

Sysmac CJ-series General-purpose Serial Connection Guide (RS-232C)

**OMRON Corporation
V750-series RFID System**

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1. Related Manuals

The table below lists the manuals related to this document.

To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions, Precautions for Safe Use, and Precaution for Correct Use of 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 and Serial Communications Units Operation Manual
W446	-	CX-Programmer Operation Manual
W344	-	CX-Protocol Operation Manual
W474	CJ2□-CPU□□	CJ-series Instructions Reference Manual
Z235	V750-BA50C04-US V740-HS01□□-□□	V750-series UHF RFID System User's Manual

2. Terms and Definition

Terms	Explanation and Definition
Protocol macro	The protocol macro is a function that stores a procedure (protocol) to send/receive data to/from general-purpose external devices in a Serial Communications Board or Serial Communications Unit. Data can be sent/received by executing the PMCR instruction on the CPU Unit.
Protocol	A unit of independent communication processing with a specific general-purpose device. A protocol includes data transfer/reception procedure. A protocol consists of multiple sequences.
Sequence	A unit of independent communication processing which can be started by executing the PMCR instruction of the ladder program. The sequence that is started will execute steps registered in its own sequence.
Step	A unit to execute any one of the followings: Send message, Receive message, Send message and receive message, Clear process for receive buffer, or Step wait. Up to 15 steps can be set per sequence.
Send message	A communication frame (command) sent to an external general-purpose device. A send message is read from the step in the sequence, and sent to the external general-purpose device.
Receive message	A communication frame (command) sent from an external general-purpose device. A receive message is read from a step in a sequence and is compared with data received from an external general-purpose device.
Matrix	A matrix is used when an external general-purpose device sends multiple types of communications frames (responses). Two or more communication frames can be registered in one matrix.
Case	A unit to register two or more communication frames (response) to the matrix. One communication frame is registered as one case. Up to 15 types of cases can be registered per matrix.

3. Remarks

- (1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing safety circuit in order to ensure safety and minimize risks of abnormal occurrence.
- (2) To ensure system safety, always read and heed the information provided in all Safety Precautions, Precautions for Safe Use, and Precaution for Correct Use of manuals for each device used in the system.
- (3) The users are 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 of or whole part of this document without the permission of OMRON Corporation.
- (5) This document provides the latest information as of April 2013. The information on this manual is subject to change for improvement without notice.

The following notation is used in this document.

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



Precautions for Safe Use

Indicates precautions on what to do and what not to do to ensure using the product safely.



Precautions for Correct Use

Indicates precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Provides useful information.

Additional information to increase understanding or make operation easier.

Symbols



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



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

4. Overview

This document describes the procedure for connecting the RFID Reader/Writer (V750 Series) of OMRON Corporation (hereinafter referred to as OMRON) with the CJ2-series Programmable Controller + Serial Communication Unit (hereinafter referred to as the PLC), and provides the procedure for checking their connection.

Refer to the serial communications settings described in 6. Serial Communications Settings and 7. Connection Procedure to understand the setting method and key points to connect the devices via serial communications.

The user program in the prepared CX-Programmer project file and the protocol data in the prepared CX-Protocol project file are used to check the serial connection by sending/receiving the message of "Read product type and version (sequence No. 900)" to/from the destination device.

Prepare the latest CX-Programmer project file and CX-Protocol project file beforehand. To obtain the file, contact your OMRON representative.

Name	File name	Version
CX-Programmer project file (extension: cxp)	OMRON_V750_PMCR232C_EV102.cxp	Ver.1.02
CX-Programmer project file (extension: psw)	OMRON_V750_PMCR_EV100.psw	Ver.1.00

*Hereinafter, the CX-Programmer project file is referred to as the "project file".

The user program in the project file is referred to as the "ladder program" or "program".

The CX-Protocol project file is referred to as the "protocol macro data".

Caution

This document aims to explain the wiring method and communications settings necessary to connect the corresponding devices and provide the setting procedure. The program used in this document is designed to check if the connection was properly established, and is not designed to be constantly used at a site. Therefore, functionality and performances are not sufficiently taken into consideration. When you construct an actual system, please use the wiring method, communications settings and setting procedure described in this document as a reference and design a new program according to your application needs.



5. Applicable Devices and Support Software

5.1. Applicable Devices

The applicable devices are given below.

Manufacturer	Name	Model
OMRON	CJ2-series CPU Unit	CJ2-CPU
OMRON	Serial Communications Unit	CJ1W-SCU1-V1 CJ1W-SCU2
OMRON	RFID Reader/Writer (complies with FCC and EN)	V750-BA50C04-US
OMRON	Antenna	V740-HS01
OMRON	Antenna Cable	V740-A01 M



Additional Information

As applicable devices above, the devices with the models and versions listed in Section 5.2. are actually used in this document to describe the procedure for connecting devices and checking the connection.

You cannot use devices with versions lower than the versions listed in Section 5.2.

To use the above devices with versions not listed in Section 5.2 or versions higher than those listed in Section 5.2, check the differences in the specifications by referring to the manuals before operating the devices.

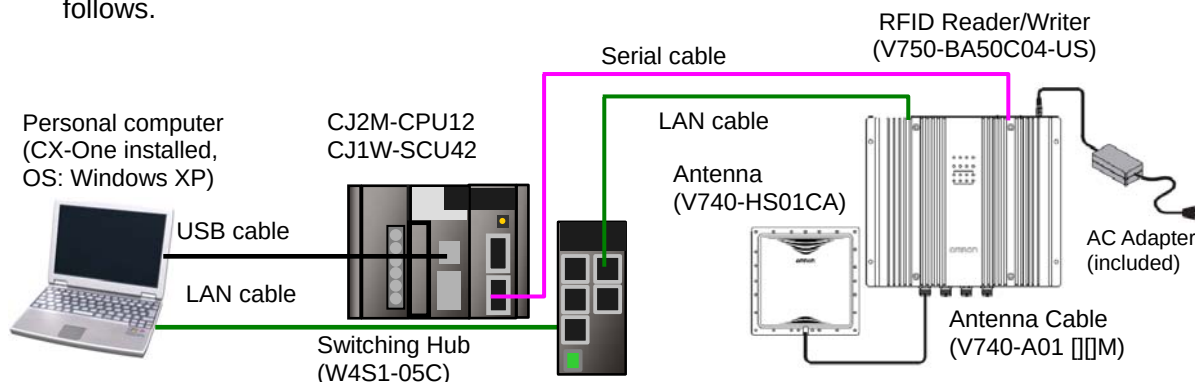


Additional Information

This document describes the procedure to establish the network connection. Except for the connection procedure, it does not provide information on operation, installation or wiring method. It also does not describe the function or operation of the devices. Refer to the manuals or contact your OMRON representative.

5.2. Device Configuration

The hardware components to reproduce the connection procedure of this document are as follows.



Manufacturer	Name	Model	Version
OMRON	Serial Communications Unit	CJ1W-SCU42	Ver.2.0
OMRON	Switching Hub	W4S1-05C	Ver.1.0
OMRON	CPU Unit	CJ2M-CPU12	Ver.2.0
OMRON	Power Supply Unit	CJ1W-PA202	
OMRON	CX-One	CXONE-AL□□C-V4 /AL□□D-V4	Ver.4.xx
OMRON	CX-Programmer	(Included in CX-One)	Ver.9.41
OMRON	CX-Protocol	(Included in CX-One)	Ver.1.96
OMRON	CX-Programmer project file (ladder program)	OMRON_V750_PMCR232 C_EV102.cxp	Ver.1.02
OMRON	CX-Programmer project file (protocol macro data)	OMRON_V750_PMCR_EV 100.psw	Ver.1.00
-	Personal computer (English OS:Windows XP)	-	
-	USB cable (USB 2.0 type B connector)	-	
-	Serial cable (RS-232C)	-	
-	LAN cable (for setting)	-	
OMRON	RFID Reader/Writer	V750-BA50C04-US	Ver.102- 102-103-0
OMRON	Antenna (Circular) (4 max.)	V740-HS01CA	
OMRON	Antenna Cable	V740-A01 □□M	
OMRON	AC Adapter (Included)	-	



Precautions for Correct Use

Prepare the latest project file and protocol macro data beforehand.
(To obtain the files, contact your OMRON representative.)



Precautions for Correct Use

Update the CX-Programmer to the version specified in this section or higher version using the auto update function. If a version not specified in this section is used, the procedures described in Section 6 and subsequent sections may not be applicable. In that case, use the equivalent procedures described in the CX-Programmer Operation Manual (Cat.No. W446).



Additional Information

It may not be possible to reproduce the same operation with different devices or versions. Check the configuration, model and version. If they are different from your configuration. Contact your OMRON representative.



Additional Information

For information on the serial cable (RS-232C), refer to 3-4 *RS-232C and RS-422A/485 Wiring* in the *CJ-series Serial Communications Boards and Serial Communications Units Operation Manual* (Cat.No. W336).



Additional Information

The system configuration in this document uses USB for the connection between the personal computer and PLC.

6. Serial Communications Settings

This section provides the specifications of the communications parameters and cable wiring that are set in this document.



Additional Information

To perform communications without using the settings specified in this section, you need to modify the program. For details on the program, refer to 9. *Program*.

6.1. Serial Communications Settings

The settings required for serial communications are given below.

6.1.1. Communications Settings between the Personal Computer and the RFID Reader/Writer

The setting example below is used to explain the setting procedure of the RFID Reader/Writer by using the personal computer.

Setting item	Personal computer used for setting	RFID Reader/Writer
IP address	192.168.1.1	192.168.1.200 (Default)
Subnet mask	255.255.255.0	255.255.255.0 (Default)
Gateway	---.---.---.---	192.168.1.254 (Default)

*In this document, the gateway setting is unnecessary because the connection is made in the same segment.

6.1.2. Communications Settings between the Serial Unit and the RFID Reader/Writer

The settings for serial communications are as follows:

Setting item	Serial Communications Unit	RFID Reader/Writer
Unit number	0	-
Communications (connection) port	Port 2 (RS-232C)	-
Serial communications mode	Protocol macro	-
Data length	7 bits (Default)	7 bits (Default)
Stop bits	2 bits (Default)	2 bits (Default)
Parity	Even (Default)	Even (Default)
Baud rate	57,600 bps	57,600 bps (Default)
Protocol macro Transmission mode	Full-duplex	-
Terminator	-	[CR][LF] (Fixed)



Precautions for Correct Use

This document describes the procedure for setting the CJ1W-SCU42 Serial Communications Unit when unit number 0 and communications port 2 are used. To connect devices under different conditions, refer to 9. *Program* and create a program by changing the allocation areas and PMCR control word.

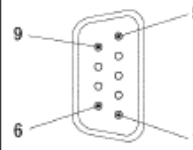
6.2. Cable Wiring Diagram

For details on the cable wiring, refer to *Section 3 Installation and Wiring* of the *CJ-series Serial Communications Boards and Serial Communications Units Operation Manual* (Cat.No. W336) and *Section 4 Diagnosis and Maintenance-Wiring* for cable of *V750-series UHF RFID System User's Manual*(Cat.No. Z235). Check the connector configuration and pin assignment for wiring.

■Connector configuration and pin assignment

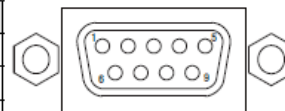
<OMRON CJ1W-SCU42> Applicable connector: D-sub 9 pin

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

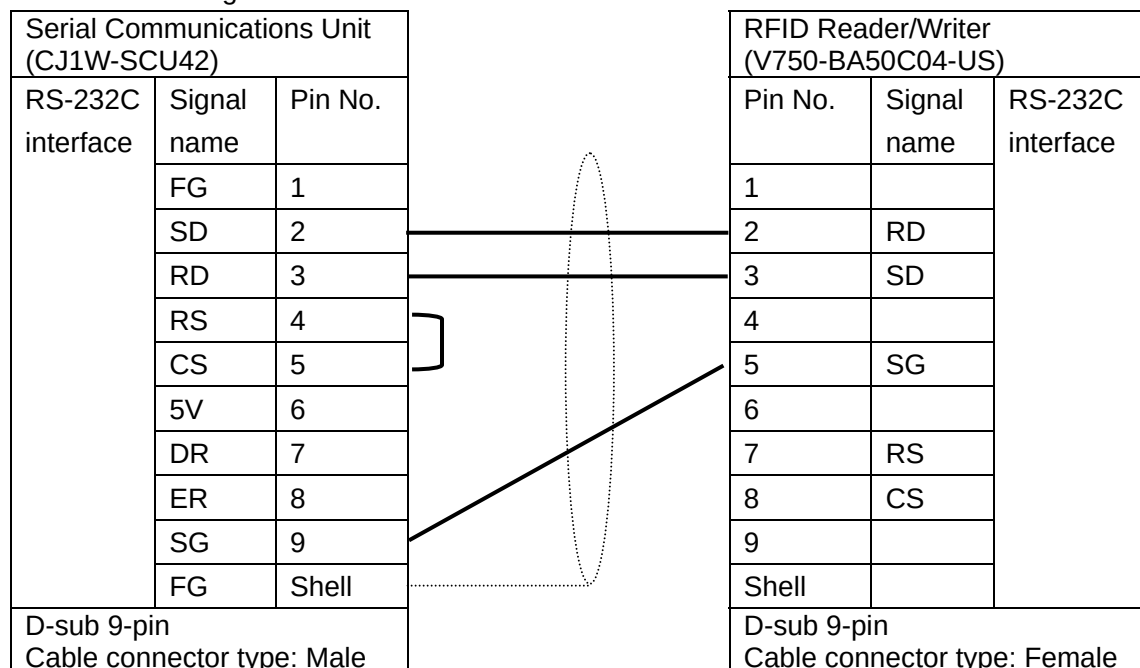


<OMRON V750-BA50C04-US> Applicable connector: D-sub 9 pin

Pin No.	Name	Function	I/O
1	---	---	---
2	RD	Receive Data	IN
3	SD	Send Data	OUT
4	---	---	---
5	SG	Signal Ground	---
6	---	---	---
7	RS	Request to Send	OUT
8	CS	Clear to Send	IN
9	---	---	---



■Cable/Pin arrangement

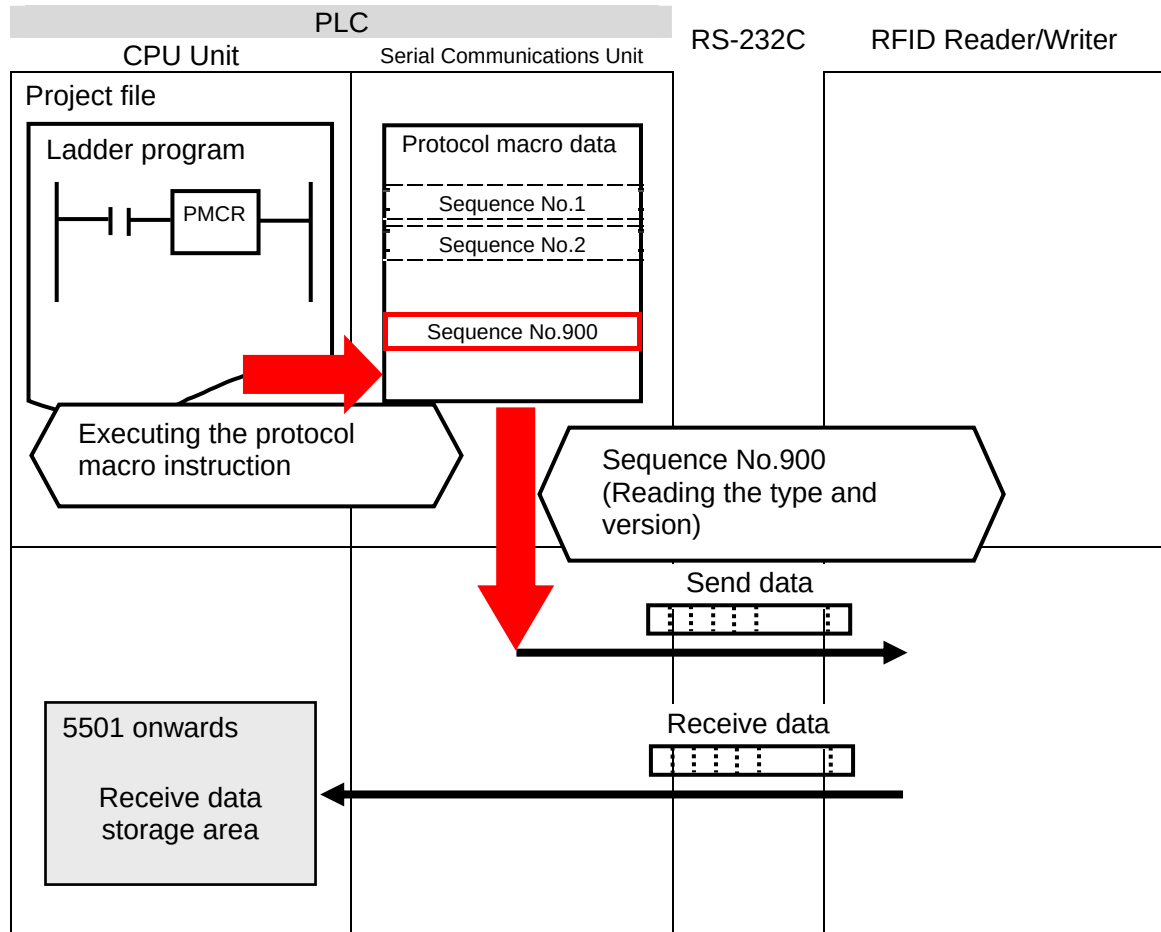


6.3. Example of Checking Connection

Example of Checking Connection

This document uses an example of the ladder program and protocol macro data in which the PLC sends/receives a message to/from the RFID Reader/Writer.

The PLC and RFID Reader/Writer send and receive the message of "Sequence No. 900 (read product type and version)". The following figure outlines the operation.



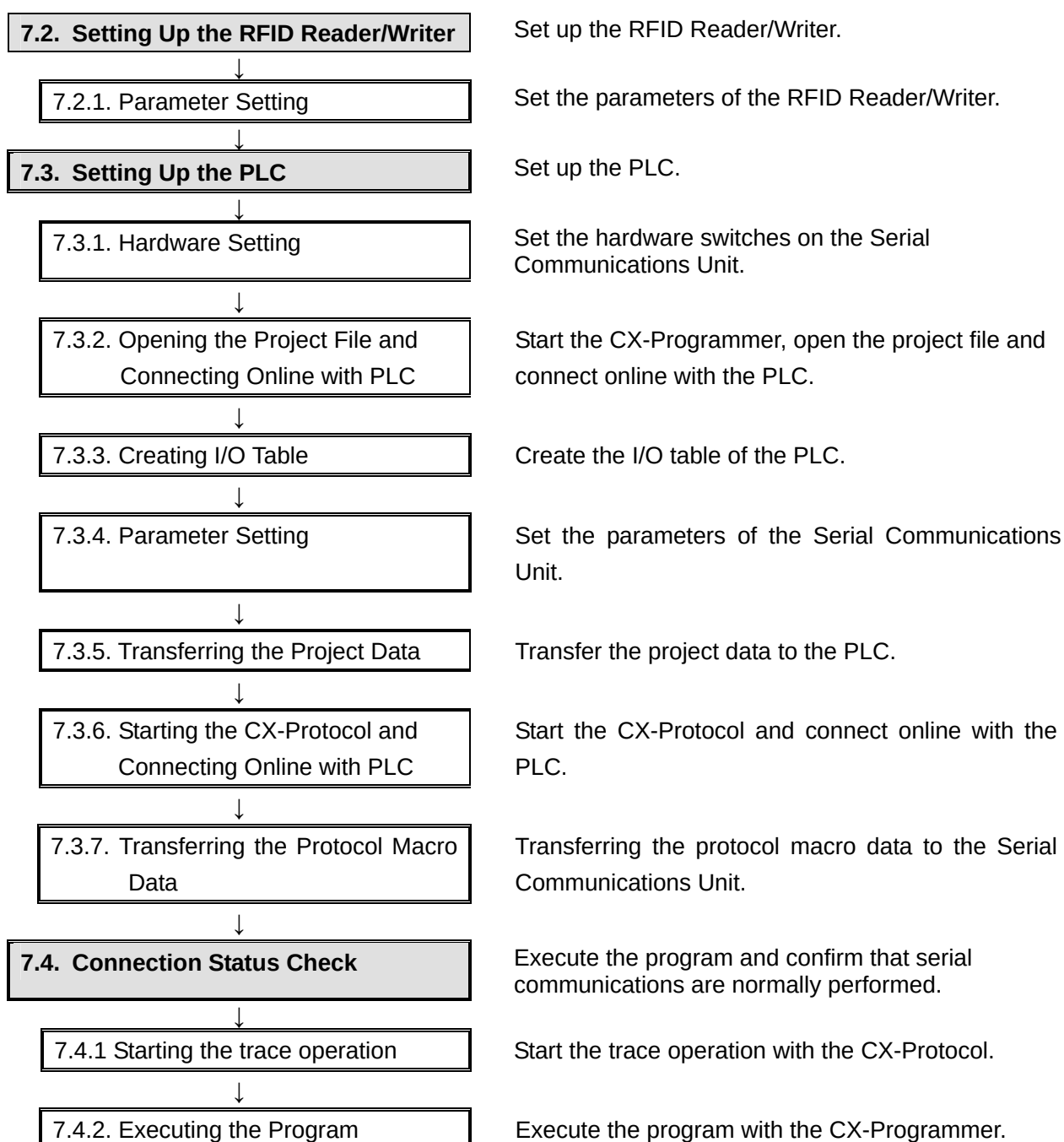
7. Connection Procedure

This section explains the procedure for connecting the RFID Reader/Writer to the PLC via serial communications.

This document explains the procedures for setting up the PLC and RFID Reader/Writer from the factory default setting. For the initialization, refer to *Section 8 Initialization Method*.

7.1. Work Flow

Take the following steps to connect the RFID Reader/Writer to the PLC via serial communications.





7.4.3. Checking the Trace Data

Check the trace data of the CX-Protocol and confirm that correct data are sent and received.



7.4.4. Checking the Receive Data

Confirm that the correct data are written to the I/O memory of the PLC by using the CX-Programmer.

7.2. Setting Up the RFID Reader/Writer

Set up the RFID Reader/Writer.

7.2.1. Parameter Setting

Set the parameters of the RFID Reader/Writer. For the setting, a web browser (e.g., Internet Explore) that can execute Java software is required. Install the software when necessary so that Java software can operate.

Set the IP address of the personal computer to 192.168.1.1.



Precautions for Correct Use

Use a personal computer to set the parameters of the RFID Reader/Writer.

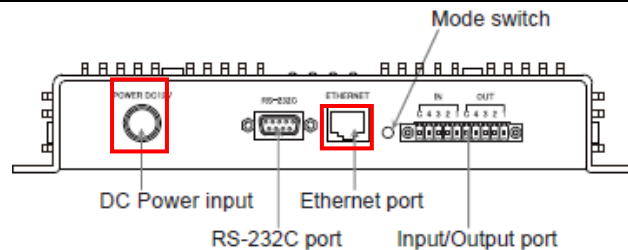
Note that you may need to change the settings of the personal computer depending on the status of the personal computer.

- 1 Connect the antenna to the antenna port on the side of the RFID Reader/Writer.



(Side of RFID Reader/Writer)

- 2 Connect the Switching Hub to the Ethernet port on the other side of the RFID Reader/Writer using the LAN cable. Connect the included AC Adapter cable to the DC power input.



