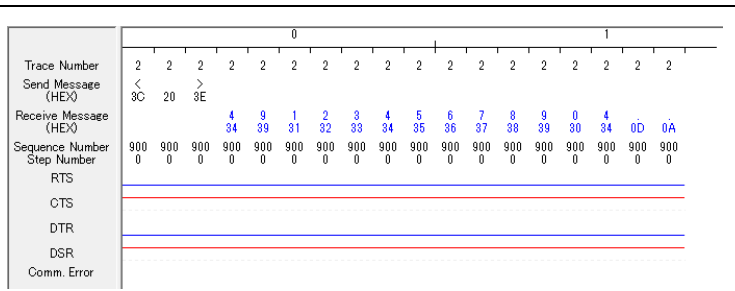
The program starts running and the PLC performs serial communications with the code reader to read the barcode .

* The reading is a successful if the PASS LED indicator on the code reader is lit green.



7.4.3. Checking the Trace Data

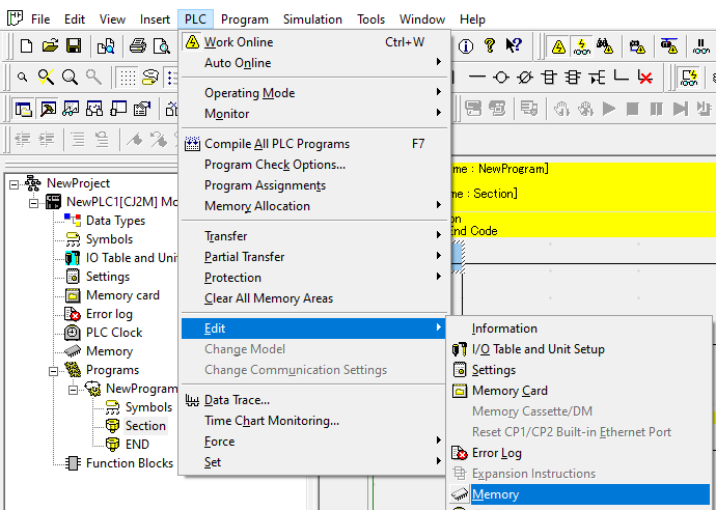
Using the trace data of the CX-Protocol, check that the correct data is sent and received.

<p>1 In the CX-Protocol, select Upload Trace from the PLC Menu.</p>									
<p>2 A dialog box as shown in the figure on the right appears. Click Yes.</p>									
<p>3 Check the Send Message and Receive Message in the trace data file shown in the figure on the right.</p> <p>* In the example on the right, you can see that the controller has sent the “Read trigger” command and received the barcode data shown in step 2 in 7.4.2.</p>	 <table border="1" data-bbox="703 1366 1442 1608"> <tr> <td>■ Send Data</td> <td>Hexadecimal: 3C 20 3E</td> </tr> <tr> <td></td> <td>Text String: “< >”</td> </tr> <tr> <td>■ Receive Data</td> <td>Hexadecimal: 34 39 31 32 33 34 35 36 37 38 39 30 34 0D 0A</td> </tr> <tr> <td></td> <td>Text String: “4912345678904”<CR><LF></td> </tr> </table>	■ Send Data	Hexadecimal: 3C 20 3E		Text String: “< >”	■ Receive Data	Hexadecimal: 34 39 31 32 33 34 35 36 37 38 39 30 34 0D 0A		Text String: “4912345678904”<CR><LF>
■ Send Data	Hexadecimal: 3C 20 3E								
	Text String: “< >”								
■ Receive Data	Hexadecimal: 34 39 31 32 33 34 35 36 37 38 39 30 34 0D 0A								
	Text String: “4912345678904”<CR><LF>								

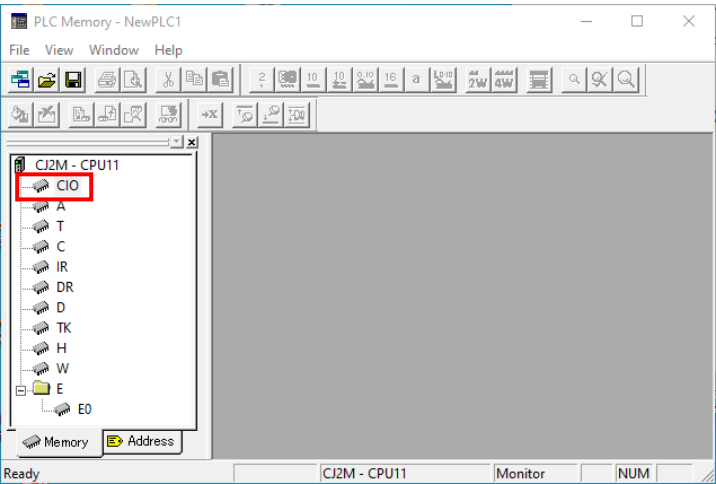
7.4.4. Checking the Receive Data

In the CX-Programmer, check that the correct data is written to the I/O memory of the PLC.

1 In the CX-Programmer, select **Edit – Memory** from the **PLC** Menu.

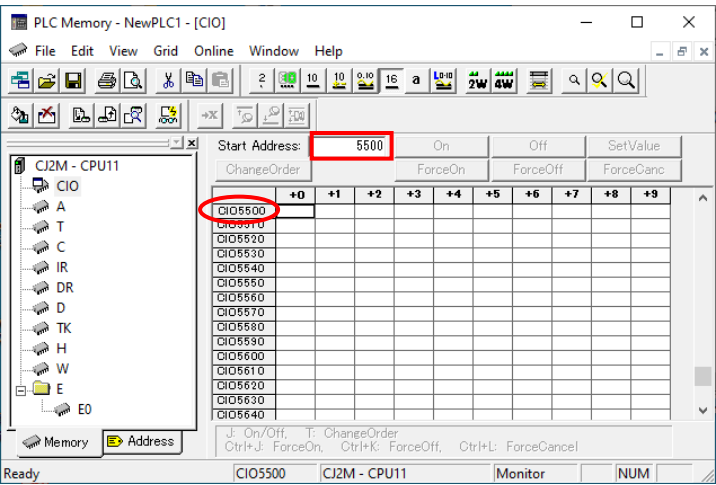


2 In the PLC Memory Window displayed, double-click **CIO** listed in the **Memory** Tab Page.

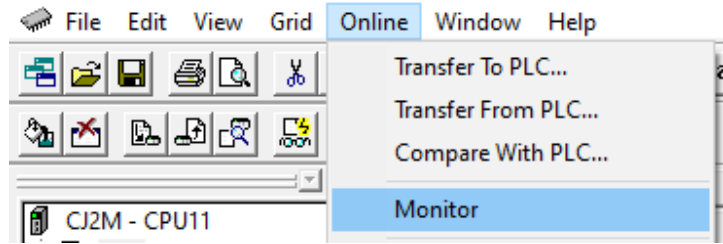


PLC Memory Window

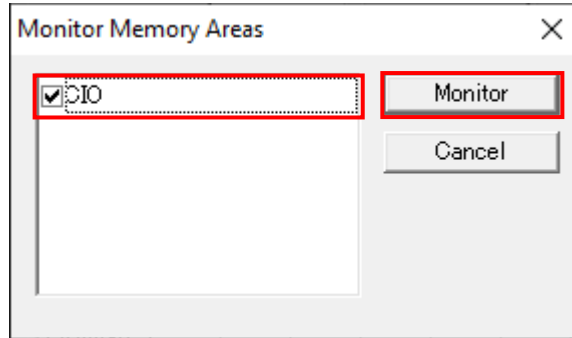
3 In the **CIO** Window displayed, enter **5500** in the **Start Address** field. Confirm that the start address is changed to **CIO5500**.



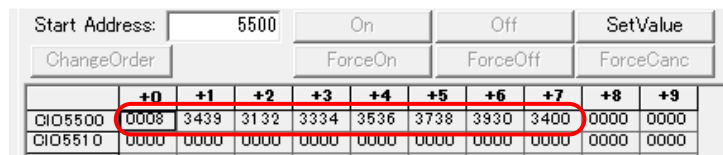
4 Select **Monitor** from the **Online** Menu.



