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FATEC

Mitsubishi Programmable Controllers Training Manual Safety Programmable Controller Basic Course

SAFETY PRECAUTIONS

(Always read these instructions before using the products.)

When designing the system, always read the relevant manuals and give sufficient consideration to safety.
During the exercise, pay full attention to the following points and handle the product correctly.

[EXERCISE PRECAUTIONS]

⚠WARNING

- Do not touch the terminals while the power is on to prevent electric shock.
- Before opening the safety cover, turn off the power or ensure the safety.
- Do not touch the movable portion.

⚠CAUTION

- Follow the instructor's direction during the exercise.
- Do not remove the module of the demonstration machine or change wirings without permission.
  Doing so may cause failures, malfunctions, personal injuries and/or a fire.
- Turn off the power before mounting or removing the module.
  Failure to do so may result in malfunctions of the module or electric shock.
- When the demonstration machine (such as X/Y table) emits abnormal odor/sound, press the "Power switch" or "Emergency switch" to turn off.
- When a problem occurs, notify the instructor as soon as possible.

MEMO

REVISIONS

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

Revision date	*Manual number	Description
April 2020	SH(NA)-082341ENG-A	First edition

TRADEMARKS

Ethernet is a registered trademark of Fuji Xerox Co., Ltd. in Japan.

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In some cases, trademark symbols such as '™' or '®' are not specified in this manual.

MEMO

INTRODUCTION

To help users to understand the MELSEC iQ-R series safety programmable controllers, this manual describes the safety standards, how to operate a safety programmable controller, and how to create/edit programs and set parameters using GX Works3.

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Safety Application Guide [SH-081538ENG]	Overview of safety systems, how to configure safety systems, examples of installation and wiring, and application programs	e-Manual PDF
MELSEC iQ-R Safety Function Block Reference [BCN-P5999-0815]	Specifications of the safety FBs	e-Manual PDF
Mitsubishi Safety Programmable Controller MELSEC iQ-R Series Machinery Directive (2006/42/EC) Compliance [BCN-P5999-0502]	Machinery Directive (2006/42/EC) for the mitsubishi safety programmable controller MELSEC iQ-R series	PDF
CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual [SH-081449ENG]	Procedures required to use safety I/O modules, system configuration, parameter setting, functions, and troubleshooting	e-Manual PDF
CC-Link IE Field Network Remote I/O Module User's Manual [SH-081114ENG]	Procedures required to use I/O modules, system configuration, parameter setting, functions, and troubleshooting	e-Manual PDF
MELSEC iQ-R Module Configuration Manual [SH-081262ENG]	system configuration, specifications, installation, wiring, maintenance, and inspection of MELSEC iQ-R series programmable controllers	e-Manual PDF
GX Works3 Operating Manual [SH-081215ENG]	System configuration, parameter settings, and online operations of GX Works3	e-Manual PDF
MELSEC iQ-R Programming Manual (Program Design) [SH-081265ENG]	Program specifications (ladder, ST, FBD/LD, and SFC programs)	e-Manual PDF
MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks) [SH-081266ENG]	Instructions for the CPU module and standard functions/function blocks	e-Manual PDF
MELSEC iQ-R Programming Manual (Module Dedicated Instructions) [SH-081976ENG]	Dedicated instructions for the intelligent function modules	e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Application) [SH-081264ENG]	Memory, functions, devices, and parameters of the CPU module	e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Startup) [SH-081263ENG]	Performance specifications, procedures before operation, and troubleshooting of the CPU module	e-Manual PDF
MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup) [SH-081256ENG]	Specifications, procedures before operation, system configuration, wiring, and communication examples of Ethernet, CC-Link IE Controller Network, and CC-Link IE Field Network	e-Manual PDF

Point

e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

MEMO

CONTENTS

1 OVERVIEW

1.1 Safety Programmable Controller

The safety programmable controller is an international safety standards certified controller and prevents labor accidents.
It performs safety control by turning safety output off responding to safety input. Safety input means a signal input from a safety component (such as an emergency stop switch and a safety light curtain) that complies with the international safety standards. Safety output means a signal output to a hazard (such as a motor and a robot) to stop power supplied to it.
The safety programmable controller performs the high-level self-diagnostic function, which is one of the requirements of the international safety standards, at start-up and during operation. When an error occurs in the safety programmable controller itself, the controller detects the error during execution of the self-diagnostic function and forcibly turns off safety output. This prevents the loss of the safety function due to an error. The safety programmable controller differs the most from the standard programmable controller at this point.
The safety programmable controller has obtained the safety approval of the highest safety level for a programmable controller: Category 4 and PLe of ISO 13849-1:2006, SIL3 of IEC 62061:2012, and SIL3 of IEC 61508:2010.
Users can use the safety programmable controller when configuring a safety system that complies with ISO 13849-1:2006 (Category 4 and PLe), IEC 62061:2012 (SIL3), and IEC 61508:2010 (SIL3).

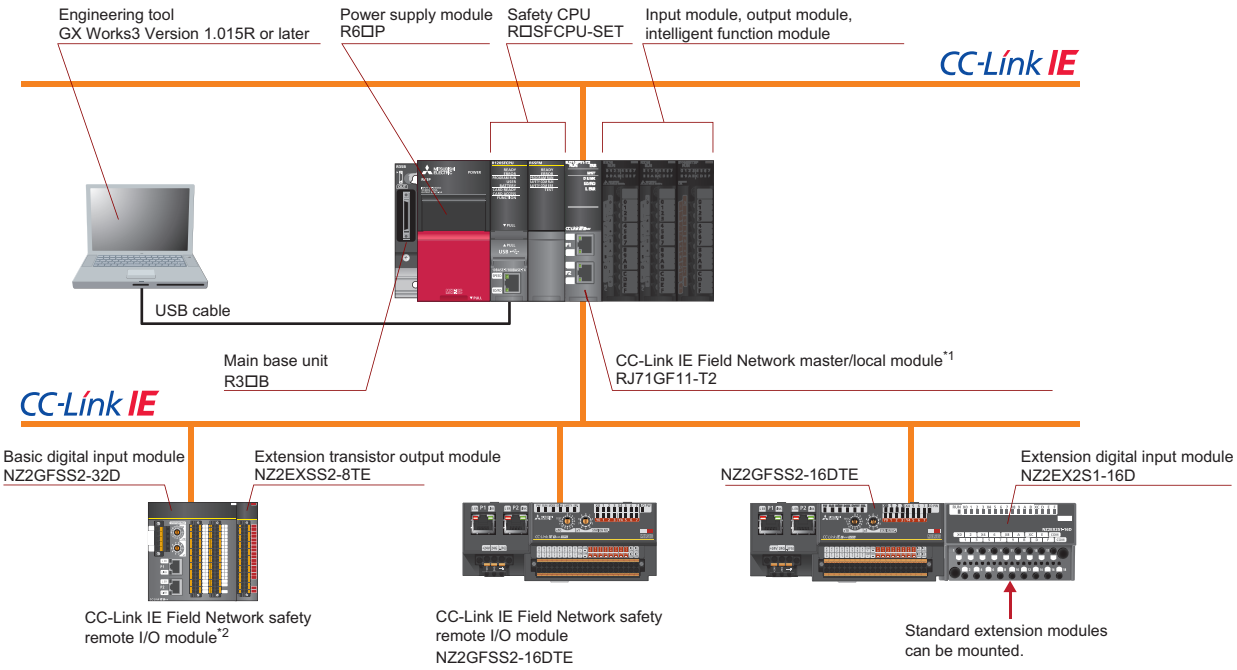
1.2 Features of MELSEC iQ-R series Safety Programmable Controller

1.2.1 Safety CPU and safety remote I/O module

The Safety CPU and safety remote I/O module comply with the international safety standards: ISO 13849-1:2006 (Category 4 and PLe) and IEC 61508:2010 (SIL3). The Safety CPU can execute both standard programs and safety programs.

1.2.2 System configuration

The following is an example of the system configuration using the MELSEC iQ-R series safety programmable controller.



*1 Firmware version 07 or later

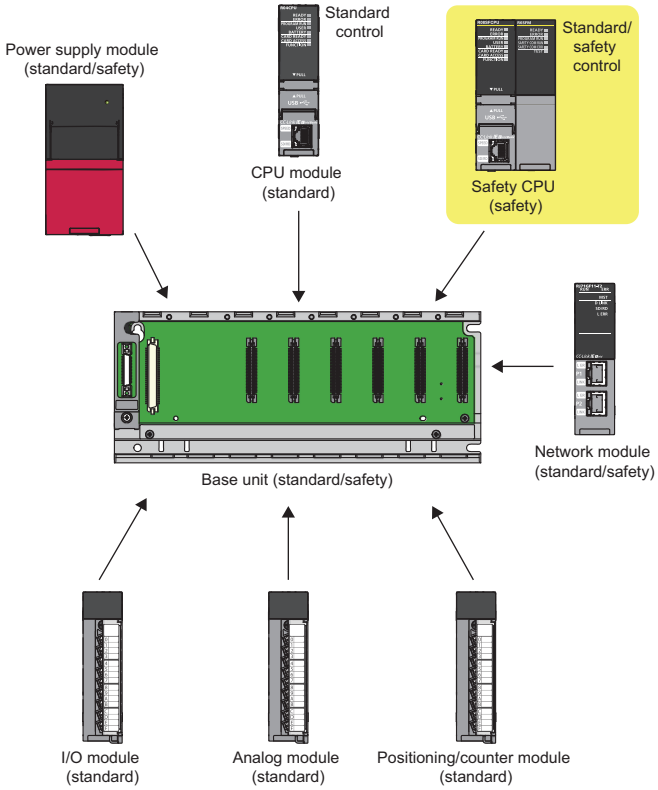
*2 Input: 32 points (single wiring), Output: 8 points (single wiring)

1.2.3 Integration of standard control and safety control

With the existing series of programmable controllers, standard control and safety control must be performed separately using two systems. It costs much for users to purchase and start up the systems. In addition, a large control panel is required so that two systems can be installed.

With MELSEC iQ-R series, the Safety CPU can execute both standard programs and safety programs, enabling standard control and safety control with one CPU module.

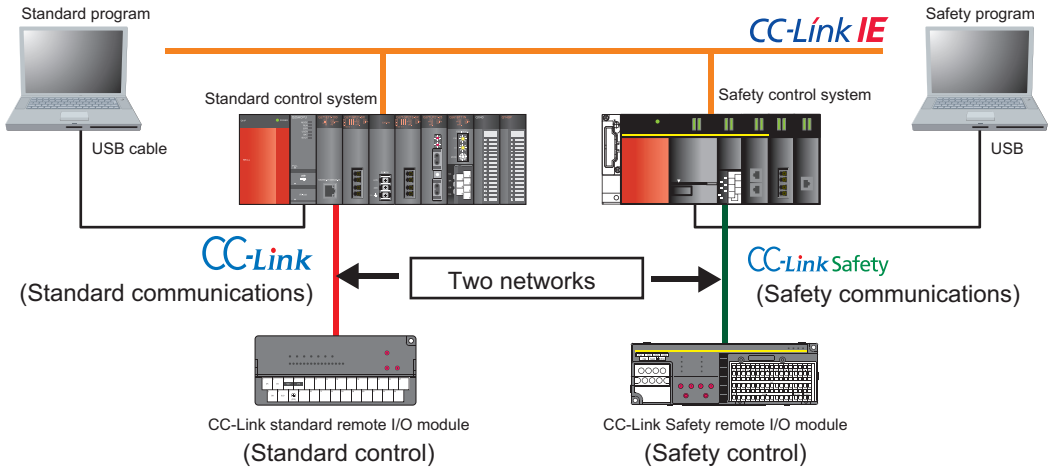
Modules for standard control (CPU module, I/O module, analog module, positioning module, counter module), module for safety control (Safety CPU), and common modules (power supply module, network module) can be all mounted on the same base unit. It means that only one system is enough for both standard control and safety control, saving costs, space, and wiring.



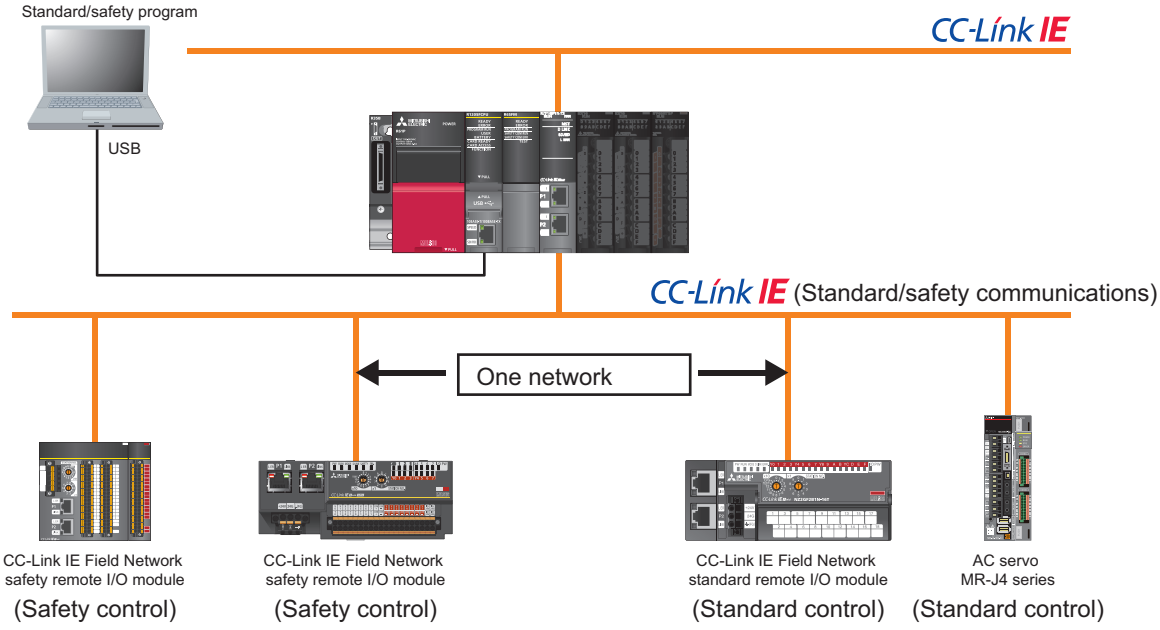
1.2.4 Integration of standard communications and safety communications

The MELSEC-Q series Safety CPU performs only safety communications, and therefore two different networks are required for standard communications and safety communications. On the other hand, the MELSEC iQ-R series Safety CPU can perform both standard communications and safety communications, and therefore the required network is only one, CC-Link IE Field Network. In addition, you don't need to prepare dedicated cables because standard Ethernet cables can be used in the CC-Link IE Field Network system.

MELSEC-QS series



MELSEC iQ-R series

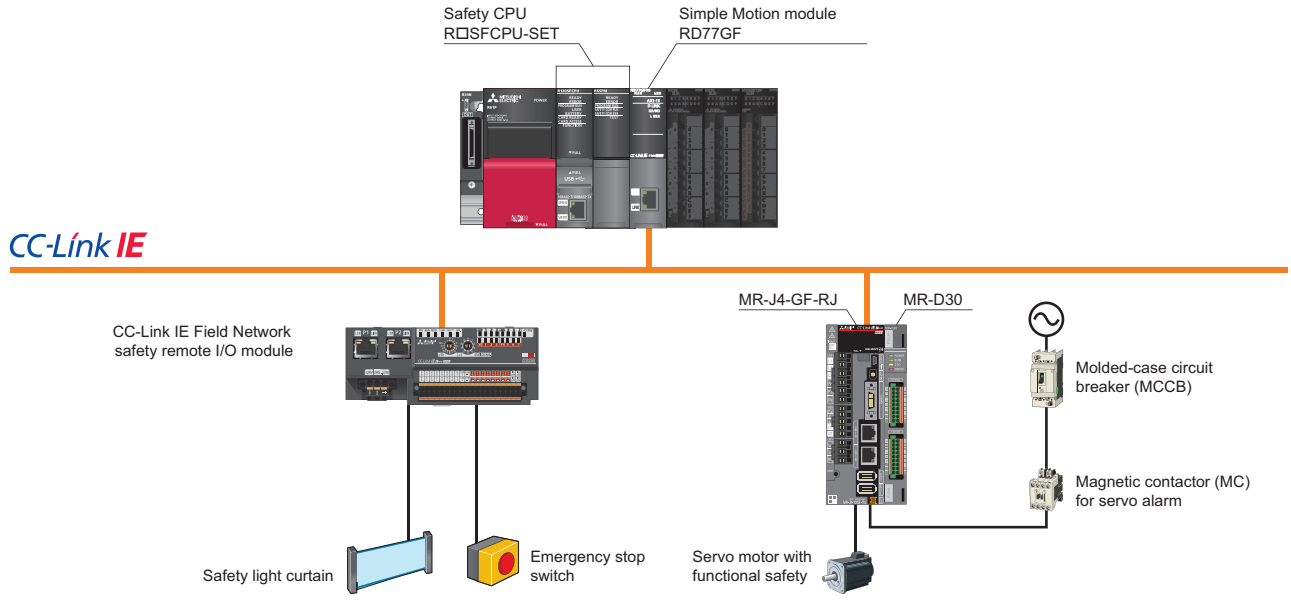


1.2.5 Interfacing with MELSERVO-J4 series general-purpose AC servo

The MELSEC iQ-R series programmable controller can interface with the MELSERVO-J4 series AC servo over CC-Link IE Field Network. Mount the Safety CPU and the Simple Motion module (RD77GF) on the same base unit. The AC servo amplifier can receive safety signals from the Safety CPU via the Simple Motion module over CC-Link IE Field Network.*1 Wiring between the safety remote I/O module and the MR-D30 functional safety unit is not required.

*1 The Safety CPU (R□SFCPU-SET) does not support the inter-module synchronization function.

■System configuration example



For details, refer to the following.

SERVO AMPLIFIERS & MOTORS MELSERVO-J4 catalog

■MELSERVO-J4 series general-purpose AC servo

The MELSERVO-J4 series general-purpose AC servo can perform safety control that conforms to Category 4 and PLe of ISO 13849-1:2006 and SIL3 of IEC 61508:2010 when it is used together with the MR-D30.

- The MR-J4-GF-RJ servo amplifier can execute the safety monitoring functions (STO, SS1, SS2, SOS, SLS, SBC, and SSM) when it is used together with the MR-D30. The safety monitoring functions can be set in parameters.*2
- There is no need to turn off the control power of the servo amplifier, resulting in the reduction of the time required for a restart and the elimination of the home position return.
- An electromagnetic contactor for preventing unexpected motor start is not required.*3

*2 Use the MR-D30 with the software version A1 or later.

*3 For the MR-J4 series servo amplifier, no electromagnetic contactor is required to meet the STO requirements. In the system configuration above, however, an electromagnetic contactor is connected for servo alarm and preventing an electric shock.

IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 and PLe of ISO 13849-1:2006, SIL3 of IEC 61508:2010
SS1 (Safe stop 1)	
SS2 (Safe stop 2)*4	
SOS (Safe operating stop)*4	
SLS (Safely-limited speed)*5	
SBC (Safe brake control)	
SSM (Safe speed monitor)*5	

*4 A servo motor with functional safety needs to be used to achieve the safety levels.

*5 If a servo motor with functional safety is not used, the safety levels achieved will be Category 3 and PLd of ISO 13849-1:2006 and SIL2 of IEC 61508:2010.

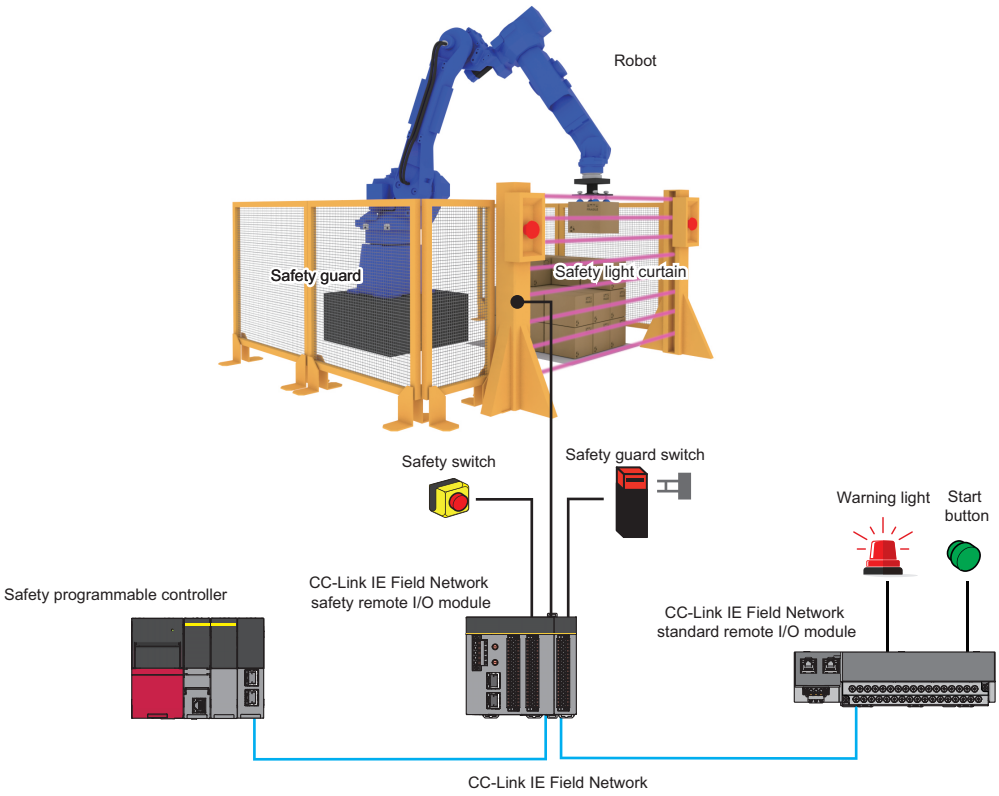
1.3 Demonstration Machine Used in the Training

In the actual work site, a safety guard shall be installed as shown below, surrounding the robot.
No more measure is required if the robot is completely enclosed and no one ever approaches the hazard.
However, a person will probably approach the robot for maintenance or a person may enter the safeguarded area from the opening.