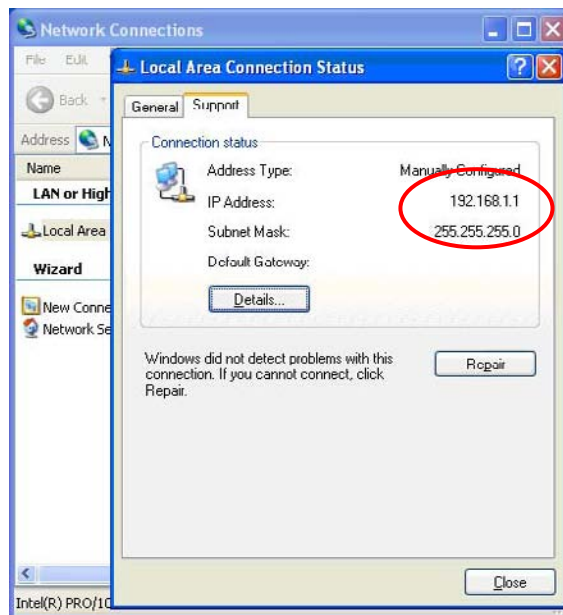
(Other side of RFID Reader/Writer)

- 3 Start Internet Explorer from the personal computer that is connected to the Switching Hub.

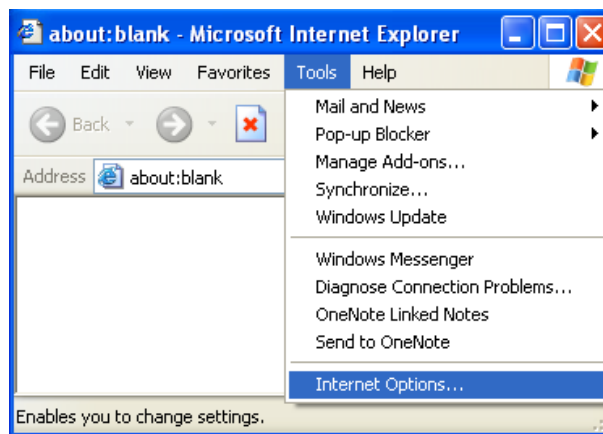


*Set the IP address of the personal computer to 192.168.1.1. Use the following procedure to check the IP address of the personal computer.

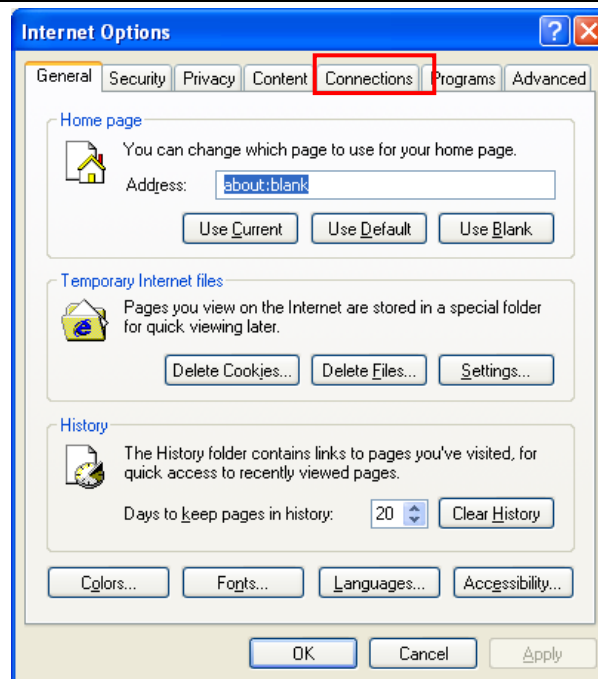
- (1) Click **Network Connections** on the Control Panel.
- (2) Double-click **Local Area Connection** on the Network Connections.
- (3) Click the Support Tab on the Local Area Connection Status Dialog Box.
- (4) Confirm that the IP address is 192.168.1.1.



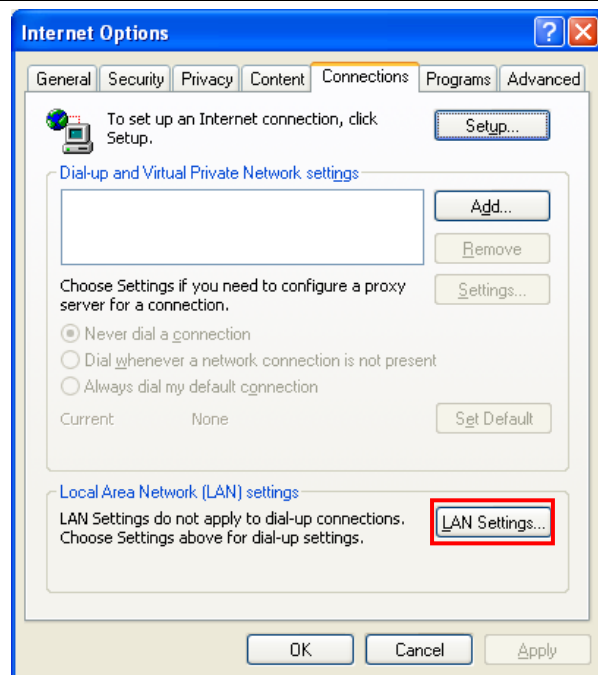
- 4 Click **Internet Options** from the Tools Menu of the Internet Explorer.



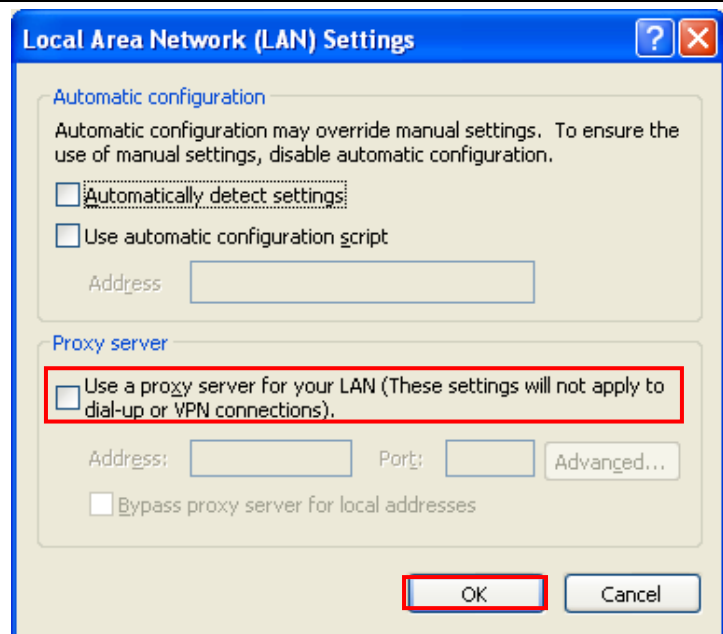
- 5 The Internet Options Dialog Box is displayed. Select the Connections Tab.



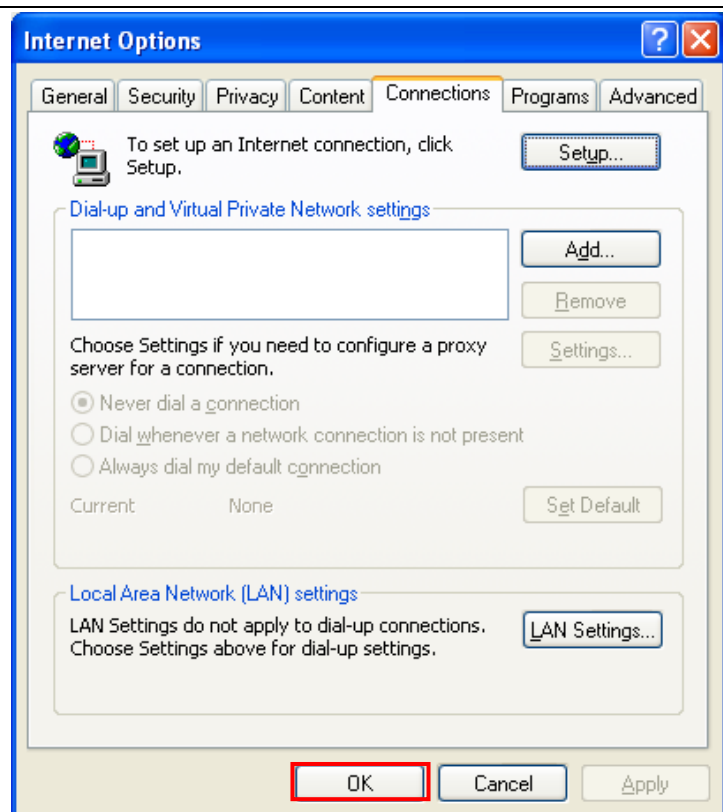
- 6 On the Internet Options Dialog Box, click the LAN Settings Button.



- 7 The Local Area Network (LAN) Settings Dialog Box is displayed.
Confirm that the *Use a proxy server for your LAN* Check Box is cleared from the Proxy server Field, and click the **OK** Button.



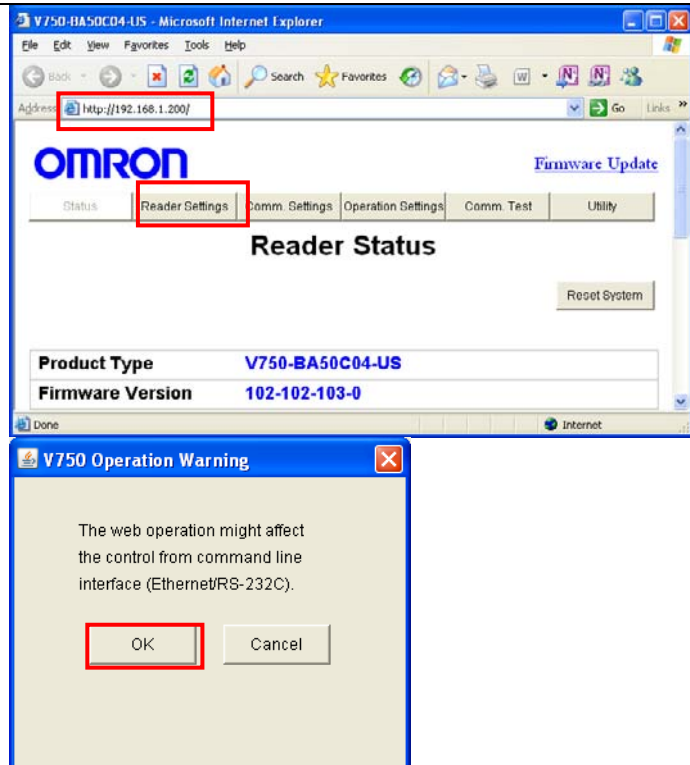
- 8 Click the **OK** Button on the Internet Options Dialog Box.



- 9 Type `http://192.168.1.200` / in the address bar of Internet Explorer.

The Reader Status Window is displayed. Click the **Reader Settings** Button.

The V750 Operation Warning Dialog Box is displayed. Click the **OK** Button.

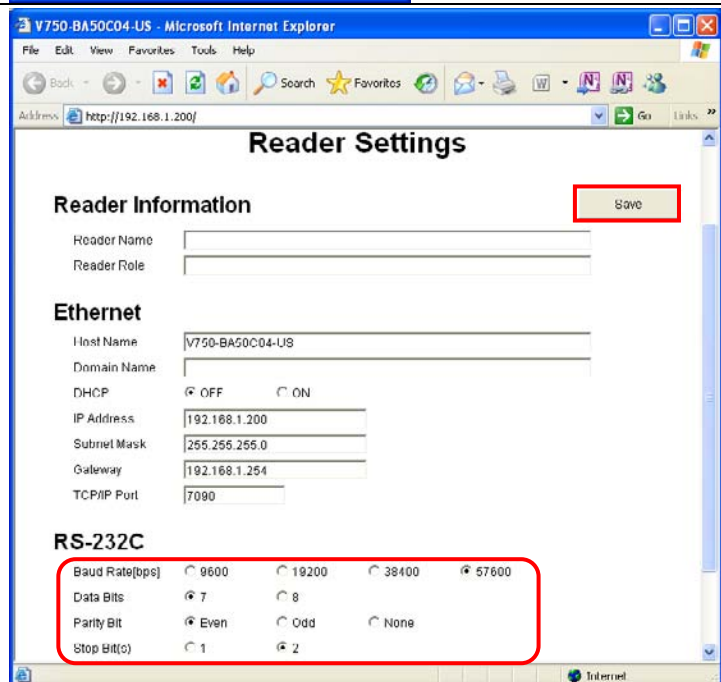


- 10 The Reader Settings Window shows the RS-232C settings. Confirm that the settings are made as follows (all default values).

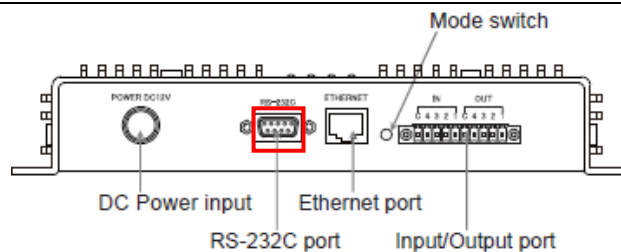
Baud rate : 57600 bps
Data length: 7 bits
Parity : Even
Stop bit : 2 bits

*If the settings are different from the above, change the corresponding set values.

*To change the settings, select a button of the corresponding parameter value. (Refer to the figure on the right for change pattern.)
After changing, click the **Save** Button. When saving the settings is completed, cycle the power supply to the RFID Reader/Writer.



- 11 Connect the Serial Communications Unit to the RS-232C port on the other side of the RFID Reader/Writer using the Serial cable.



(Other side of RFID Reader/Writer)

7.3. Setting Up the PLC

Set up the PLC.

7.3.1. Hardware Setting

Set the hardware switches of the Serial Communications Unit.



Precautions for Correct Use

Make sure that the power supply is OFF when you perform the settings.

- 1 Make sure that the power supply to the PLC is OFF when you perform the settings.

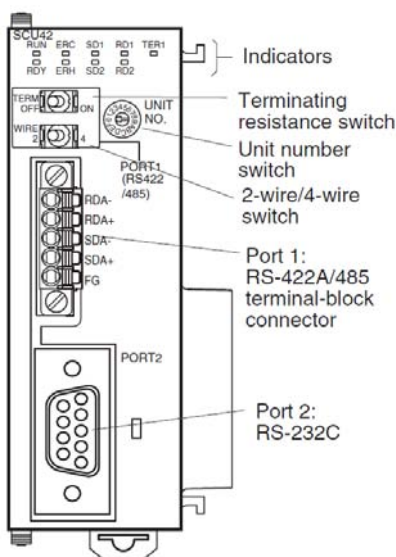
*If the power supply is turned ON, settings may not be applicable in the following procedure.

Refer to the right figure and check the hardware switches on the front panel of the Serial Communications Unit.

Connect the serial cable (RS-232C) to Port 2 connector.

*This setting is required to use the Port 2 of Serial Communications Unit.

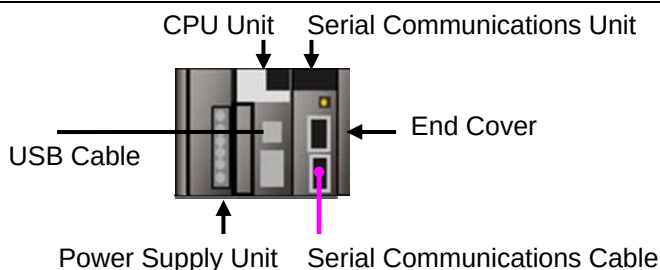
CJ1W-SCU42



- 2 Set the Unit No. Switch to 0. (The unit number is factory-set to 0.)



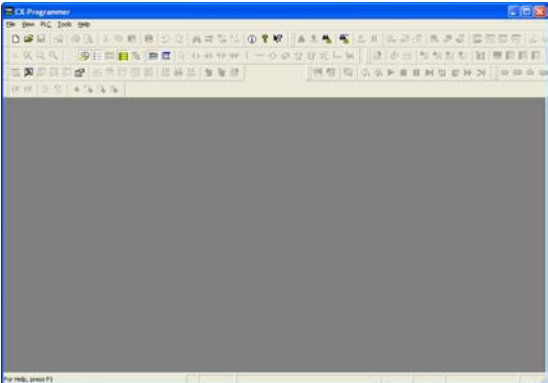
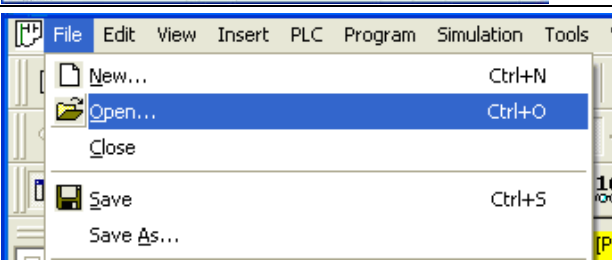
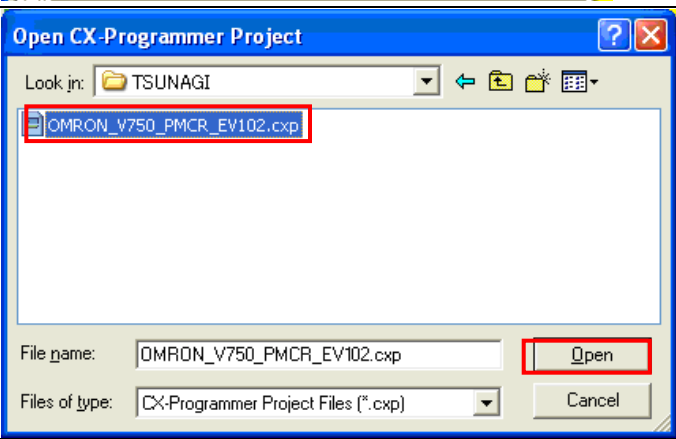
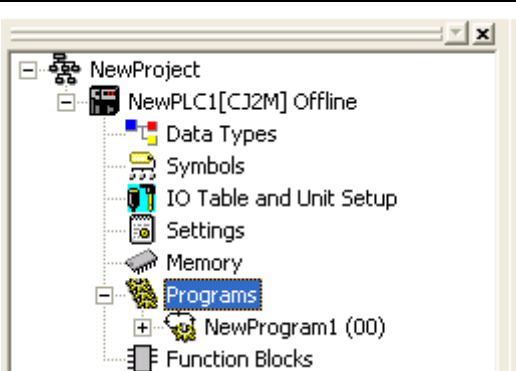
- 3 Connect the Serial Communications Unit to the PLC as shown on the right. Connect the serial communications cable and USB cable, and turn ON the power supply to the PLC.



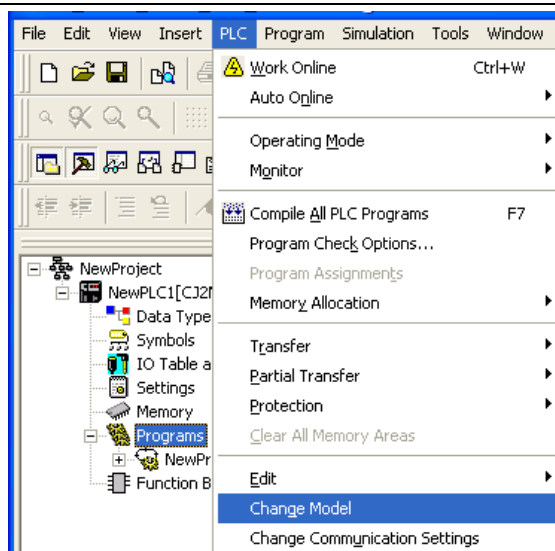
7.3.2. Opening the Project File and Connecting Online with PLC

Start the CX-Programmer, read the project file and connect online with the PLC.

Install the CX-Programmer and USB driver in the personal computer beforehand.

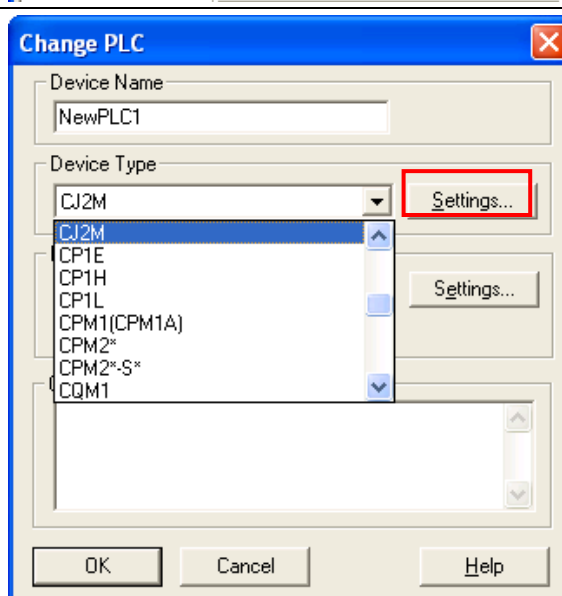
1	Confirm that the PC and PLC are connected with the USB cable and turn ON the power supply to the PLC. Start the CX-Programmer. *If a confirmation dialog for an access right is displayed at start, select to start.	
2	Select Open from the File Menu.	
3	On the Open CX-Programmer Project Dialog Box, select the OMRON_V750_PMCR232C_EV102.cxp.cxp and click the Open Button. *Obtain the project file from OMRON.	
4	After opening the project file, select Programs in the project workspace.	 (Project workspace)

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



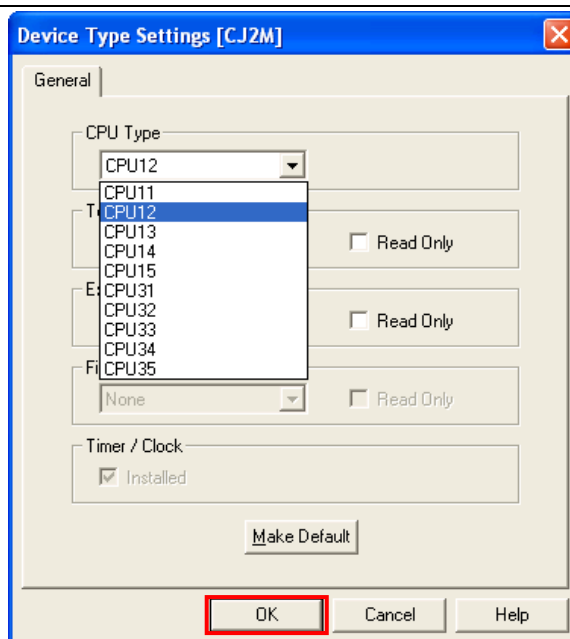
- 6 The Change PLC Dialog Box is displayed. Select a device type of the PLC to use from the pull-down list in the Device Type, and click the **Settings** Button.

*CJ2M is selected in this document.



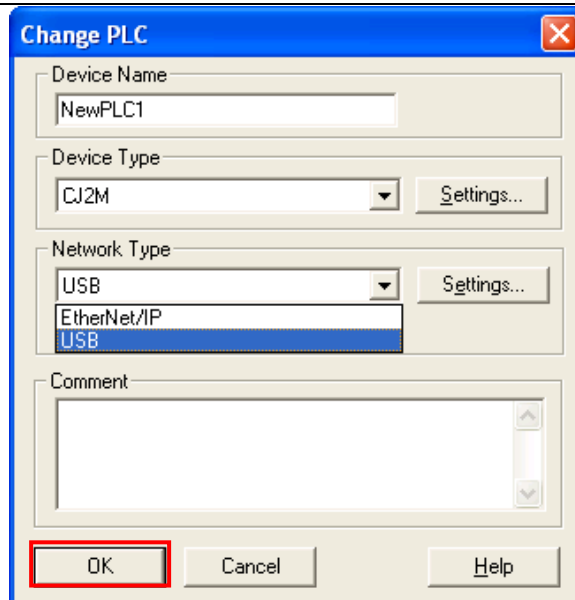
- 7 The Device Type Settings Dialog Box is displayed. Select a CPU type to use from the pull-down list in the CPU Type, and click the **OK** Button.