5 The **Monitor Memory Area** Dialog Box is displayed. Select the check box next to **CIO** and click **Monitor**.



6 Check the received data (read code) in the **CIO** Window in the figure on the right.

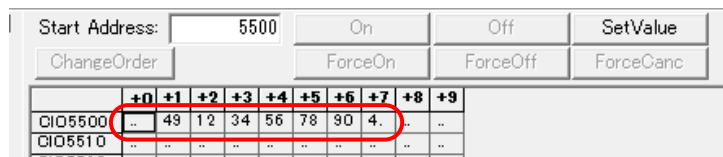
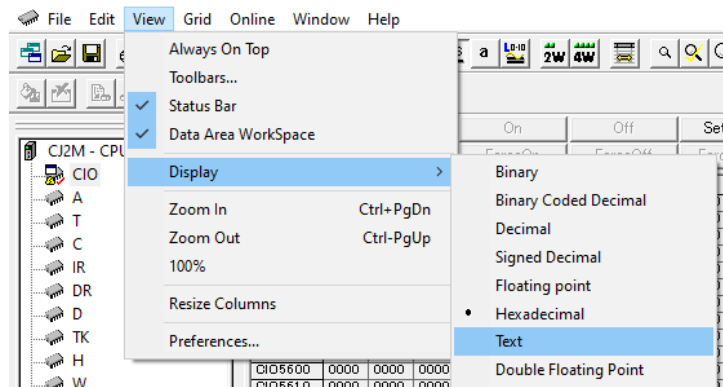


* In the example on the right, the data stored in words starting from **CIO5501** is “3439 3132 3334 3536 3738 3930 3400” in hex (i.e., a text string of “4912345678904”), which is the same as the trace data in step 3 in 7.4.3.

* The word **CIO5500** stores the number of words used (“0008” in hex). The read code is stored in words **CIO5501** to **CIO5507**.

For more information, refer to 9.2.2. *PMCR Instruction Operand Settings*.

* You can change the display format from hex to text string by selecting **Display – Text** from the **View** Menu.



8. Initializing the System

In this document, it is assumed that the controller and the code reader use the factory default settings.

If you change their settings from the default, you may not be able to perform various setting procedures as described.

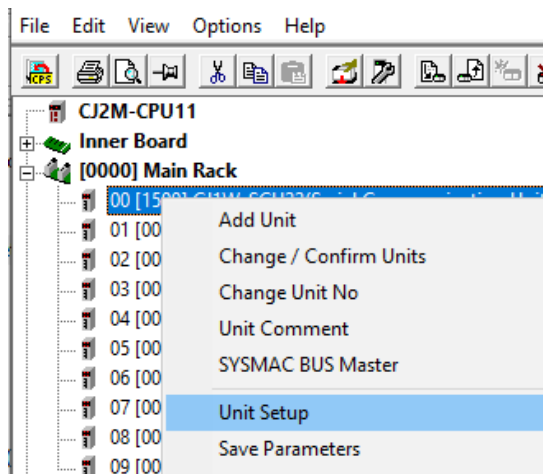
8.1. Initializing the PLC

In order to initialize the PLC, both the CPU Module unit and Serial Communications Unit must be initialized. Please put the PLC in PROGRAM mode before initialization.

8.1.1. Serial Communications Unit

To initialize the Serial Communications Unit, in the CX-Programmer, select **Edit – I/O Table and Unit Setup** from the **PLC Menu**.

In the **PLC IO Table** Window, right-click on the Serial Communications Unit and select **Unit Setup** from the menu.



In the **View Parameters** Dialog Box, after clicking **Set Defaults**, click **Transfer [PC to Unit]**.

C1W-SCU22 [View Parameters] ✕

Displayed Parameter All Parameters

Item	Set Value	Unit
Port1: Port settings	Defaults	
Port1: Serial communications mode	Host Link(default)	
Port1: Data length	7 bits	
Port1: Stop bits	2 bits	
Port1: Parity	Even	
Port1: Baud rate	Default(9600bps)	
Port1: Send delay	Default (0 ms)	
Port1: Send delay (user-specified)	0	ms
Port1: CTS control	No	
Port1: 1:N/1:1 protocol setting	1:N protocol	
Port1: Host Link compatible device mode	Default(Mode A)	
Port1: Host Link unit number	0	
Port1: No-Protocol Start code	0	

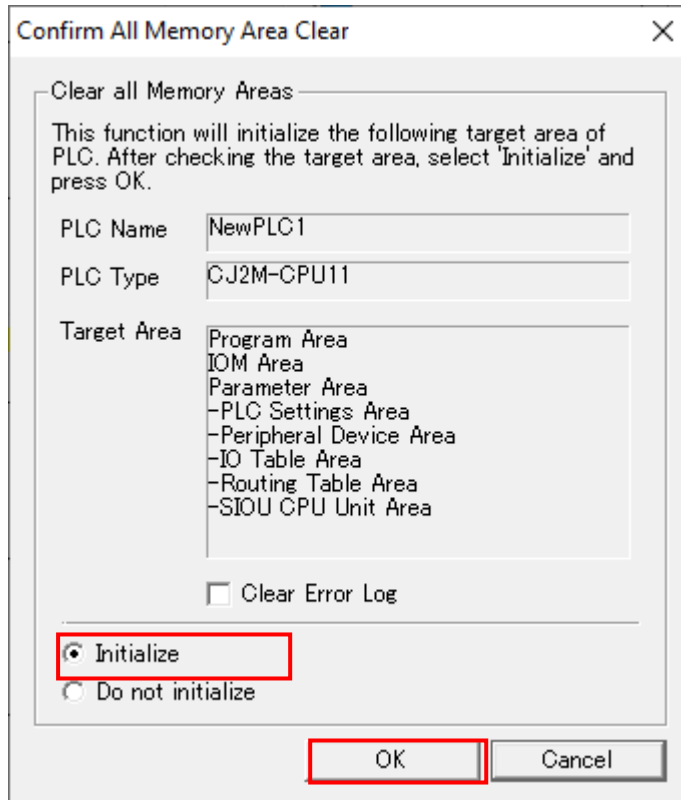
Help

Transfer[Unit to PC] Transfer[PC to Unit] Compare Restart

Set Defaults OK Cancel

8.1.2. CPU Unit

To initialize the CPU Unit, select **Clear All Memory Areas** from the **PLC** Menu in the CX-Programmer. In the **Confirm All Memory Area Clear** Dialog Box, select **Initialize** and click **OK**.



8.2. Initializing the Code Reader

For information on initializing the code reader, please refer to *How to initialize the settings?* in Q&A in *Appendices* of the *MicroHAWK V320-F/V330-F/V420-F/V430-F Series Barcode Reader User Manual* (Cat. No. Z432).

9. Program

This section describes the details of the program and protocol macro data used in this document.

9.1. Overview

This section describes the specifications and functions of the program and protocol macro data used to check the connection between the code reader and the PLC (Serial Communications Unit (hereinafter SCU unit)).

This program and protocol macro data use the protocol macro function of the SCU unit to send and receive a “Read trigger” command to and from the code reader, and judge whether they have ended normally or abnormally.

Here, “normal end” of the program means that the communications sequence of the protocol macro has ended successfully.

Also, “error end” means that the communications sequence of a protocol macro has ended abnormally.

In this section, if it is necessary to distinguish between decimal data and hexadecimal data, add “&” to the beginning of decimal data and “#” to the beginning of hexadecimal data. (For example, “&1000” for decimal data, “#03E8” for hexadecimal data)



Note

We have verified in our test configuration that the program and protocol macro data enable communications for the product versions and product lot used for evaluation.

However, we do not guarantee their operations where there are electrical noise or other disturbances, or variations in the performance of the devices themselves.

9.1.1. Communications Data Flow

This is the flow from issuing command data from the PLC (SCU unit) to the code reader through serial communications and receiving response data from the code reader.