In the training, we configure a safety system to stop the operation of the robot when a person enters the safeguarded area from the door or the opening and goes close to the robot. The entry of a person or an emergency stop in the event of a danger is handed over to the safety system as safety information using safety components (such as emergency stop switch, safety light curtain, and safety guard switch). The operation of the robot stops when a safety component detects the entry of a person or the emergency stop switch is pressed.

You can learn the basic safety functions using the demonstration machine.

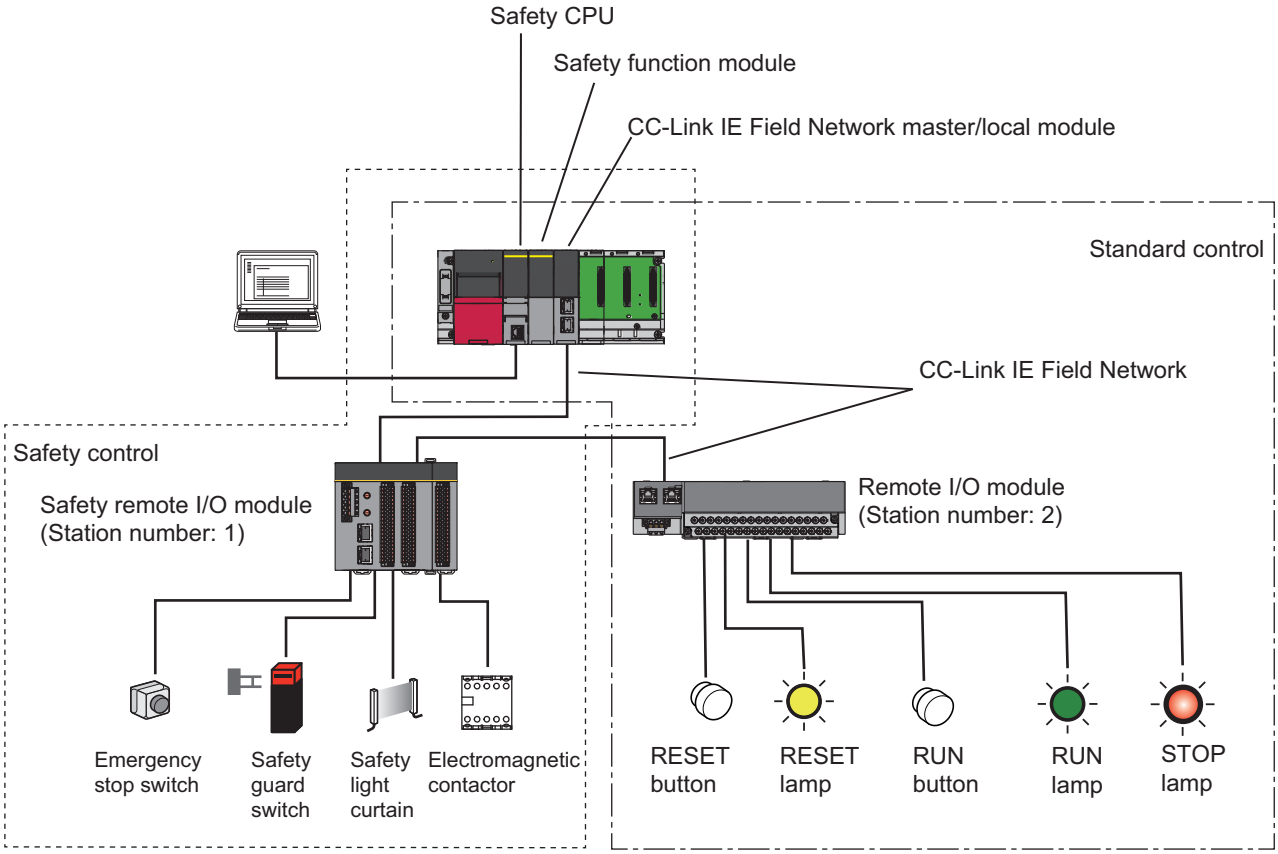
<Image of the safety system>



2 CONFIGURATION

2.1 Safety Application Configuration Example

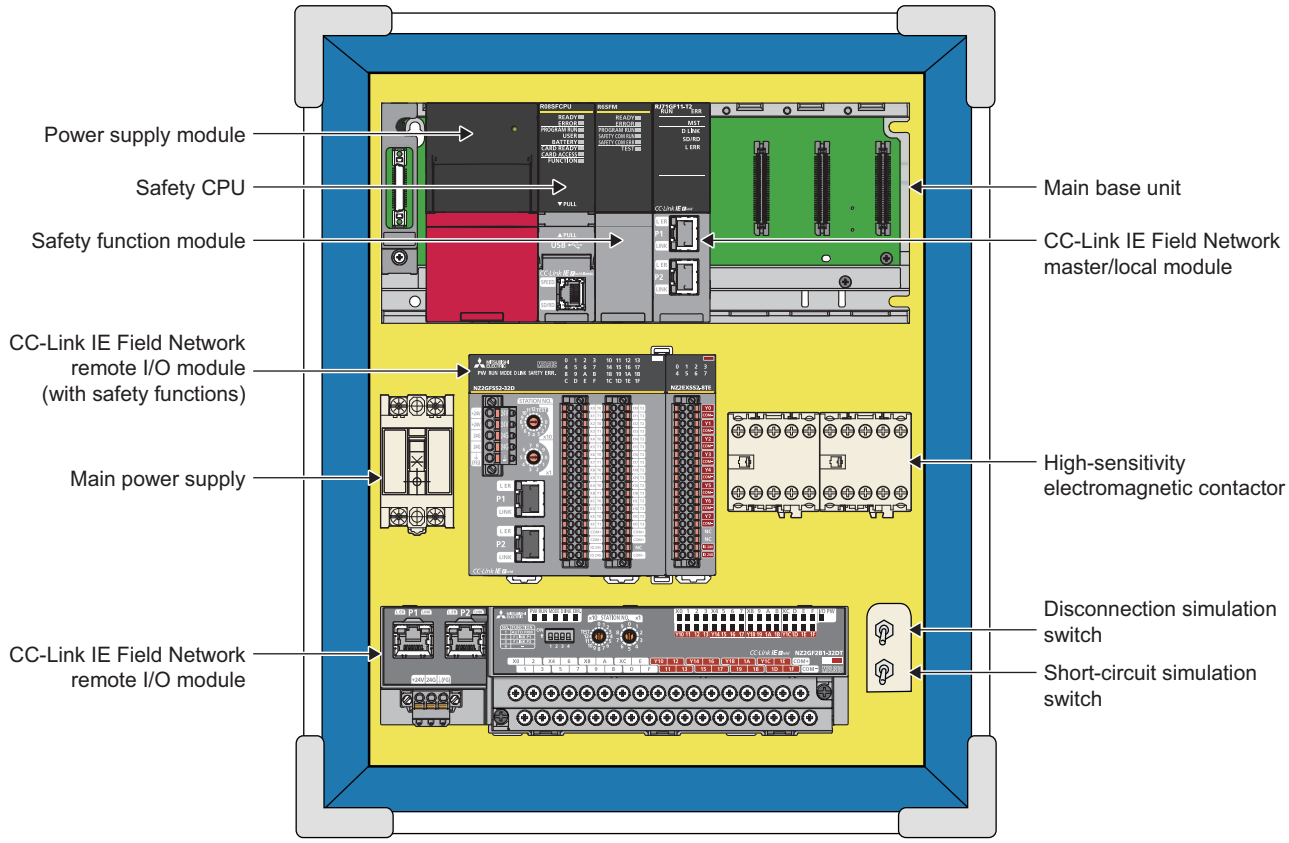
This chapter describes a configuration example of a safety application using a safety programmable controller, based on the system configuration of the demonstration machine shown below.



2.2 Demonstration Machine

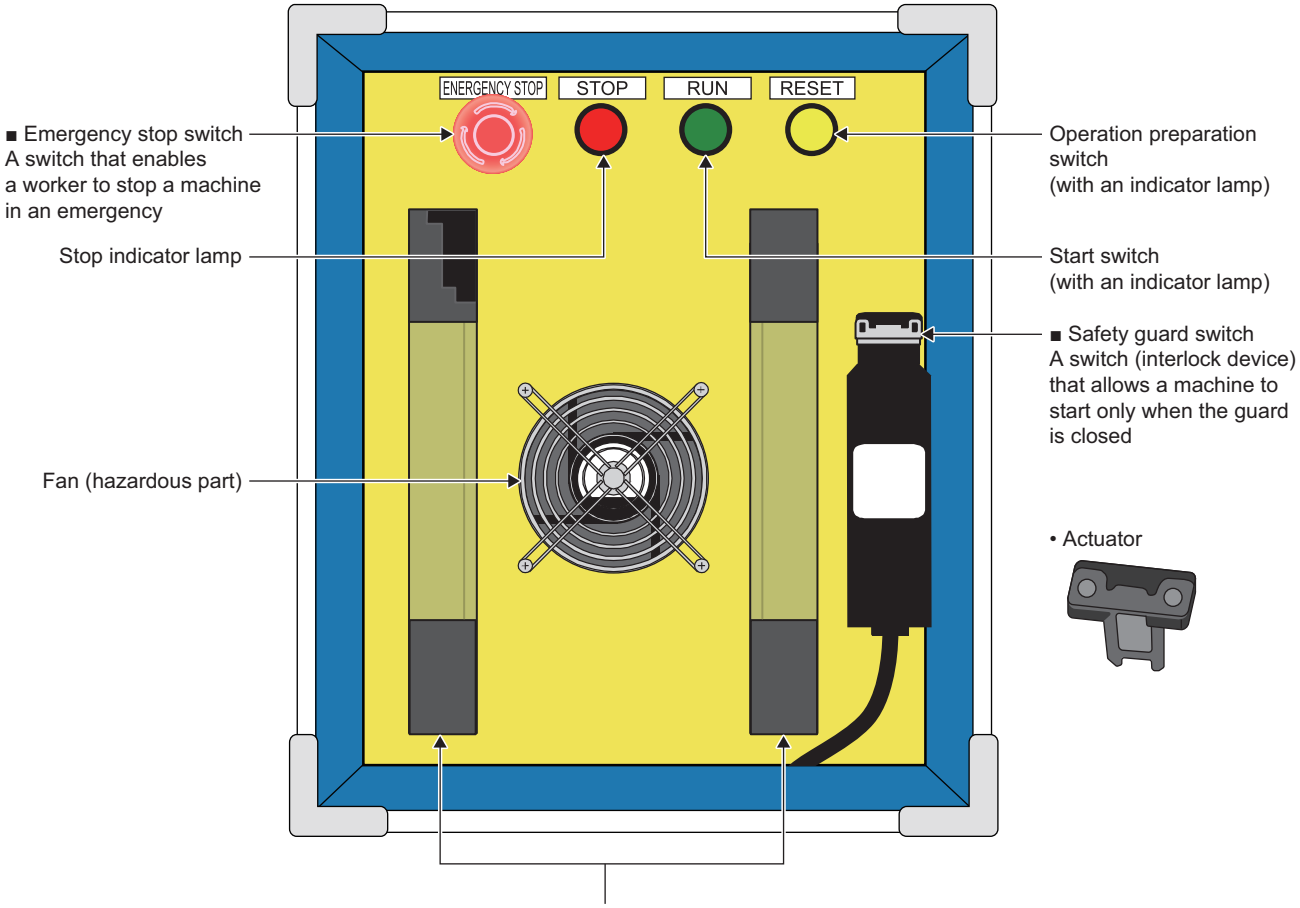
2.2.1 Hardware configuration of demonstration machine (safety programmable controller side)

The following is the hardware configuration of the demonstration machine (safety programmable controller side).



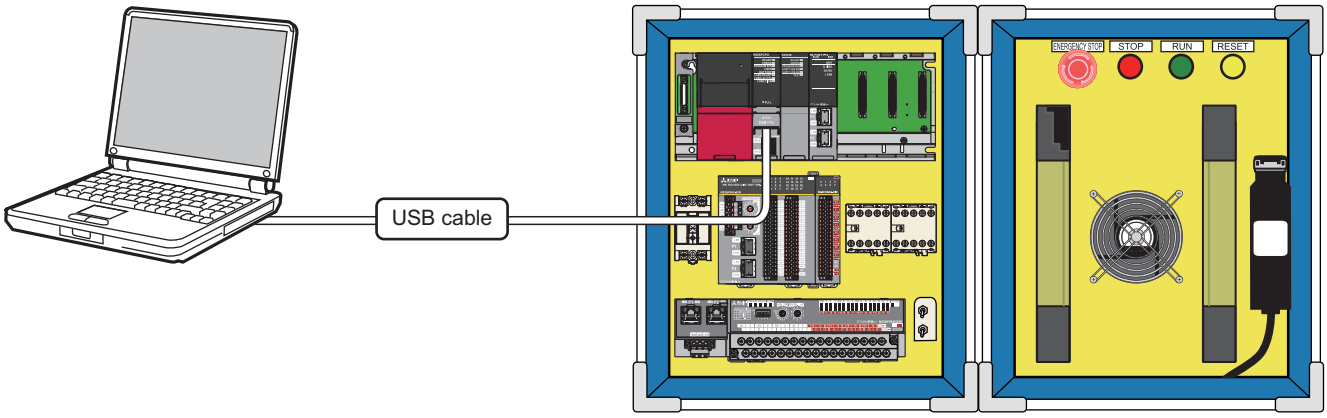
2.2.2 Hardware configuration of demonstration machine (safety component side)

The following is the hardware configuration of the demonstration machine (safety component side).



2.2.3 System configuration of demonstration machine

The following is the system configuration of the demonstration machine.



2.2.4 Wiring specifications

Cables of the remote I/O modules used in the demonstration machine shall be connected as follows.

Safety remote I/O module

No.	Component	Input	Input dark test	Output	Output dark test
1	Emergency stop switch	SA\X0-T0, SA\X1-T1	○ Executed	—	—
2	Safety light curtain	SA\X2, SA\X3, COM-	× Not required	—	—
3	Safety guard switch	SA\X6-T0, SA\X7-T1	○ Executed	—	—
4	Electromagnetic contactor	SA\X4-T0, SA\X5-T1	○ Executed	SA\Y0+, SA\Y0-	○ Executed

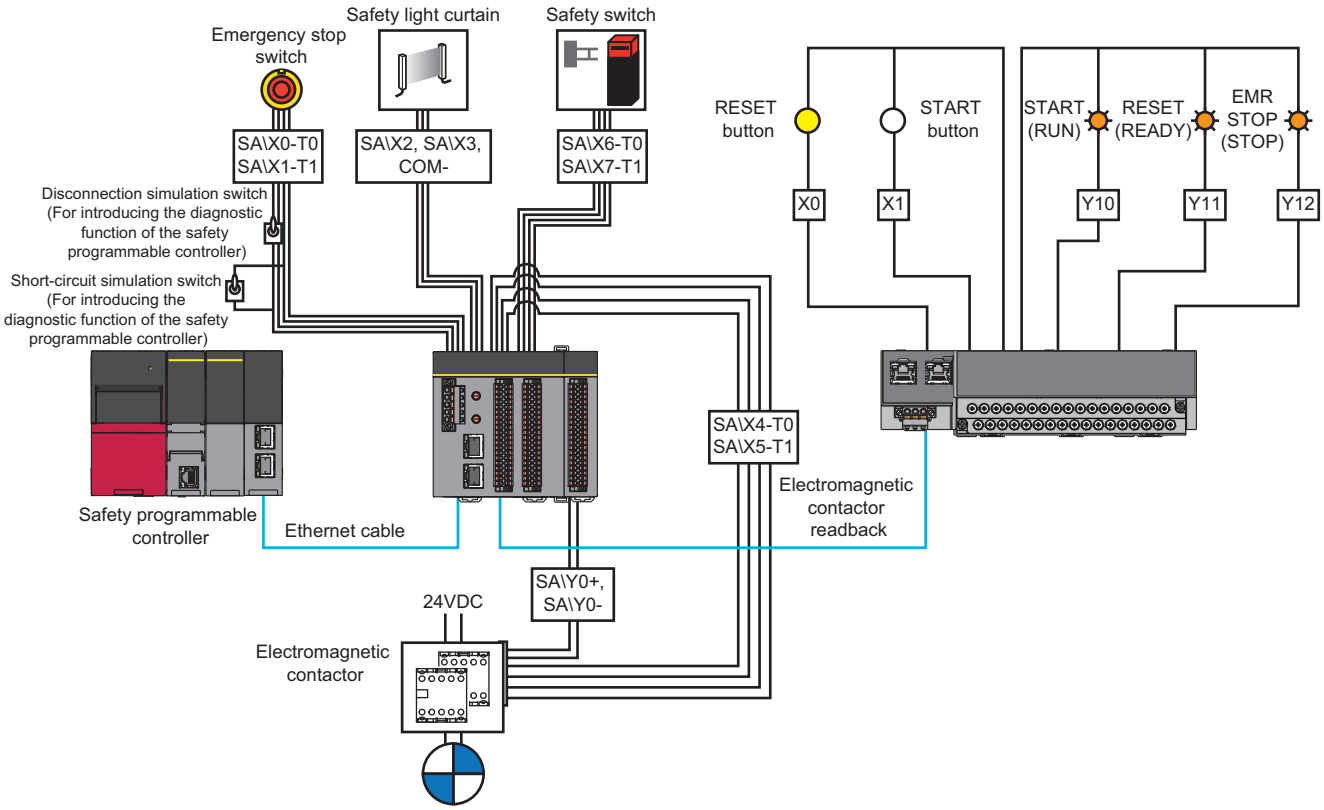
Standard remote I/O module

No.	Component	Input	Input dark test	Output	Output dark test
1	Standard switch	X0-COM, X1-COM	N/A	—	—

2.2.5 Wiring

Entire wiring

The following is the entire wiring diagram of the demonstration machine.

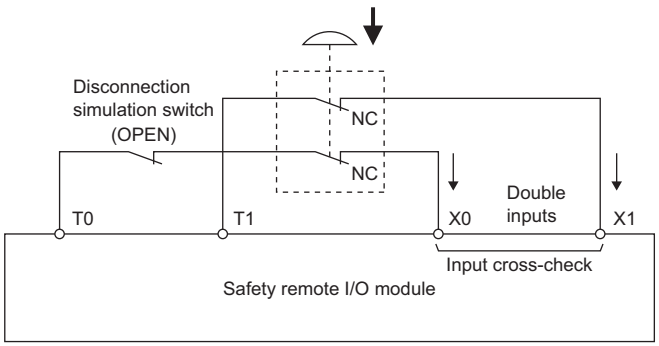


Double wiring

The following cables are double-wired: between the emergency stop switch and the safety remote I/O module and between the safety guard switch and the safety remote I/O module.

By cross-checking input signals of double wiring, a safety input can be turned off even though either one of the signals has an error.

In the demonstration machine, the disconnection simulation switch for introducing the diagnostic function of the safety programmable controller is provided on the wiring of the emergency stop switch.

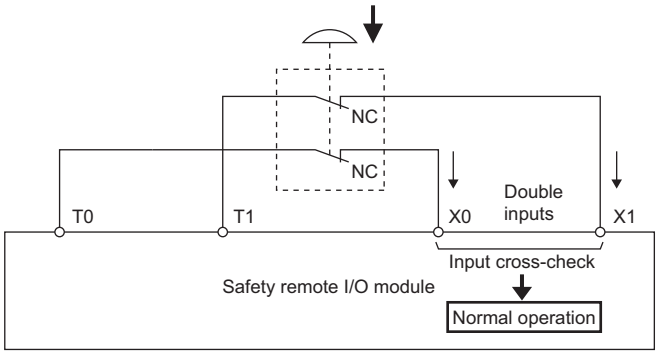


[Operation]

The operation when the disconnection simulation switch is turned on/off is as follows.