*CPU12 is selected in this document.

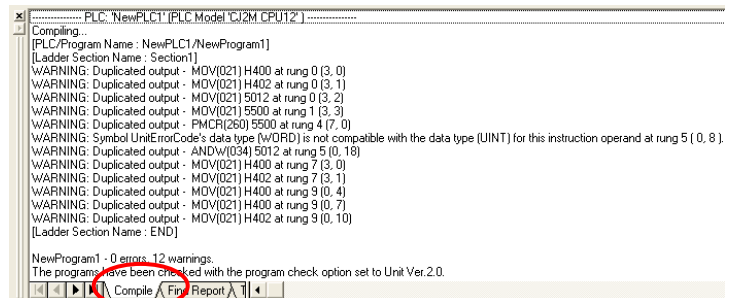
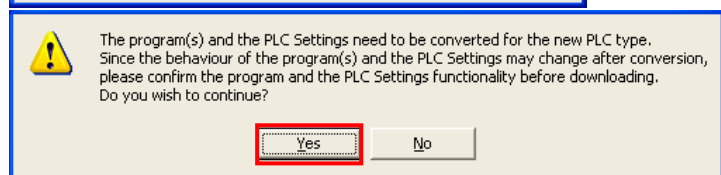


- 8 Confirm that the Network Type is set to USB on the Change PLC Dialog Box and click the **OK** Button.

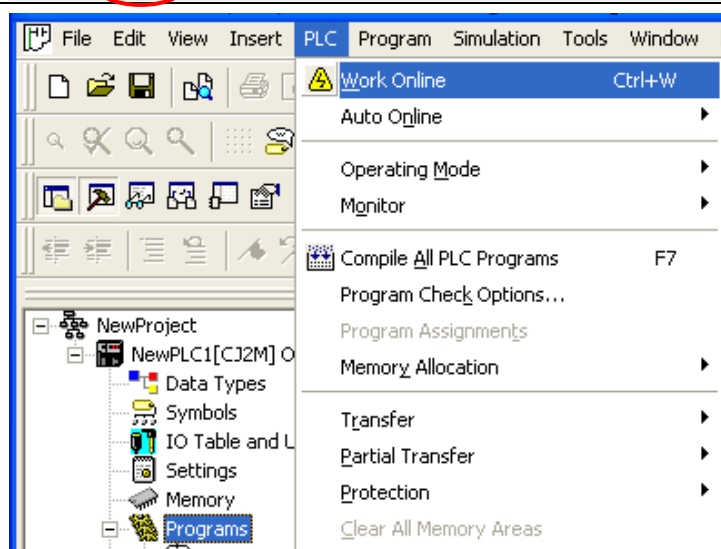
*When the Network Type is not set to USB, select USB from the pull-down list.



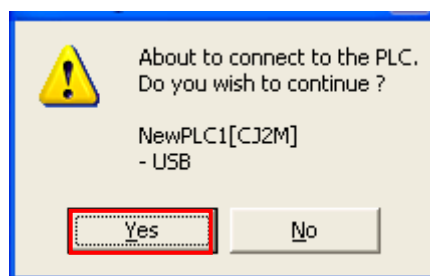
*If you changed the Device Type in step 6 or changed the CPU Type in step 7, the dialog box on the right will be displayed. Click the **Yes** Button. Confirm that the program was normally converted ("0 errors" must be shown). (Although duplicated output warnings were detected in the right dialog, they are not problems.)



- 9 Select **Programs** in the project workspace and select **Work Online** from the PLC Menu.



- 10 The dialog box on the right is displayed. Click the **Yes** Button.



- 11 Check that the CX-Programmer and the PLC are normally connected online.



*The icon  is selected during online connection.

Additional Information



If the CX-Programmer and PLC are not connected online, please check the connection of the cable. Or, return to step 5 and check the settings that were set in steps 6 to 8 and try to connect them again.



Additional Information

The dialogs explained in this document may not be displayed depending on the environmental setting of CX-Programmer.

This document explains the setting procedure when the setting item "Confirm all operations affecting the PLC" is selected.

7.3.3. Creating the I/O Table

Create the I/O table of the PLC.

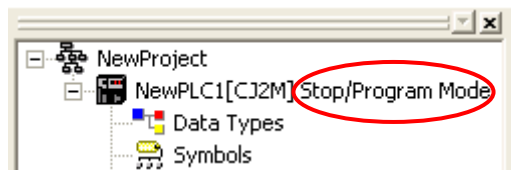
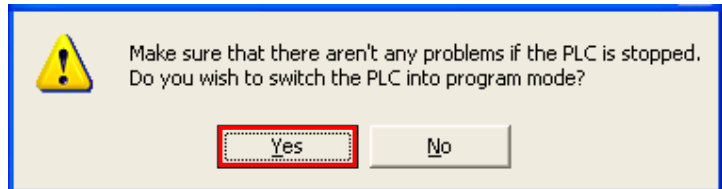
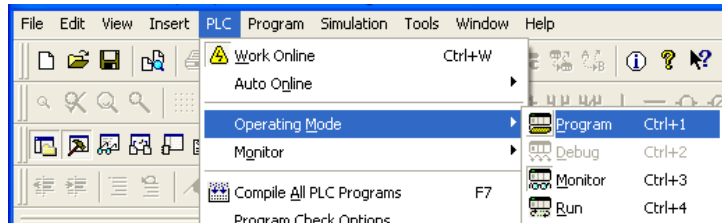
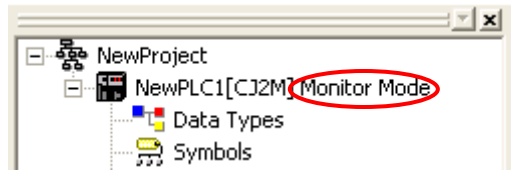
- 1 If the operating mode of the PLC is RUN Mode or Monitor Mode, change it to Program Mode by following steps (1) to (3).

(1) Select **Operating Mode - Program** from the PLC Menu of the CX-Programmer.

(2) The dialog box on the right is displayed. Click the **Yes** Button.

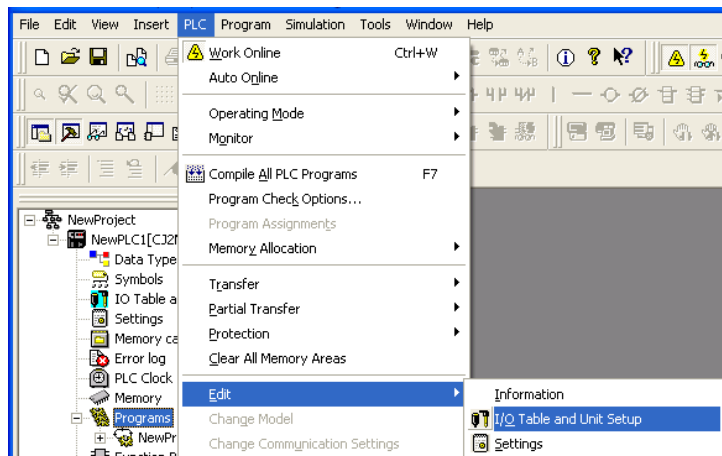
*Please refer to *Additional Information* on the previous page for the settings concerning the dialog display.

(3) Confirm that Stop/Program Mode is displayed on the right of the PLC model in the Project workspace of the CX-Programmer.

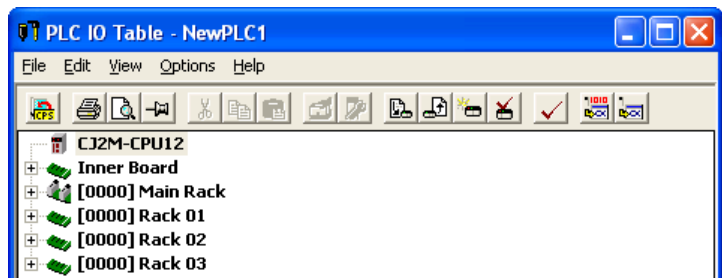


(Project workspace)

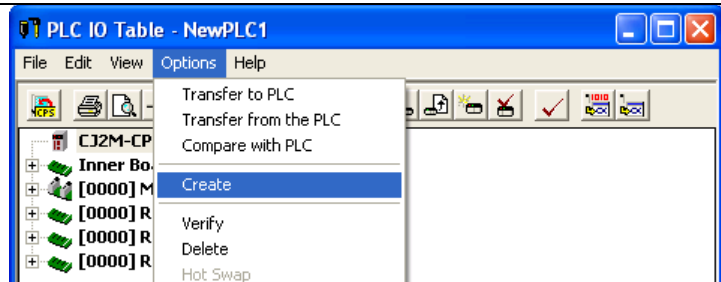
- 2 Select **Edit - I/O Table and Unit Setup** from the PLC Menu of the CX-Programmer.



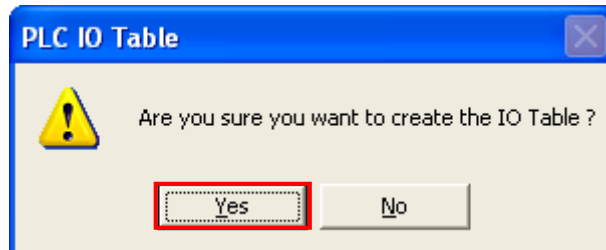
The PLC I/O Table Window is displayed.



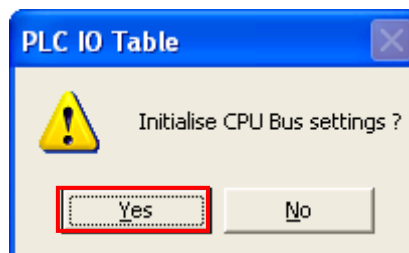
- 3 Select **Create** from the Options Menu of the PLC I/O Table Window.



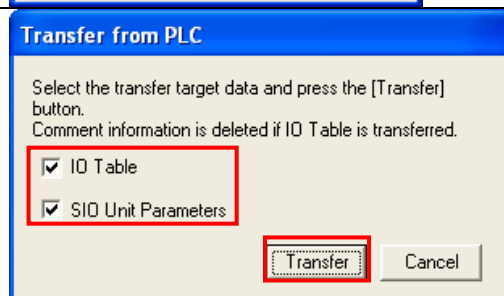
The dialog box on the right is displayed. Click the **Yes** Button.



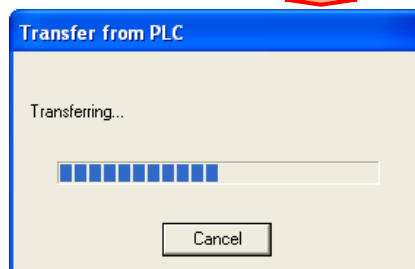
The dialog box on the right is displayed. Click the **Yes** Button.



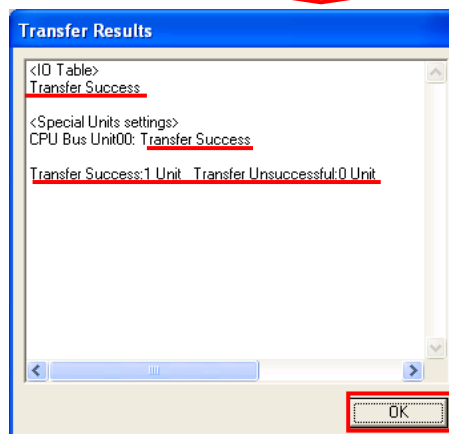
- 4 The Transfer from PLC Dialog Box is displayed. Select the *I/O Table* Check Box and *SIO Unit Parameters* Check Box, and click the **Transfer** Button.



When the transfer is completed, the Transfer Results Dialog Box is displayed.



Read the message in the dialog box to confirm that the transfer was normally executed.



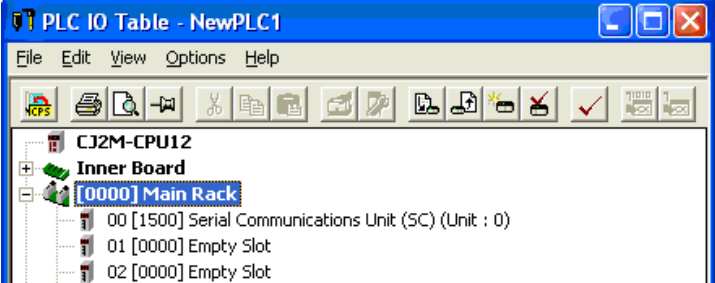
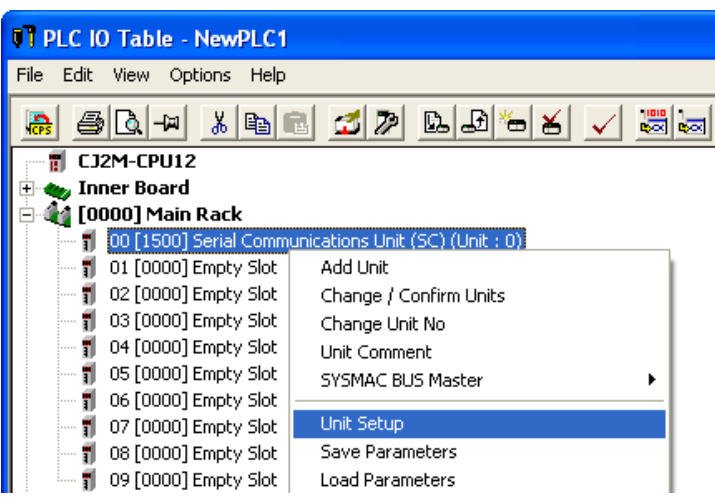
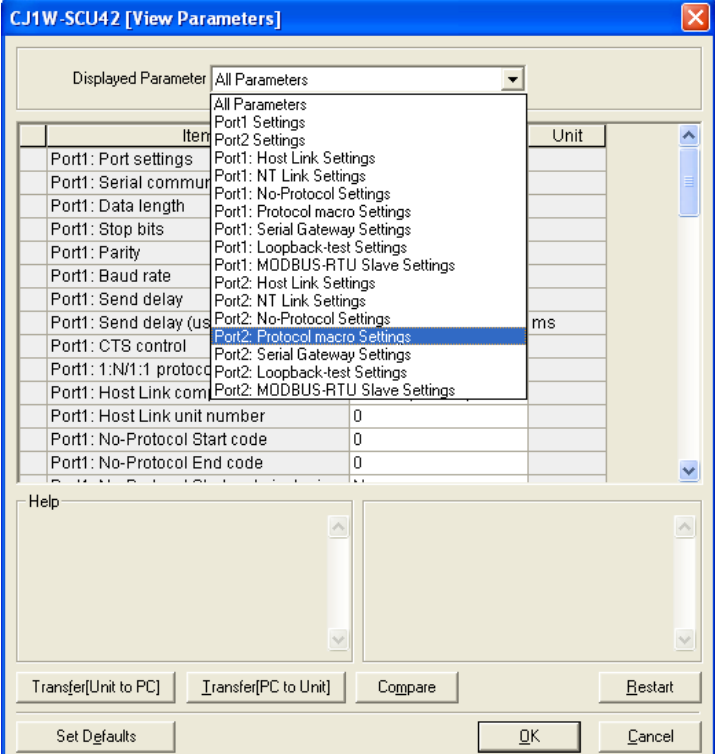
When the I/O table is created normally, the dialog box shows the following:

Transfer Success: 1 Unit
Transfer Unsuccessful: 0 Unit

Click the **OK** Button.

7.3.4. Parameter Setting

Set the parameters of the Serial Communications Unit.

1	Double-click the [0000] Main Rack on the PLC IO Table Window to display a tree.	
2	Right-click 00[1500]CJ1W-SCU42, and select the Unit Setup.	
3	The View Parameters Dialog Box is displayed. Select Port2: Protocol macro Settings from Displayed Parameter. *This setting is required to use the Port 2 of Serial Communications Unit.	

- 4 The setting items of the Port 2: Protocol macro Settings are listed as shown in the right figure. (The figure shows default values.)

CJ1W-SCU42 [View Parameters]

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 timeo	0	ms
Port2: Serial Gateway send start timeou	0	ms
Port2: Protocol macro Transmission m	Half-duplex	
Port2: Clearing/holding the contents of t	Clear	
Port2: Link word specification data exch	On-request I/O refe	
Port2: Maximum number of bytes in prot	0	Byte

- 5 Select *User settings* from Port settings.

Set the following parameters in the same way.

- Serial communications mode: Protocol macro
- Data length: 7 bits
- Stop bit: 2 bits
- Parity: Even
- Baud rate: 57600 bps
- Protocol macro Transmission method: Full-duplex
- *Use the default settings for other parameters.

CJ1W-SCU42 [View Parameters]

Displayed Parameter Port2: Protocol macro Settings

Item	Set Value	Unit
Port2: Port settings	User settings	
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 timeo	0	ms
Port2: Serial Gateway send start timeou	0	ms
Port2: Protocol macro Transmission m	Half-duplex	
Port2: Clearing/holding the contents of t	Clear	
Port2: Link word specification data exch	On-request I/O refe	
Port2: Maximum number of bytes in prot	0	Byte

- 6 Confirm that all parameters are set for port 2 in step 5. Click the **Transfer [PC to Unit]** Button.

CJ1W-SCU42 [View Parameters]

Displayed Parameter Port2: Protocol macro Settings

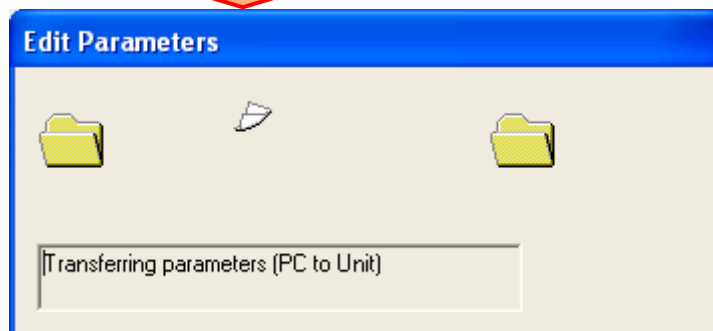
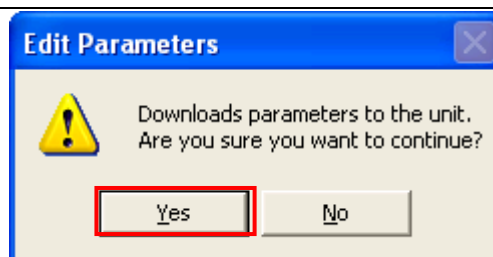
Item	Set Value	Unit
Port2: Port settings	User settings	
Port2: Serial communications mode	Protocol macro	
Port2: Data length	7 bits	
Port2: Stop bits	2 bits	
Port2: Parity	Even	
Port2: Baud rate	57600bps	
Port2: Serial Gateway Response timeo	0	ms
Port2: Serial Gateway send start timeou	0	ms
Port2: Protocol macro Transmission m	Full-duplex	
Port2: Clearing/holding the contents of t	Clear	
Port2: Link word specification data exch	On-request I/O refe	
Port2: Maximum number of bytes in prot	0	Byte

Help

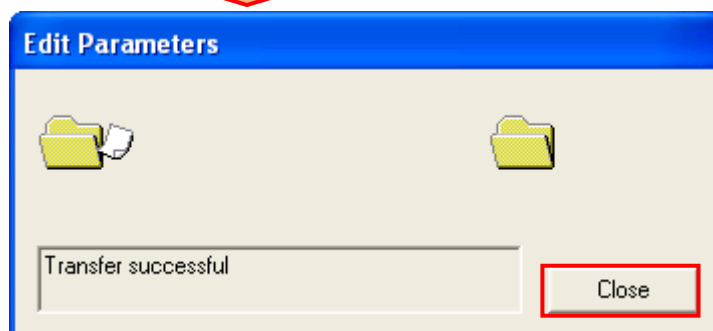
Transfer[Unit to PC] **Transfer[PC to Unit]** Compare Restart

Set Defaults OK Cancel

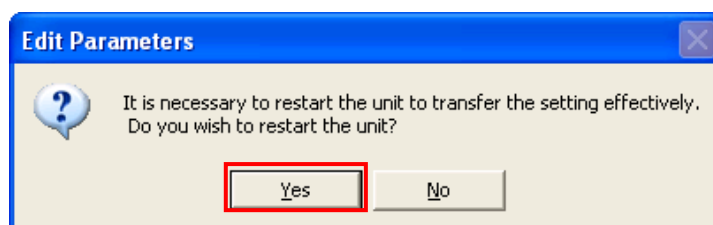
- 7 The dialog box on the right is displayed. Click the **Yes** Button.



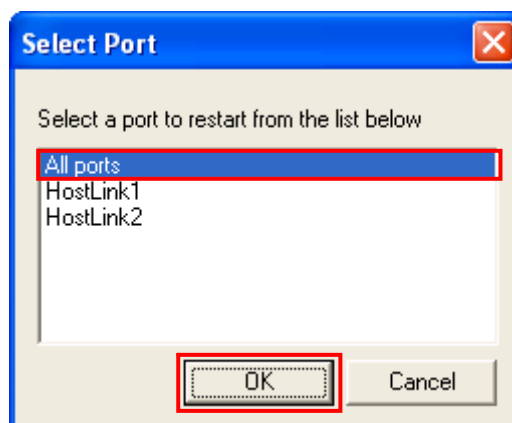
The dialog box on the right is displayed when the transfer is completed. Click the **Close** Button.



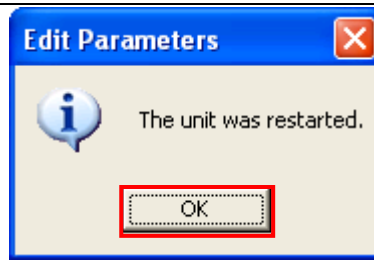
- 8 The dialog box on the right is displayed. Click the **Yes** Button.



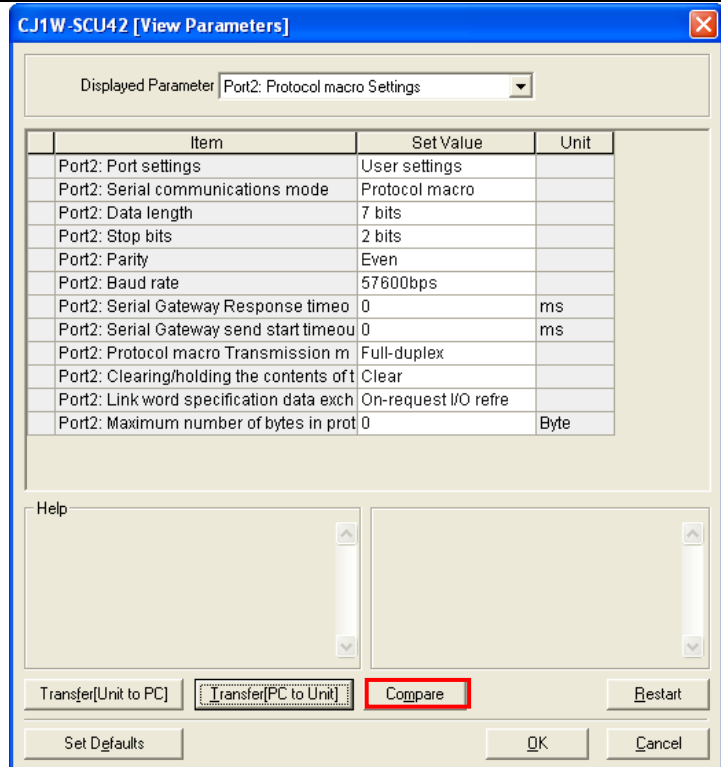
The Select Port Dialog Box is displayed. Select *All ports* and click the **OK** Button.