1.	Communications Sequence Execution Processing	The PROTOCOL MACRO instruction (Mnemonic: PMCR) for the sequence number specified in the program is executed to call the communications sequence (protocol macro data) registered in the SCU unit.
▼		
2.	Command Send Processing	Based on the sequence number specified in step 1, the SCU unit issues a send message (command data) to the code reader.
▼		
3.	Response Processing Receive	The SCU unit stores the receive message (response data) received from the code reader in the internal memory of the specified CPU Unit.

9.1.2. PMCR Instruction and Send and Receive Messages

This section describes the PROTOCOL MACRO instruction (Mnemonic: PMCR, hereinafter abbreviated as “PMCR instruction”) and the general movement of send and receive messages.



Note

For details, refer to *Serial Communications Instructions (PMCR)* in *Section 3 Instructions in the CJ-series Instructions Reference Manual (Cat. No. W474)*.

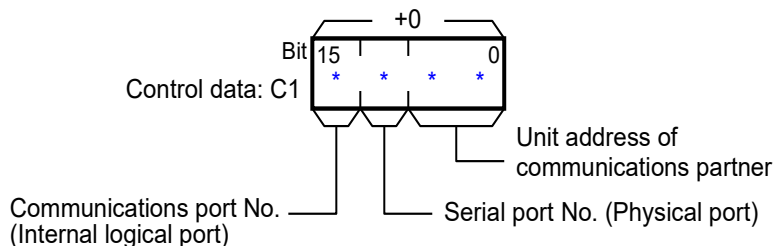
● PMCR Instruction Operand Data

Instruction	Mnemonic	Code	Symbol/Operand	Function	Location	Execution condition
PROTOCOL MACRO	PMCR @PMCR	260	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> PMCR(260) C1 C2 S R </div> <p>C1: Control word 1 C2: Control word 2 S: 1st send word R: 1st receive word</p>	<p>Calls and executes a communications sequence registered in a Serial Communications Board (CS Series only) or Serial Communications Unit.</p>	Output	Required

C1: Control Data

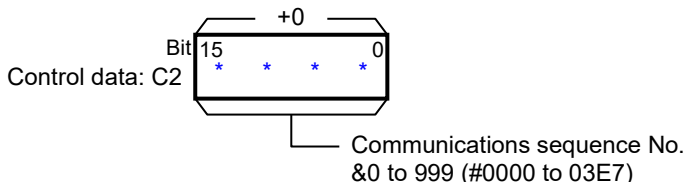
Set three types of data about the SCU unit.

- Communications port No. (Internal logical port): #0 to 7
- Serial port No. (Physical port): #1 to 2 (#1: PORT1, #2: PORT2)
- Unit address of communications partner: #Unit No. + #10



C2: Control Data

Set the communications sequence number registered as protocol macro data. Refer to 9.2.1. *Communications Sequence Number* for the sequence number registered in the protocol macro data.



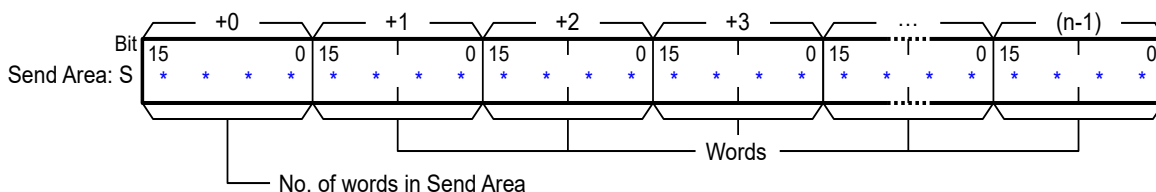
S: First Send Word and Send Area (Send Area Specification)

Set the number of words (n) to be secured for the send area (including the word S).

Setting range: n = &0 to 250 or #0000 to 00FA

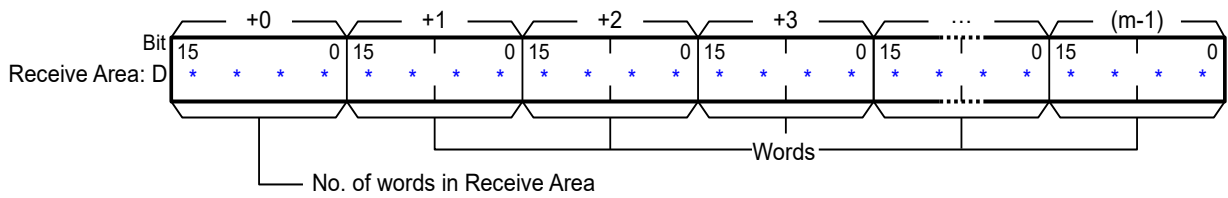
Send data (data assigned to variables) is stored in the words S+1 to S+(n-1).

If there is no operand specified in the execution sequence, such as a direct or linked word, specify the constant #0000 for the word S.



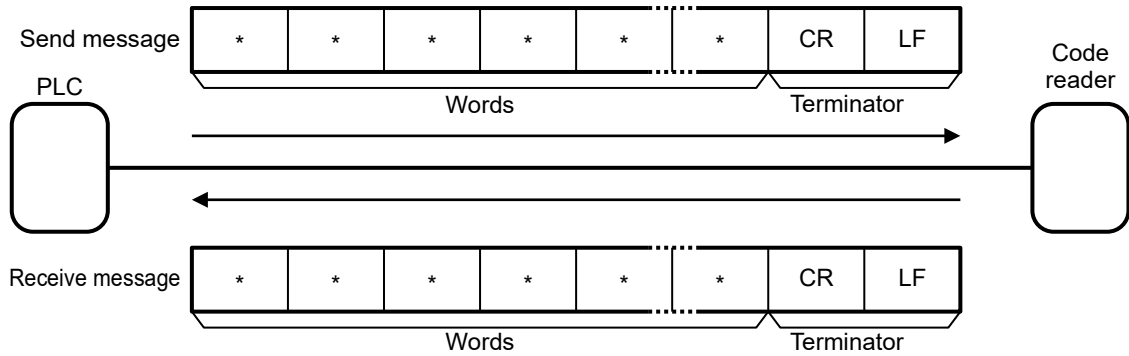
D: First Receive Word and Receive Area (Receive Area Specification)

The number of words (m) of received data is automatically stored in word D (including the word D). In the words D+1 to D+(m-1), actually received data is stored. (Setting range: m = &0 to 250 or #0000 to 00FA)

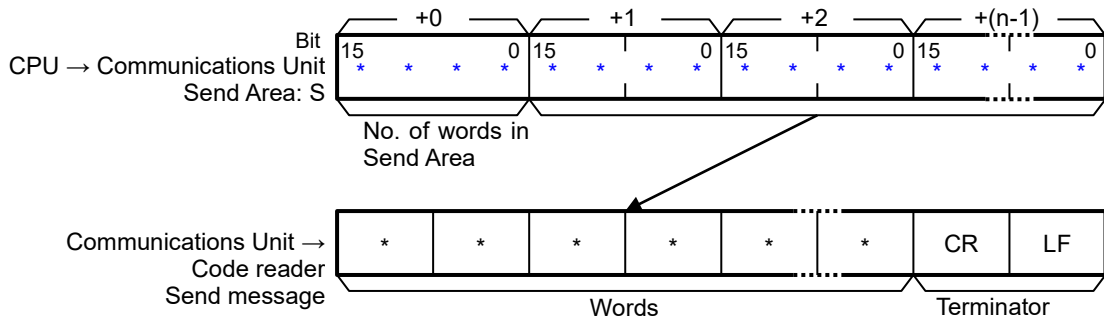


• Send and Receive Messages

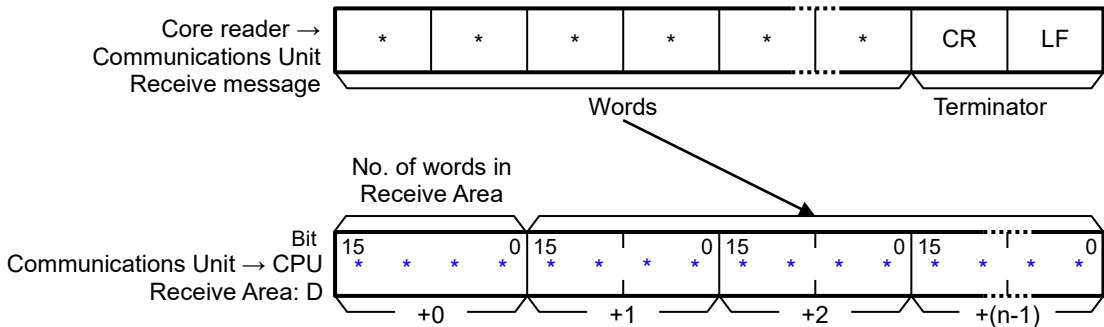
Overview of Send and Receive Messages



Relationship between Send Area S (PMCR Instruction Operand) and Send Message



Relationship between Receive Message and Receive Area D (PMCR Instruction Operand)



9.2. Communications Sequence

This section describes the communications sequence (protocol macro data) that can be used with PMCR instructions in the program.