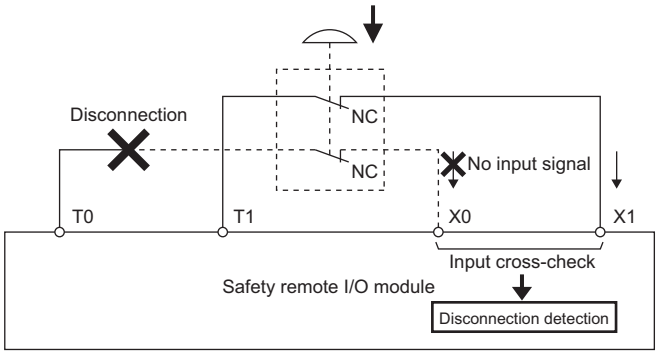
(Disconnection simulation switch: Off (normal operation))

Signals are input to both input terminals (X0 and X1), and the cross-check completes successfully. It means that there is no disconnection in the system.



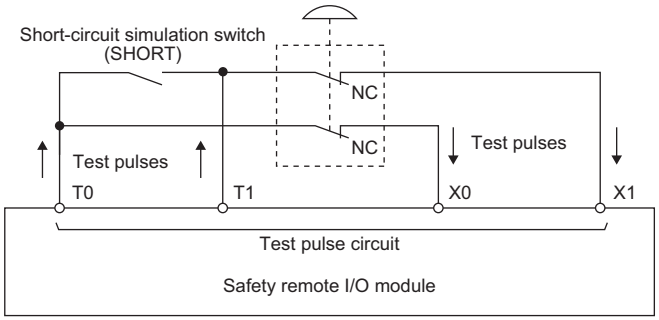
(Disconnection simulation switch: On (disconnection))

No signal is input to the input terminal (X0), and the cross-check completes with an error. It means that there is a disconnection in the system.



Input dark test circuit

The input dark test circuit is provided in the emergency stop switch circuit and the safety guard switch circuit. A safety input can be turned off when a short-circuit error is detected. In the demonstration machine, the short-circuit simulation switch for introducing the diagnostic function of the safety programmable controller is provided between the output terminals T0 and T1. When the short-circuit simulation switch is turned on, a short circuit occurs between T0 and T1. As a result, test pulses output from T0 and T1 are not input to the input terminals (X0 and X1), and an error occurs.

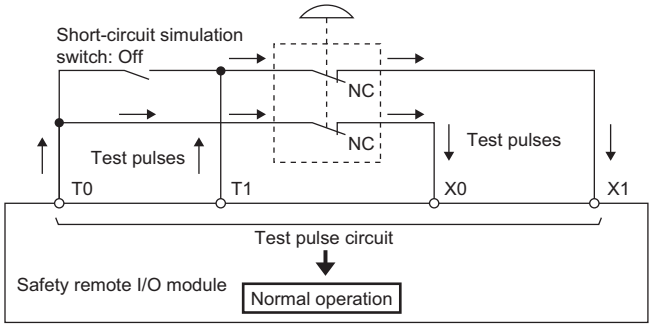


[Operation]

The operation when the short-circuit simulation switch is turned on/off is as follows.

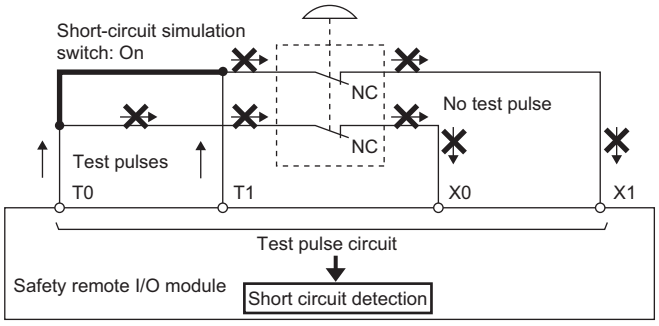
(Short-circuit simulation switch: Off (normal operation))

Test pulses are input to both input terminals (X0 and X1), and the normal operation is detected in the test pulse circuit. It means that there is no short circuit in the system.



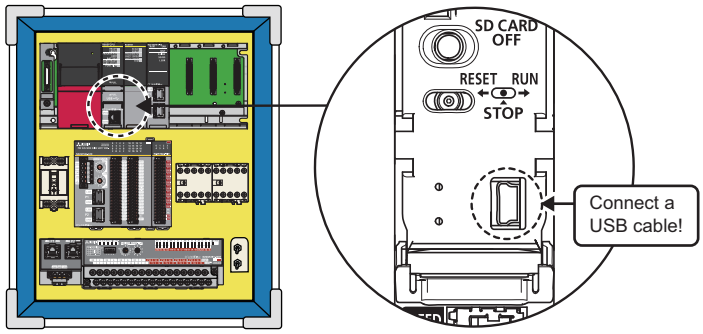
(Short-circuit simulation switch: On (short circuit))

Test pulses are not input to the input terminals (X0 and X1), and an error is detected in the test pulse circuit. It means that there is a short circuit in the system.

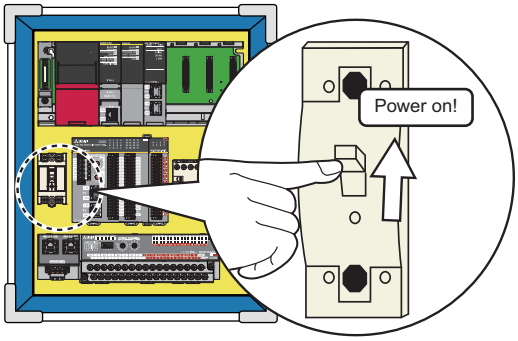


2.3 Connecting the Personal Computer and the Safety Programmable Controller and Powering on the Demonstration Machine

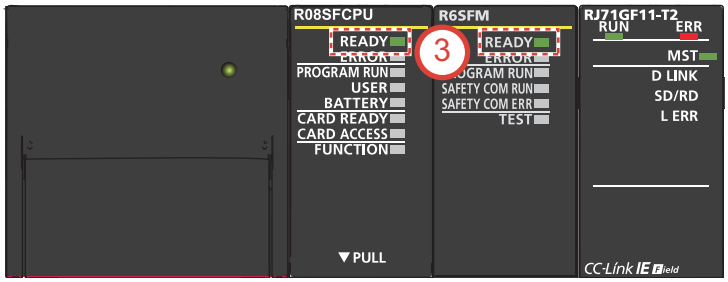
Operating procedure



1. Connect the personal computer to the safety programmable controller with a USB cable.



2. Check that the demonstration machine is plugged into an outlet, and power it on.



3. Check that the READY LED of the Safety CPU (R08SFCPU) and the safety function module (R6SFM) is on.

2.4 Network-Related Switch Settings

2.4.1 Switch settings of each module

Set switches of each module as follows.

Safety CPU

There is no network-related switch.

Safety function module

There is no switch.

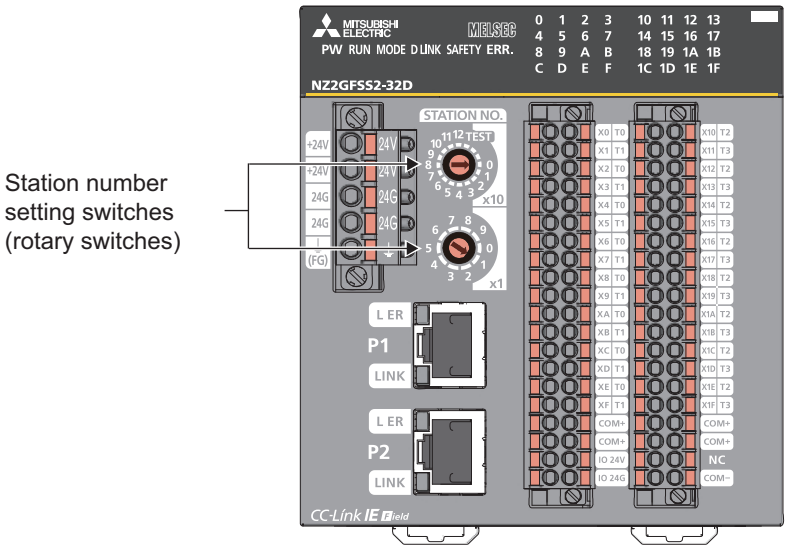
CC-Link IE Field Network master/local module

There is no network-related switch.

CC-Link IE Field Network remote I/O module (with safety functions)

Set the station number setting switches (rotary switches).

Set "01" in the configuration example shown on Page 16 Safety Application Configuration Example.



2.4.2 Procedure after setting the switches

Perform the following to enable the switch setting values.

Operating procedure

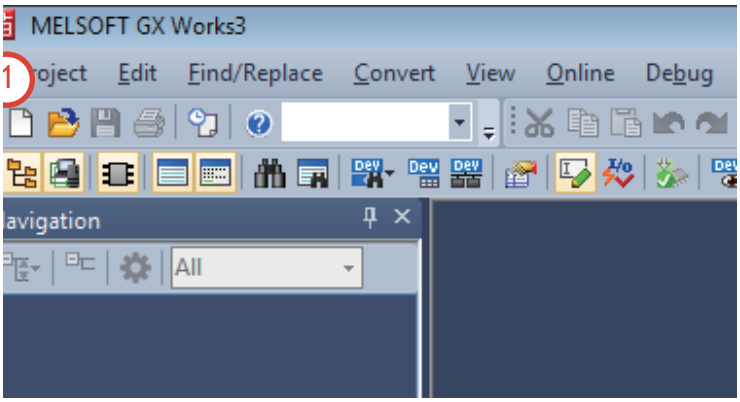
1. Power off and on the safety remote I/O module.

2.5 Parameter Settings of Each Module

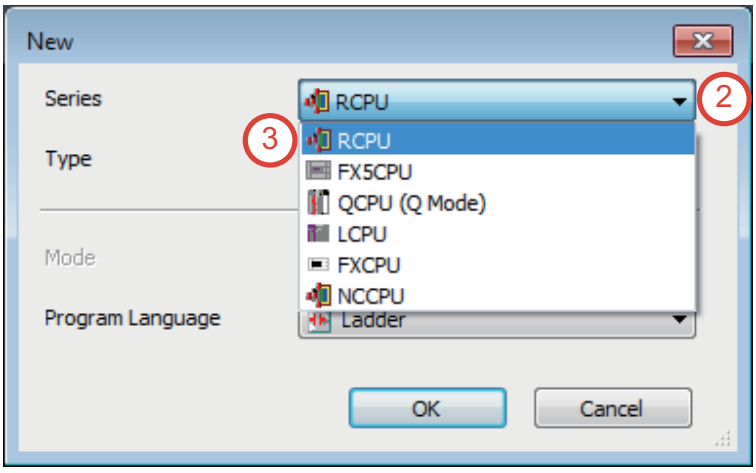
This section describes the module configuration and parameter settings using GX Works3 for the configuration example shown on Page 16 Safety Application Configuration Example.

2.5.1 Creating a new project

Operating procedure

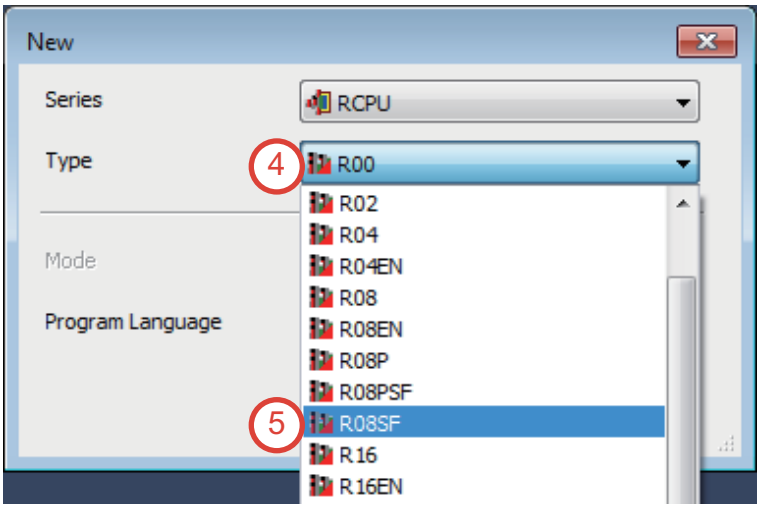


1. Click on the toolbar or select [Project] → [New] (Ctrl + N) from the menu.



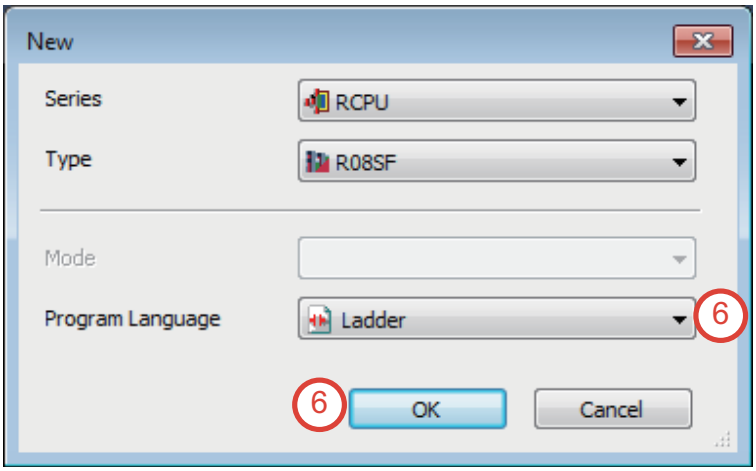
2. Click the drop-down button of "Series".

3. Select "RCPU" from the drop-down menu.

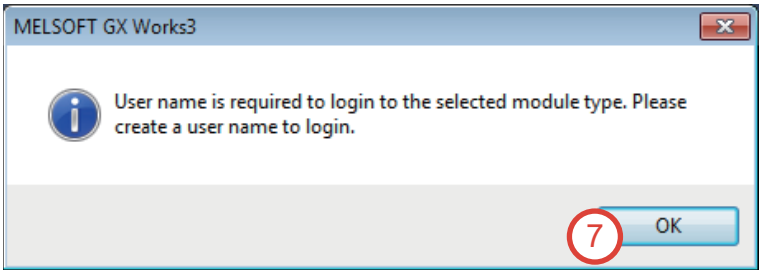


4. Click the drop-down button of "Type".

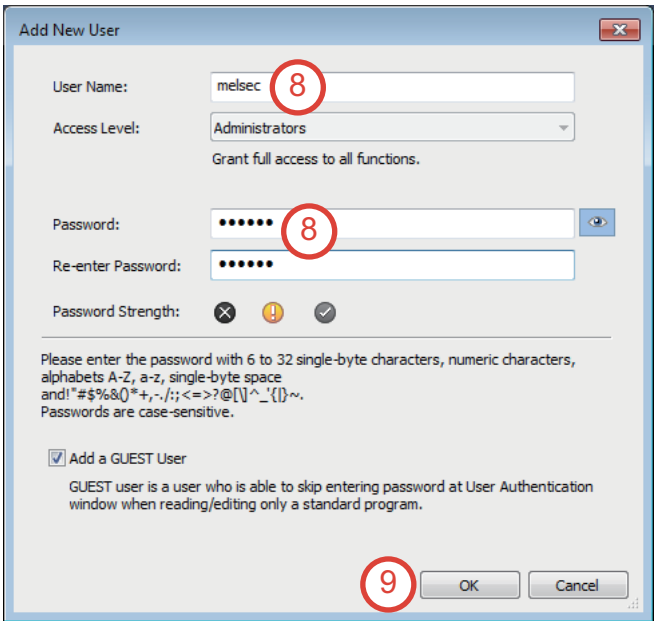
5. Select "R08SF" from the drop-down menu.

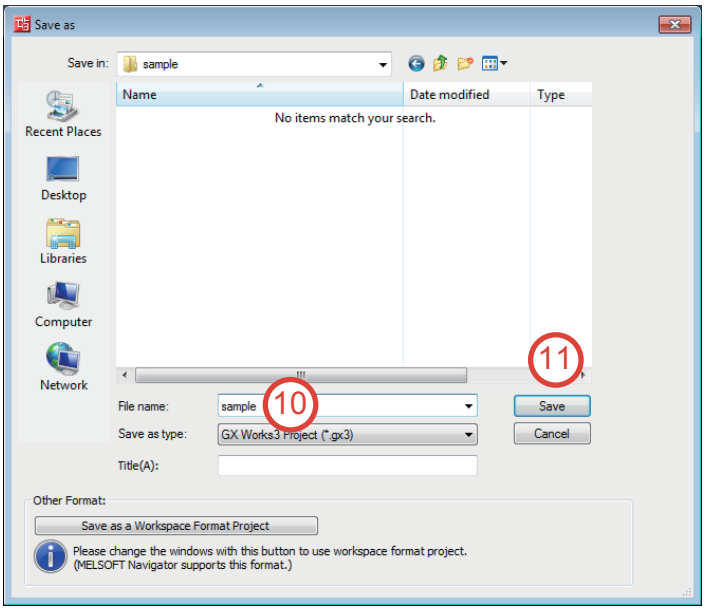


6. Click the drop-down button of "Program Language". Select "Ladder" from the drop-down menu. Then, click the [OK] button.



7. Click the [OK] button.





8. Enter the user name, password, and re-enter password.

User Name: melsec

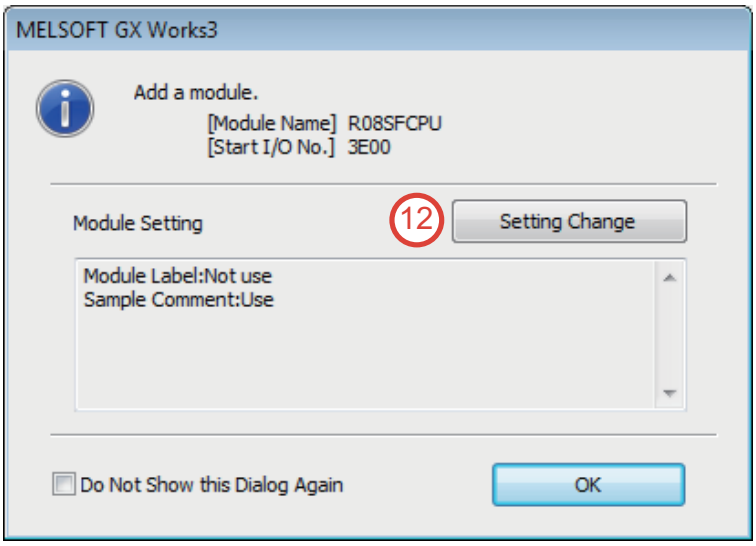
Password: melsec

9. Click the [OK] button.

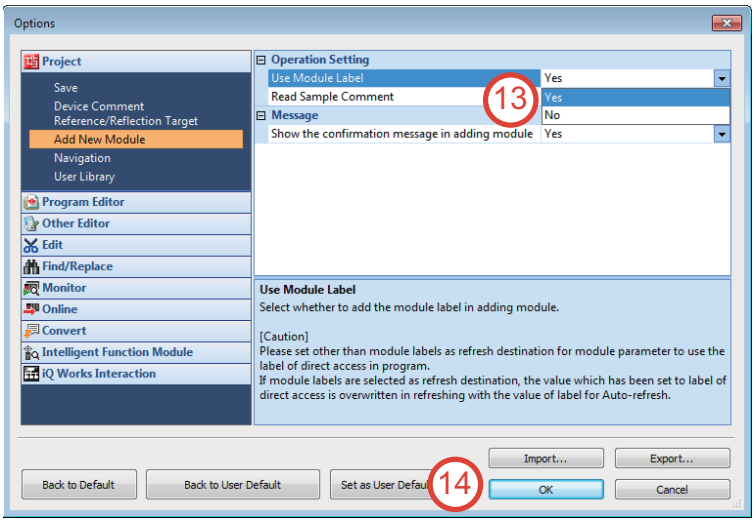
10. Enter the file name.