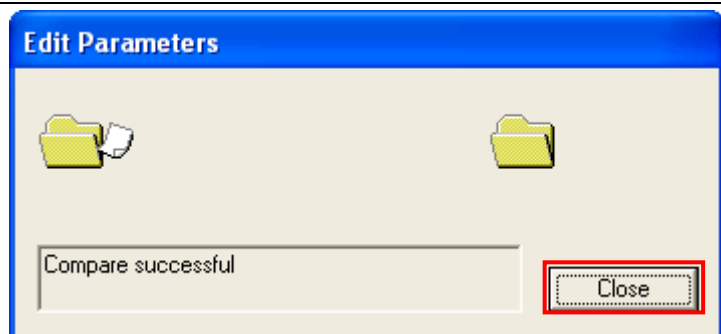
- 9 The dialog box on the right is displayed. Click the **OK** Button.



- 10 Click the **Compare** Button on the View Parameters Dialog Box.



- 11 The dialog box on the right is displayed if the parameter settings match. Click the **Close** Button.



12 Click the **OK** Button on the View Parameters Dialog Box.

Close the Edit Parameters Dialog Box and the PLC IO Table.

CJ1W-SCU42 [View Parameters]

Displayed Parameter Port2: Protocol macro Settings

Item	Set Value	Read Value (Compare)	
Port2: Port settings	User settings	User settings	
Port2: Serial communications mode	Protocol macro	Protocol macro	
Port2: Data length	7 bits	7 bits	
Port2: Stop bits	2 bits	2 bits	
Port2: Parity	Even	Even	
Port2: Baud rate	57600bps	57600bps	
Port2: Serial Gateway Response timeo	0	0	m:
Port2: Serial Gateway send start timeou	0	0	m:
Port2: Protocol macro Transmission m	Full-duplex	Full-duplex	
Port2: Clearing/holding the contents of t	Clear	Clear	
Port2: Link word specification data exch	On-request I/O refre	On-request I/O refreshi	
Port2: Maximum number of bytes in prot	0	0	By

Help

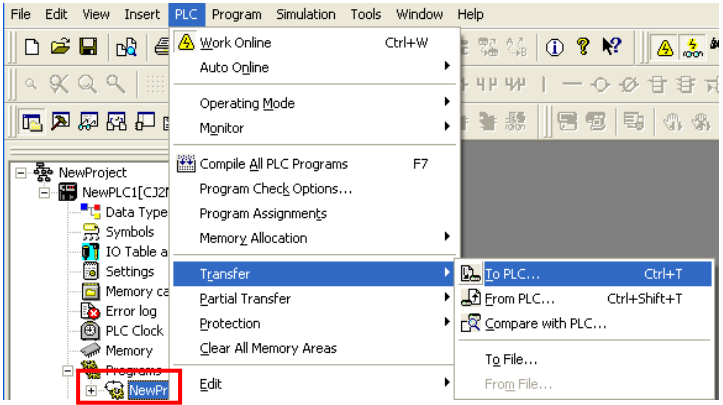
Transfer[Unit to PC] Transfer[PC to Unit] Compare Restart

Set Defaults **OK** Cancel

7.3.5. Transferring the Project Data

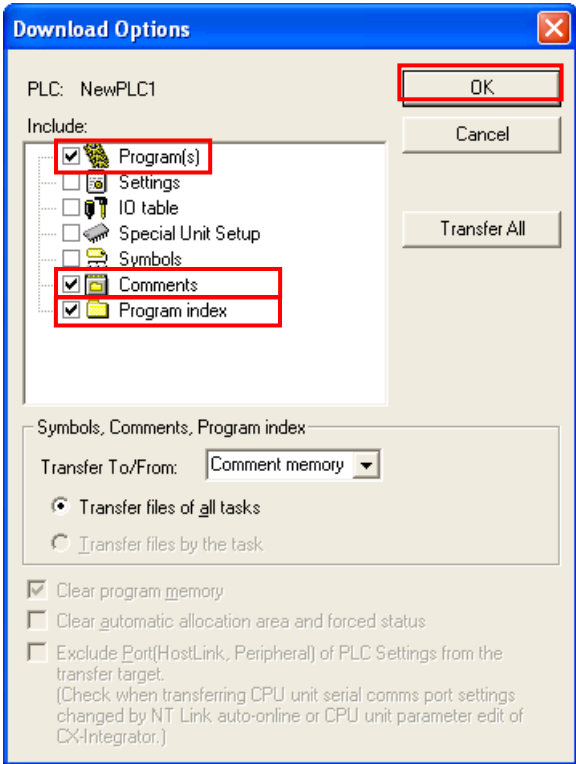
Transfer the project data to the PLC.

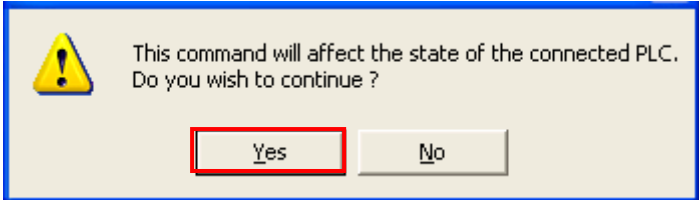
- 1 Select **Programs** on the project workspace of CX-programmer, and select **Transfer - To PLC** from the PLC Menu.


- 2 Select the *Program(s)* Check Box, *Comments* Check Box, and *Program index* Check Box, and click the **OK** Button.

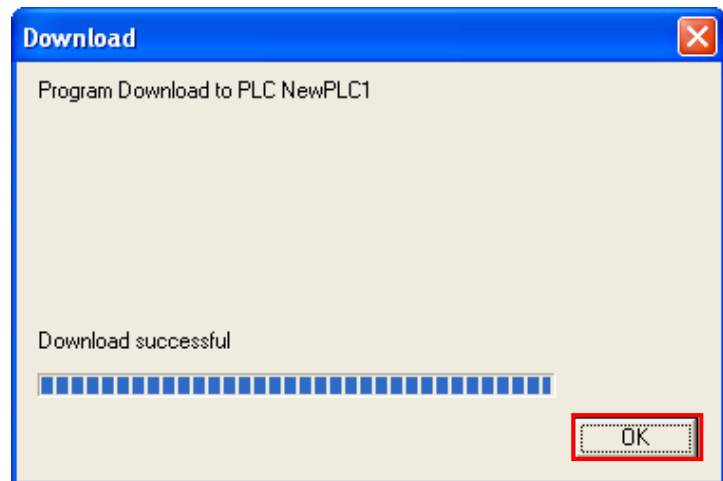
*Transferring the I/O table and Special Unit Setup is unnecessary here because they were transferred in Sections 7.3.3 and 7.3.4.

*The *Comments* Check Box and the *Program index* Check Box may not be displayed depending on the device type. In such a case, select the *Program(s)* Check Box only and transfer the project data.

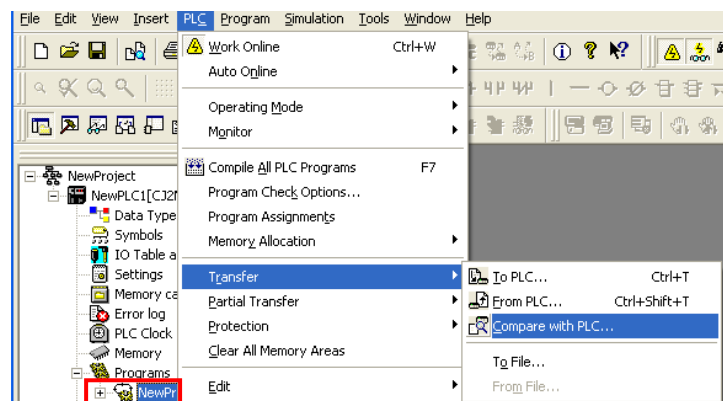

- 3 The dialog box on the right is displayed. Click the **Yes** Button.



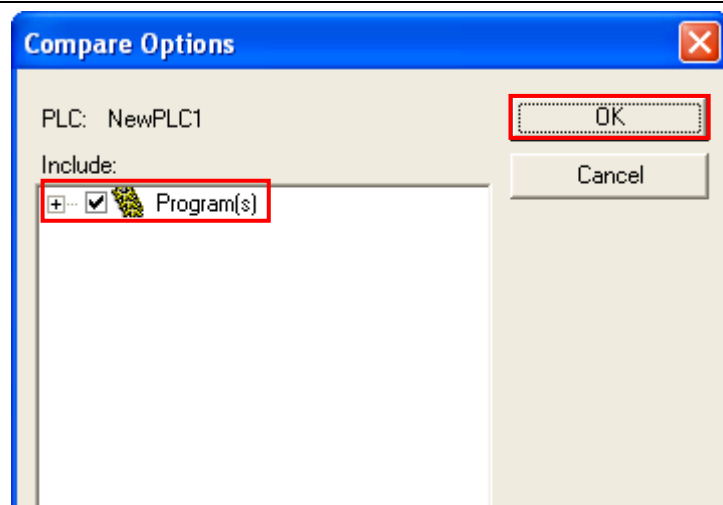
- 4 The dialog box on the right is displayed (stating "Download successful") when the transfer is completed. Click the **OK** Button.



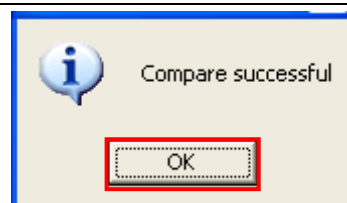
- 5 Select **Programs** in the project workspace, and select **Transfer - Compare with PLC** from the PLC Menu.



- 6 Select the *Program(s)* Check Box and click the **OK** Button.



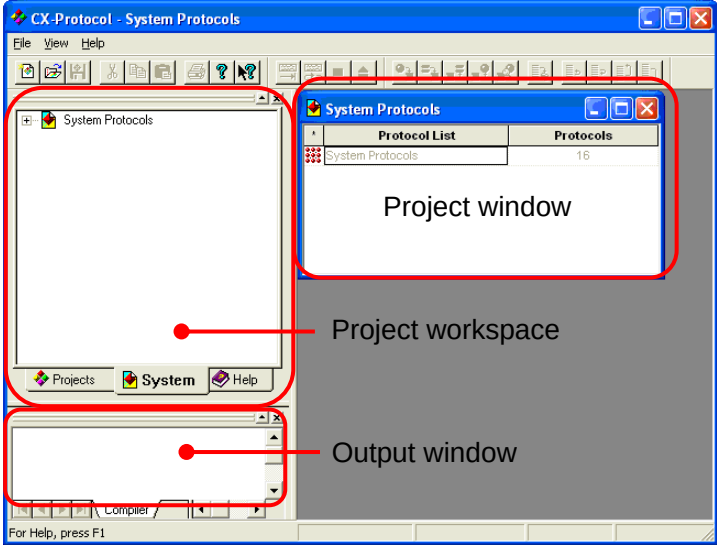
- 7 Confirm that a message stating "Compare successful" is displayed, and click the **OK** Button.



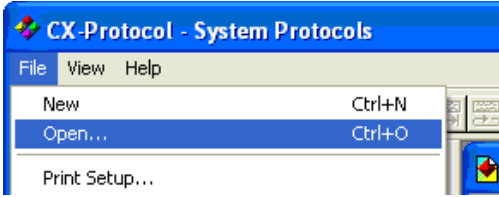
7.3.6. Starting the CX-Protocol and Connecting Online

Start the CX-Protocol and connect online with the PLC.

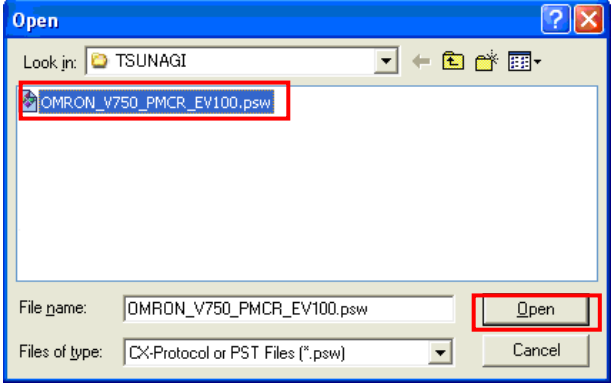
- 1 Start the CX-Protocol.

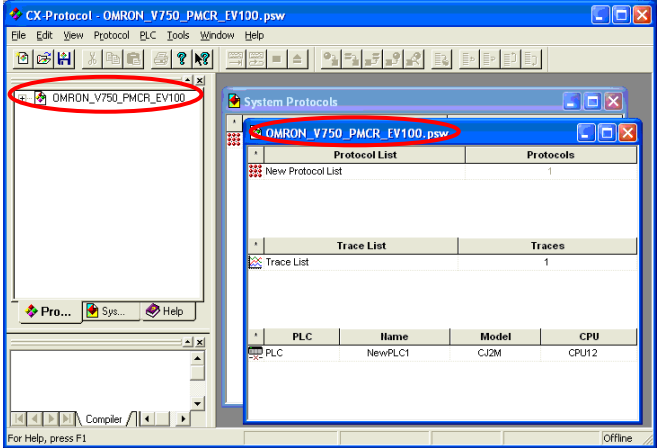


(CX-Protocol)
- 2 Select **Open** from the File Menu.

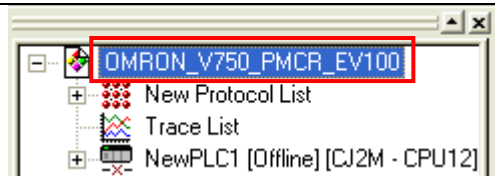

- 3 The Open Dialog Box is displayed. Select OMRON_V750_PMCR_EV100.psw and click the **Open** Button.

*Obtain the protocol macro data from OMRON.

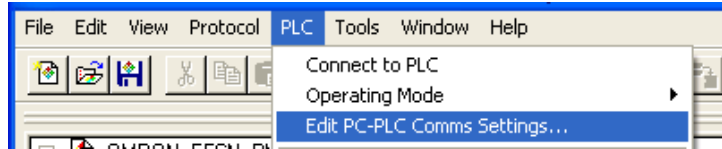

- 4 The project workspace and the Project Window show the protocol macro data that was read.



- 5 Double-click the OMRON_V750_PMCR_EV100 on the project workspace to open the tree.

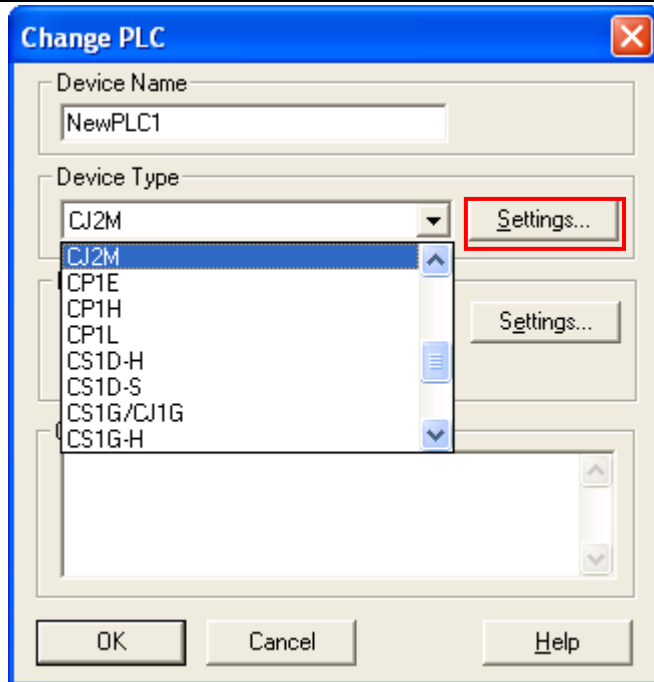


- 6 Select **Edit PC-PLC Comms Settings** from the PLC Menu.



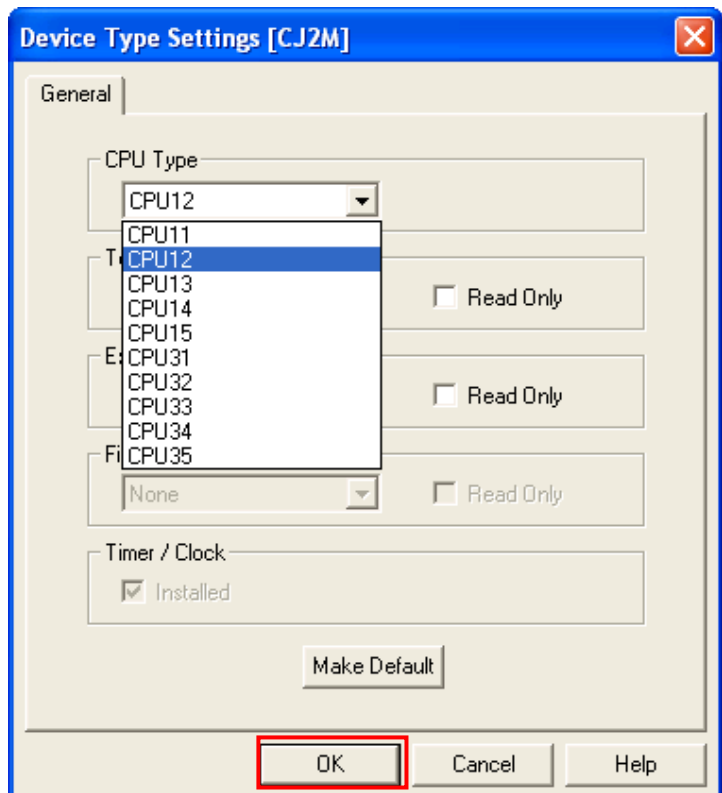
- 7 The Change PLC Dialog Box is displayed. Select a device type from the pull-down list and click the **Settings** Button.

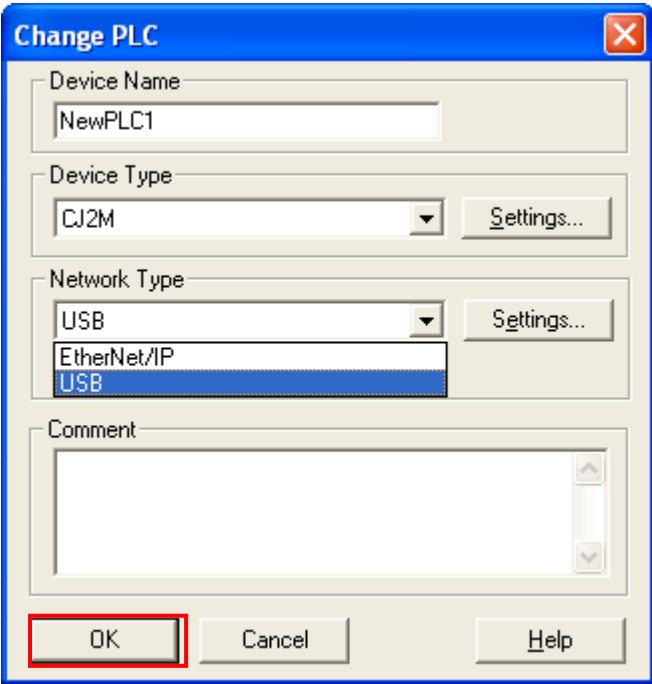
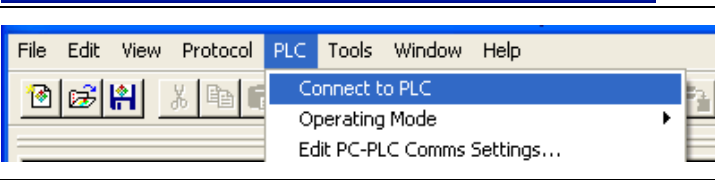
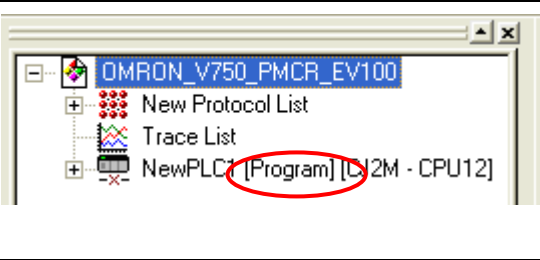
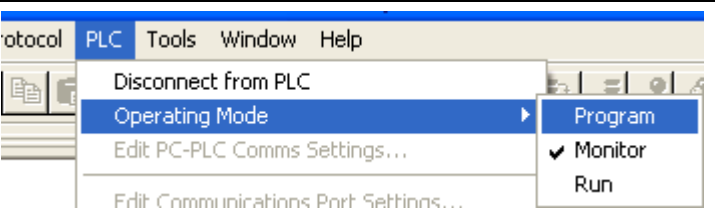
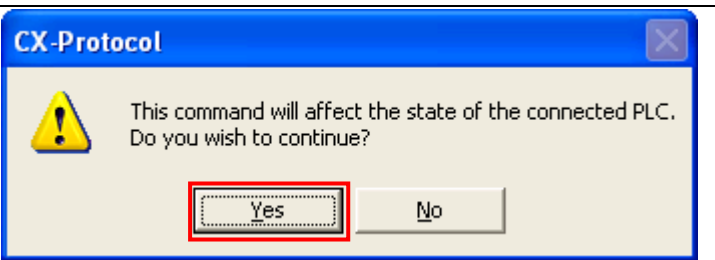
*CJ2M is used in this document.



- 8 The Device Type Settings Dialog Box is displayed. Select a CPU type from the pull-down list and click the **OK** Button.

*CPU12 is used in this document.

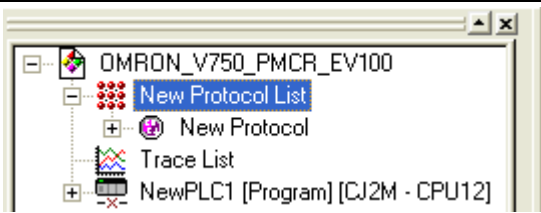


9	Confirm that the Network Type is set to USB on the Change PLC Dialog Box and click the OK Button. *If the Network Type is not set to USB, select <i>USB</i> from the pull-down list.	 The 'Change PLC' dialog box is shown. The 'Device Name' field contains 'NewPLC1'. The 'Device Type' dropdown is set to 'CJ2M'. The 'Network Type' dropdown is set to 'USB', with 'EtherNet/IP' and 'USB' visible in the list. The 'Comment' field is empty. The 'OK' button is highlighted with a red rectangle.
10	Select Connect to PLC from the PLC Menu.	 The 'PLC' menu is open, showing options: 'Connect to PLC', 'Operating Mode', and 'Edit PC-PLC Comms Settings...'. 'Connect to PLC' is highlighted.
11	Confirm that the PLC icon in the Project Workspace changed from Offline to Program and that Controller is connected online. *If Monitor or Run is displayed, follow steps 12 and 13 to change it to Program.	 The Project Workspace shows the hierarchy: OMRON_V750_PMCR_EV100 > New Protocol List > Trace List > NewPLC1. The 'NewPLC1' icon is circled in red and labeled '[Program] [CJ2M - CPU12]'.
12	If the operating mode is Monitor or Run, select Operating Mode - Program from the PLC Menu.	 The 'Operating Mode' submenu is open, showing options: 'Program', 'Monitor' (checked), and 'Run'. 'Program' is highlighted.
13	The dialog box on the right is displayed. Click the Yes Button. Confirm that the operating mode was changed to the Program mode as shown in step 11.	 The 'CX-Protocol' warning dialog box is shown. It 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 rectangle.

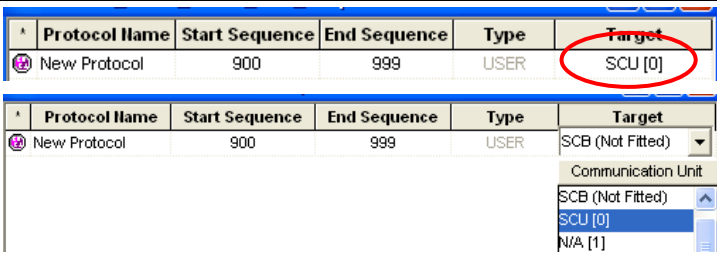
7.3.7. Transferring the Protocol Macro Data

Transfer the protocol macro data to the Serial Communications Unit.