9.2.1. Communications Sequence Number

The communications sequence (protocol macro data) registered in the SCU unit is identified by the communications sequence number. By specifying the communications sequence number with a PMCR instruction, the corresponding code reader command is executed in the code reader.

The following communication sequence is available with the protocol macro data.

No.	Command	Description
900	Read trigger	Issues a trigger to read the code.

9.2.2. PMCR Instruction Operand Settings

The PMCR instruction operands for communications sequence No. 900 "Read trigger" are as follows.

- Settings of Control Word C1 (C1: 5010)

Word	Setting (Data format)	Data description
C1	Communications port No. (1-digit hex)	#7210: Communications port No. 7, Serial port No. 2, #Unit No.+ #10
	Serial port No. (1-digit hex)	
	Unit address of communications partner (2-digit hex)	

- Setting of Control Word C2 (C2: 5011)

Word	Setting (Data format)	Data description
C2	Communications sequence No.	&900 (Read trigger)

- Setting of First Send Word (S: 5020)

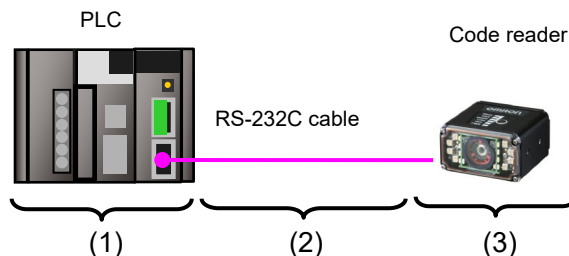
Word	Setting (Data format)	Data description
S	Number of Send words (4-digit hex)	#0000: Specifies that the command does not have required parameters.

- Settings of First Receive Word and Area (D: 5500)

Word	Setting (Data format)	Data description
D	Number of Receive words (4-digit hex)	(No setting is required since it is receive data.)
D+1	Receive word 0 (4-digit hex)	
D+2	Receive word 1 (4-digit hex)	
D+3	Receive word 2 (4-digit hex)	
:	:	
D+250	Receive word 249 (4-digit hex)	

9.3. Error Judgment Processing

This program performs error judgment processing for the following three types of errors (1) to (3). Refer to 9.8. *Error Processing* for error codes.



(1) PMCR instruction execution error (PMCR instruction error)

An error such as a sequence No. setting error or memory word setting error that makes a PMCR instruction inexecutable is judged as a “PMCR instruction error”. The judgment is made by the SCU unit’s CIO Area addresses 1519.00 to 03 “Port Operation Status Error Codes”.

(2) Code reader communications error (Communications error)

An error such as garbled characters in data transmission, transmission error due to inconsistent baud rate setting in communications with the code reader, etc. is judged as a “Communications error”. The judgment is made by the SCU unit’s CIO Area address 1518.15 “Transmission Error Status Transmission Error Flag”.

(3) Code reader error

An error such as a command error, parameter error, data error, or inexecutable error on the code scanner is judged as a “Code reader error”. The judgment is made based on the response data returned from the code reader. The program detects this error as a timeout error in (2) since no response is returned from the code reader when it occurs.



Note

For the CIO Area of the SCU unit, refer to 9.4.2. *Fixed CIO Area and Related Auxiliary Area Addresses*.

9.4. Memory Map

This section describes the memory map of the program.

9.4.1. Usable Memory Addresses

The tables below show area and word addresses that are required to execute the program.

You can change the following allocations to any addresses.



Precautions for Correct Use

When you change the address allocations, be careful not to cause address duplication.

- Input Memory

Below is the word addresses in the CIO Area that are used to operate the program.

Address	Data type	Variable name	Description
5000.00	BOOL	Input_Start	Turns from OFF to ON to start the program.

- Output Memory

Below are the word addresses that reflect the execution result of the program.

Address	Data type	Variable name	Description
5000.02	BOOL	Output_NormalEnd	Turns ON when the program has ended normally.
5000.03	BOOL	Output_ErrorEnd	Turns ON when one or more of the following errors occur. ① PMCR instruction error ② Communication error ③ Code reader error
5501 to 5750	WORD	ReadCodeValue	Stores the read code value received from the code reader. 250 words are secured.
H400	UINT	Output_ProtocolMacro_ErrorCode	Stores the error code if a PMCR instruction error or communication error occurs.

- Internal Memory

Below are the word addresses that are used only for calculations by the program.

Address	Data type	Variable name	Description
5000.01	BOOL	Internal_PMCRInstructionExecuting	Indicates the execution status of the PMCR instruction. Turns ON when the PMCR instruction is executed and turns OFF when not executed.
5000.04	BOOL	Internal_PMCRInstruction_NormalEnd	Turns ON when the PMCR instruction has ended normally.
5000.05	BOOL	Internal_PMCRInstruction_ErrorEnd	Turns ON if a communication error (transmission error, etc.) occurs.
5000.07	BOOL	Internal_ProtocolMacroErrorCodePresent	Turns ON if a PMCR instruction error (one of the following three) occurs. ① Sequence No. Error ② Data Read/Write Area Exceeded Error ③ Protocol Data Syntax Error
5010	UINT	Internal_ControlData_1	This is a PMCR instruction execution parameter.
5011	UINT	Internal_ControlData_2	This is a PMCR instruction execution parameter.
5012	UINT	Internal_ProtocolMacro_ErrorCode	Stores the error code if a PMCR instruction error occurs.
5020	UINT	Internal_SendDataStartWord	Sets the number of send message words for the PMCR instruction.
5500	UINT	Internal_ReceiveDataStartWord	Stores the number of receive message words from the code reader.

9.4.2. Fixed CIO Area and Related Auxiliary Area Addresses

The tables below show area addresses that are required to execute the program.

- CIO Area

The following address allocations cannot be arbitrarily changed since they are fixed by the unit address (unit number) setting for the SCU unit.

In the program, the unit number is set to "0".

Address	Data type	Variable name
1518.15	BOOL	TransmissionError_SCU_0_P2
1518	WORD	TransmissionErrorStatus_SCU_0_P2
1519.10	BOOL	SequenceAbout_SCU_0_P2
1519.11	BOOL	SequenceEnd_SCU_0_P2
1519.15	BOOL	ProtocolMacroExecuting_SCU_0_P2
1519	UINT	ProtocolMacroErrorCode_SCU_0_P2



Note

For details on the CIO Area of the SCU unit, refer to 2-3-2 CIO Area in 2-3 I/O Memory Allocations in the *CJ-series Serial Communications Boards/Units Operation Manual* (Cat. No. W336).

- Related Auxiliary Area

The following related Auxiliary Area address allocation cannot be arbitrarily changed because it corresponds to the communications port (internal logical port) specified in the program (by the PMCR instruction operand).

The program uses communications port No. 7 (internal logical port).

Address	Data type	Variable name
A202.07	BOOL	CommunicationsPortEnabledFlag_P7



Note

For the related Auxiliary Area used for PMCR instructions, refer to *Serial Communications Instructions (PMCR)* in Section 3 Instructions in the *CJ-series Instructions Reference Manual* (Cat. No. W474).