File name: sample

11. Click the [Save] button.

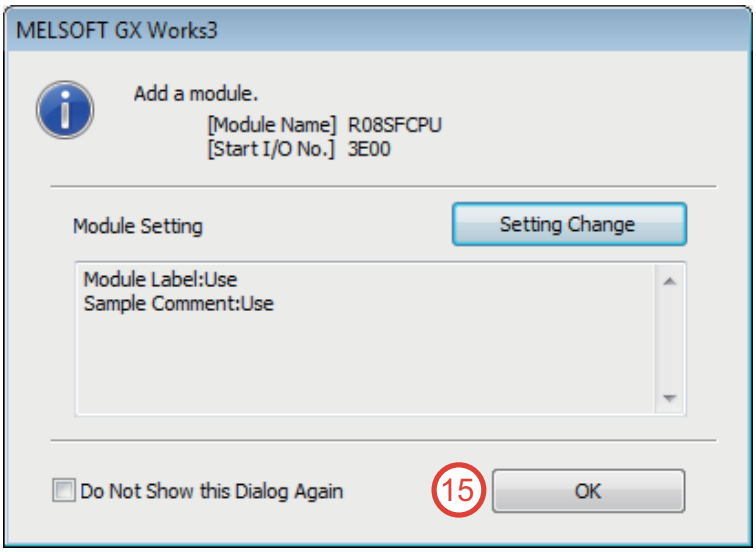


12. Click the [Setting Change] button.

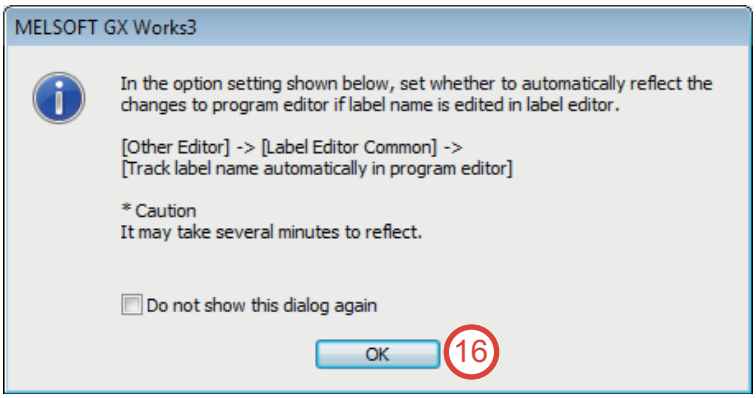


13. Set "Use Module Label" to "Yes".

14. Click the [OK] button.

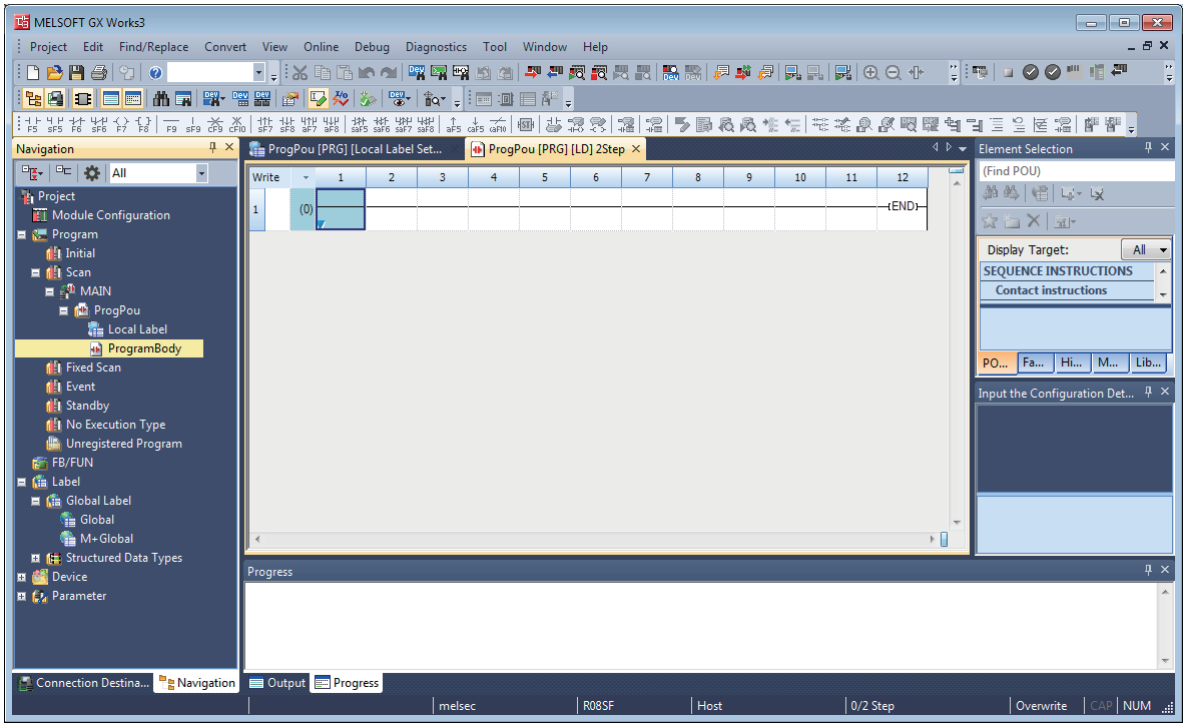


15. Click the [OK] button.



16. The dialog box that confirms an addition of the label of selected module ("R08SF" here) appears. Click the [OK] button.

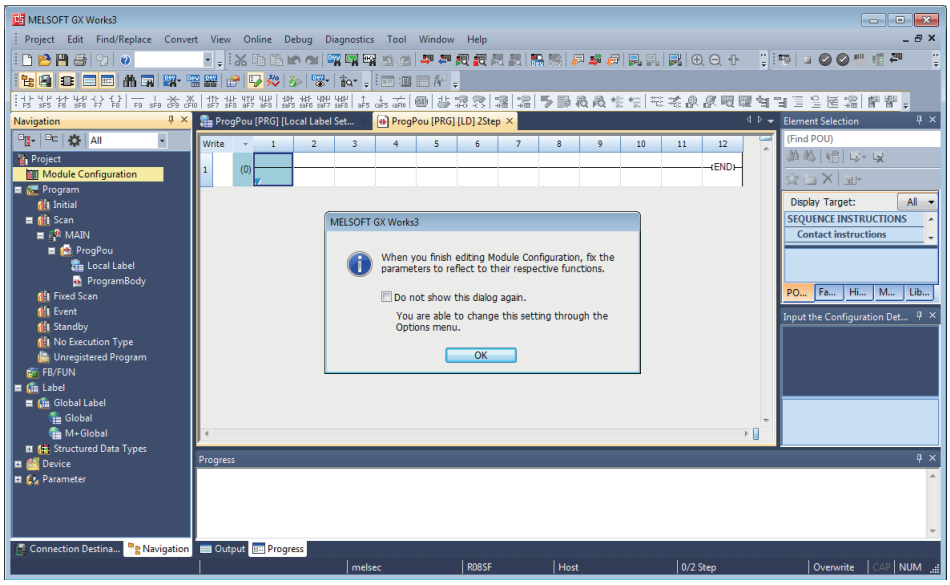
17. A new project is created.



2.5.2 Module configuration settings

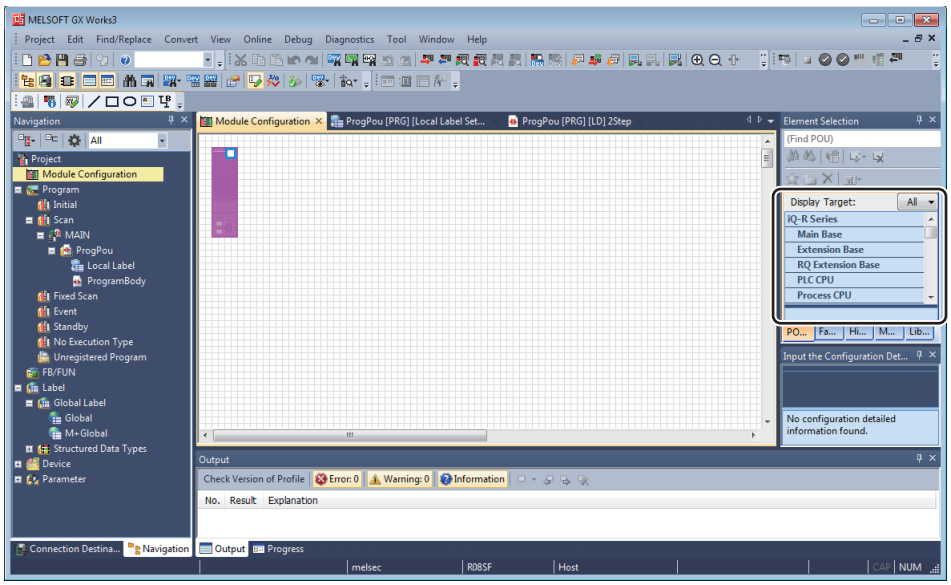
Operating procedure

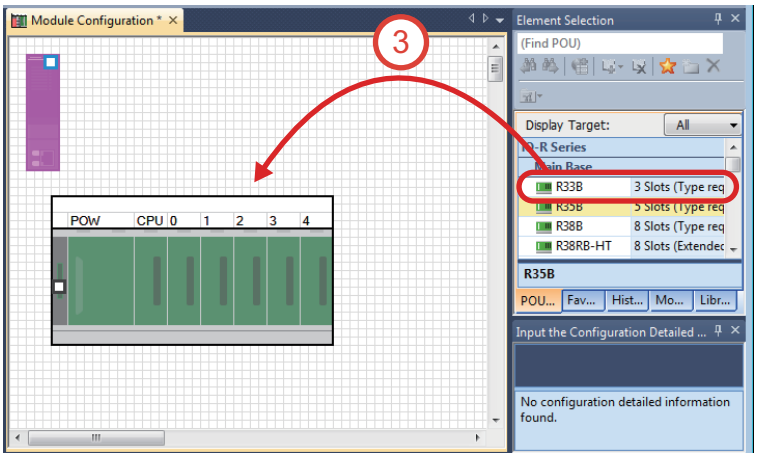
1. Double-click [Module Configuration] in the Navigation window. If the dialog box about parameter information appears, click the [OK] button.



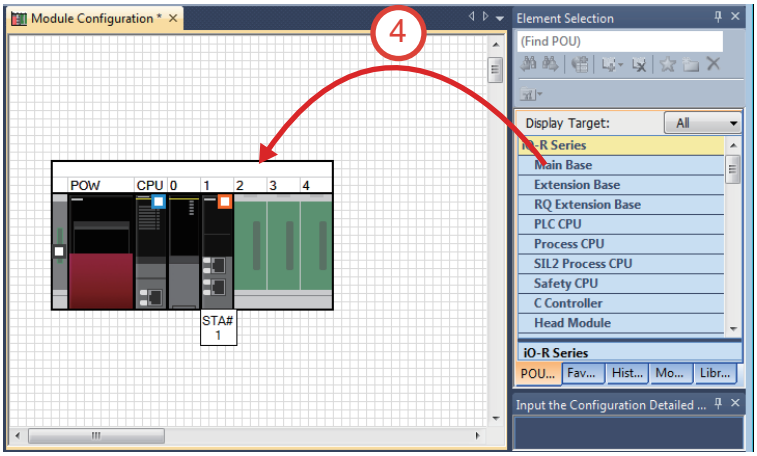
2. The "Module Configuration" window appears. Select the following from the "Element Selection" window.

- Main Base: R35B
- Power Supply: R62P
- Safety CPU: Place the CPU module in the "Module Configuration" window on the base unit.
- CPU Extension: R6SFM
- Network Module: RJ71GF11-T2



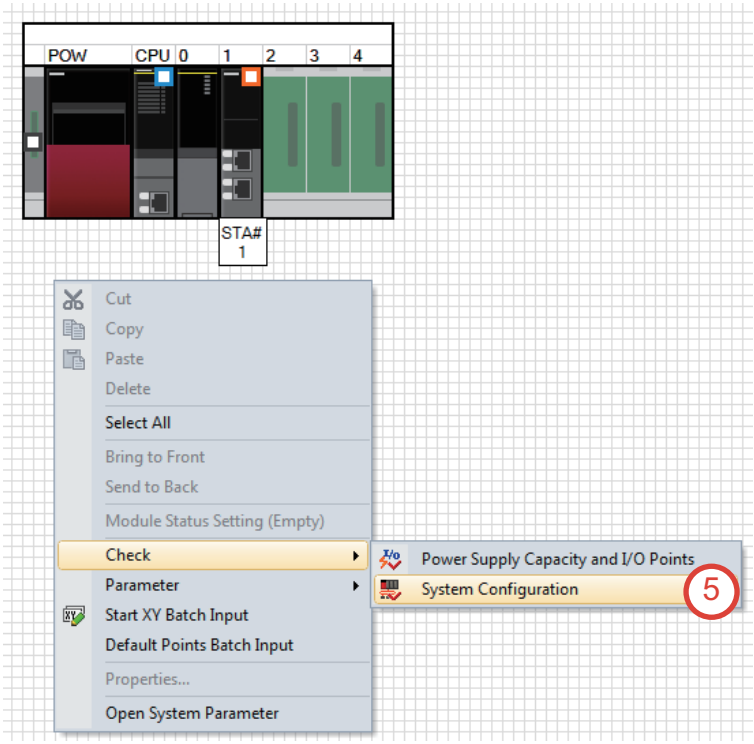


3. Select the main base unit "R35B" in the "Element Selection" window, and drag and drop it to the "Module Configuration" window.

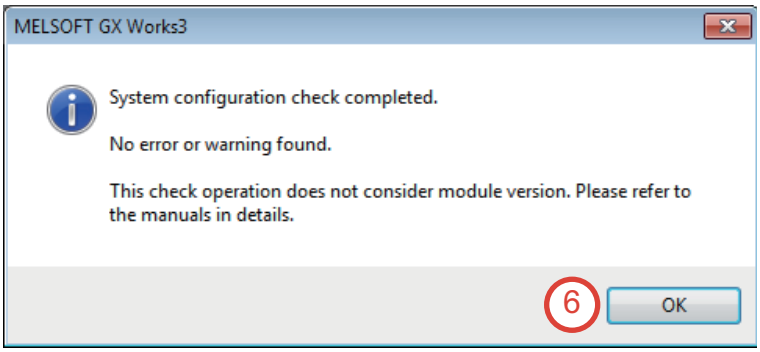


4. Select modules in the "Element Selection" window, and drag and drop them to the "Module Configuration" window in the same way as Step 3.

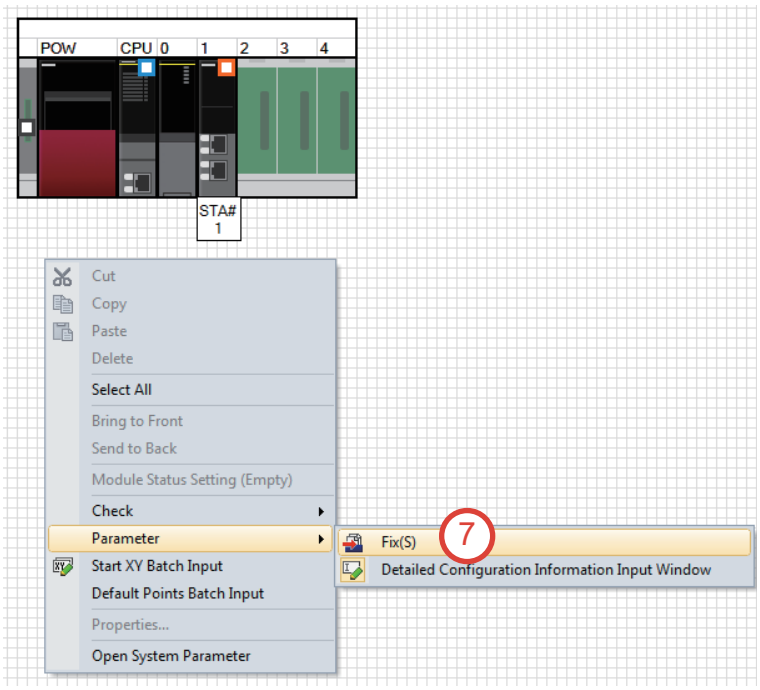
- Power Supply: R62P
- Safety CPU: Place the CPU module in the "Module Configuration" window on the base unit.
- CPU Extension: R6SFM
- Network Module: RJ71GF11-T2



5. Check the module configuration.
Right-click in the "Module Configuration" window, and select [Check] → [System Configuration].

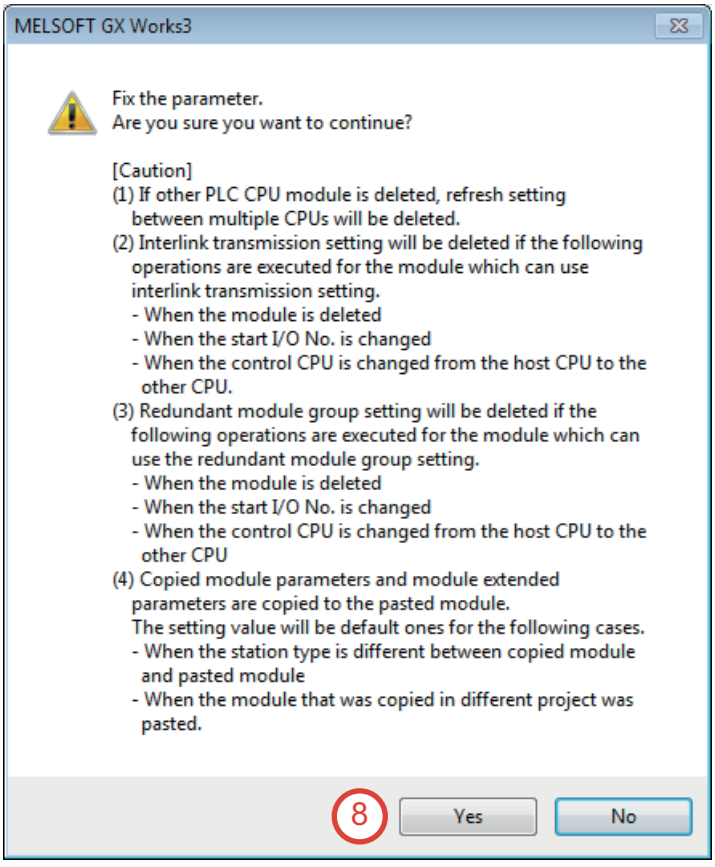


6. Check that no error exists, and click the [OK] button.

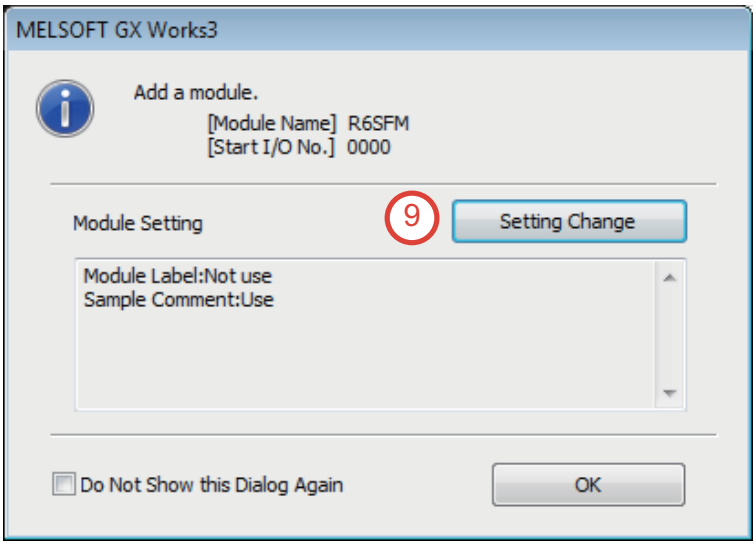


7. Fix the module configuration.

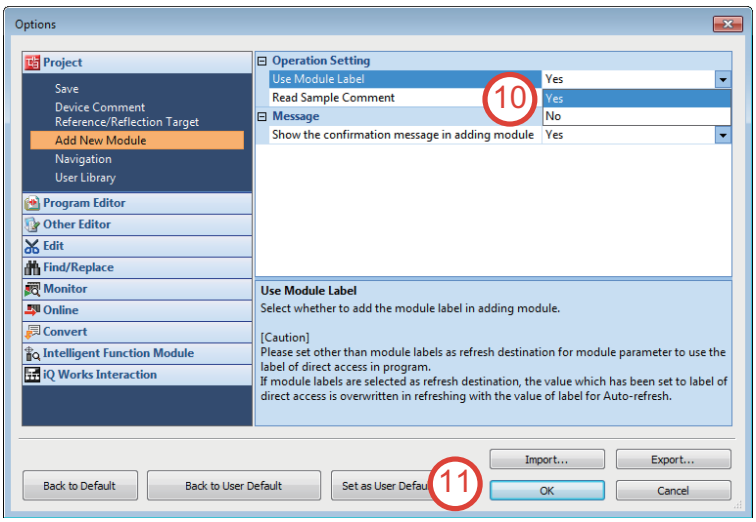
Right-click in the "Module Configuration" window, and select [Parameter] → [Fix].