- 1 Double-click the *New Protocol List* on the project workspace to open the tree.


- 2 The Project Window on the right is displayed. Confirm that SCU[0] was entered in the Target Column.

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



Protocol Name	Start Sequence	End Sequence	Type	Target
New Protocol	900	999	USER	SCU [0]

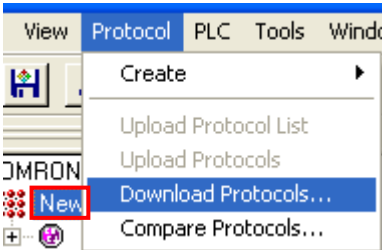
Protocol Name	Start Sequence	End Sequence	Type	Target
New Protocol	900	999	USER	SCB (Not Fitted)

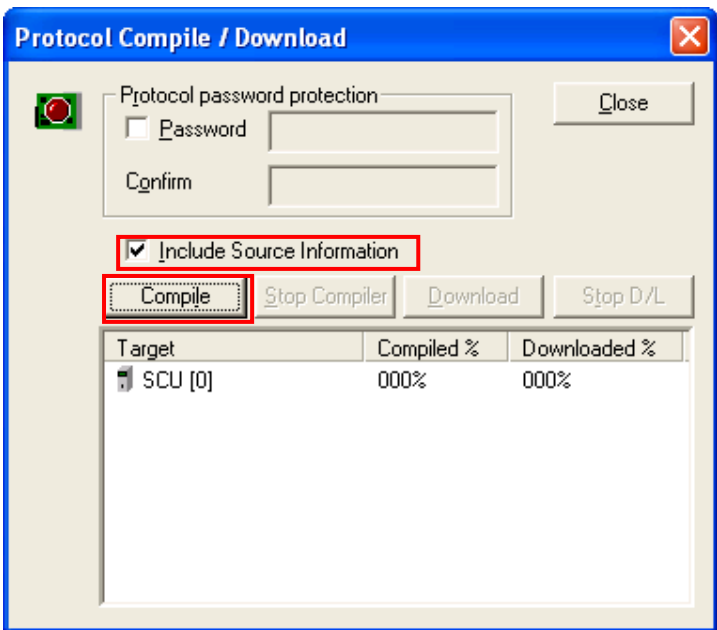
Communication Unit

SCB (Not Fitted)

SCU [0]

N/A [1]
- 3 Select *New Protocol List* and select **Download Protocols** from the Protocol Menu.


- 4 The dialog box on the right is displayed. Select the *Include Source Information* Check Box and click the **Compile** Button.



Protocol Compile / Download

Protocol password protection

☐ Password

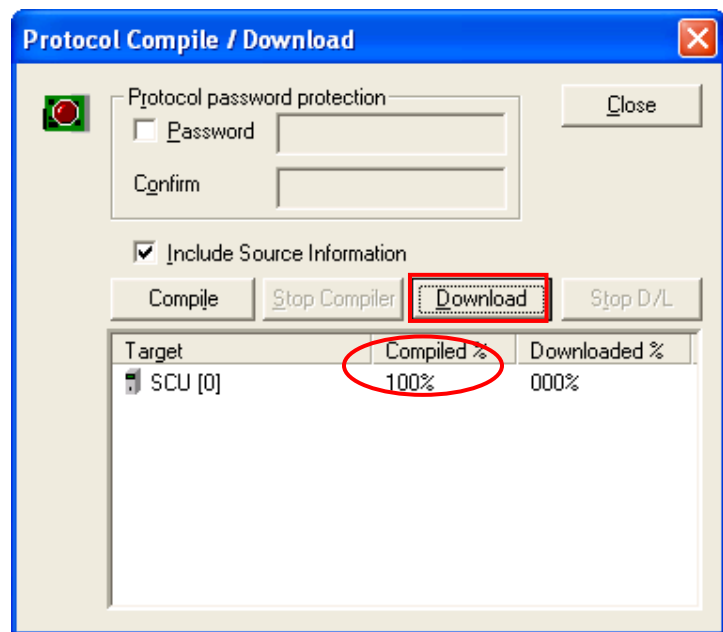
Confirm

☒ Include Source Information

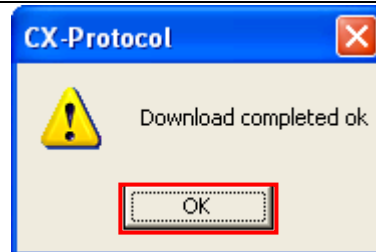
Compile Stop Compiler Download Stop D/L

Target	Compiled %	Downloaded %
SCU [0]	000%	000%

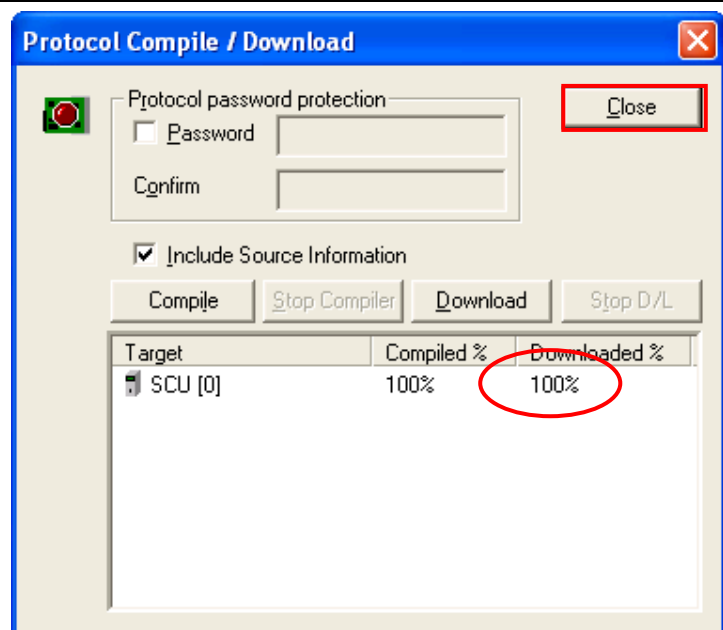
- 5 When 100% is displayed in the Compiled % Column, the compile operation is completed. After confirming that the compile operation is completed, click the **Download** Button.



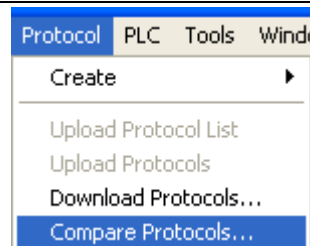
- 6 The dialog on the right is displayed. Click the **OK** Button.



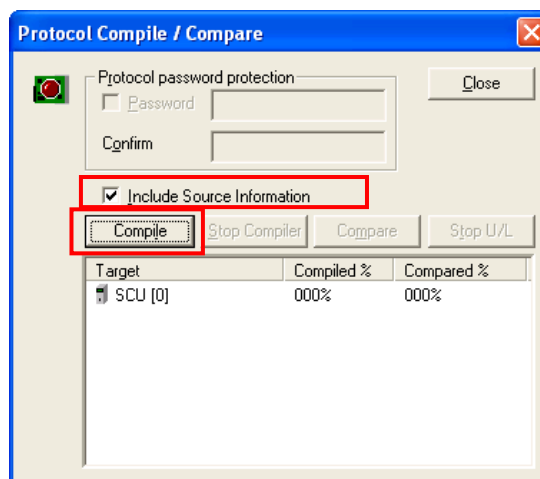
- 7 Check that 100% is displayed in the Downloaded % Column in the right figure, and click the **Close** Button.



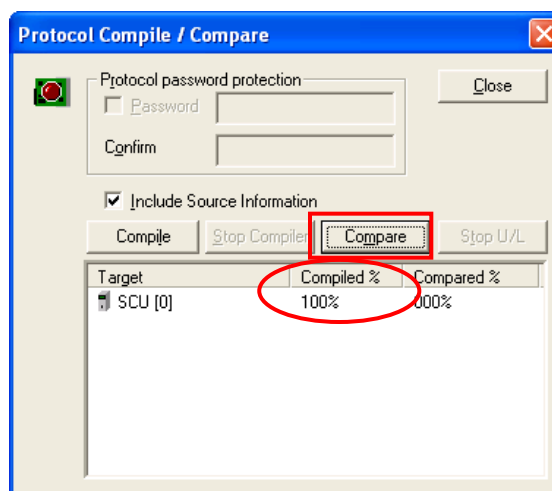
- 8 Select **Compare Protocols** from the Protocol Menu.



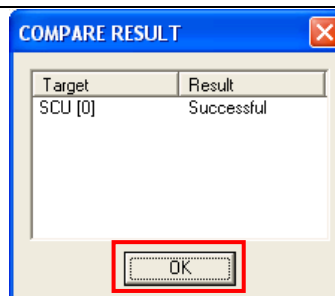
- 9 The dialog box on the right is displayed. Select the *Include Source Information* Check Box and click the **Compile** Button.



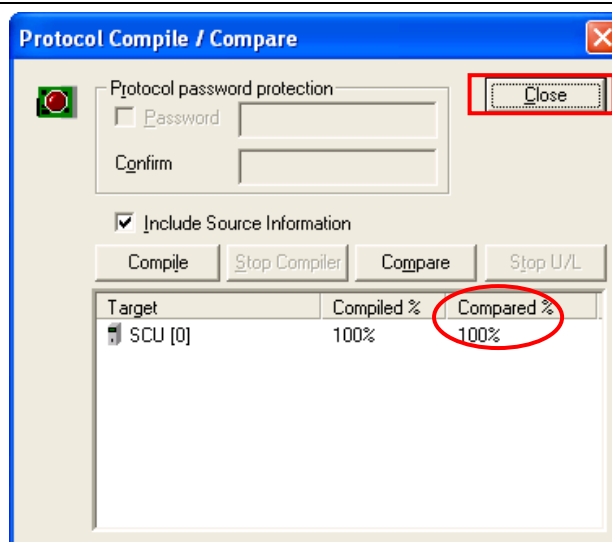
- 10 When 100% is displayed in the Compiled % Column, the compile operation is completed. After confirming that the compile operation is completed, click the **Compare** Button.



- 11 The dialog box on the right is displayed. Click the **OK** Button.



- 12 Check that 100% is displayed in the Compared % Column in the right figure, and click the **Close** Button.



7.1. Transferring the Project Data

Execute the program and confirm that serial communications are normally performed.

Caution

Confirm safety sufficiently before monitoring power flow and present value status in the Ladder Section window or when monitoring present values in the Watch window. If force-set/reset or set/reset operations are inadvertently performed by pressing short-cut keys, the devices connected to Output Units may malfunction, regardless of the operating mode of the CPU Unit.



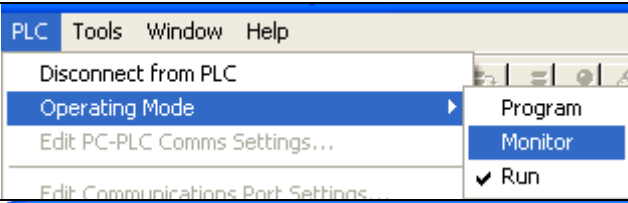
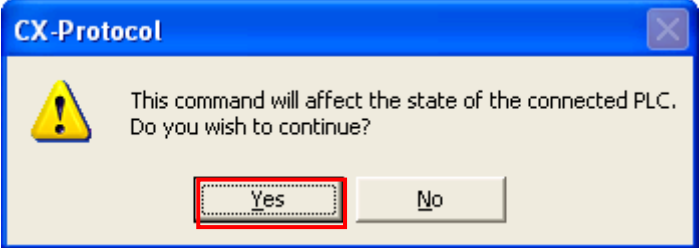
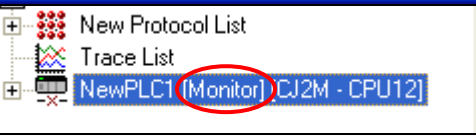
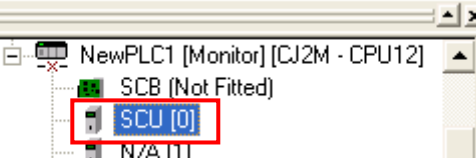
Precautions for Correct Use

Please confirm that the LAN cable is connected before proceeding to the following procedure.

If it is not connected, turn OFF the power to the devices, and then connect the LAN cable.

7.1.1. Starting the Trace Operation

Start the trace operation with the CX-Protocol.

1	Select Operating Mode – Monitor from the PLC Menu of the CX-Protocol.	
2	The dialog box on the right is displayed. Click the Yes Button.	
3	Confirm that the operating mode was changed to Monitor mode and double-click  NewPLC1.	
4	The  NewPLC1 tree is expanded. Select the Serial Communications Unit (SCU[0] in the right figure).	

5 Select the Trace 2 icon (🎯) on the Project Window.
(Confirm that Trace 2 is highlighted as shown on the right figure.)

*Trace 2 corresponds to port 2 of the Serial Communications Unit.

	Trace	Status
🎯	Trace 1	Not Tracing
🎯	Trace 2	Not Tracing

6 Select **Start Trace - One Shot Trace** from the PLC Menu.

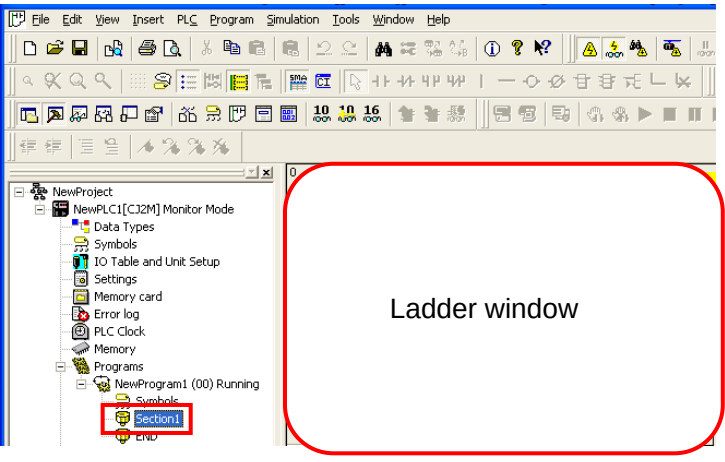
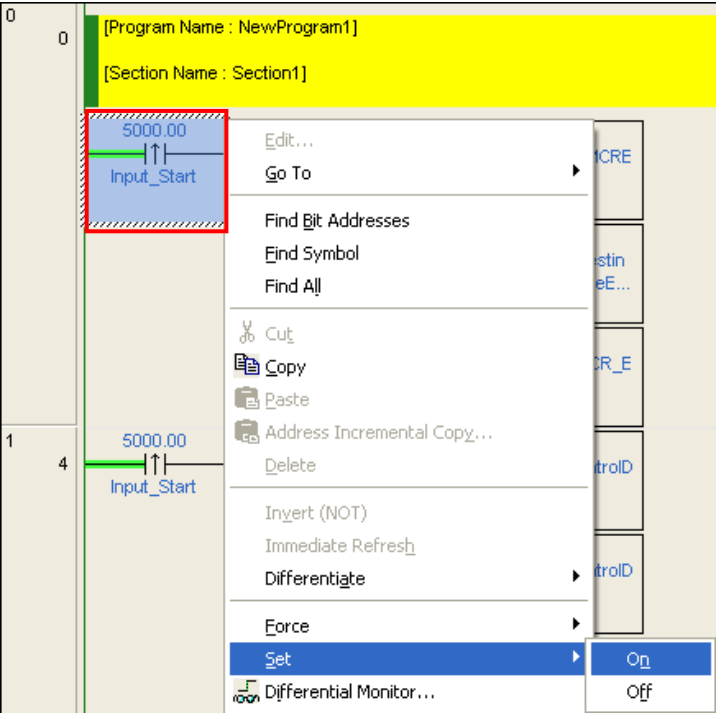
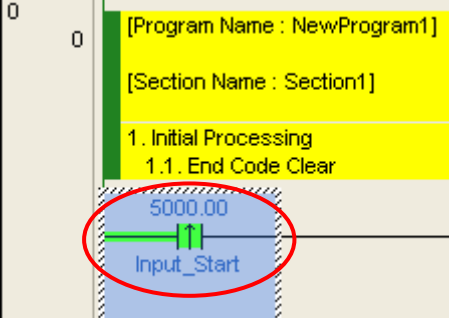
A screenshot of the PLC menu in a software application. The menu is open, showing options: Disconnect from PLC, Operating Mode, Edit PC-PLC Comms Settings..., Edit Communications Port Settings..., Upload Communications Port Settings, Download Communications Port Settings, Start Trace, Stop Trace, and Upload Trace. The 'Start Trace' option is highlighted, and a sub-menu is visible to its right, showing 'Continuous Trace' and 'One Shot Trace'. The 'One Shot Trace' option is highlighted in blue.

7 Confirm that the status of Trace 2 in the Project Window was changed to One-shot Trace Running.

	Trace	Status
🎯	Trace 1	Not Tracing
🎯	Trace 2	One-shot Trace Running

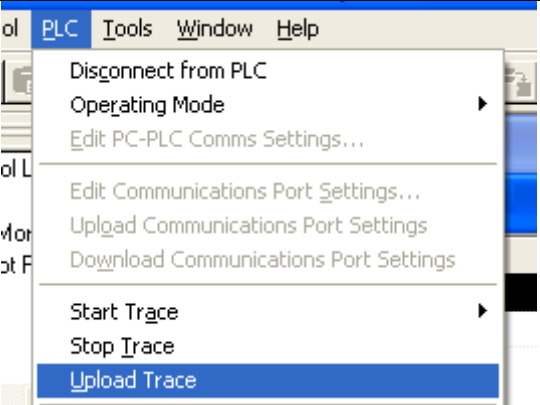
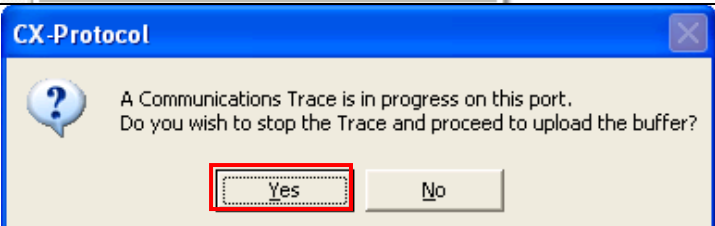
7.1.2. Executing the Program

Execute the program with the CX-Programmer.

1 Expand the Programs tree on the project workspace of the CX-Programmer, and double-click Section 1. The section 1 ladder is displayed on the ladder window.	
2 On the ladder window, right-click an Input_Start and select Set - On. *Right-click any Input_Start. (In the right figure, Input_Start of block 0 is right-clicked.)	
3 Confirm that the Input_Start contact was changed to ON as shown in the right figure.	

7.1.3. Checking the Trace Data

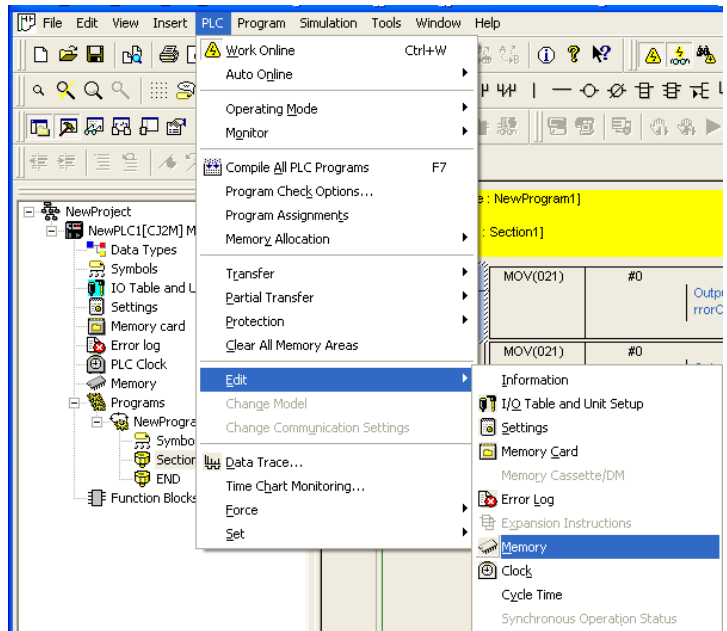
Check the trace data of the CX-Protocol and confirm that correct data are sent/received.

1 Select Upload Trace from the PLC Menu of the CX-Protocol.	
2 The dialog box on the right is displayed. Click the Yes Button.	
3 Check the receive message on the trace data file shown in the right figure. (In the right example, GETR0000[]typ="V750-BA50C04-US"[]fwv=102-102-103-0 ([] indicate a space) is received as the RFID Reader/Writer product type and version. *The right figure shows the product type and version of the RFID Reader/Writer that were received. The codes received differ depending on the RFID Reader/Writer used.	 Product type of receive message: "V750-BA50C04-US" (First row: String) "56 37 35 30 2D 42 41 35 30 43 30 34 2D 55 53" Second row: ASCII (Hex) code) Version of receive message: "102-102-103-0" (First row: String) "31 30 32 2D 31 30 32 2D 31 30 33 2D 30" (Second row: ASCII (Hex) code)

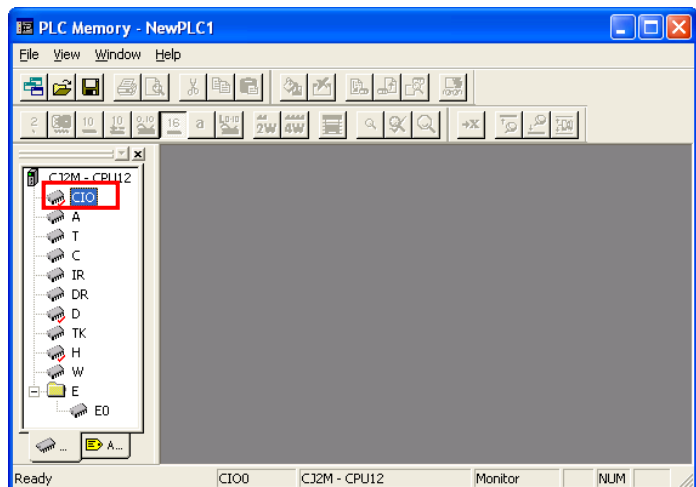
7.1.4. Checking the Receive Data

Confirm that correct data are written to the I/O memory of the PLC by using the CX-Programmer.

- 1 Select **Edit - Memory** from the PLC Menu of the CX-Programmer.

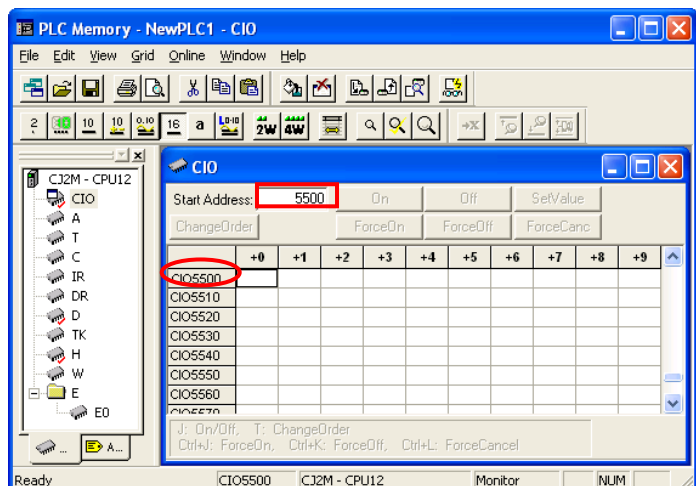


- 2 Double-click **CIO** in the PLC Memory Window that is displayed.