9.5. Ladder Program

9.5.1. Functional Components of Ladder Program

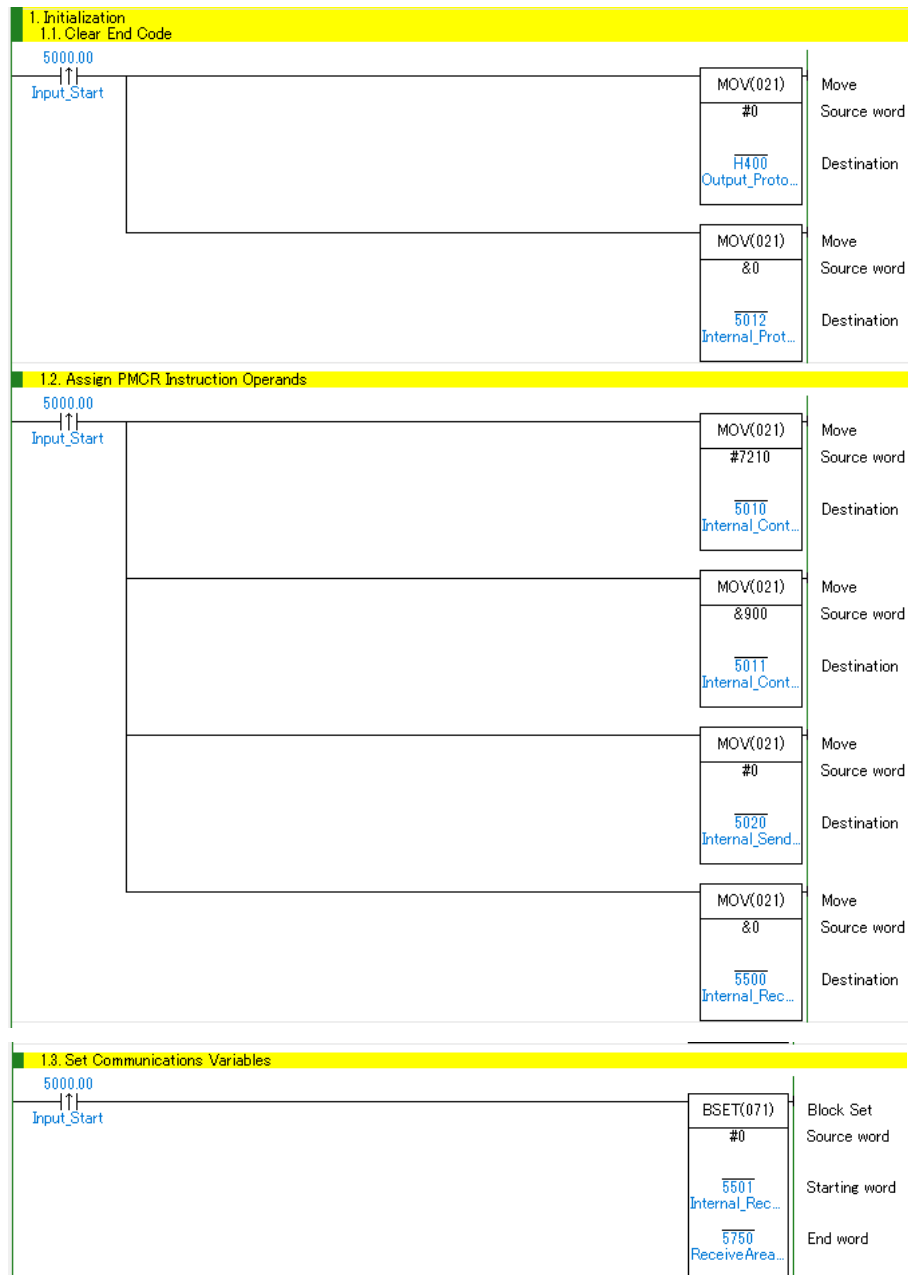
The functional components of the program are as follows.

Category	Subcategory	Description
1. Initialization	1.1. Clear End Code 1.2. Assign PMCR Instruction Operands 1.3. Set Communications Variables	Clear the used area and make initial settings as a preparation for communications.
2. PMCR Instruction Executing Status Control	2.1. PMCR Instruction Executing 2.2. PMCR Instruction Execution Processing 2.3. Normal/Error Judgment Processing	Call and execute the communications sequence (protocol macro data) registered in the SCU unit. After execution, make a normal/error judgment based on related flags and receive data.
3: Normal End Status Control	3.1. Normal End Processing 3.2. Set End Code	Turn ON the Normal End Flag. Set the end code for normal end.
4: Error End Status Control	4.1: Error End Processing 4.2. Set End Code	Turns ON the Error End Flag. Set the end code corresponding to the error cause.

9.5.2. Detailed Description of Functional Components

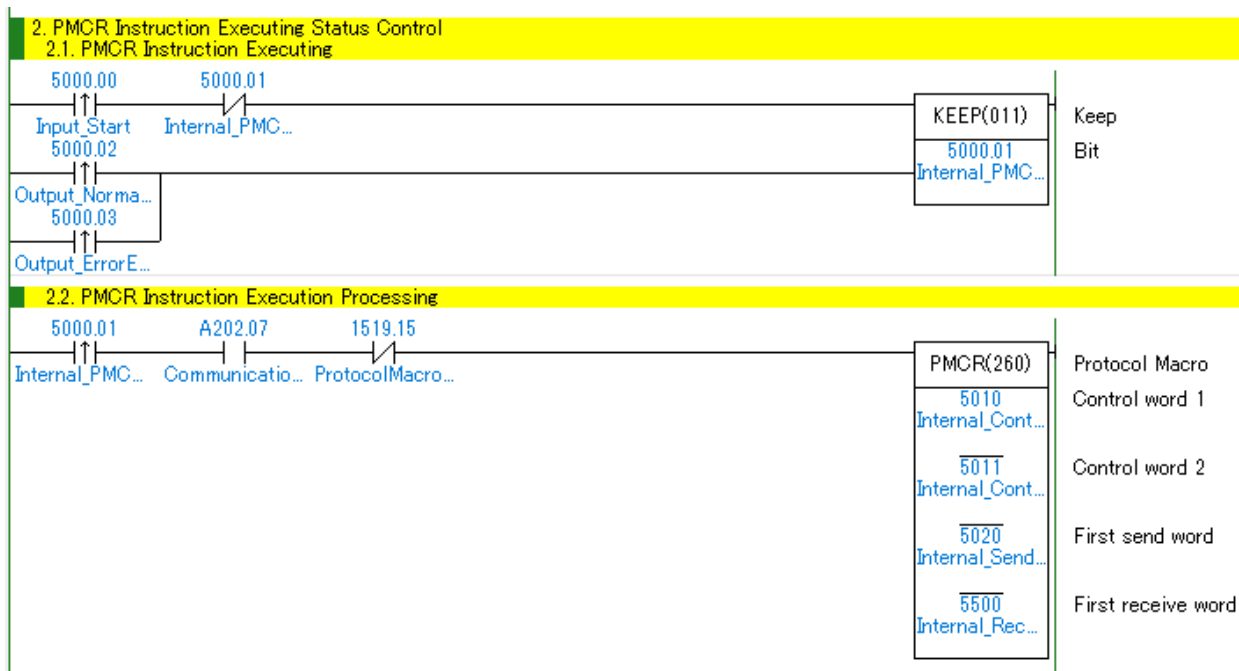
The functional components of the program are shown below.

- 1. Initialization



No.	Overview	Description
1.1.	Clear End Code	Clears the error code storage area to zeros.
1.2.	Assign PMCR Instruction Operands	Sets the execution parameters (operands) of the PMCR instruction.
1.3.	Set Communications Variables	Initializes the storage area for the receive data.

• 2. PMCR Instruction Executing Status Control



No.	Overview	Description
2.1.	PMCR Instruction Executing	Changes to the PMCR Instruction Executing status. The executing status is cleared at the normal/error end of the program.
2.2.	PMCR Instruction Execution Processing	Executes the PMCR instruction on condition that communications port No. 7 is usable and that the protocol macro is not running.