8. Click the [Yes] button.

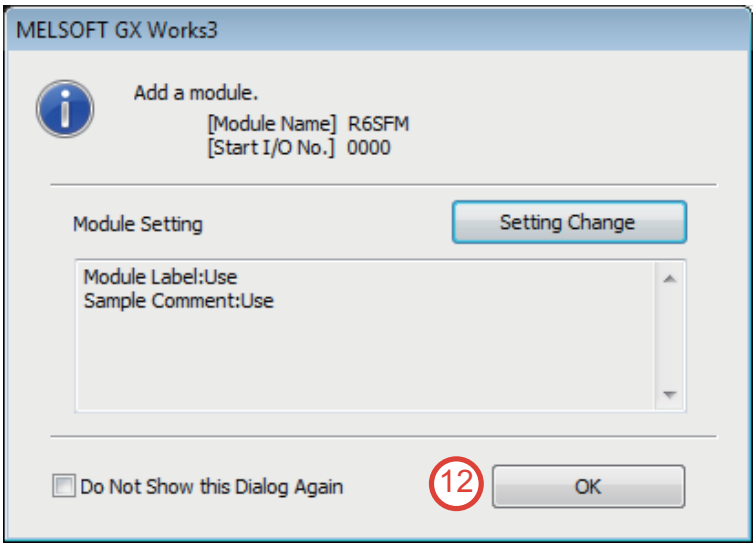


9. Click the [Setting Change] button.

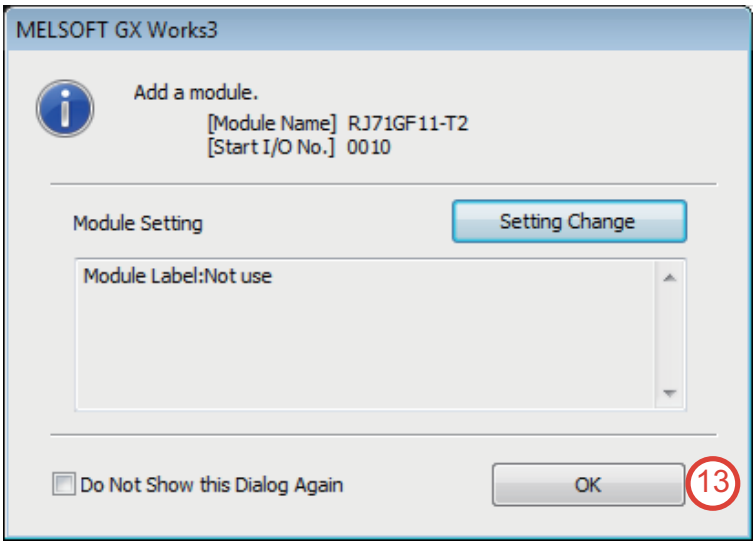


10. Set "Use Module Label" to "Yes".

11. Click the [OK] button.



12. Click the [OK] button.



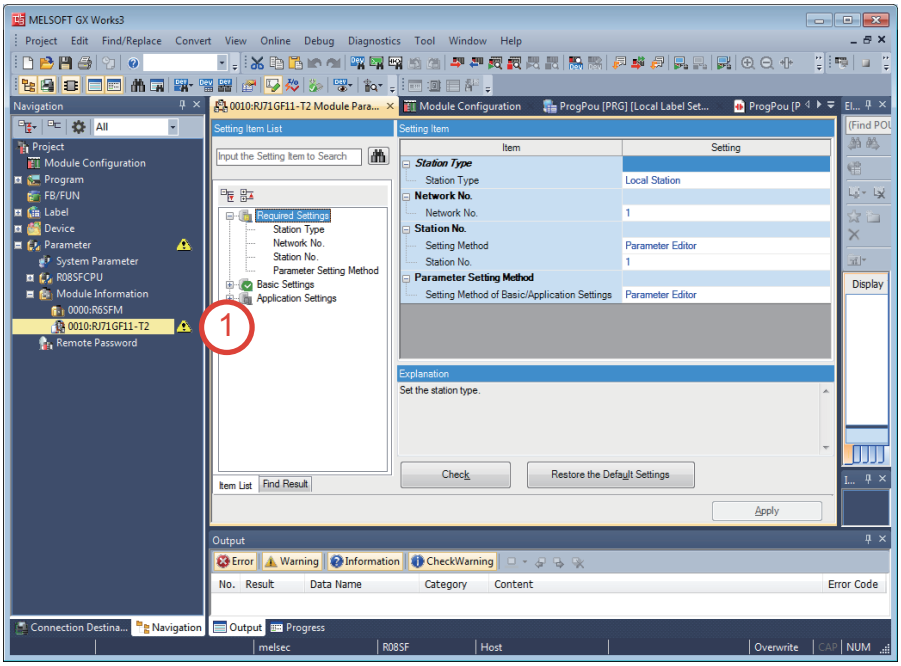
13. Click the [OK] button.

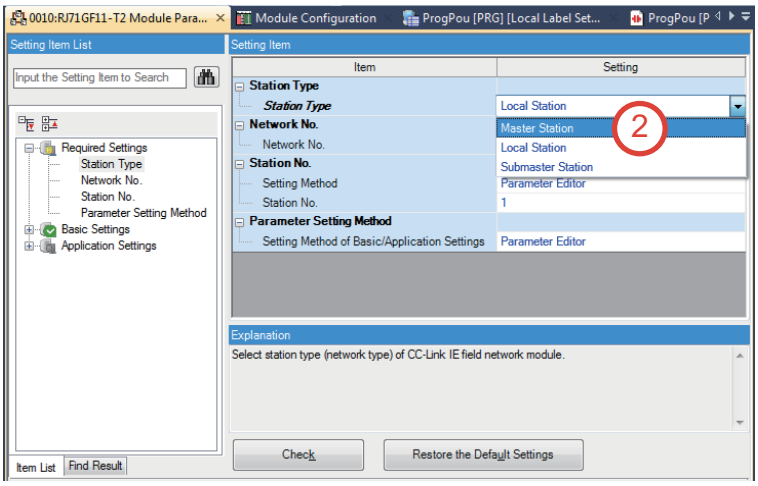
2.5.3 Network configuration settings

Set the network configuration for the configuration example shown on Page 16 Safety Application Configuration Example.

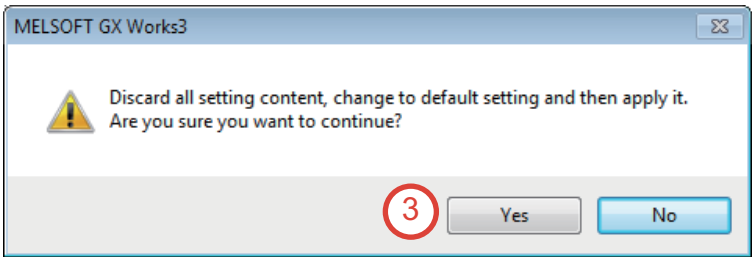
Operating procedure

1. Double-click [Parameter] → [Module Information] → [RJ71GF11-T2] in the Navigation window.

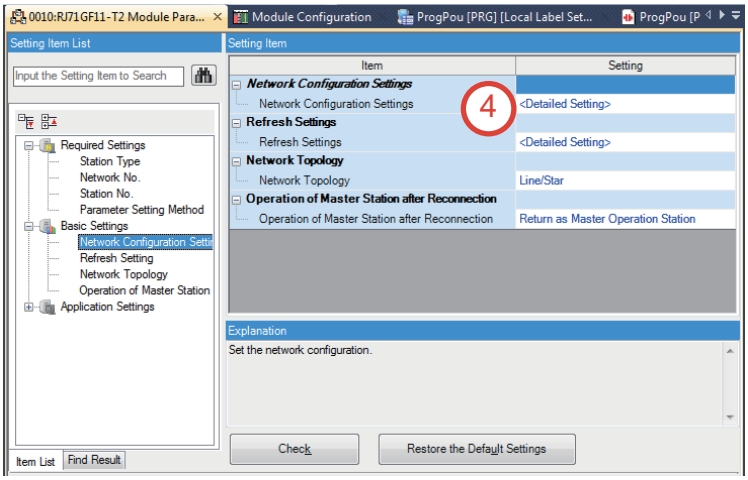




2. Set "Station Type" to "Master Station".



3. Click the [Yes] button.

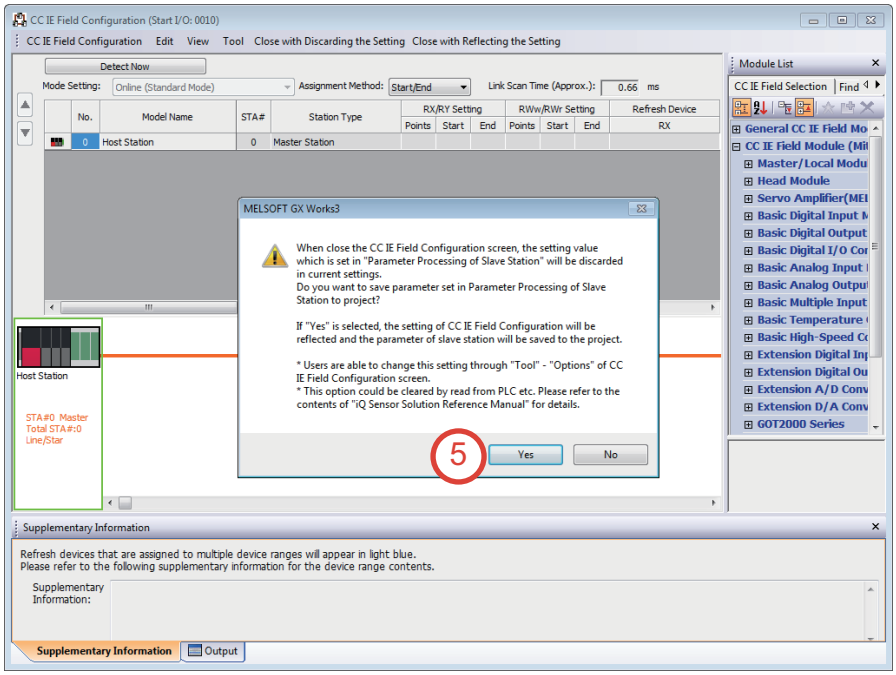


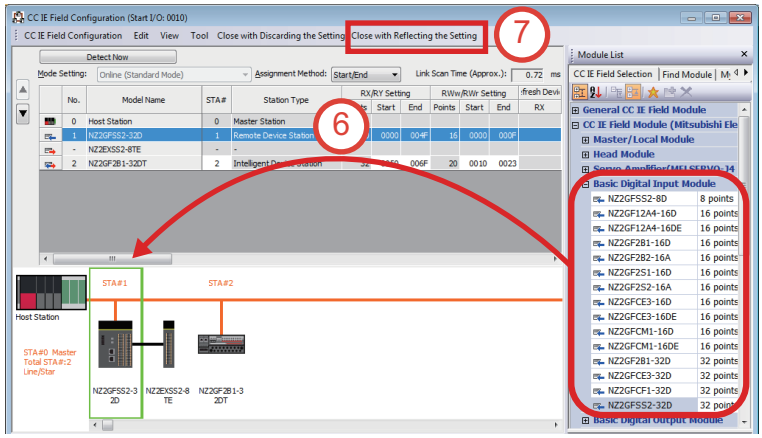
4. Double-click [Basic Settings] → [Network Configuration Settings] → "<Detailed Setting>".

5. The following window appears.

When the [Yes] button is clicked, the parameters of the slave station are saved into the project file.

Click the [Yes] button here.





6. Drag and drop the following from the "Module List" window.

Basic Digital Input Module

- NZ2GFSS2-32D

Extension Digital Output Module

- NZ2EXSS2-8TE

Basic Digital I/O Combined Module

- NZ2GF2B1-32DT

For the profile registration method, refer to the following.

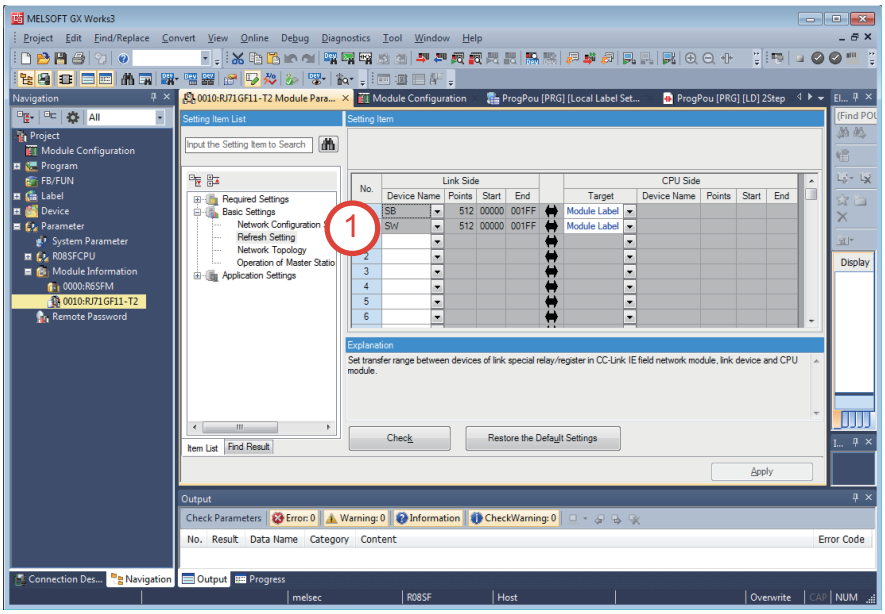
☞ Page 106 Profile Registration

7. Click the [Close with Reflecting the Setting] button.

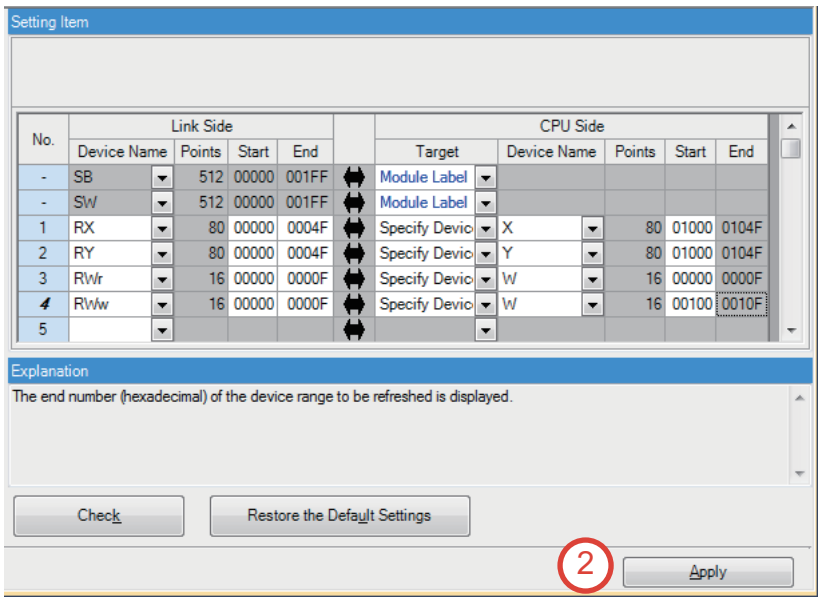
2.5.4 Network refresh settings

Operating procedure

1. Double-click [Parameter] → [Module Information] → [RJ71GF11-T2] in the Navigation window. Then, double-click [Basic Settings] → [Refresh Setting] → "<Detailed Setting>".



2. Set the devices on the link side and the CPU side as follows.
After setting the devices, click the [Apply] button.



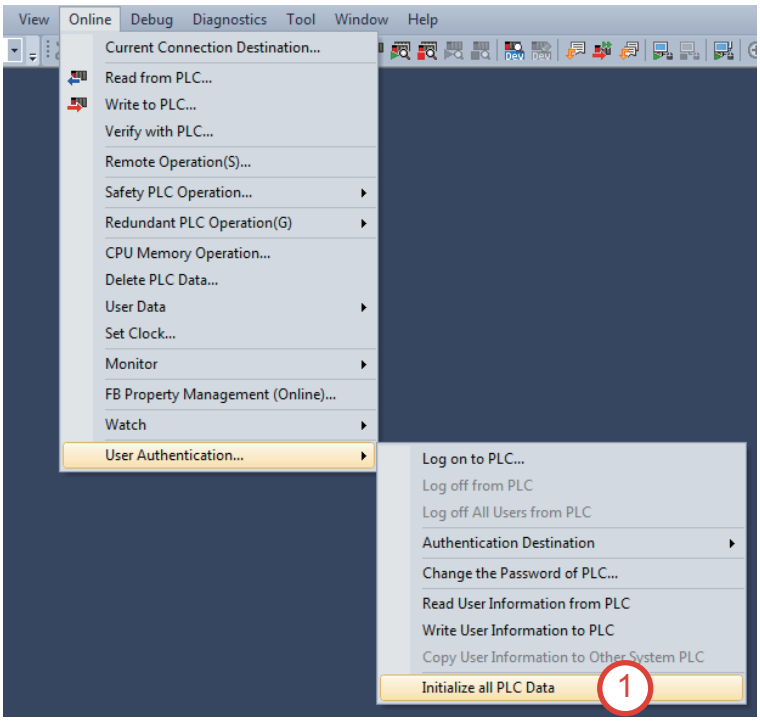
2.5.5 Initializing all data in the programmable controller

This section describes how to initialize all data in the programmable controller.

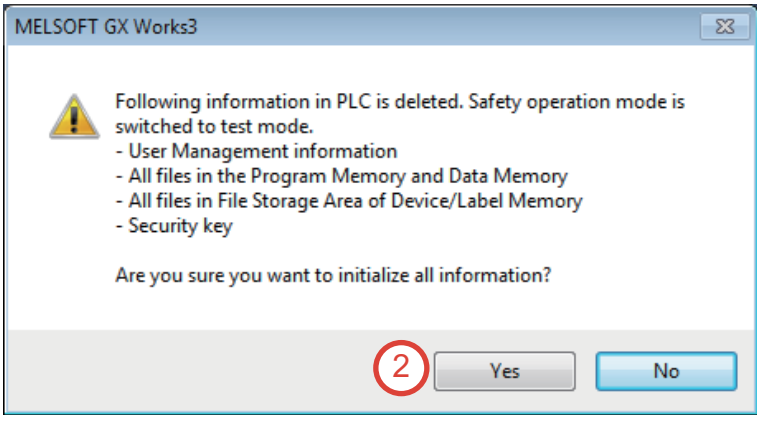
Point

If the programmable controller is newly purchased or is used in the different project, perform this operation.

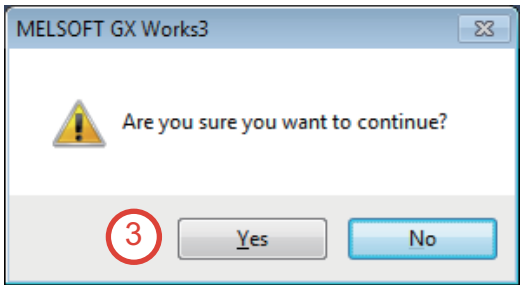
Operating procedure



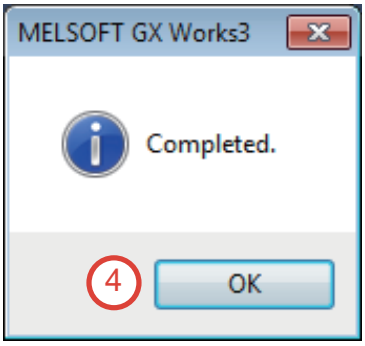
1. Select [Online] → [User Authentication] → [Initialize all PLC Data] from the menu.



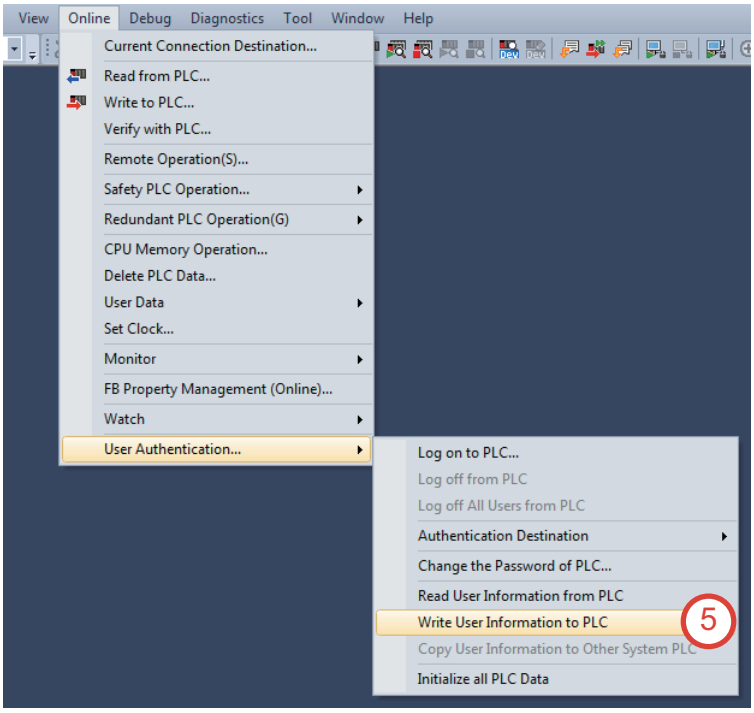
2. Click the [Yes] button.