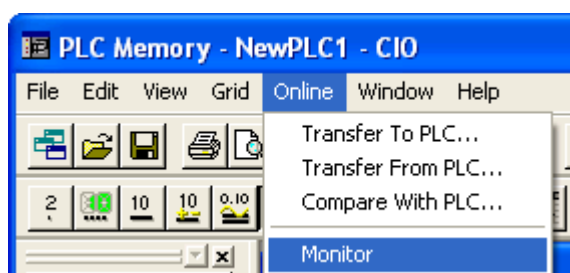


(PLC Memory Window)

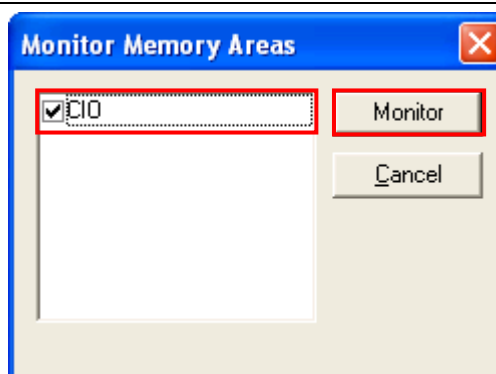
- 3 Enter 5500 in the Start Address Field of the displayed CIO Dialog Box.
Confirm that the start address was changed to CIO 5500.



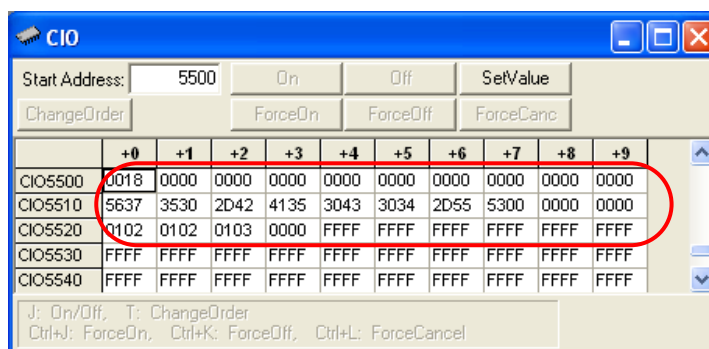
- 4 Select **Monitor** from the Online Menu.



- 5 The Monitor Memory Areas Dialog Box is displayed. Select the **CIO** Check Box and click the **Monitor** Button.



- 6 On the CIO Window shown on the right, check the received data (identification code).
(In the right example, the data stored in CIO 5510 onwards are "V750-BA50C04-US" (product type) and "102-102-103-0" (version). These data the same as those in step 3 of Section 7.4.3.)



*In CIO 5500, the number of used words (18 words (24 in decimal) is stored. The product type is stored in CIO5510 to CIO5517 and the version is stored in CIO5520 to CIO5523.

*For details, refer to 9.2.2 *PMCR Instruction Operand Settings*.

Product type: ASCII code from CIO5510
 "5637 3530 2D42 4135 3043 3034 2055 53"
 (V750-BA50C04-US)
 Version: BCD value from CIO5520
 "0102 0102 0103 0000" (102-102-103-0)

8. Initialization Method

This document explains the setting procedure from the factory default setting.

If the device settings are changed from the factory default setting, some settings may not be applicable as described in this procedure.

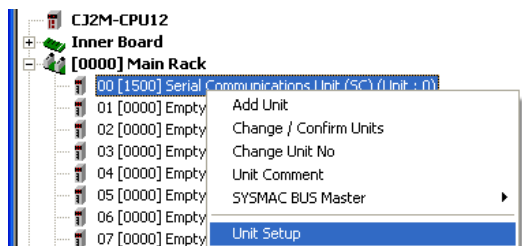
8.1. Initializing the PLC

To initialize the PLC, you need to initialize the Serial Communications Unit and the CPU Unit. Change to PROGRAM mode before initialization.

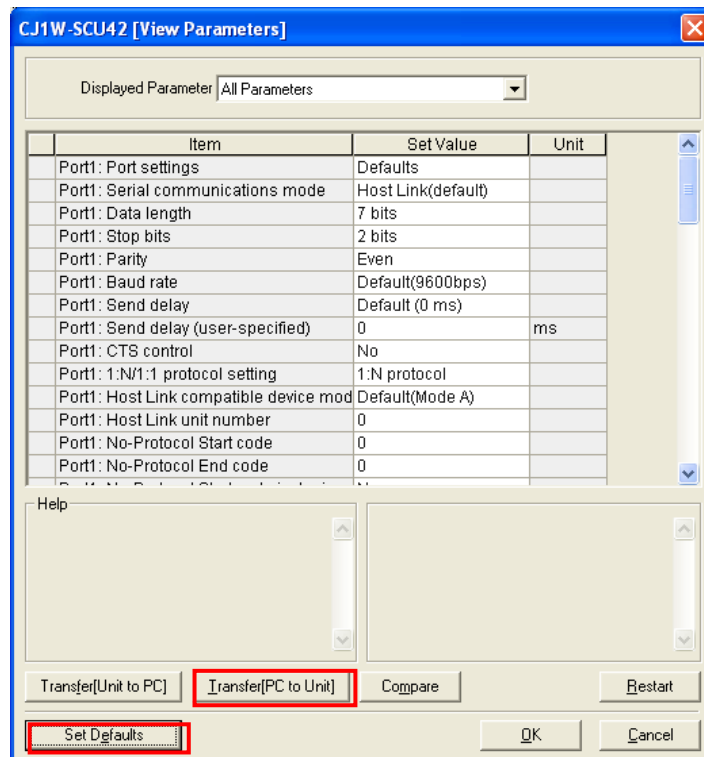
8.1.1. Serial Communications Unit

To initialize the settings of the Serial Communication Unit, select **Edit - I/O Table** and Unit Setup from the PLC Menu of the CX-Programmer.

On the PLC I/O Table Window, right-click the *Serial Communication Unit* and select **Unit Setup**.

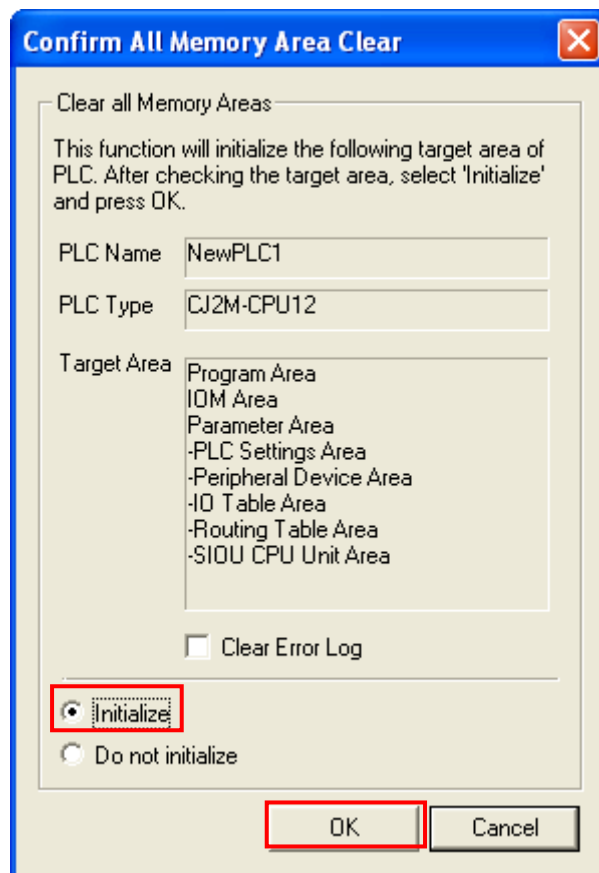


On the View Parameters Dialog Box, click the **Set Defaults** Button and click the **Transfer [PC to Unit]** Button.



8.1.2. CPU Unit

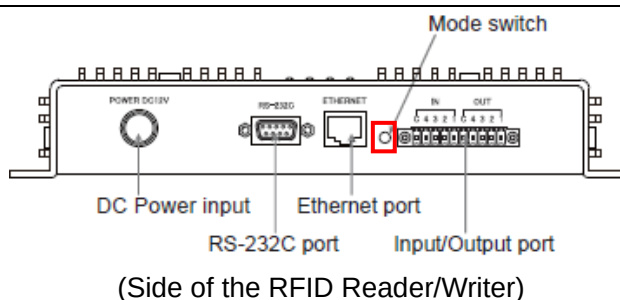
To initialize the settings of the CPU Unit, select **Clear All Memory Areas** from the PLC Menu of the CX-Programmer. On the Confirm All Memory Area Clear Dialog Box, select the *Initialize* Option and click the **OK** Button.



8.2. Initializing the RFID Reader/Writer

Use the following procedure to initialize the settings of the RFID Reader/Writer.

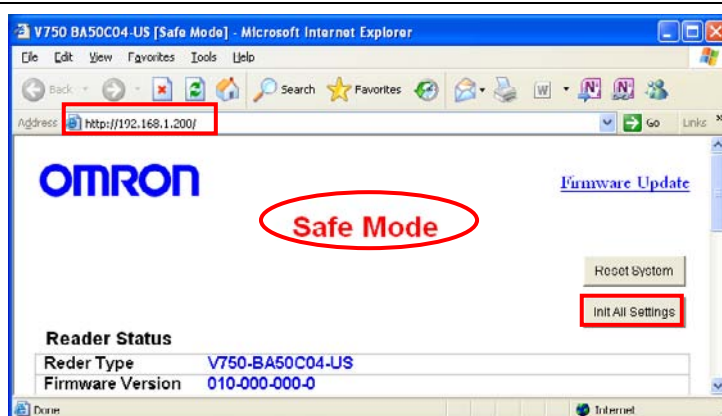
- 1 Press the mode switch at least one second and start the Safe Mode of the RFID Reader/Writer.



- 2 Type "http://192.168.1.200/" in the address bar of the Internet Explorer.

The Safe Mode Window is displayed. Click the **Init All Settings** Button.

*The firmware version of the safe mode is 010-000-000-0.



Additional Information

For the initialization of the RFID Reader/Writer, refer to *Mode switch* in *Names and Functions of Components in Reader* of *Section 2 Specifications and Performance* and *Mode* in *Section 3 Mode and Function* in the *V750-series UHF RFID System User's Manual* (Cat. No. Z235).

9. Program

This section explains the details on the program and protocol macro data that are used in this document.

9.1. Overview

This section explains the specifications and functions of the program and protocol macro data that are used to check the connection between the RFID Reader/Writer (hereafter, referred to as "destination device") and the PLC (Serial Communications Unit) (hereinafter, referred to as "SCU Unit").

This program and protocol macro data send and receive the "Read product type and version" command to/from the destination device by using the protocol macro function of the SCU Unit and detects a normal end or an error end.

A normal end of this program means a normal end of the communications sequence of the protocol macro.

An error end means an error end of the communications sequence of the protocol macro and destination device error (detected with the response data from the destination device).

In this section, the "&" prefix is added to decimal data and the "#" prefix is added to hexadecimal data when it is necessary to distinguish between decimal and hexadecimal data. (e.g., "&1000" for decimal and "#03E8" for hexadecimal)



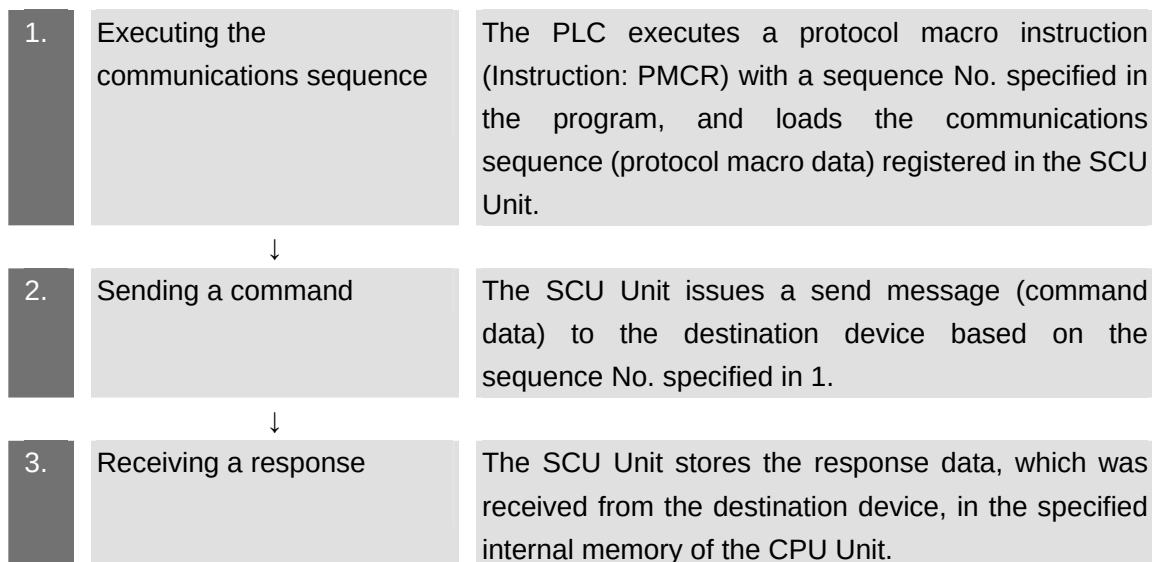
Additional Information

OMRON has confirmed that normal communications can be performed using this program and protocol macro data under the OMRON evaluation conditions including the test system configuration, version of each product, and product Lot, No. of each device which was used for evaluation.

OMRON does not guarantee the normal operation under the disturbance such as electrical noise and the performance variation of the device.

9.1.1. Communications Data Flow

The following figure shows the data flow from when the PLC (SCU Unit) issues command data to the destination device until when the PLC (SCU Unit) receives the response data from the destination device.



9.1.2. PMCR Instruction and Send/Receive Message

This section outlines the protocol macro instruction (Instruction: PMCR, hereinafter referred to as the PMCR instruction) and the general operation of the send/receive message.



Additional Information

Please refer to *Serial Communication Instructions (PMCR)* of *Section 3 Instructions* in the *CJ-series Instructions Reference Manual* (Cat.No. W474) for details.

● PMCR instruction operand data

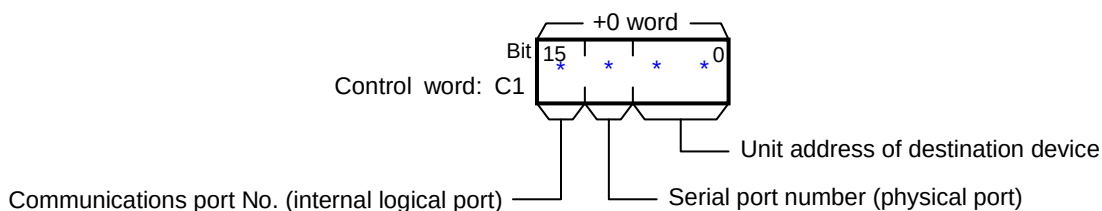
Instruction	Mnemonic	Variations	Function code	Function
PROTOCOL MACRO	PMCR	@PMCR	260	Starts a communications sequence (protocol data) that is registered in a Serial Communications Board (CS Series only) or Serial Communications Unit.

Symbol	PMCR	
	C1	C1: Control word 1
	C2	C2: Control word 2
	S	S: First send word
	R	R: First receive word

[C1: Control word 1]

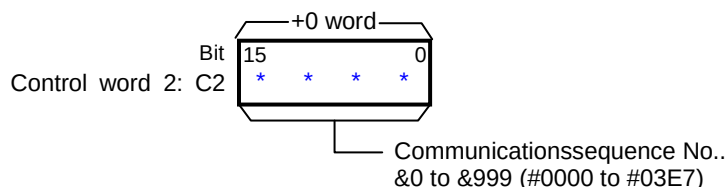
Set the following 3 items of the SCU Unit.

- Communications port No. (internal logical port): #0 to #7
- Serial port number (physical port): #1 and #2 (#1: PORT1, #2: PORT2)
- Unit address of destination device: # unit number + #10



[C2: Control word 2]

Set the Communications Sequence No. that was registered as the protocol macro data. For information on the sequence number registered in this protocol macro data, refer to 9.2.1 Communications Sequence No.



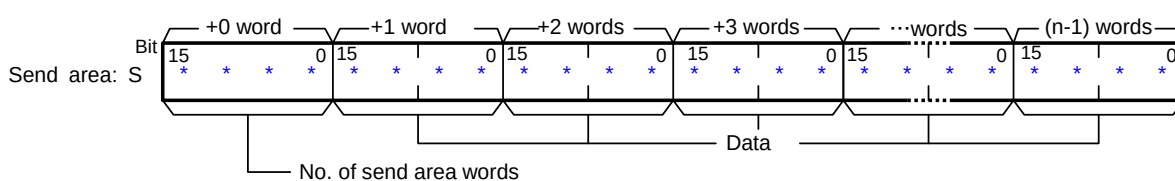
[S: First send word (send area specification)]

Set the number of words (n) to be sent. (Including the S word.)

Between #0000 and #00FA (&0 and &250) words can be set.

Enter the send data in words from S+1 to S+(n-1).

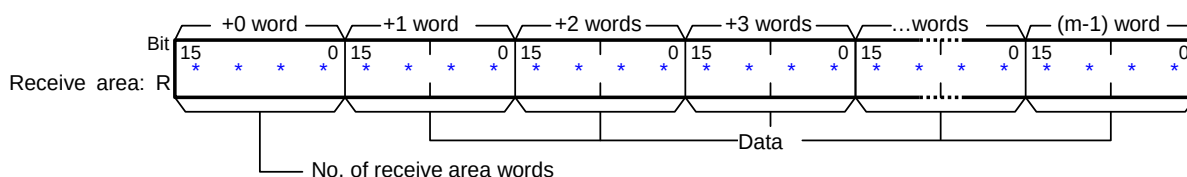
If there is no operand specified in the execution sequence, such as a direct or linked word, set the constant #0000 for S.



[R: First receive word (receive area specification)]

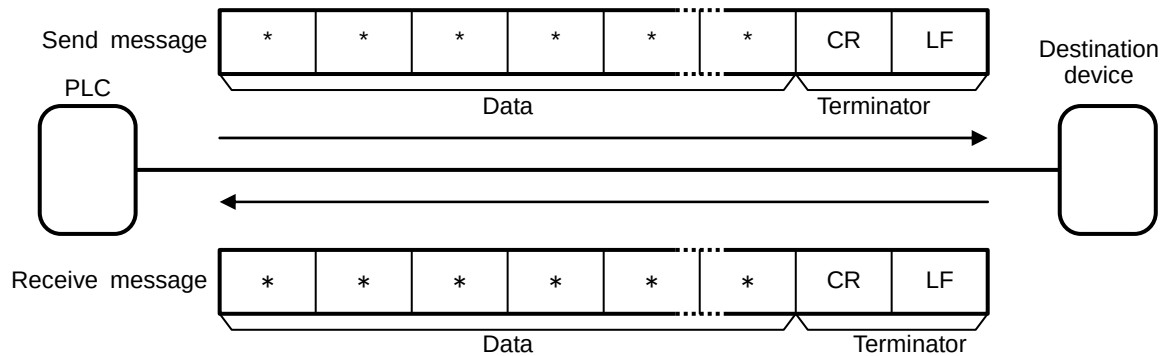
The number of receive data words (m) is automatically stored in R. (Including the R word.)

The received data is stored in the words from R+1 to R+(m-1). (m=&0 to &250 or #0000 to #00FA)

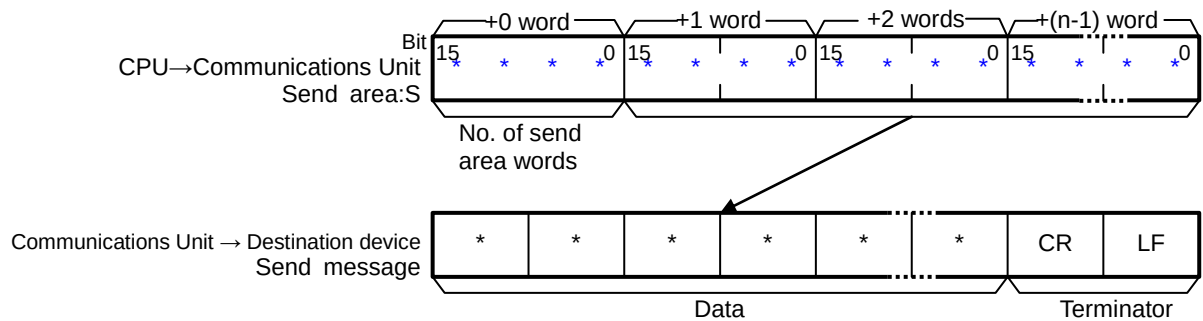


- Send/receive message

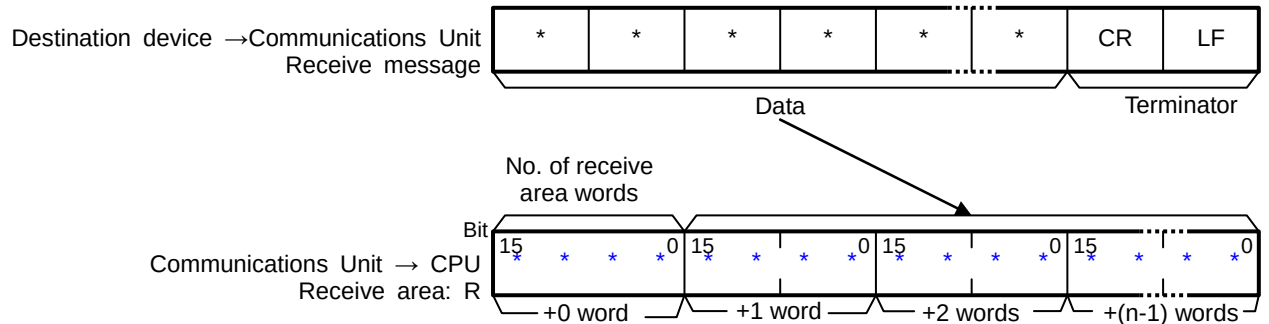
[Overview of send/receive message]



[Relationship between send area S (PMCR instruction operand) and send message]



[Relationship between receive message and receive area R (PMCR instruction operand)]



9.2. Communications Sequence

This section explains the communications sequence (protocol macro data) that can be used for the PMCR instruction of this program.

9.2.1. Communications Sequence Number

A communications sequence (protocol macro data) that is registered in the SCU Unit is identified by the communications sequence number. The SCU Unit executes a destination device command by specifying a communications sequence number in the PMCR instruction. This protocol macro data includes the following communication sequence.

No.	Command name	Description
900	GETR	Reads the Reader/Writer settings.

9.2.2. PMCR Instruction Operand Settings

The PMCR instruction operands of “read product type and version” (Communications sequence No. 900 (#0384)) are shown below.

•Control word C1 settings (C1: CIO 5010)

Word	Description (data type)	Data (explanation)
C1	Communications port No. (1-digit hex)	#7210 (Communications port No. 7, Serial port No.2, #Unit number + #10)
	Serial port No. (1 digit Hex)	
	Destination unit address (2-digit hex)	

•Control word C2 setting (C2: CIO 5011)

Word	Description (data type)	Data (explanation)
C2	Communications sequence No.	&900 (Read product type and version)

•Control word S settings (S: CIO 5020)

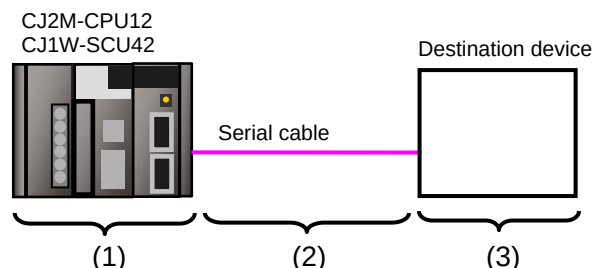
Word	Description (data type)	Data (explanation)
S	Number of words to send (4-digit hex)	#0000 (No variable in the send message of the protocol macro data)

•Control word R settings (R: CIO 5500)

Word	Description (data type)	Data (explanation)
R	Number of words to receive (4-digit hex)	Receive data. Setting is unnecessary
R+1	Local_ReceiveSymbolArea_ResponseCode (UINT)	
R+2	Receive data [0] (4-digit hex)	
R+3	Receive data [1] (4-digit hex)	
:	:	
R+23	Receive data [21] (4-digit hex)	

9.3. Error Detection Processing

This program detects and handles errors (1) to (3). For information on error codes, refer to 9.8 *Error Process*.