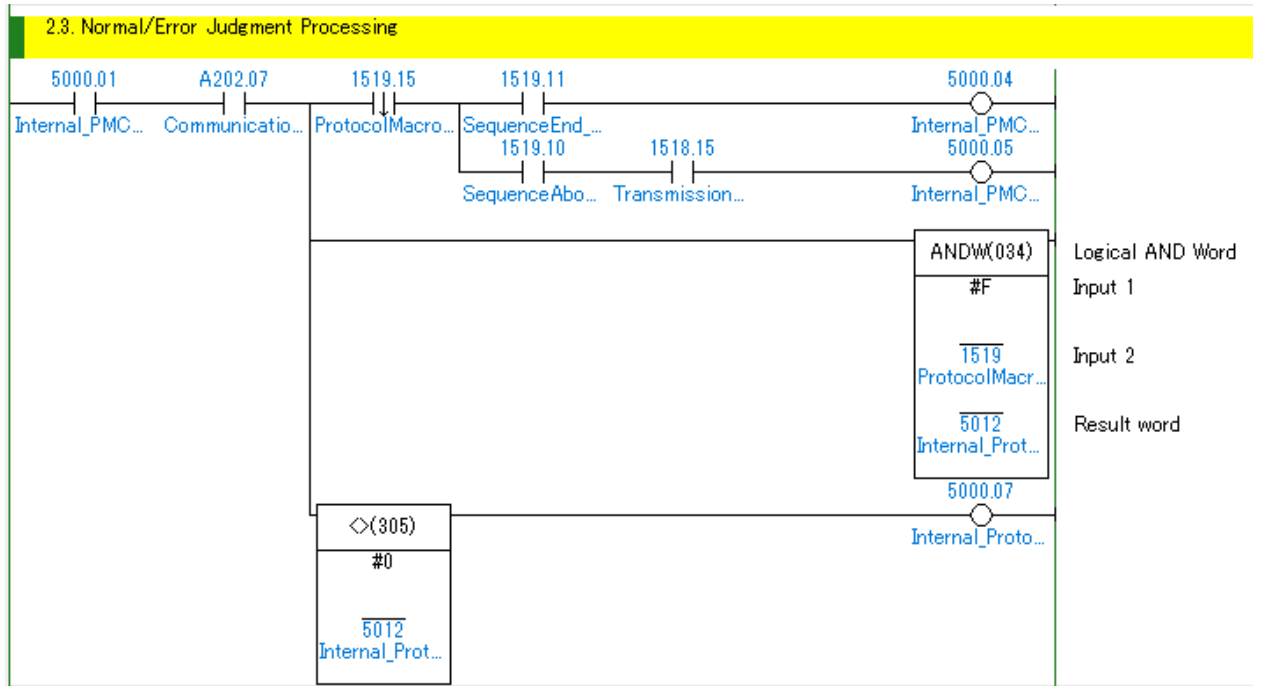
Precautions for Safe Use

Check the customer specifications of the program before specifying the receive data storage area in the PMCR instruction. An unexpected memory area may be overwritten.



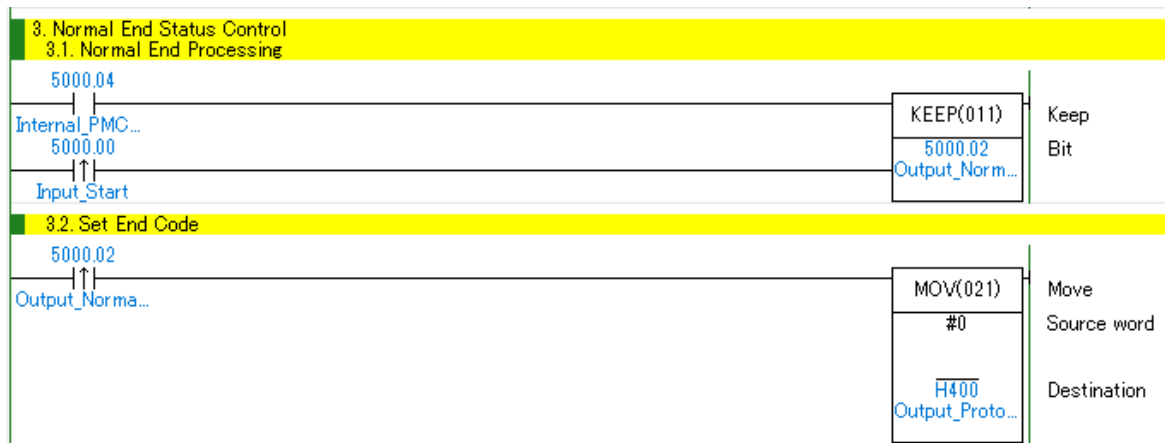
Precautions for Correct Use

The program uses communications port No. 7 (internal logical port). Even when a communication port is necessary for other communications, avoid using communications port No. 7. If you must use communications port No. 7, confirm that the Network Communications Instruction Enabled Flag (A202.07) is ON before use.



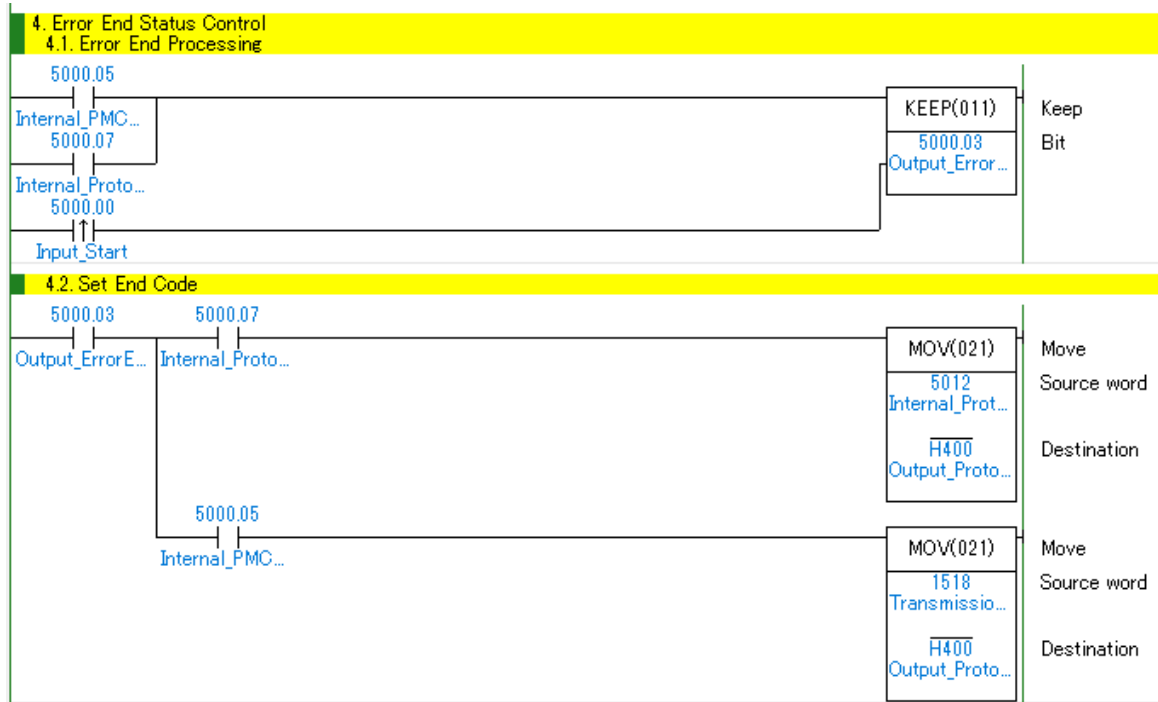
No.	Overview	Description
2.3.	Normal/Error Judgment Processing	<p>Judges whether program execution has ended normally or abnormally.</p> <p>The program is considered to have ended normally if all of the following conditions are met.</p> <p>(1) PMCR instruction at normal end (without PMCR instruction error)</p> <p>(2) Communications sequence at normal end (without communications error)</p> <p>If an error occurs in either one of the above conditions, the error flag corresponding to the error turns ON.</p>

• 3. Normal End Status Control



No.	Overview	Description
3.1.	Normal End Processing	Turns ON the normal end flag when the program is judged to have ended normally in 2.3. <i>Normal/Error Judgment Processing</i> ,
3.2.	Set End Code	Sets the end code for normal end "#0000" in the end code storage area.