3. Click the [Yes] button.

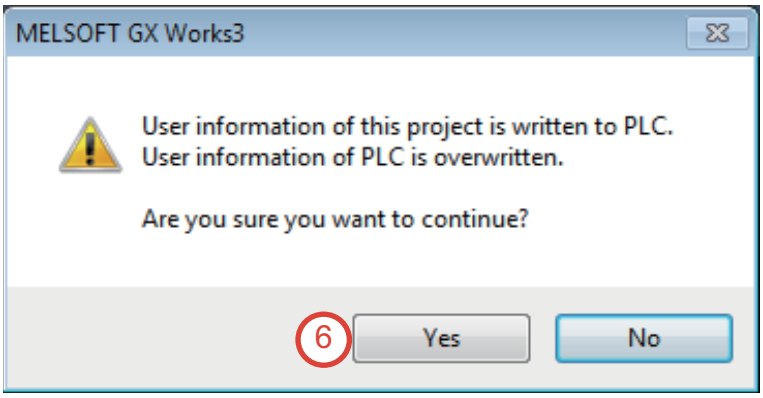


4. Click the [OK] button.

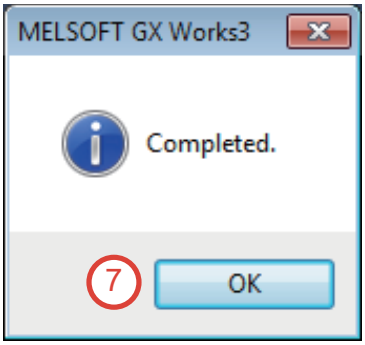


5. Write user information to the programmable controller.

Select [Online] → [User Authentication] → [Write User Information to PLC] from the menu.



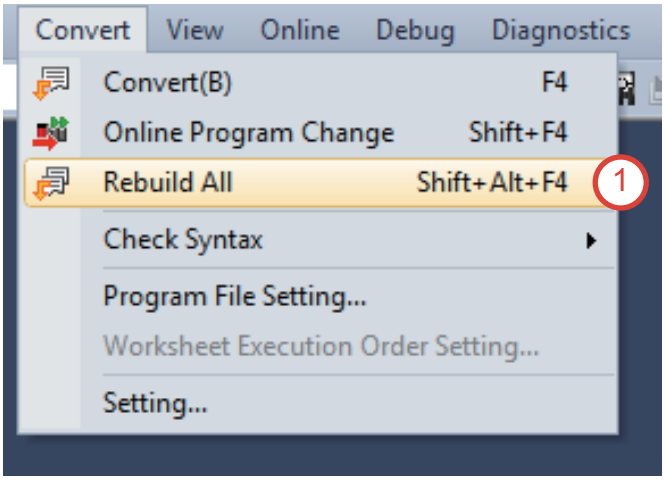
6. Click the [Yes] button.



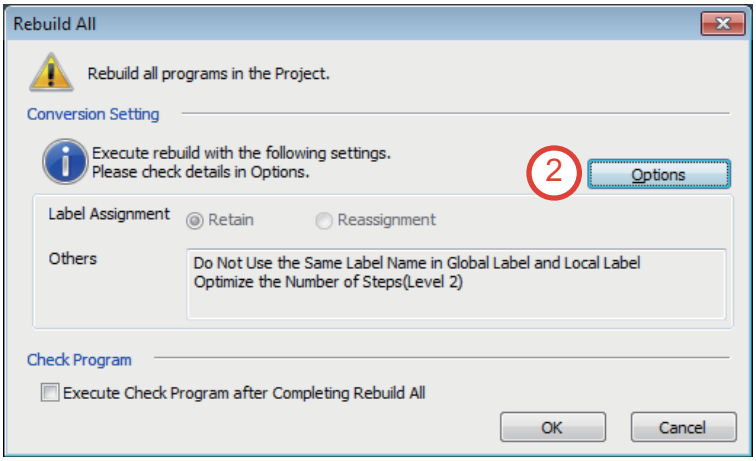
7. Click the [OK] button.

2.5.6 Converting the entire project

Operating procedure

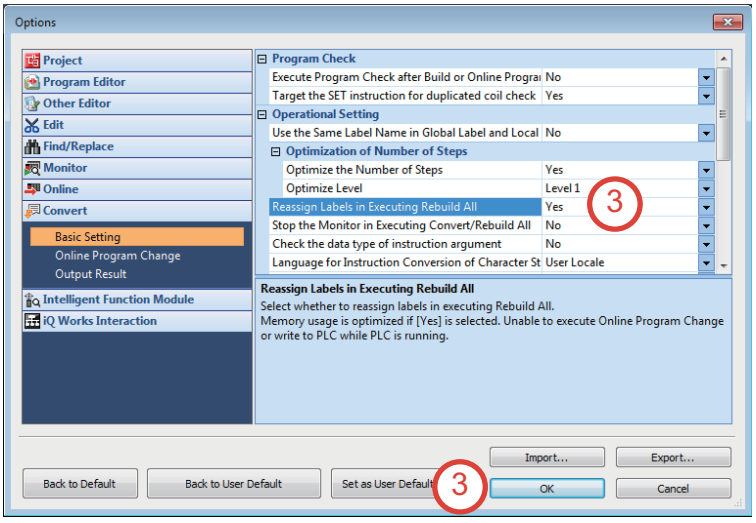


1. Select [Convert] → [Rebuild All] from the menu.

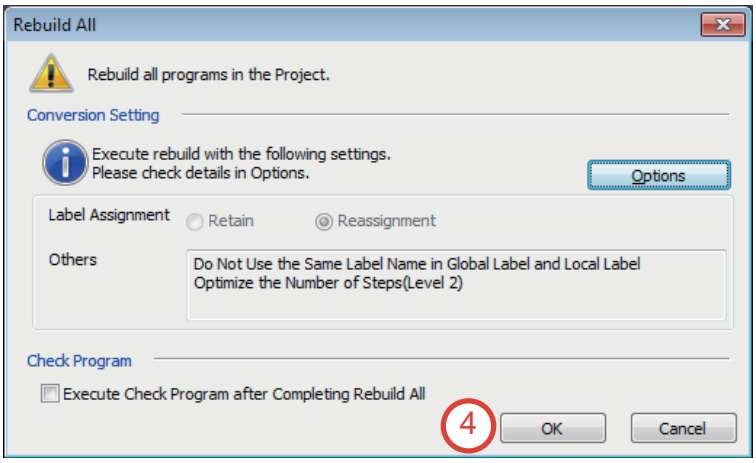


2. When "Label Assignment" is set to "Retain", click the [Options] button.

When "Label Assignment" is set to "Reassignment", skip over Step 2 and Step 3, and go to Step 4.



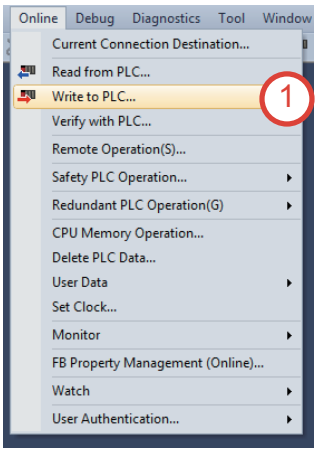
3. Set "Reassign Labels in Executing Rebuild All" to "Yes", and click the [OK] button.



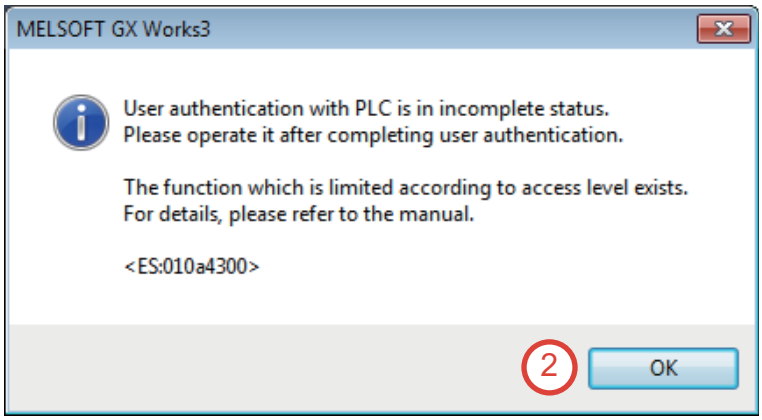
4. Check that "Label Assignment" is set to "Reassignment", and click the [OK] button.

2.5.7 Writing the project to the programmable controller

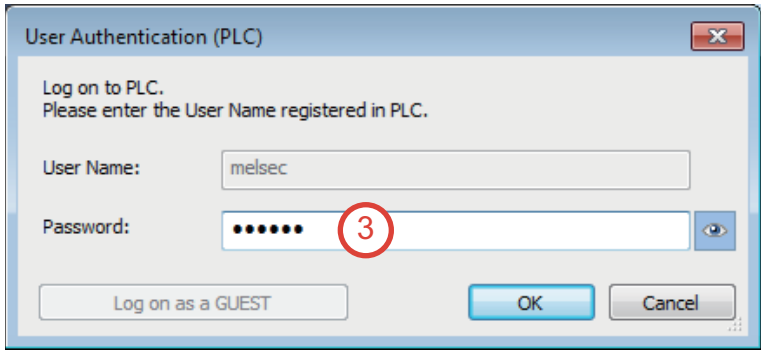
Operating procedure



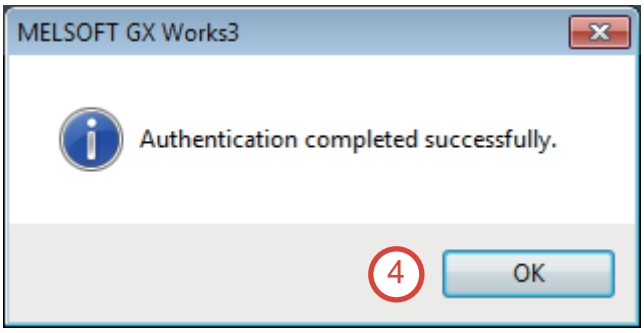
1. Select [Online] → [Write to PLC] from the menu.



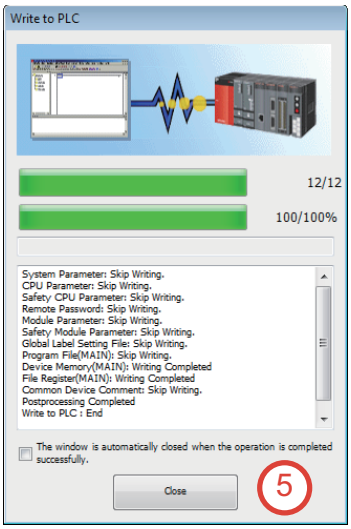
2. If the user authentication with the programmable controller is not completed, the "Use Authentication" window appears. Click the [OK] button.



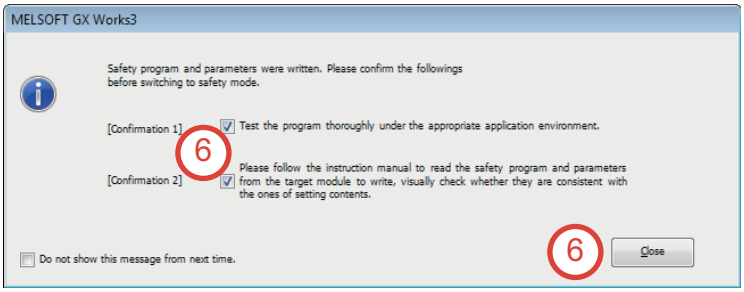
3. Enter the password. (Password: melsec)



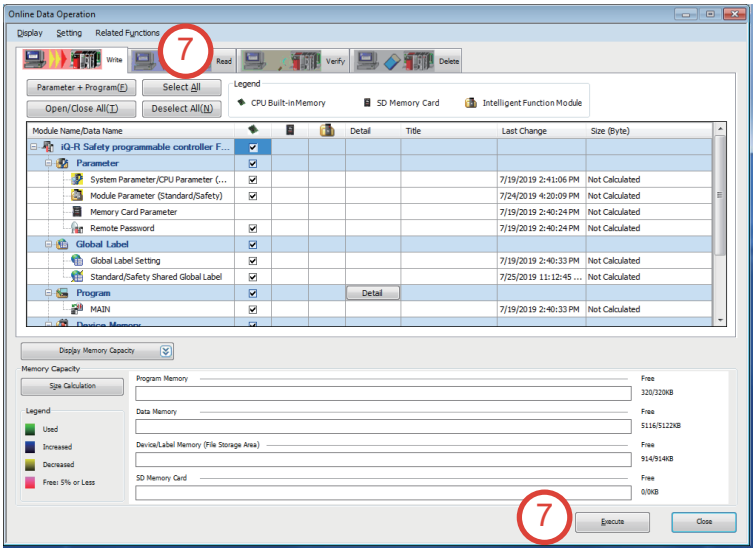
4. Click the [OK] button.



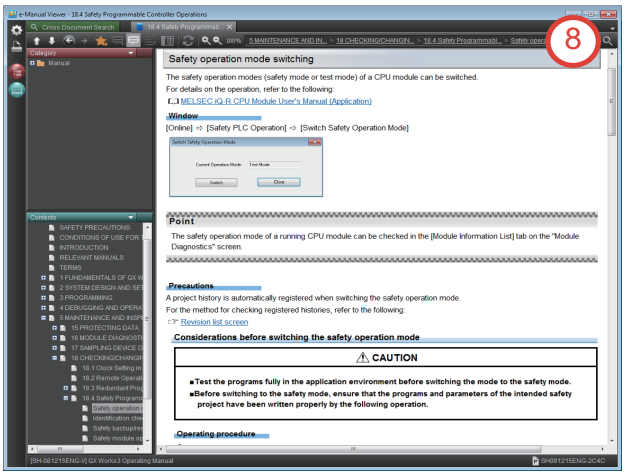
5. After the project is written to the programmable controller, click the [Close] button.



6. Check the descriptions of "Confirmation 1" and "Confirmation 2", select the both checkboxes, and click the [Close] button.

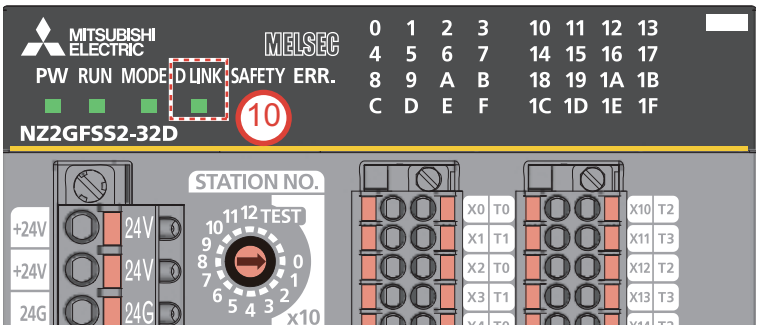


7. Click the [Select All] button, and then click the [Execute] button.



8. Every time the project is written to the safety programmable controller, e-Manual Viewer starts up and precautions for the safety operation mode switching are displayed. Click the [×] button.

9. After the project is written to the programmable controller, power off and on the demonstration machine.



10. Check that the D LINK LED of the safety remote I/O module is on.

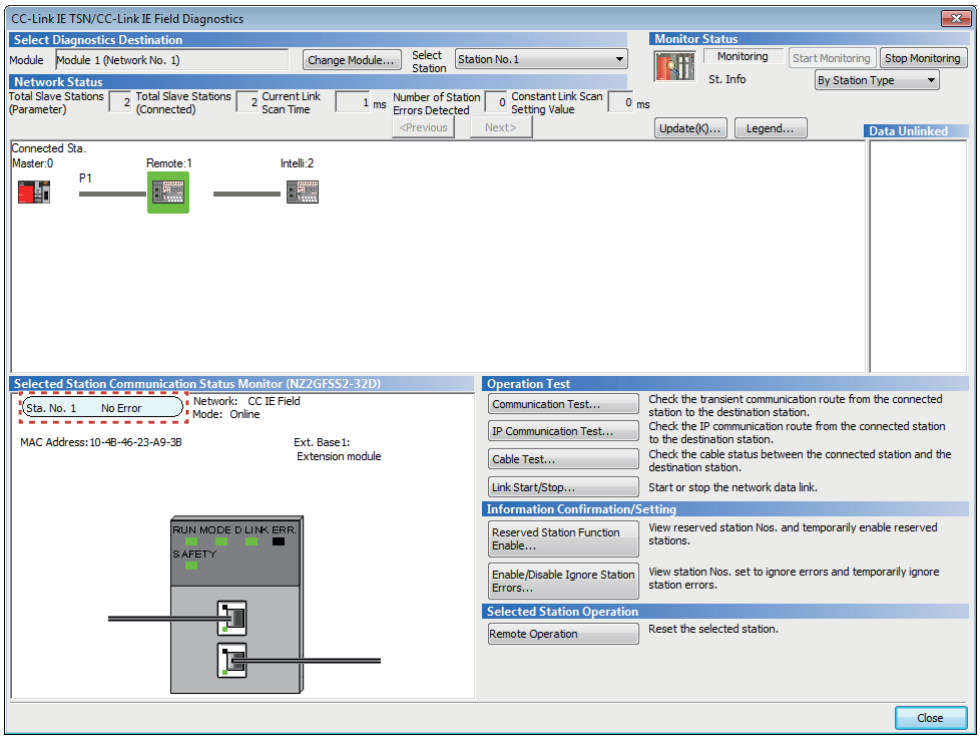
2.5.8 Setting the CC-Link IE Field Network slave station

This section describes how to write parameters to the slave station (safety remote I/O module).

Point

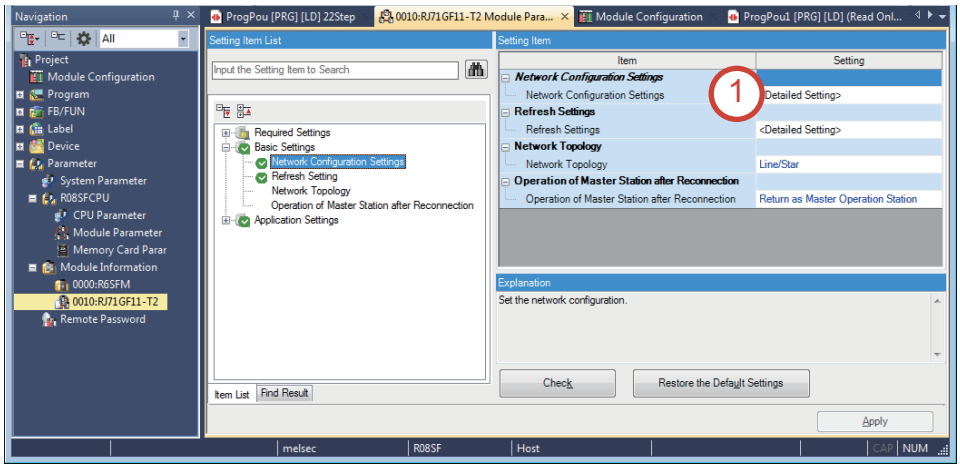
The operations described on earlier pages of this manual must be completed, and the slave station (safety remote I/O module) must be recognized on CC-Link IE Field Network.

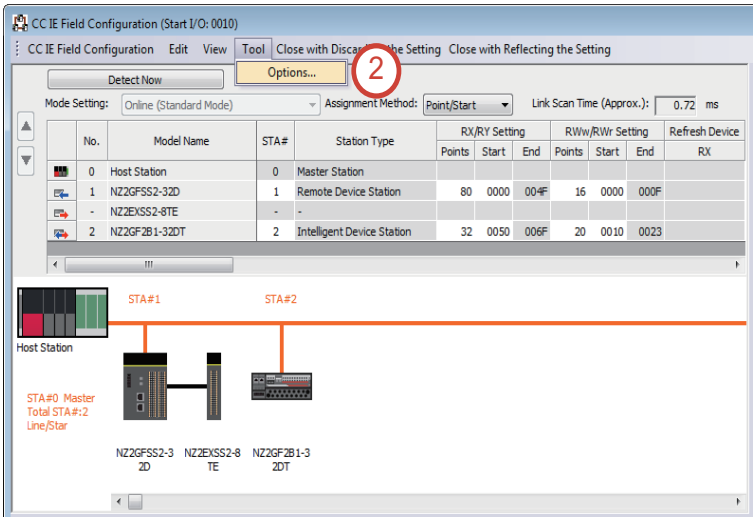
Select [Diagnostics] → [CC-Link IE Field Diagnostics] from the menu, and check that the slave station can be monitored normally.



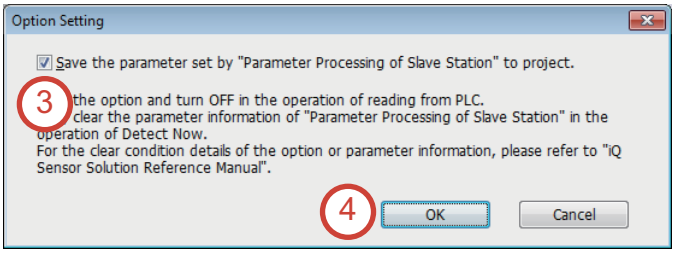
Operating procedure

1. Double-click [Parameter] → [Module Information] → [0010:RJ71GF11-T2] in the Navigation window. Then, double-click [Basic Settings] → [Network Configuration Settings] → "<Detailed Setting>".