(1) Errors when executing the PMCR instruction (PMCR instruction error)

An incorrect sequence number and an incorrect memory address, which prevent the execution of the PMCR instruction, are detected as PMCR instruction errors. An error can be detected with error codes (1519.00 to 03) of the Port Operating Status in the addresses located to the SCU Unit.

(2) Errors when communicating with destination device (Communications errors)

An error that occurs during communications with a destination device is detected as a communications error. Communications errors include a transmission error caused by a character corruption or unmatched baud rate setting. An error can be detected with the Transmission Error Flag (1518.15) of Transmission Error Status in the addresses allocated to the SCU Unit.

(3) Errors in the destination device (Destination device error)

A command error, parameter error, data error, and execution failure in the destination device are detected as destination device errors. An error is detected with the response data which is sent from the destination device. With this program, the destination device error is detected when there is a difference between a normal receive message (hereinafter referred to as a normal message) and error receive message (hereinafter referred to as an error message). (Refer to 9.6.6. *Receive Message Settings* for details.)

Normal message	SOH	'GETR'	'0000'	*...*	**	#0D0A
	Start code	Command Code	End code	Response data	FCS	Terminator

Error message	SOH	'GETR'	****	**	#0D0A
	Start code	Command Code	End code	FCS	Terminator

Error message (Undefined command)	SOH	'ICMD'	****	**	#0D0A
	Start code	Command Code	End code	FCS	Terminator

**Additional Information**

For information on the addresses allocated to the SCU Unit, refer to 9.4.2 *List of Fixed Allocations*.

9.4. Memory Maps

This section shows the memory maps of this program.

9.4.1. Lists of Addresses

The tables below list the addresses necessary to execute this program.

You can change the allocations below to any addresses.



Precautions for Correct Use

Make sure there is no duplicated address when changing addresses.

●Input address

This address is used to operate the program.

Address	Data type	Symbol name	Explanation
5000.00	BOOL	Input_Start	Starts the program when this address changes from OFF to ON.

●Output addresses

The execution results of the program are stored in these addresses.

Address	Data type	Symbol name	Explanation
5000.02	BOOL	Output_NormalEnd	Turns ON when the program ends normally.
5000.03	BOOL	Output_ErrorEnd	Turns ON when one or more of the following errors occur. (1) PMCR instruction error (2) Communications error (3) Destination device error
5502	WORD	Receive data [0] (4-digit Hex)	Stores bytes 1 and 2 of the identification code that were received from the destination device.
5503	WORD	Receive data [1] (4-digit Hex)	Stores bytes 3 and 4 of the identification code that were received from the destination device.
:	:	:	
5511	WORD	Receive data [9] (4-digit Hex)	Stores bytes 19 and 20 of the identification code that were received from the destination device.
H400	UINT	Output_PMCR_ErrorCode	Stores the error code when a PMCR instruction error or communications error occurs.
H402	UINT	Output_DestinationDeviceErrorCode	Stores the error code received from a destination device when an error occurs in a destination device.

●Internal addresses

These addresses are used to operate this program only.

Address	Data type	Symbol name	Explanation
5000.01	BOOL	Local_PMCRExecuting	Indicates the PMCR instruction execution status. This flag turns ON when the PMCR instruction is being executed, and turns OFF when the PMCR instruction is not executed.
5000.04	BOOL	Local_PMCRNormalEnd	Turns ON when the PMCR instruction ends normally.
5000.05	BOOL	Local_PMCRErrorEnd	Turns ON when a communications error (e.g., transmission error) occurs.
5000.06	BOOL	Local_DestinationDeviceError	Turns ON when a destination device error occurs.
5000.07	BOOL	Local_PMCRErrorCode	Turns ON when any of the following PMCR instruction errors occurs. (1) Sequence No. error (2) Data read/write area exceeded error (3) Protocol macro syntax error
5010	UINT	Local_ControlWord1	Execution parameter of PMCR instruction.
5011	UINT	Local_ControlWord2	Execution parameter of PMCR instruction.
5012	UINT	Local_PMCR_ErrorCode	Stores the error code when a PMCR instruction error occurs.
5020	UINT	Local_FirstSendWord	Sets the number of send message words of the PMCR instruction.
5500	UINT	Local_FirstReceiveWord	Stores the number of message words received from the destination device.
5501	UINT	Local_ReceiveSymbolArea_ResponseCode	Stores the error code of a destination device when a destination device error occurs.

9.4.2. List of Fixed Allocations

The tables below list the addresses necessary to execute this program.

- Allocated CIO areas

The following allocations cannot be changed because they are determined according to the unit number that is set for the SCU Unit.

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

Address	Data type	Symbol name
1518.15	BOOL	TransmissionError_SCU_F_P1
1519.10	BOOL	SequenceAbortCompletion_SCU_F_P1
1519.11	BOOL	SequenceEndCompletion_SCU_F_P1
1519.15	BOOL	ProtocolMacroExecuting_SCU_F_P1
1519	UINT	ProtocolMacroErrorCode_SCU_F_P1



Additional Information

For details on the area allocated to the SCU Unit, refer to *Section 2-3-2 CIO Area* of the *CJ-series Serial Communications Boards and Serial Communications Units Operation Manual* (Cat.No. W336).

- Related Auxiliary Area

The address of the following related auxiliary area corresponds to the communications port (internal logical port) specified in the program (operand of PMCR instruction). Thus, it must not be changed freely.

This program uses Communications Port (internal logical port) No.7.

Address	Data type	Symbol name
A202.07	BOOL	CommPortEnabledFlag_P7



Additional Information

For information on related auxiliary area for the PMCR instruction, refer to *Related Auxiliary Area Words and Bits of Chapter 3 Instructions - Serial Communications instructions (PMCR)* of *CJ series Instructions Reference Manual* (Cat.No. W474).

9.5. Ladder Program

9.5.1. Ladder Program Function Configuration

The functional configuration of this program is as follows:

Major classification	Minor classification	Description
1.Initialization processing	1.1 Response code clear 1.2 Operand setting for PMCR instruction 1.3 Send/receive symbol setting	Preparation for communications. The area to be used is cleared and initialization settings are performed.
2.PMCR instruction execution management	2.1 PMCR instruction executing 2.2 PMCR instruction execution processing 2.3 Normal/error detection processing	The communications sequence (protocol macro data) registered in the SCU Unit is identified and executed. Whether the operation ended normally or abnormally is determined based on the related flags and receive data.
3.Normal end state management	3.1 Normal end processing 3.2 Response code setting	The normal completion flag is turned ON. The response code which indicates the normal end is set.
4.Error end state management	4.1 Error end processing 4.2 Response code setting	The error end flag is turned ON. The response code is set according to the error cause.

9.5.2. Explanation on Each Functional Component

This section shows the program.

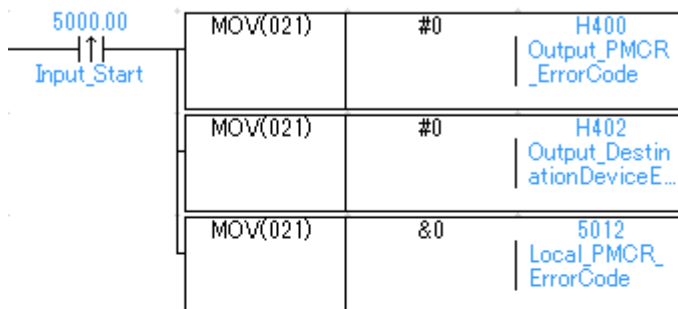
●1. Initialization processing

[Program Name : NewProgram1]

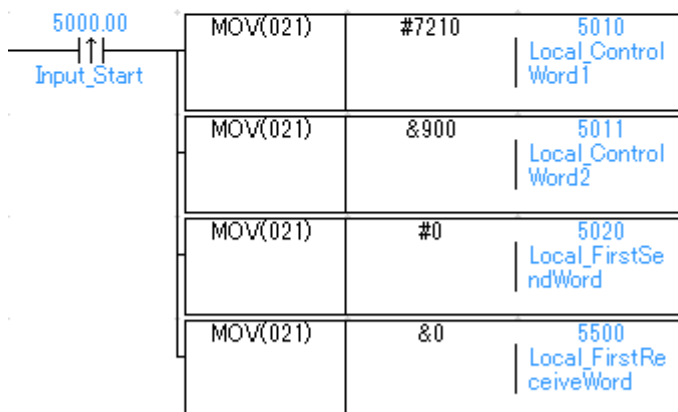
[Section Name : Section1]

1. Initialization processing

1.1. Response code clear



1.2. Operand setting for PMCR instruction

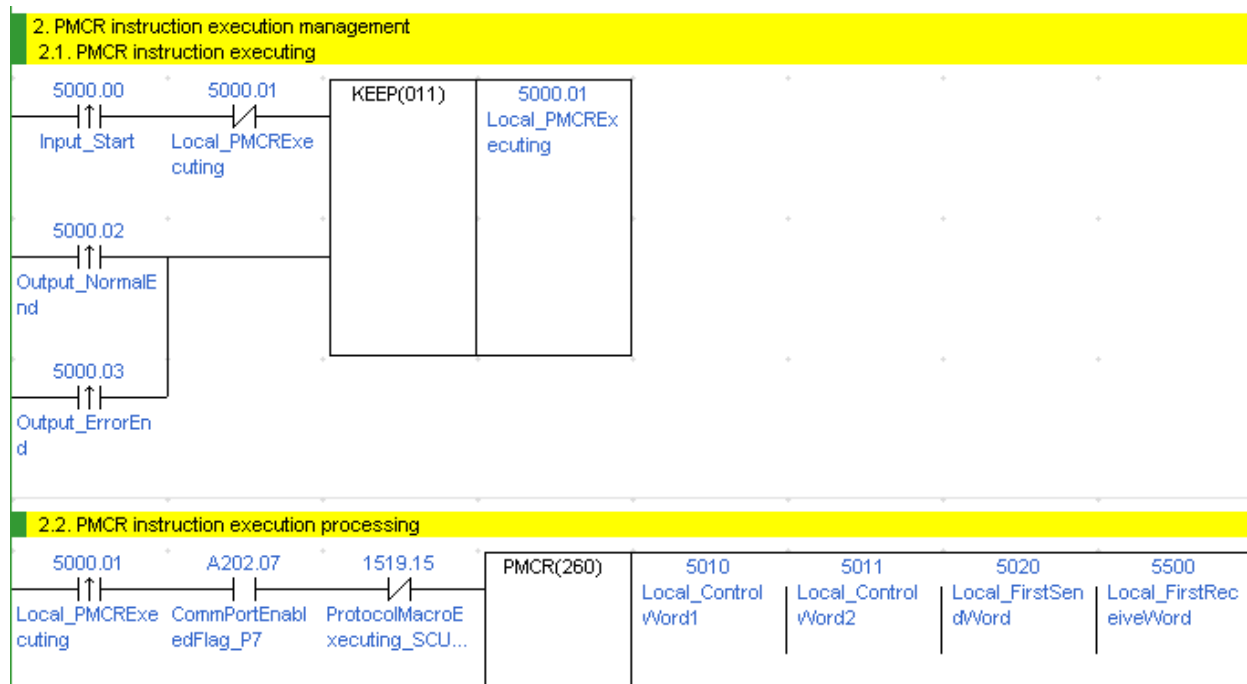


1.3. Send/receive symbol setting



No.	Overview	Description
1.1.	Response code clear	Clears the error code storage area to zero.
1.2.	Operand setting for PMCR instruction	Sets the PMCR execution parameters (operands).
1.3.	Send/receive symbol setting	Initializes the receive data storage area.

●2. PMCR instruction execution management



No.	Overview	Description
2.1.	PMCR instruction executing	Enters the PMCR instruction executing status. The executing status will be reset at a normal end or an error end of the program.
2.2.	PMCR instruction execution processing	The PMCR instruction is executed under the following conditions. •Port No.7 can be used. •The protocol macro is not being executed.



Precautions for Safe Use

Please check the overall program before specifying the area to save the receive data of PMCR instruction. Or, data may be written in an unintended memory area.

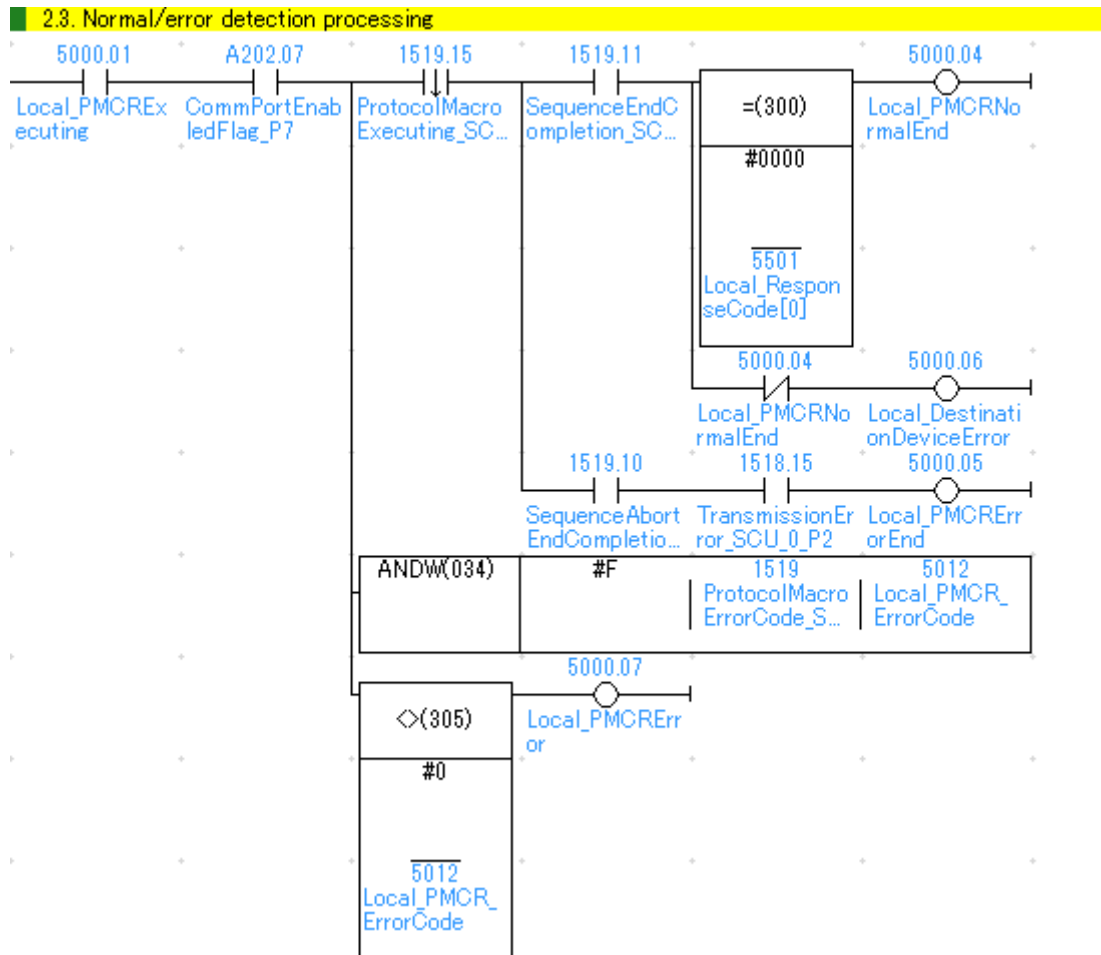


Precautions for Correct Use

This program uses Communications Port (internal logical port) No.7.

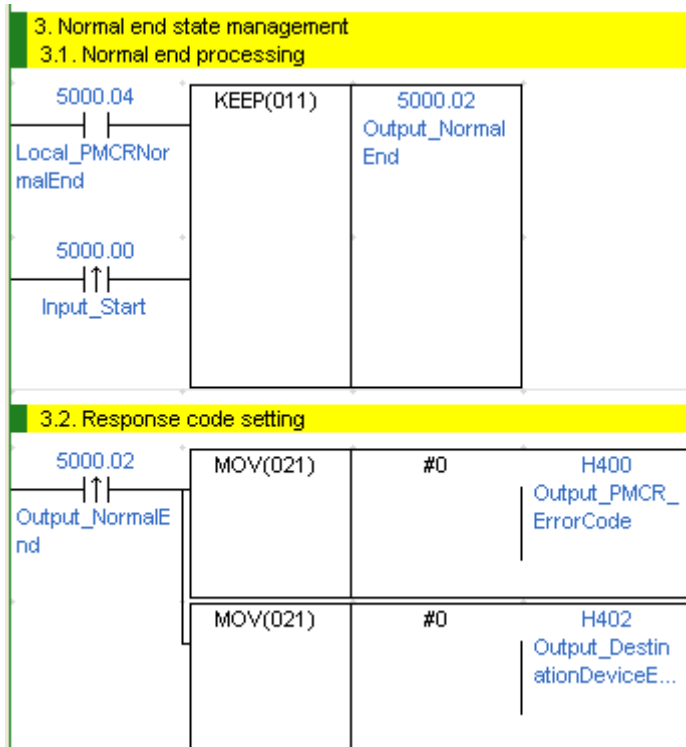
Do not use Communications Port No.7 for other purpose.

If you have no choice but to use Communication Port No. 7, confirm that the Communications Port Enabled Flag (A202.07) is ON.



No.	Overview	Description
2.3.	Normal/error detection processing	Detects whether the program is executed normally or abnormally. It is considered as normal end when all the following requirements are met. (1)Normal end of PMCR instruction (No PMCR instruction error) (2)Normal end of communications sequence (No communications error) (3)Receives normal message from the destination device (No destination device error) When any of the above errors occurs, the corresponding error flag turns ON.

●3. Normal end state management

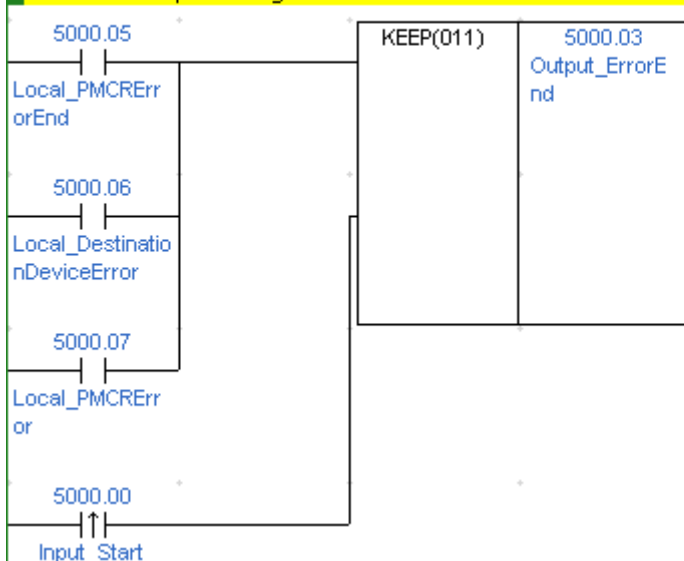


No.	Overview	Description
3.1.	Normal end processing	Turns ON the normal end flag when normal end of the program is detected in 2.3 Normal/error detection processing.
3.2.	Response code setting	Sets the normal response code "#0000" in the response code storage area.

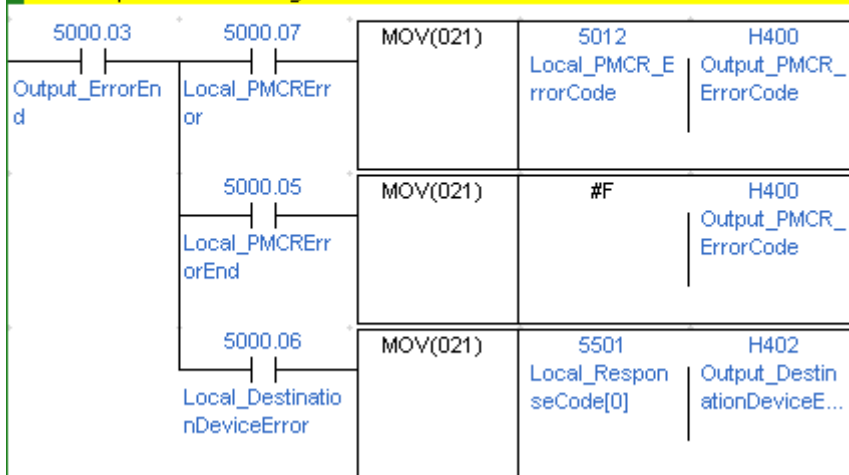
●4.Error end state management

4. Error completion state management

4.1. Error end processing



4.2. Response code setting



No.	Overview	Description
4.1.	Error end processing	Turns ON the error end flag when an error end of the program is determined in 2.3 Normal/error detection processing.
4.2.	Response code setting	If an error occurs, sets the corresponding response code in the response code storage area.



Additional Information

Refer to 9.8 Error Processing in this document for response codes.

9.6. Protocol Macro Data

The protocol macro data consists of Sequence, Step, Send/Receive Message, and Matrix. Its composition is described as follows:

- When there is only one receive message format for a step (send/receive once)

- Set one send message and one receive message for the step

Sequence No.900	Step No.00	Send message 00	Receive message 00
•			
•			
Sequence No. xxx	Step No. yy	Send message yy	Receive message yy

xxx: 999 max. yy: 15 max

- When there are several kinds of receive message formats for a step (send/receive once)

- Set the send message and matrix for the step

- Set several kinds of cases (receive messages) for the matrix

Sequence No.900	Step No.00	Send message 00	<Matrix>	
•			Case No.00	Receive message 00
•				
•	Step No. yy		Case No. zz	Receive message zz
	yy: 15 max	zz: 14 max	Case No.15	Other

Sequence No. xxx xxx: 999 max Case No. 15 is automatically set

9.6.1. Composition of Protocol Macro Data

This protocol macro data uses three different receive message formats (normal message and error messages) for the send message (SD_GETRVER). The matrix (GetVer_Mat) is used and the structure is shown below.

Sequence No.900	Step No.00	SD_GETRVER	<GetVer_Mat>	
			Case No.00	RV_ERR
			Case No.01	RV_ICMD
			Case No.02	RV_GETRVER
			Case No.15	Other

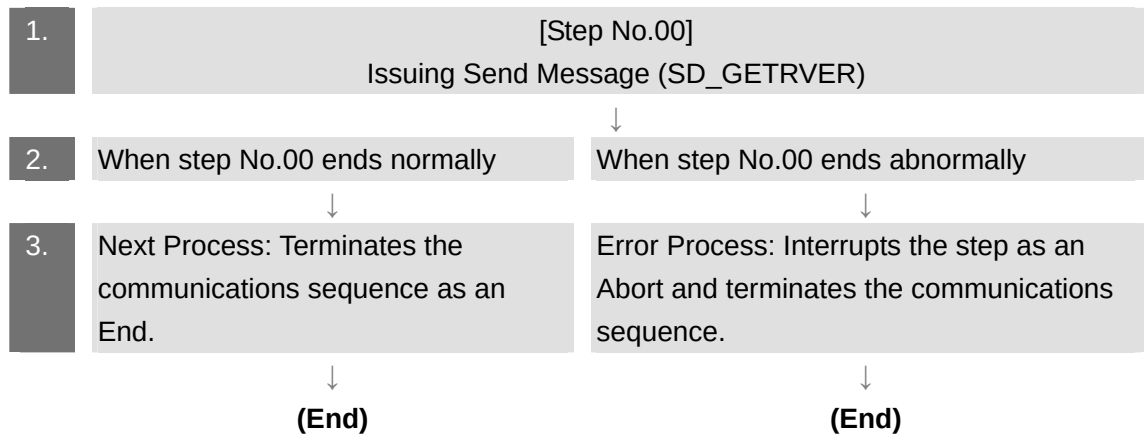
* RV_GETRVER: For normal message reception

RV_ERR and RV_ICMD: For error message reception

(Refer to 9.6.6. Receive Message Settings for details.)