● 4. Error End Status Control



No.	Overview	Description
4.1.	Error End Processing	Turns ON the Error End Flag when the program is judged to have ended abnormally in 2.3. <i>Normal/Error Judgment Processing</i> .
4.2.	Set End Code	Sets the end code for error end corresponding to the error cause in the end code storage area.



Note

For the end codes, refer to 9.8. *Error Processing*.

9.6. Protocol Macro Data

Protocol macro data consists of the following components: Sequence, Step, Send Message, Receive Message, and "Reception Matrix".

- When there is only one receive message format for one step (i.e., single send and receive operation)
 - One receive message and one send message are set for the step.

Sequence No. 900	Step No. 00	Setting Message 00	Receive Message 00
.			
.	Step No. yy	Send Message yy	Receive Message yy
Sequence No. xxx	xxx: 999 max., yy: 15 max.		

- When there are more than receive messages for one step (i.e., single send and receive operation)
 - One send message and one reception matrix are set for the step.
 - Several "cases" (receive messages) are set for the reception matrix.

Sequence No. 900	Step No. 00	Setting Message 00	Reception Matrix	
.			Case No. 00	Receive Message 00
.	Step No. yy			
.	yy: 15 max., zz: 14 max.			
Sequence No. xxx	xxx: 999 max., Case No. 15 automatically set			
			Case No. zz	Receive Message: zz
			Case No. 15	Other

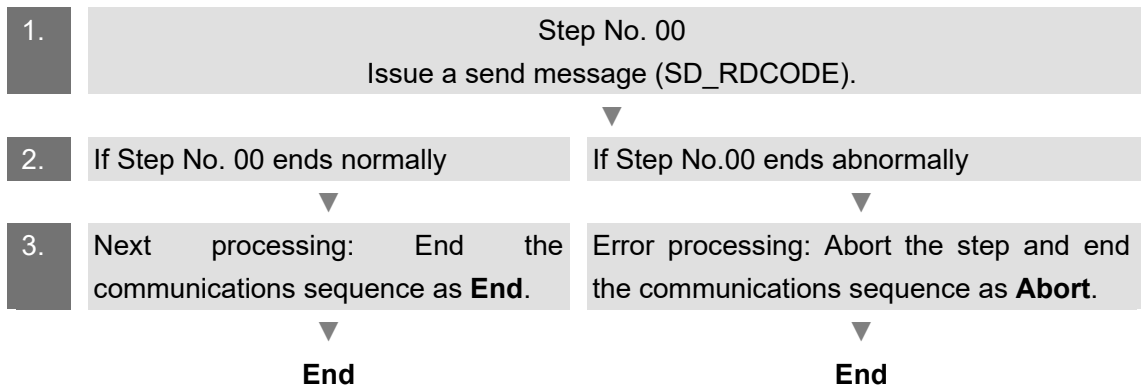
9.6.1. Format of This Protocol Macro Data

This protocol macro data has a structure without the reception matrix as shown below, since it has only one receive message (SD_RDCODE) for one send message (SD_RDCODE). For more information, refer to 9.6.6. *Setting the Receive Message*.

Sequence No. 900	Step No. 00	SD_RDCODE	RV_RDCODE
------------------	-------------	-----------	-----------

9.6.2. Protocol Macro Processing Procedure

The protocol macro processing procedure is as follows.



9.6.3. Sequence Settings

The protocol macro data uses a “Read trigger” (Communications sequence No. 900) to read the code. The setting items for the communications sequence include **Timeout**.



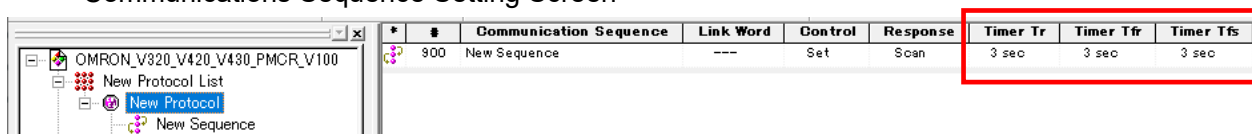
Note

For details on the sequence settings, refer to 3-2 *Sequence Attributes (Common to All Steps)* in the *CX-Protocol Operation Manual (Cat. No. W344)*.

- Timeout Settings

The timeout settings (**Timer Tr**, **Timer Tfr**, and **Timer Tfs**) for the sequence are as follows.

Communications Sequence Setting Screen



Settings

Item	Description	Meaning
Timer Tr	Reception Wait Monitoring Time	Monitors the time until the code reader receives the first data (header) after it enters the receive wait state in each step in the sequence. In the protocol macro data, it is set to 3 seconds.
Timer fr	Receive Completed Monitoring Time	Monitors the time until the code reader completes the receiving after it receives the first data (header) in each step in the sequence. In the protocol macro data, it is set to 3 seconds.
Timer Tfs	Send Completed Monitoring Time	Monitors the time until the code reader receives the last data after it sends the header. In the protocol macro data, it is set to 3 seconds.



Note

For details on how to calculate the monitoring time, refer to 4-5 *Calculation Method of Monitoring Time* in the *CX-Protocol Operation Manual (Cat. No. W344)*.

9.6.4. Step Settings

The step settings for communications sequence No.900 are shown below. The step settings include **Retry**, **Send Message** and **Recv Message** (message names), **Next**, and **Error**. The sequence in the protocol macro data consists of Step No. 00 only.



Note

For details on the step settings, refer to 3-3 *Step Attributes* in the *CX-Protocol Operation Manual* (Cat. No. W344).

- **Retry Count Setting**

The **Retry** setting for the step is shown below. If an error occurs, the protocol macro will retry the step the specified number of times (0 to 9 times). If the error persists even after the retries, it will go to Error Processing.

The retry count is valid only for the Send & Receive command.

Step Setting Screen

Step	Repeat	Command	Retry	Send Wait	Send Message	Recv Message	Response	Next	Error
00	RSET/001	Send & Receive	3	---	SD_RDCODE	RV_RDCODE	YES	End	Abort

Settings

Step	Retry
00	3

- **Send/Receive Message (Message Name) Settings**

The **Send Message** and **Recv Message** settings for the step are shown below. The send message name and receive message name that are separately registered are set.

Step Setting Screen

Step	Repeat	Command	Retry	Send Wait	Send Message	Recv Message	Response	Next	Error
00	RSET/001	Send & Receive	3	---	SD_RDCODE	RV_RDCODE	YES	End	Abort

Settings

Step	Send Message	Recv Message
00	SD_RDCODE	RV_RDCODE

- Next Processing and Error Processing Settings

The **Next** and **Error** processing settings for the step are shown below. The **Next** processing setting will be executed when the step execution ends normally. The **Error** processing setting will be executed when a communication error occurs.

Step Setting Screen

* Step	Repeat	Command	Retry	Send Wait	Send Message	Recv Message	Response	Next	Error
00	RSET/001	Send & Receive	3	---	SD,RDCCODE	RV,RDCCODE	YES	End	Abort

Settings

Step	Next	Error
00	End	Abort

Processing Items

Processing	Description
End	Ends the communications sequence.
Next	Advances to the next step No.
Abort	Aborts the step and end the communications sequence.
Goto	Jumps to the specified step No.
Reception Matrix	Executes the processing specified by the reception matrix setting.