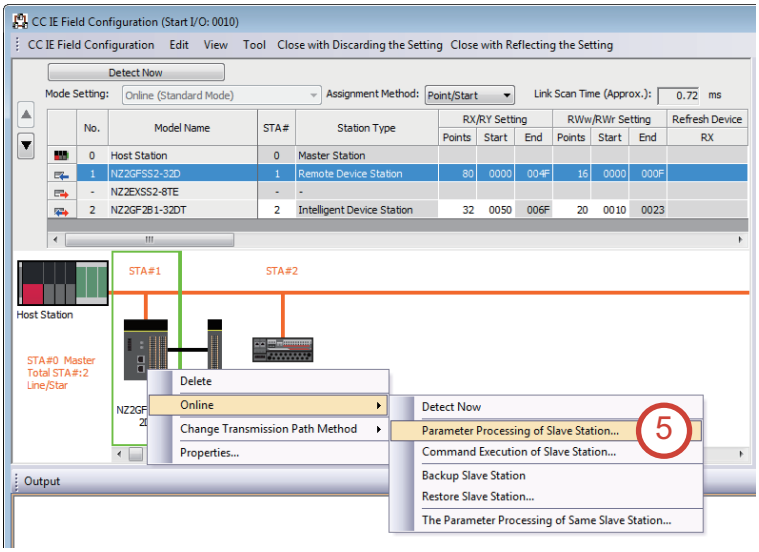


2. Select [Tool] → [Options].

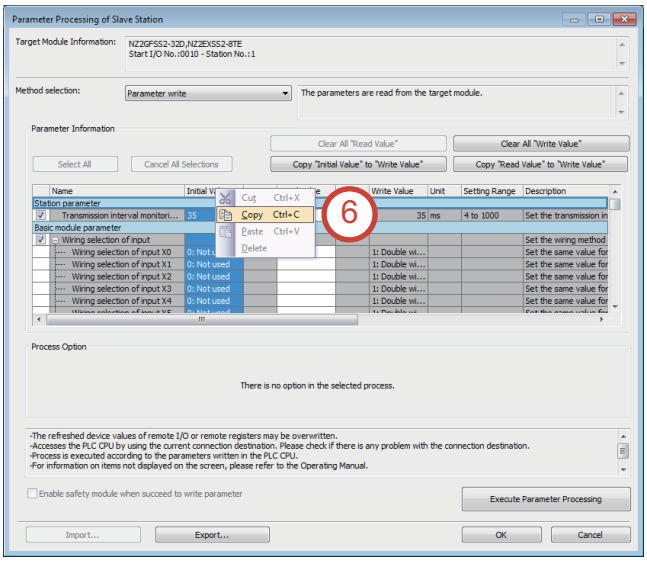


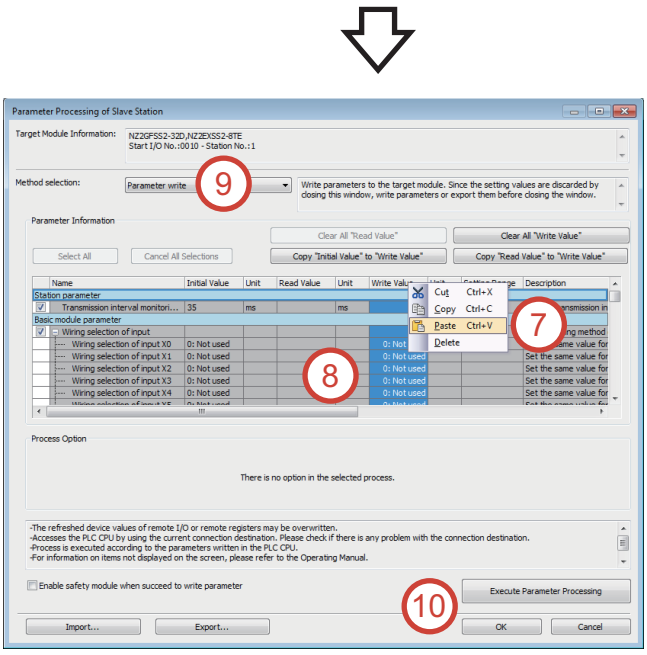
3. Check that the "Save the parameter set by "Parameter Processing of Slave Station" to project." checkbox is selected.

4. Click the [OK] button.



5. Right-click on "NZ2GFSS2-32D", and select [Online] → [Parameter Processing of Slave Station].





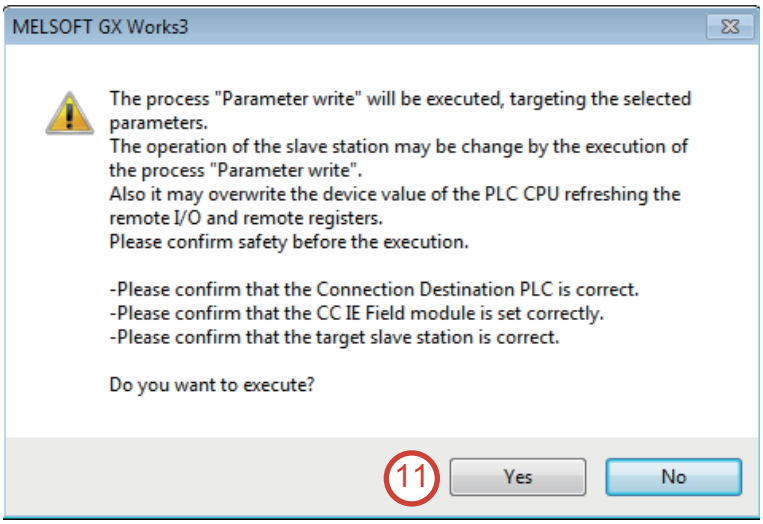
6. Right-click on "Initial Value", and select [Copy].

7. Right-click on "Write Value", and select [Paste].

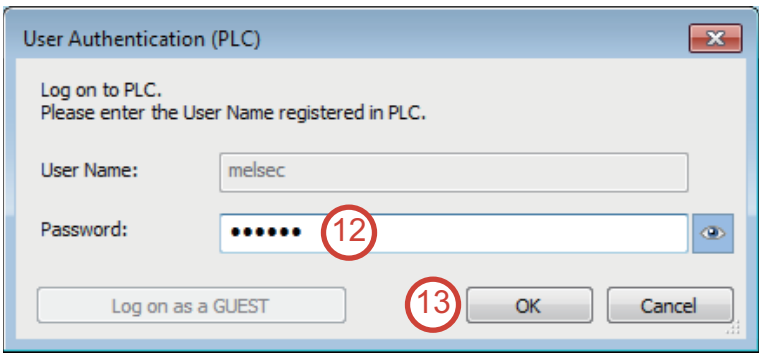
8. Change the write values as necessary. Use the default values here.

9. Set "Method selection" to "Parameter write".

10. Click the "Execute Parameter Processing" button.

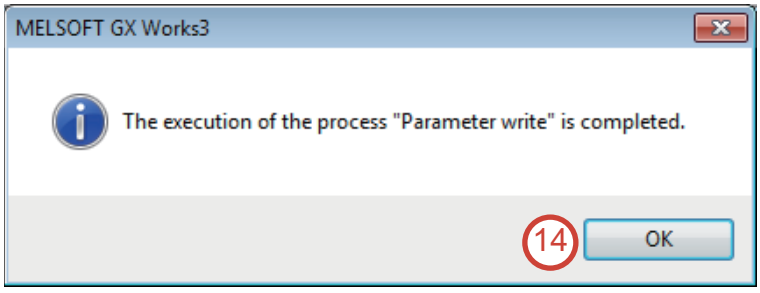


11. Click the [Yes] button.

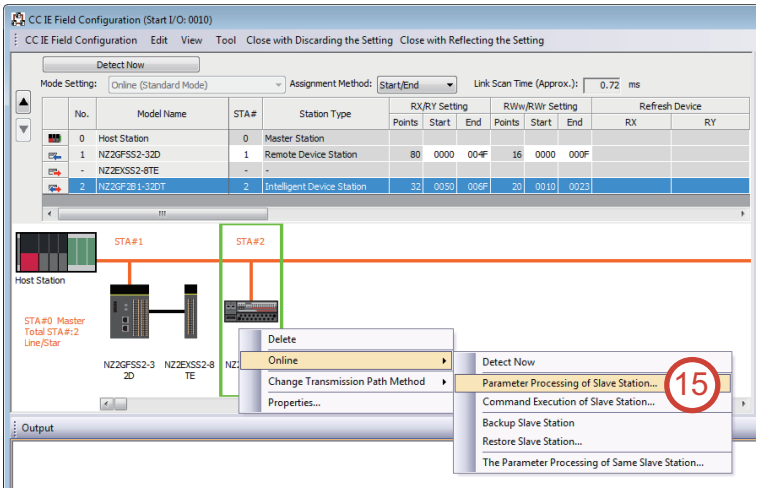


12. Enter the password. (Password: melsec)

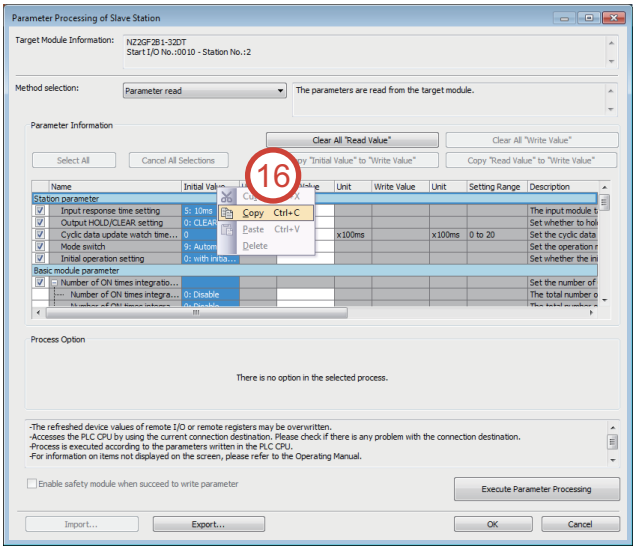
13. Click the [OK] button.



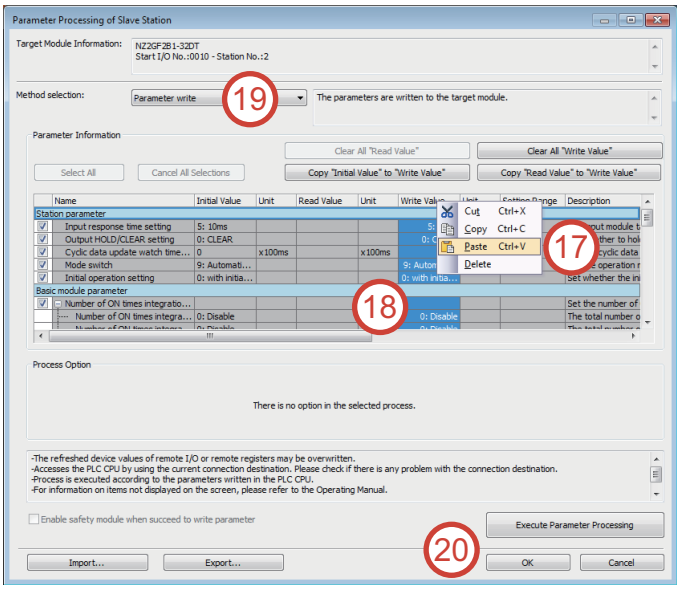
14. Click the [OK] button.



15. Right-click on "NZ2GF2B1-32DT", and select [Online] → [Parameter Processing of Slave Station].



16. Right-click on "Initial Value", and select [Copy].

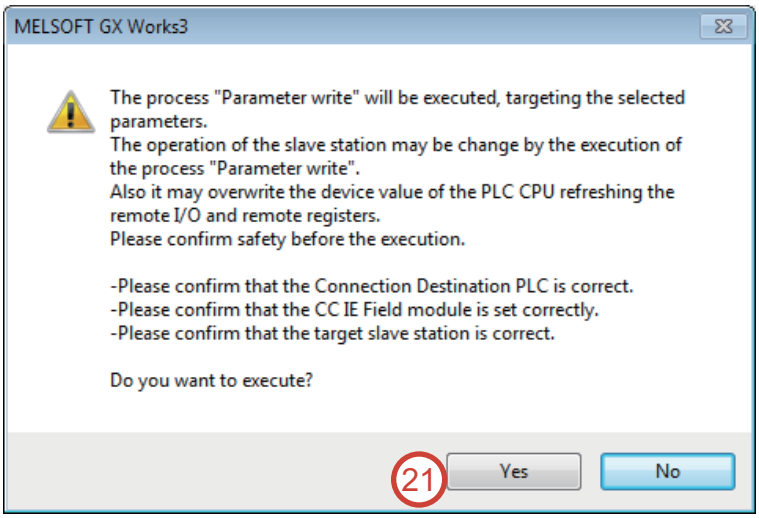


17. Right-click on "Write Value", and select [Paste].

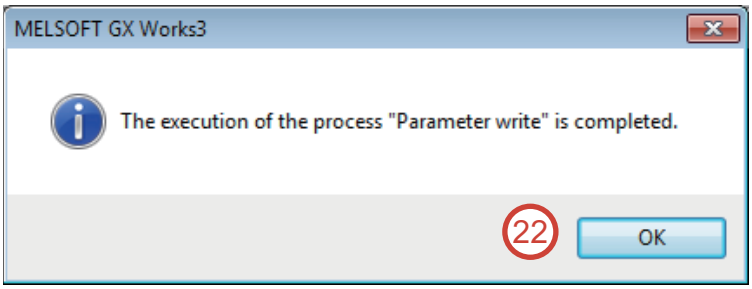
18. Change the write values as necessary. Use the default values here.

19. Set "Method selection" to "Parameter write".

20. Click the "Execute Parameter Processing" button.



21. Click the [Yes] button.

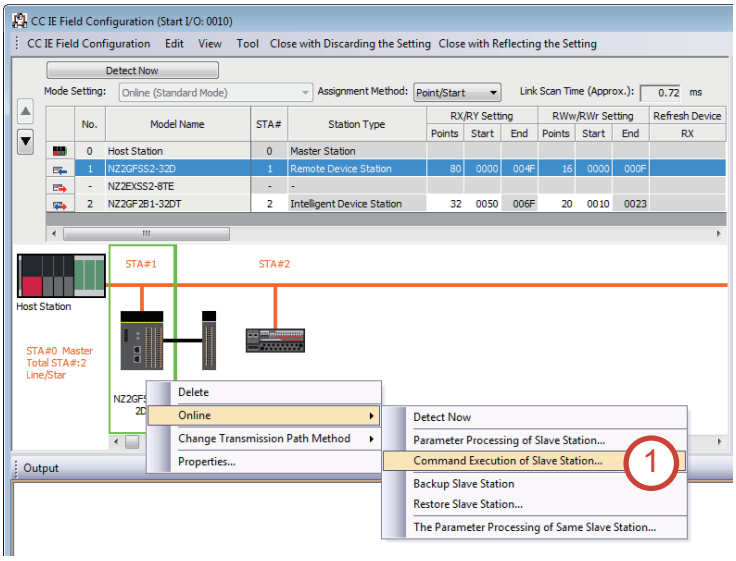


22. Click the [OK] button.

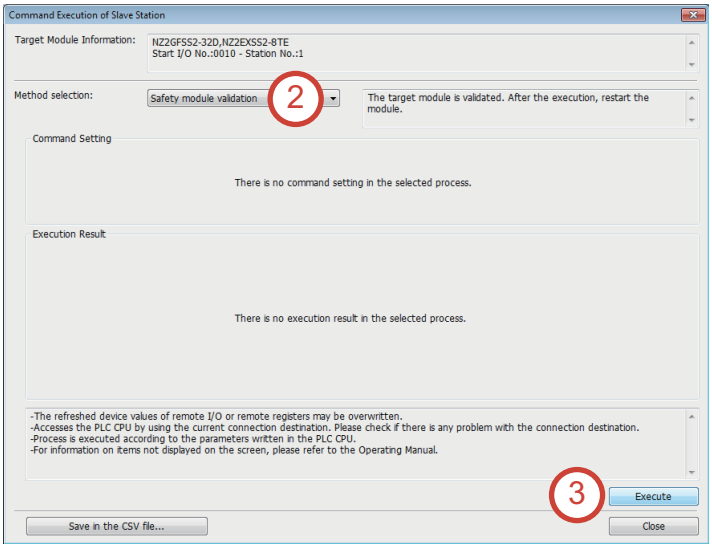
2.5.9 Enabling the CC-Link IE Field Network safety remote station

This section describes how to enable the safety remote station (slave station) following Page 48 Setting the CC-Link IE Field Network slave station. The operating procedure to display the "CC IE Field Configuration" window is the same as the procedure described on Page 48 Setting the CC-Link IE Field Network slave station.

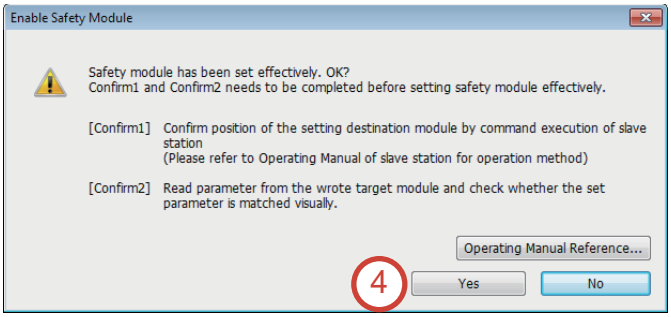
Operating procedure



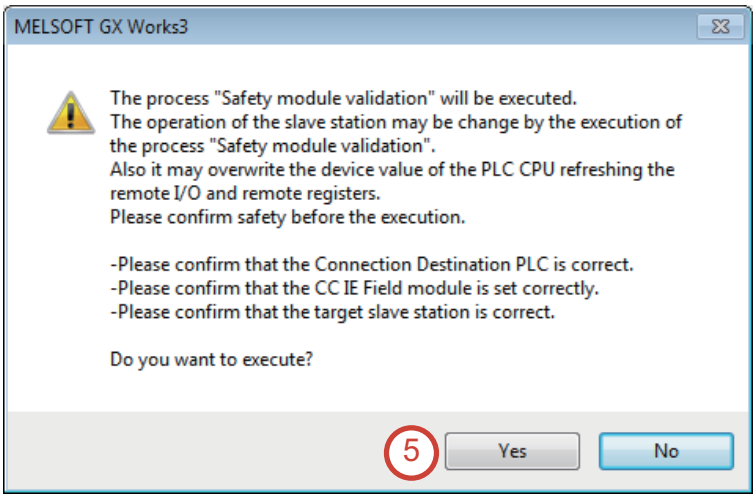
1. On the "CC IE Field Configuration" window, right-click on "NZ2GFSS2-32D", and select [Online] → [Command Execution of Slave Station].



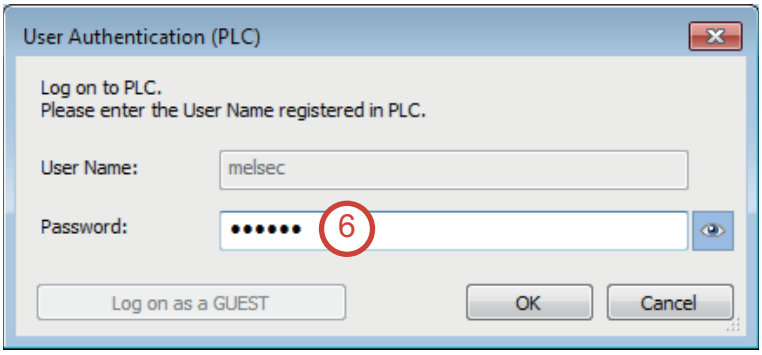
2. Set "Method selection" to "Safety module validation".
3. Click the [Execute] button.



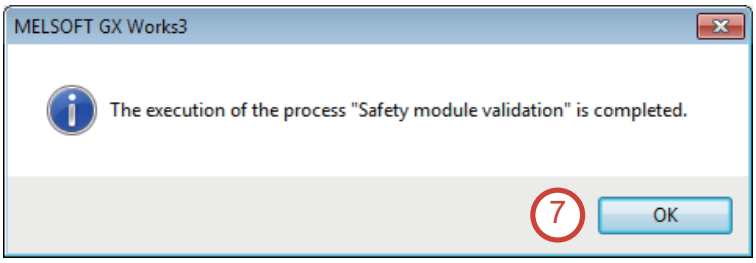
4. Check the items on the displayed window. After the check is completed without any problem, click the [Yes] button.