9.6.2. Protocol Macro Processing Procedure

This section describes the processing procedure of the protocol macro.



9.6.3. Sequence Settings

This protocol macro data reads the product type and version by using communications sequence No. 900. Set the timeout periods for the communications sequence.



Additional Information

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

•Timeout period setting

The settings of the timeout periods (Timer Tr, Tfr, and Tfs) for the sequence are shown below.

[Communications sequence setting screen]

#	Communication Sequence	Link Word	Control	Response	Timer Tr	Timer Tfr	Timer Tfs
900	New Sequence	---	Set	Scan	3 sec	3 sec	3 sec

<Settings>

Item	Description	Explanation
Timer Tr	Receive wait monitoring time	Monitors the time from the receive wait status to the reception of the first data (header) in the step of the sequence. This timer is set to 3 seconds in this protocol macro data.
Timer Tfr	Receive finish monitoring time	Monitors the time from the reception of the first data to the completion of the reception in the step of the sequence. This timer is set to 3 seconds in this protocol macro data.
Timer Tfs	Send finish monitoring time	Monitors the time from the sending of the header to the sending of the last data. This timer is set to 3 seconds in this protocol macro data.



Additional Information

Refer to *Section 4-5 Calculation Method of Monitoring Time* of the *CX-Protocol Operation Manual* (Cat.No. W344) for the calculation method of monitoring time.

9.6.4. Step Settings

This section describes the step settings for communications sequence No. 900. The settings include Retry Count, Send/Receive Messages (message names), Next Process, and Error Process. The sequence of this protocol macro data includes Step No.00 only.



Additional Information

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

•Retry Count setting

This section describes the Retry count of the step. The step is retried for the specified number of times (0 to 9 times) when an error occurs. If the error occurs after retries, the step moves to Error Process.

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

<Step setting screen>

Step	Repeat	Command	Retry	Send Wait	Send Message	Recv Message	Response	Next	Error
00	RSET/001	Send & Receive	3	---	SD PRO_R	<MX PRO_R>	YES	Matrix	Abort

<Settings>

Step No.	Retry count
00	3

•Send/receive message (message name) settings

This section describes the settings for the Send/Receive Messages of the step. Here, a pre-registered send message name and matrix name are selected.

<Step setting screen>

Step	Repeat	Command	Retry	Send Wait	Send Message	Recv Message	Response	Next	Error
00	RSET/001	Send & Receive	3	---	SD_GETRVER	<GetVer_Mat>	YES	Matrix	Abort

<Settings>

Step No.	Send message	Receive message
00	SD_GETRVER	<GetVer_Mat>

*<> in the receive message column indicates the matrix name. When there are two or more receive message formats, use the matrix.

- Next process and error process settings

This section describes the settings for the Next Process and Error Process of the step. The process specified in the Next Column is executed when the execution of the step ends normally. When a communications error occurs, the process set in the Error Column is executed.

<Step setting screen>



<Settings>

Step No.	Next process	Error process
00	Matrix	Abort

<Process list>

Process.	Description
End	Ends the communications sequence.
Next	Moves to the next step No.
Abort	Interrupts the step and ends the communications sequence.
Goto	Moves to the specified step No.
Matrix	Uses the settings of the matrix.

9.6.5. Send Message Settings

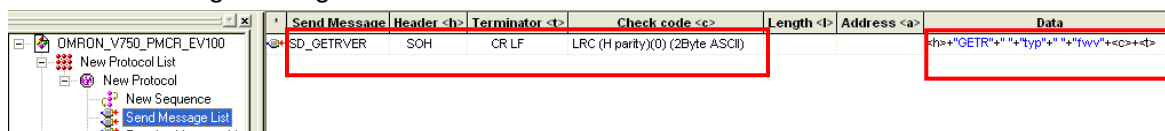
This section explains the settings of the send message.



Additional Information

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

<Send message setting screen>



•Settings of SD_GETRVER send message

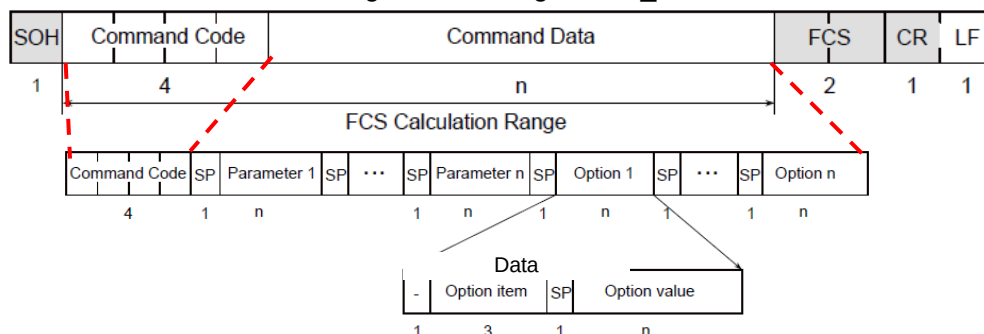
<h>+"GETR"+" "+typ"+" "+fwv"<c>+<t>

(1) (2) (3) (4) (5) (6) (7) (8)

No.	Code	Description
(1)	<h> (Header)	Type: Code, Data: SOH
(2) to (6)	"GETR", "", "typ", "", "fwv"	Constant ASCII
(7)	<c> (Check code)	Type: LRC (horizontal parity) (0) (2-byte ASCII) Setting range: 2 to 6
(8)	<t> (Terminator)	Type: Code, Data: CR+LF

<Send message command format>

This is the command format of the message that is sent from the SCU Unit to the destination device according to the settings of SD_GETRVER.



Command	Number of bytes	Remarks
Start code	1	Fixed: SOH (#01)
Command code	4	Fixed: "GETR" (Destination device command, Read setting)
(Space *1)	1	Fixed: " " (Space. Parameters and options are separated by a space.)
(Parameter or option *1)	1 and greater *2	Fixed: "typ" (product type), "fwv" (Firmware version) (Option of GETR command)
FCS	2	The horizontal parity is calculated based on the data after the start code (SOH) through just before the FCS. The result is converted into 2 ASCII code characters and they are added to the message.
Terminator	2	Fixed: CR+LF (#0D0A)

*1: When this is not used, the FCS is moved forward.

*2: Any number of bytes can be set for parameters and 3 bytes for options.

9.6.6. Receive Message Setting

This section describes the settings of receive messages. The receive messages corresponding to three response formats for a normal message and error messages (response for command, unspecified command) are set.



Additional Information

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

[Receive message setting screen]



•Settings of RV_GETRVER receive message (normal message)

<Settings>

<h>+“GETR”+&(W(1),4)+“ ”+“typ”+“=”+(W(10),*)+“ ”

(1) (2) (3) (4) (5) (6) (7) (8)

+“fwv”+“=”+&(W(20),3)+“-”+&(W(21),3)+“-”+&(W(22),3)+“-”+&(W(23),1)+<c>+<t>

(9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19)

•Settings of RV_GETRERR message name (error message: response)

<Settings>

<h>+“GETR”+&(W(1),4)+<c>+<t>

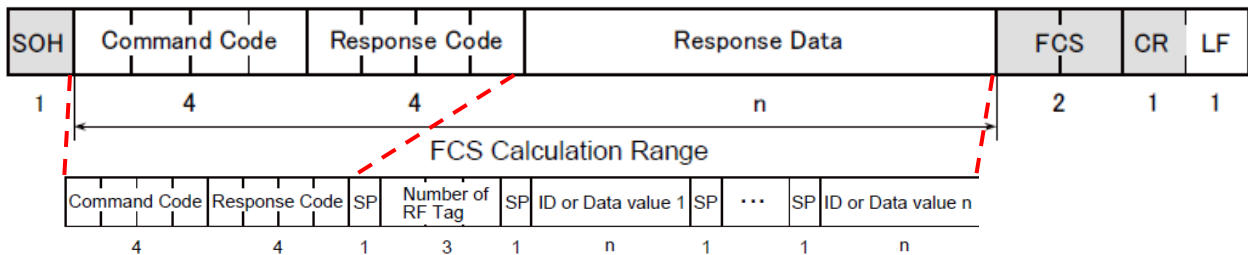
(1) (2) (3) (18) (19)

No.	Code	Description
(1)	<h>(Header)	Type: Code, Data: 02 Hex
(2) (4) (5) (6)(8)(9) (10)(12) (14)(16)	“GETR”, “”, “typ”, “”, =”, “”, “fwv”, “=”, “-”, “-”, “-”, “-”	Constant ASCII
(3)	&(W(1),4)	(W(1),4): Converts 4-byte data and stores it in the [first receive word specified with the PMCR instruction operand + 1 word]. &: Forward direction hexadecimal conversion (Converts the receive message from ASCII code into hexadecimal code, and outputs the receive data from the lower byte)
(7)	(W(10),*)	(W(10),*): Converts *-byte data and stores it in the [first receive word specified with the PMCR instruction operand + 10-word].

No.	Code	Description
(11)(13) (15)	&(W(n),3) n=20,21,22	(W(n),3): Converts 3-byte data and stores it in the [first receive word specified with the PMCR instruction operand + n word]. &: Forward direction hexadecimal conversion (Converts the receive message from ASCII code into hexadecimal, and stores the receive data from the lower byte)
(17)	&(W(23),1)	(W(23),1): Converts 1-byte data and stores it in the [first receive word specified with the PMCR instruction operand + 23-word]. &: Forward direction hexadecimal conversion (Converts the receive message from ASCII code into hexadecimal, and stores the receive data from the lower byte)
(18)	<c> (Check code)	Type: LRC (horizontal parity)(0)(1-byte BIN) Setting range: RV_GETRVER = 2 to 17 RV_GETRERR = 2 to 3
(19)	<t> (Terminator)	Type: Code, Data CR+LF

[Response format of normal and error (response) messages]

This is the response format of normal and error messages which are received by the SCU Unit from the destination device according to the settings of RV_GETRVER and RV_GETRERR.



Command	Number of bytes	Remarks
Start code	1	Fixed: SOH (#01)
Command code	4	Fixed: "GETR" (Destination device command. This program reads the setting.)
Response code	4	Except ICMD code (#140X (X=0 to 9 , A to F)) Destination device code (Refer to 8.8 Error Code List.)
(Space *)	1	Fixed: " " (Space. Data are separated by a space.)
(Response data *)	1 and greater	Fixed: "typ="[V750 product type]" (The product type is enclosed in " and ".) "fwv="[Firmware version]" (Firmware version) (The information of the options specified with the "GETR" command of this program is returned.)

Command	Number of bytes	Remarks
FCS	2	The horizontal parity is calculated based on the data after the start code (SOH) through just before the FCS. The result is converted in 2 ASCII code characters and they are added to the message.
Terminator	2	Fixed: CR+LF (#0D0A)

*The FCS is moved forward for an error message when there is no response data because the parameter of the send command is illegal.

- Settings the RV_ICMD receive message (error message: undefined command)

[Settings]

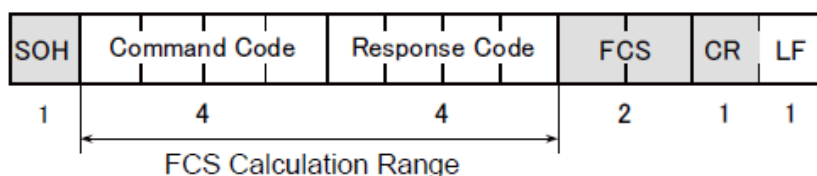
<h>+“ICMD”+&(W(1),4)+<c>+<t>

(1) (2) (3) (4) (5)

No.	Code	Remarks
(1)	<h> (Header)	Type: Code, Data: SOH
(2)	“ICMD”	Constant ASCII
(3)	&(W(1),4)	(W(1),4): Converts 4-byte data and stores it in the [first receive word specified with the PMCR instruction operand + 1 word]. &: Forward direction hexadecimal conversion (Converts the receive message from ASCII code into hexadecimal, and stores the receive data from the lower byte)
(4)	<c> (Check code)	Type: LRC (Horizontal parity) (0)(1-byte BIN) Setting range: 2 and 3
(5)	<t> (Terminator)	Type: Code, Data: CR+LF

[Response format of error message (undefined command)]

This is the response format of an error message which is received by the SCU Unit from the destination device according to the setting of RV_ICMD.



Command	Number of bytes	Remarks
Start code	1	Fixed: SOH (#01)
Command code	4	Fixed: "ICMD" (Destination device command, undefined command)
Response code	4	#140X (X=0 to 9, A to F "ICMD code) Destination device error code (Refer to 8.8. <i>Error Code List</i> .)
FCS	2	The horizontal parity is calculated based on the data after the start code (SOH) through just before the FCS. The result is converted in 2 ASCII code characters and they are added to the message.
Terminator	2	Fixed: CR+LF (#0D0A)

9.6.7. Matrix Settings

This section describes the matrix settings. GetVer_Mat matrix is registered.



Additional Information

For details on matrix settings, refer to 3-5 *Creating Matrices* in the *CX-Protocol Operation Manual* (Cat. No. W344)

<Matrix registration screen>

Matrix	Cases
GetVer_Mat	4

*In this figure, four cases are set for the GetVer_Mat matrix.

•GetVer_Mat matrix setting

The following four cases are set: case No.00, case No.01, case No.02 and case No.15.

<Case setting screen>

Case Number	Receive Message	Next Process
00	RV_GETRerr	End
01	RV_ICMD	End
02	RV_GETRVER	End
15	Other	End

<Settings>

The following table shows the settings of a Receive message and Next process for each case.

Case No.	Receive message	Next process
00	RV_GETRERR	End
01	RV_ICMD	End
02	RV_GETRVER	End
15	Other	End

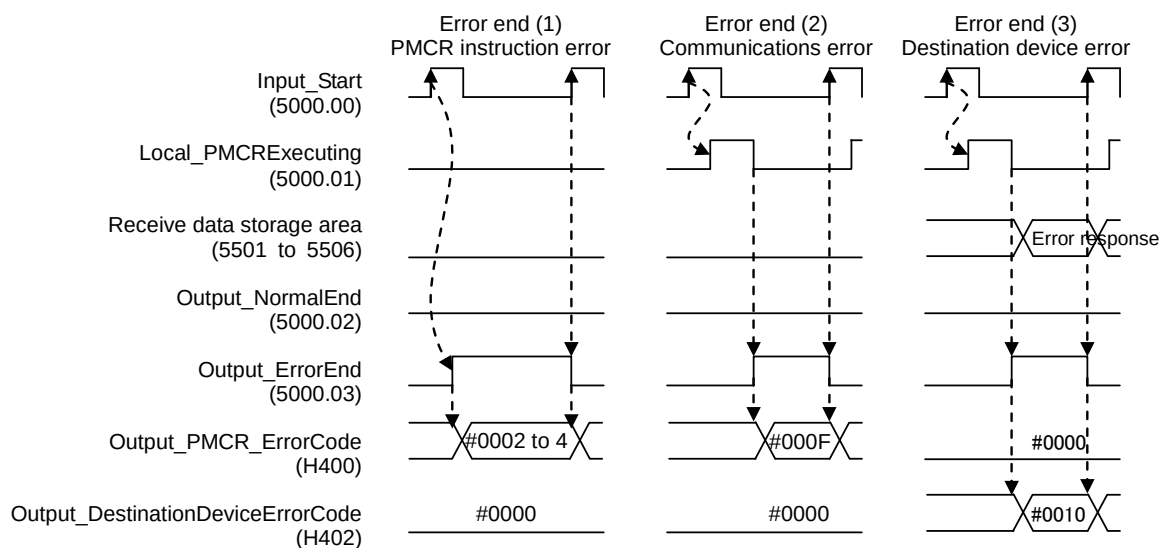
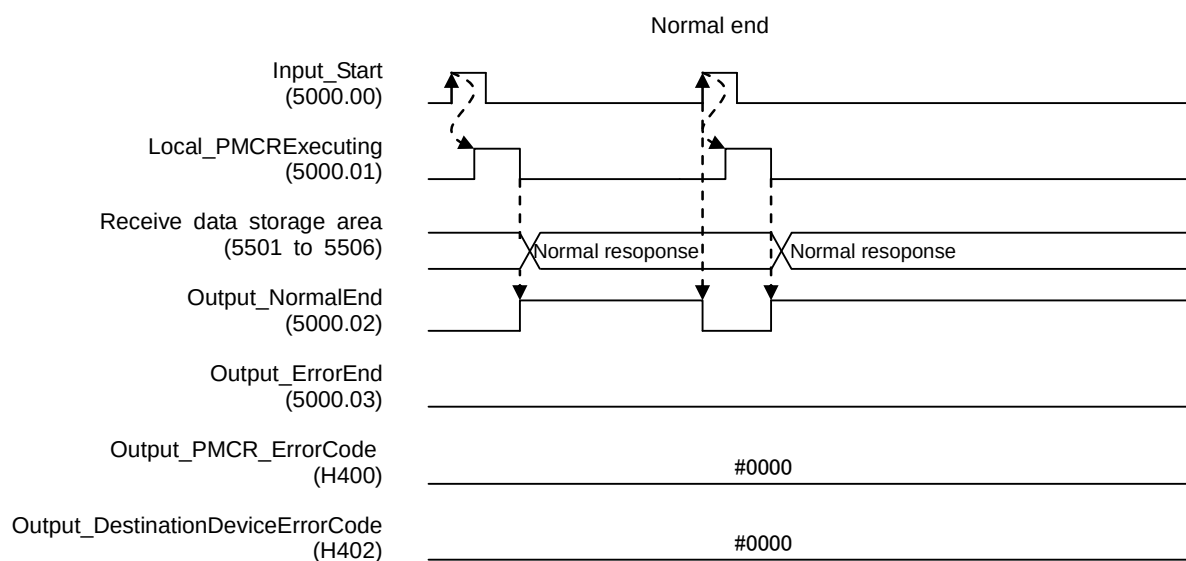
*Whether the condition of each receive message is met is determined in the following order: RV_GETRVER (normal message), RV_ERR (error message) and Other (Other message). Only the process whose condition is met first is performed. The ladder program checks the received result to detect a destination device error.

9.1. Timing Charts

The timing charts of this ladder program are shown below.

The definitions of the timing chart patterns are as follows:

Pattern	Normal end	Error end (1) PMCR instruction error	Error end (2) Communications error	Error end (3) Destination device error
Command	Normal	Error	Normal	Normal
Destination device	Normal	Normal or error	Normal or error	Error
Response	Yes	None	None	Yes



9.2. Error Process

The error details for this program are shown below.

9.2.1. Protocol Macro Error Codes

The SCU Unit detects these errors by monitoring the protocol macro operations.

The errors include (1) PMCR instruction error and (2) communications error (e.g., transmission error).

The error codes are stored in H400 (Output_PMCR_ErrorCode).

[Error code list]

Error code	Name	Classification	Description
#0002	Sequence No. error	(1)PMCR instruction error	The sequence number specified by the PMCR instruction does not exist in the Unit.
#0003	Symbol specification area exceeded error	(1)PMCR instruction error	When data is written to or read from the CPU Unit, the specified area range was exceeded.
#0004	Protocol data syntax error	(1)PMCR instruction error	A code that cannot be executed exists while the protocol macro was executed. (Example: A header exists after a terminator.)
#000F	Transmission error	(2)Communications error	Communications cannot be performed due to an error in the transmission path, etc.



Additional Information

For details and troubleshooting the protocol macro errors, refer to *12-3 Troubleshooting* of the *CJ Series Serial Communications Boards and Serial Communications Units Operation Manual* (Cat.No. W336).

9.2.2. Destination Device Error Codes

The destination device errors are detected while monitoring the communications of the destination device when the PLC sends a command. The error codes for are stored in H402 (Output_DestinationDeviceErrorCode).

[Format]

Bit	15	8	7	0
	Response code			
	#*: Main		#*: Sub	

[Response code list]

Category	Response Code		Response Name	Description
	Main	Sub		
Normal end	00	00	Normal end	The received command ended normally with no error.
Command error	10	00	Parity error	A parity error has occurred in one of the characters of the command frame (For only RS-232C).
	11	00	Framing error	A framing error has occurred in one of the characters of the command frame (For only RS-232C).
	12	00	Overrun error	An overrun error has occurred in one of the characters of the command frame (For only RS-232C).
	13	00	FCS error	The command frame has an incorrect FCS (For only RS-232C).
	14	0X (See Note1)	Command code error	Incorrect command has been received. The response code is ICMD.
		1X (See Note1)	Command parameter error	Command parameter is incorrect.
		2X (See Note1)	Command option error	Command option is incorrect.
	15	00	Process error	Specified command can not be executed. Ex. Caused by executing a communication command when the last command is being executed. Ex. Caused by incorrect setting of filtering condition.
		0X (See Note1)	Filter error	Specified filter settings is incorrect. Ex. Caused by incorrect setting of filtering condition.
RF Tag communication error	18	00	Frame length error	A command received from the host exceeds the receive buffer (512 Bytes).
	70	00	LBT busy error	Channel none by can LBT use. (The electric wave cannot be sent.)
		1X (See Note1)	Communication error	During the transaction after tag detection, communication error or process time out has occurred, and consequently the transaction can not be completed normally. Specified password does not match to the one of the target tag.
		2X (See Note1)	Communication error	During the transaction after tag detection, communication error or process time out has occurred, and consequently the transaction can not be completed normally ." In the case of ID write/Data write, a part of data in the tag may have been written.
	71	00	Verification error	The reader has not written the data to the tag by reason of verification error.
	7A	00	Address specification error	Specifying Bank/Address in the tag memory is incorrect and command can not be executed.
	7B	00	Data write error	During the data write into the detected tag, sufficient power is not supplied to the tag.
	7C	1X (See Note1)	Antenna detection error	At the R/W starts up, an appropriate antenna has not been connected to the specified antenna port.
		2X (See Note1)	Antenna error	Error occurred with the antenna connected to the specified antenna port (even though the antenna is detected normally when start up).
	7E	00	Lock error	When data write or read command is sent for the locked area. It depends on the tag's chip specifications. (For Monza chip, when these commands are sent for Lock Bit of User Memory because this area does not exist.) ^(See Note2)
System error	9A (See Note1)	XX (See Note1)	System error	An error that blocks command execution has been detected in the hardware (such as malfunction of inner circuit or temporary execution error caused by noise).

Note1: 'x' character in response code means one character in the list of 0 to 9 or A to F.

Note2: Depends on the specification of IC chip equipped in the RF tag. (It occurs at Monza chip when it specified the lock bit which does not exist in its memory map.

**Additional Information**

For details and troubleshooting the destination device errors, refer to *Section 7 Troubleshooting Alarms and Errors* in the *V750-series UHF RFID System User's Manual* (Cat. No. Z235).

10. Revision History

Revision code	Date of revision	Revision reason and revision page
01	2013/04/15	First edition

OMRON Corporation Industrial Automation Company
Tokyo, JAPAN

Contact: www.ia.omron.com

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,
IL 60173-5302 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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