9.6.5. Send Message Settings

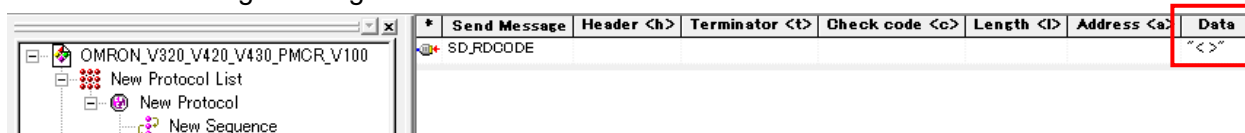
The send message settings are shown below.



Note

For details on the Send Message settings, refer to 3-4 *Communication Message Attributes* in the *CX-Protocol Operation Manual* (Cat. No. W344).

Send Message Setting Screen



• Settings for Send Message "SD_RDCODE"

Settings

"<>"
(1)

No.	Code	Description
(1)	"<>"	Message data: ASCII constant, Data: "<>"

Send Message Command Format

This is the command format of messages sent from the SCU unit to the code reader according to the "SD_RDCODE" setting.

"<"(#3C)	" "(#20)	">"(#3E)
----------	----------	----------

Command	Number of bytes	Description
Header	0	None
"<>"	3	Fixed: "<>" (#3C203E) (Read trigger command)
Terminator	0	None

* A setting that is referred to as "Footer" on the code reader corresponds to "Terminator" in the protocol macro data. Hereinafter, it is referred to as "Terminator".

9.6.6. Receive Message Settings

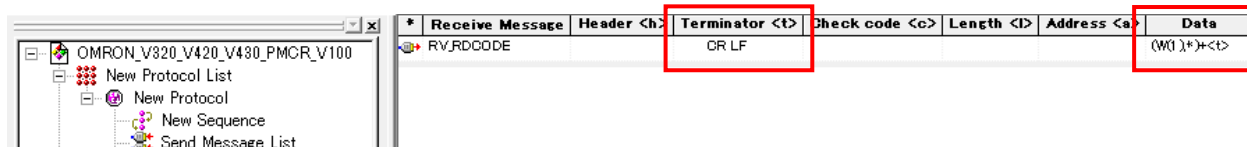
The receive message settings are shown below.



Note

For details on receive message settings, refer to 3-4 *Communication Message Attributes* in the *CX-Protocol Operation Manual* (Cat. No. W344).

Receive Message Setting Screen



- Settings for Receive Message “RV_RDCODE”

Settings

(W(1),*)+<t>

(1) (2)

No.	Code	Description
(1)	(W(1),*)	Message data: Variable Loads all variable length data and stores them in the Internal_ReceiveDataStartWord+1 and higher words specified by the PMCR instruction operand in the program (words starting from 5501).
(2)	<t>(Terminator)	Message data: Constant in hex, Type: Code, Data: <CR><LF>

* Header <h> is set to None.

Response Format of Receive Message

This is the response format of the receive message from the code reader that the SCU unit receives according to the RV_RDCODE setting.

ReadCodeValue	<CR><LF>
---------------	----------

Command	Number of bytes	Remarks
Data	Variable length	Variable: ReadCodeValue
Terminator	2	Fixed: <CR><LF> (#0D0A)

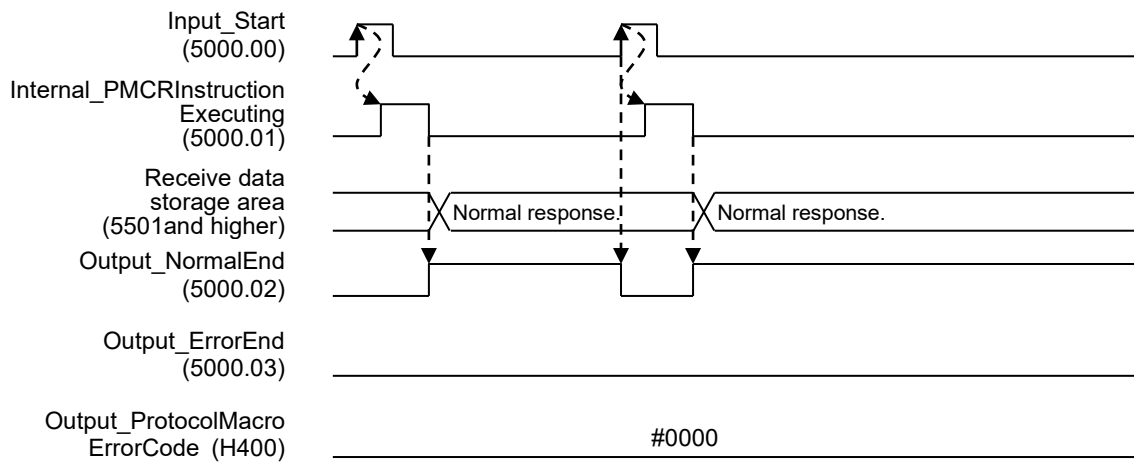
9.7. Timing Chart

The timing chart for the program is shown below.

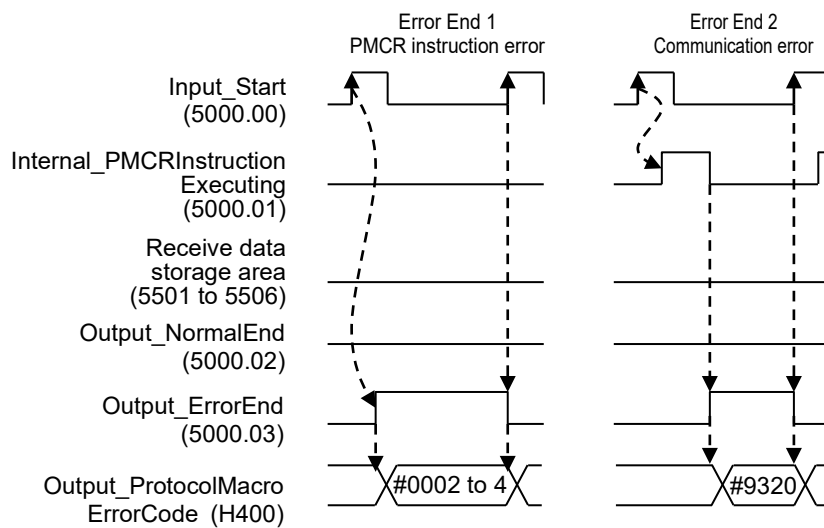
The timing chart patterns are defined as follows.

Pattern	Normal End	Error End 1 ExecPMCR Instruction Error	Error End 2 Protocol Macro Error
Command	Normal	Error	Error
Code reader	Normal	Normal or Error	Normal or Error
Response	Yes	No	No

• Normal End



• Error End



9.8. Error Processing

This section provides information on errors that can occur during the execution of the program.

9.8.1. Protocol Macro Error Codes

These errors are detected by the macro operation monitoring function of the SCU unit. They are stored in the word H400 (Variable name: *Output_ProtocolMacro_ErrorCode*).

Error Code List

Error code	Name
#0000	No error
#0002	Sequence number error
#0003	Data read/write area exceeded error
#0004	Protocol Data Syntax Error



Note

For details on protocol macro errors and corrections, refer to *12-3 Troubleshooting* in the *CJ-series Serial Communications Boards/Units Operation Manual* (Cat. No. W336).

9.8.2. Transmission Error Status

The table below shows the error flags for transmission errors that can occur. They are stored in the word H400 (Variable name: *Output_ProtocolMacro_ErrorCode*).

Transmission Error Status

Bit	Description
15	1: Transmission error 0: No transmission error
14	1: Send finished monitoring time over 0: Normal
13	1: Receive finished monitoring time over 0: Normal
12	1: Receive wait monitoring time exceeded 0: Normal
8 to 11	Number of retries
7	1: FCS check error 0: Normal
6	1: Commands error 0: Normal
5	1: Timeout 0: Normal
4	1: Overrun error 0: Normal
3	1: Framing error 0: Normal
2	1: Parity error 0: Normal
0, 1	(Not used)



Note

For details on the transmission error status and corrections, refer to *12-3 Troubleshooting* in the *CJ-series Serial Communications Boards/Units Operation Manual* (Cat. No. W336).

10. Revision History

Revision Code	Revision Date	Revised Page and Reason
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