5. Click the [Yes] button.



6. Enter the password. (Password: melsec)

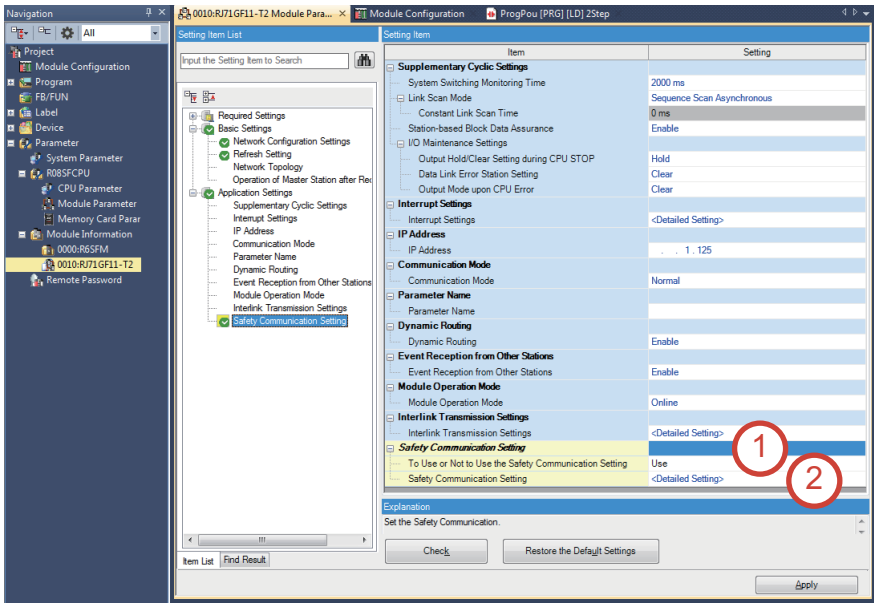


7. Click the [OK] button.

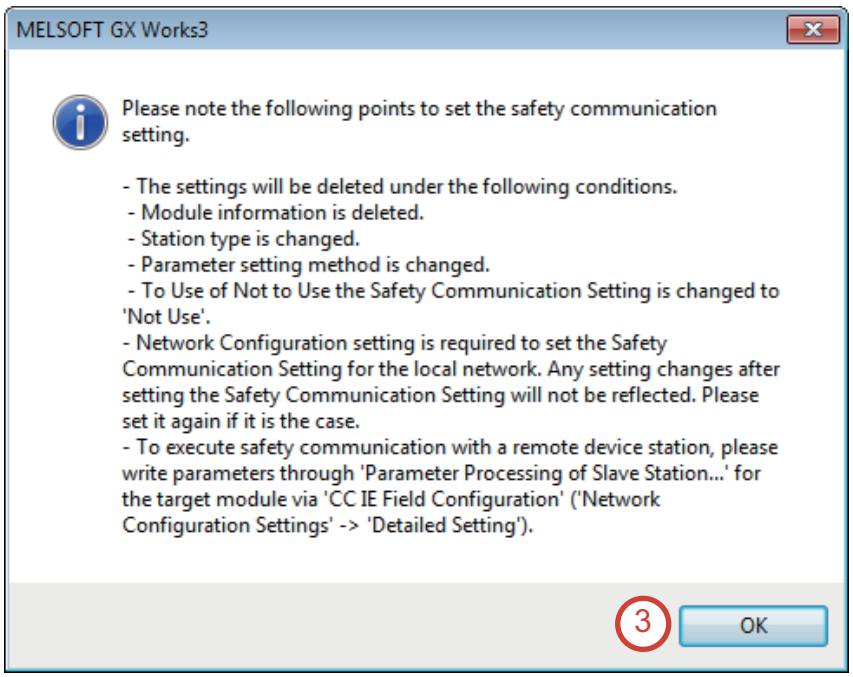
2.5.10 Setting the CC-Link IE Field Network safety communication parameters

Operating procedure

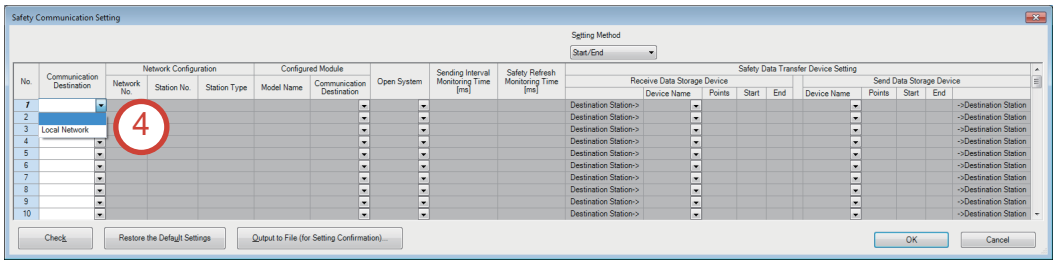
1. Double-click [Parameter] → [Module Information] → [0010:RJ71GF11-T2] in the Navigation window. Then, double-click [Application Settings] → [Safety Communication Setting], and set "To Use or Not to Use the Safety Communication Setting" to "Use".
2. Double-click "<Detailed Setting>" of "Safety Communication Setting".



3. Click the [OK] button.



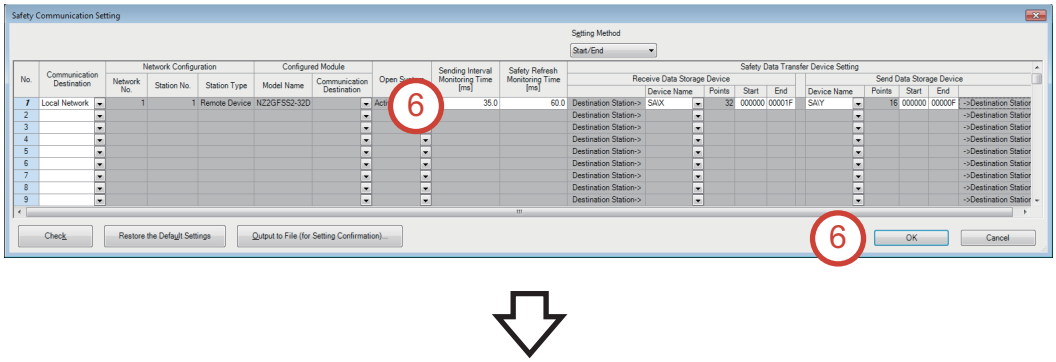
4. Set "Communication Destination" to "Local Network" on the "Safety Communication Setting" window.



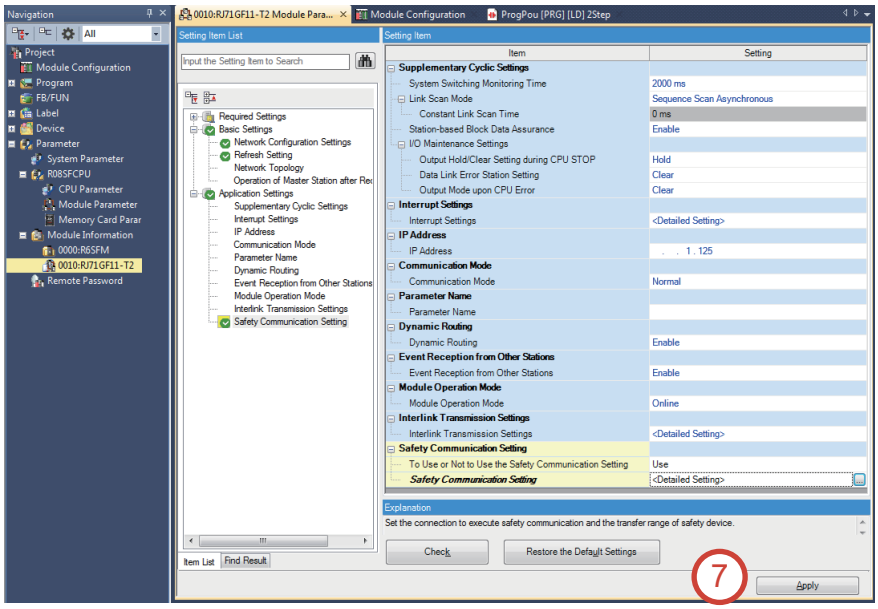
5. Select the safety communication target safety remote I/O module (NZ2GFSS2-32D), and click the [Add] button.

6. Set "Sending Interval Monitoring Time", "Safety Refresh Monitoring Time", "Receive Data Storage Device", and "Send Data Storage Device" as follows. After setting the parameters, click the [OK] button.

- Sending Interval Monitoring Time: 35.0 [ms]
- Safety Refresh Monitoring Time: 60.0 [ms]
- Receive Data Storage Device: SA\X, Start: 000000, End: 00001F
- Send Data Storage Device: SA\Y, Start: 000000, End: 00000F

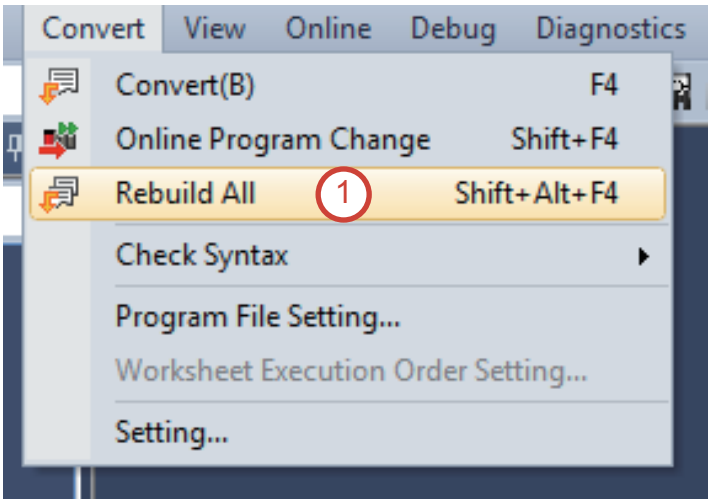


7. Click the [Apply] button.

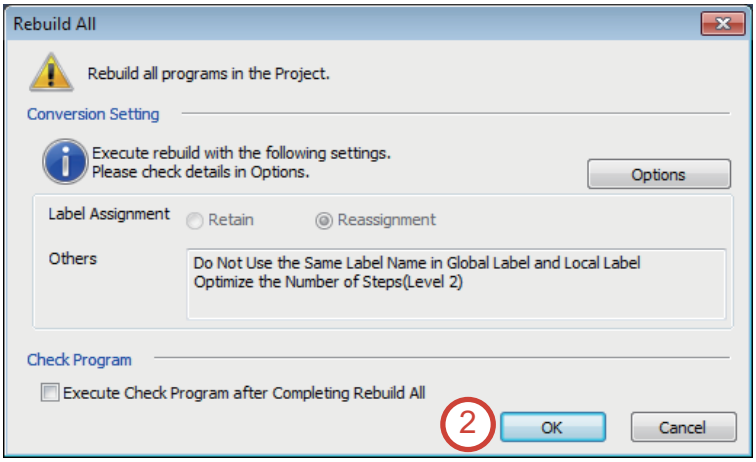


2.5.11 Writing parameters to the programmable controller after setting the CC-Link IE Field Network safety communication parameters

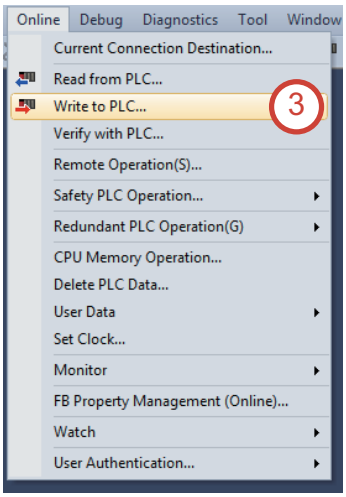
Operating procedure



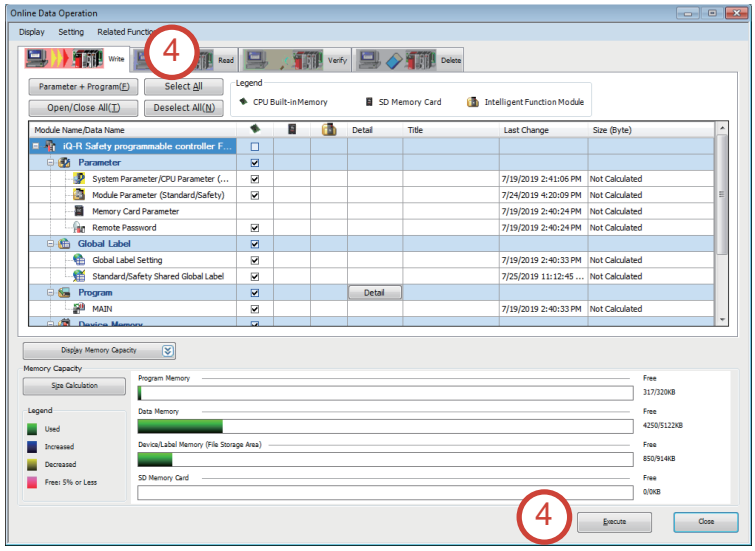
1. Convert the entire project. Select [Convert] → [Rebuild All] from the menu.



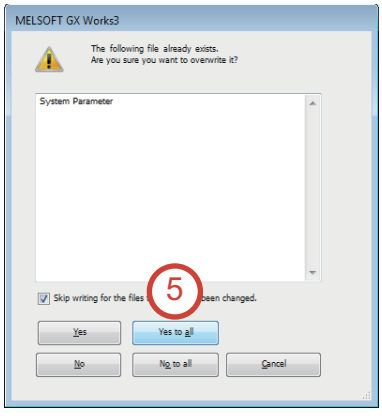
2. Click the [OK] button.



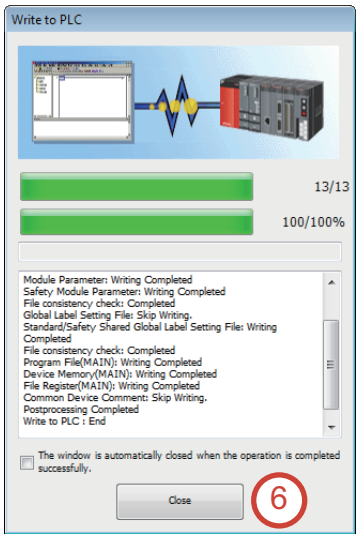
3. Select [Online] → [Write to PLC] from the menu.



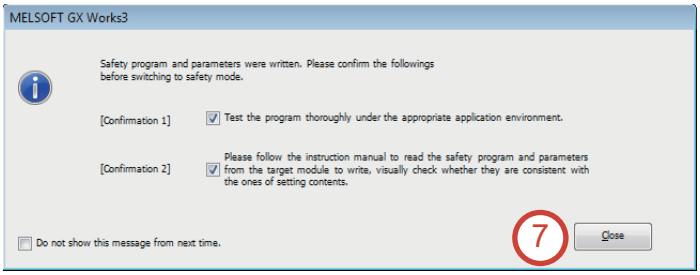
4. Click the [Select All] button, and then click the [Execute] button.



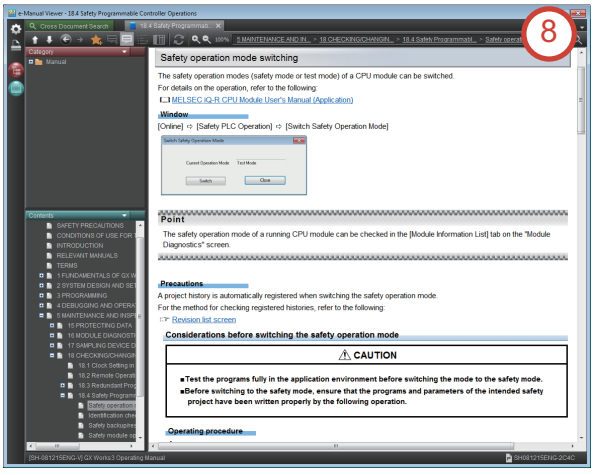
5. Click the [Yes to all] button.



6. After the parameters are written to the programmable controller, click the [Close] button.

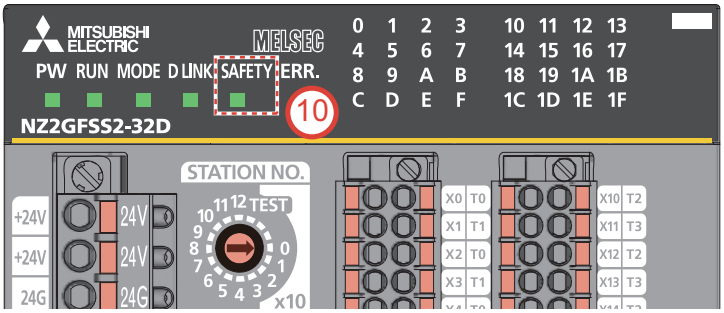


7. Check the descriptions of "Confirmation 1" and "Confirmation 2", select the both checkboxes, and click the [Close] button.



8. Every time the parameters are written to the safety programmable controller, e-Manual Viewer starts up and precautions for the safety operation mode switching are displayed. Click the [×] button.

9. After the parameters are written to the programmable controller, power off and on the demonstration machine.



10. Check that the SAFETY LED of the safety remote I/O module is on.

2.6 Creating a Safety Program

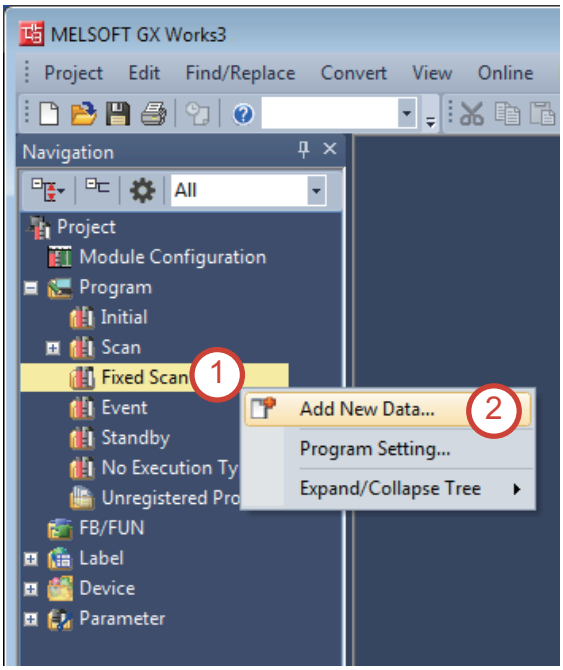
A program for safety control in the configuration example shown on Page 16 Safety Application Configuration Example must be created as a safety program.

Restriction

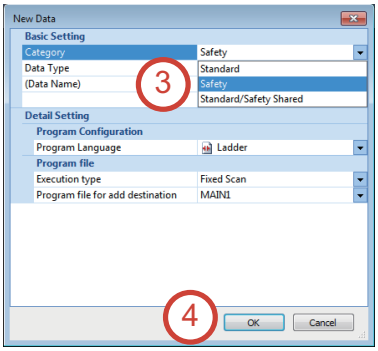
Safety programs are executed only as a fixed scan execution type program. The supported programming language is ladder only.

2.6.1 Creating a new safety program

Operating procedure

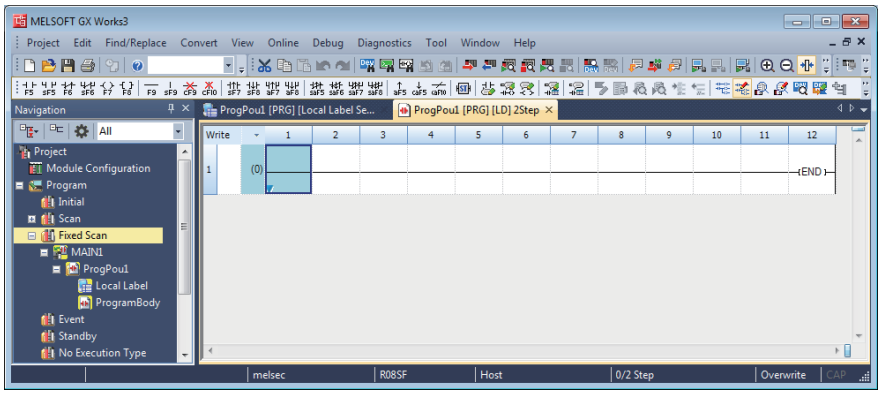


1. Double-click [Project] → [Program] in the Navigation window. Then, right-click on [Fixed Scan].
2. Select [Add New Data].



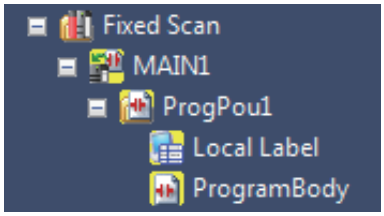
3. Click the drop-down button of "Category", and select "Safety".
4. Click the [OK] button.

5. The safety program shown below is created in the same way as the standard program.



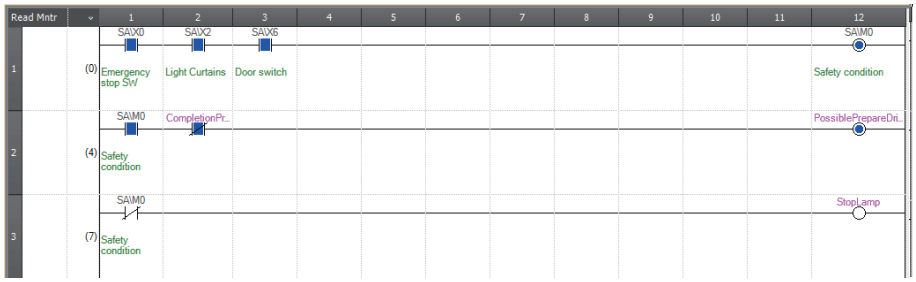
Point

The icons of the safety program (MAIN1, ProgPou1, Local Label, ProgramBody) are displayed with yellow background.



<Safety program example>

The following is a part of the sequence program used in Page 73 PREPARING THE DEMONSTRATION MACHINE.



2.6.2 Differences between safety programs and standard programs

The following table lists the differences between safety programs and standard programs.

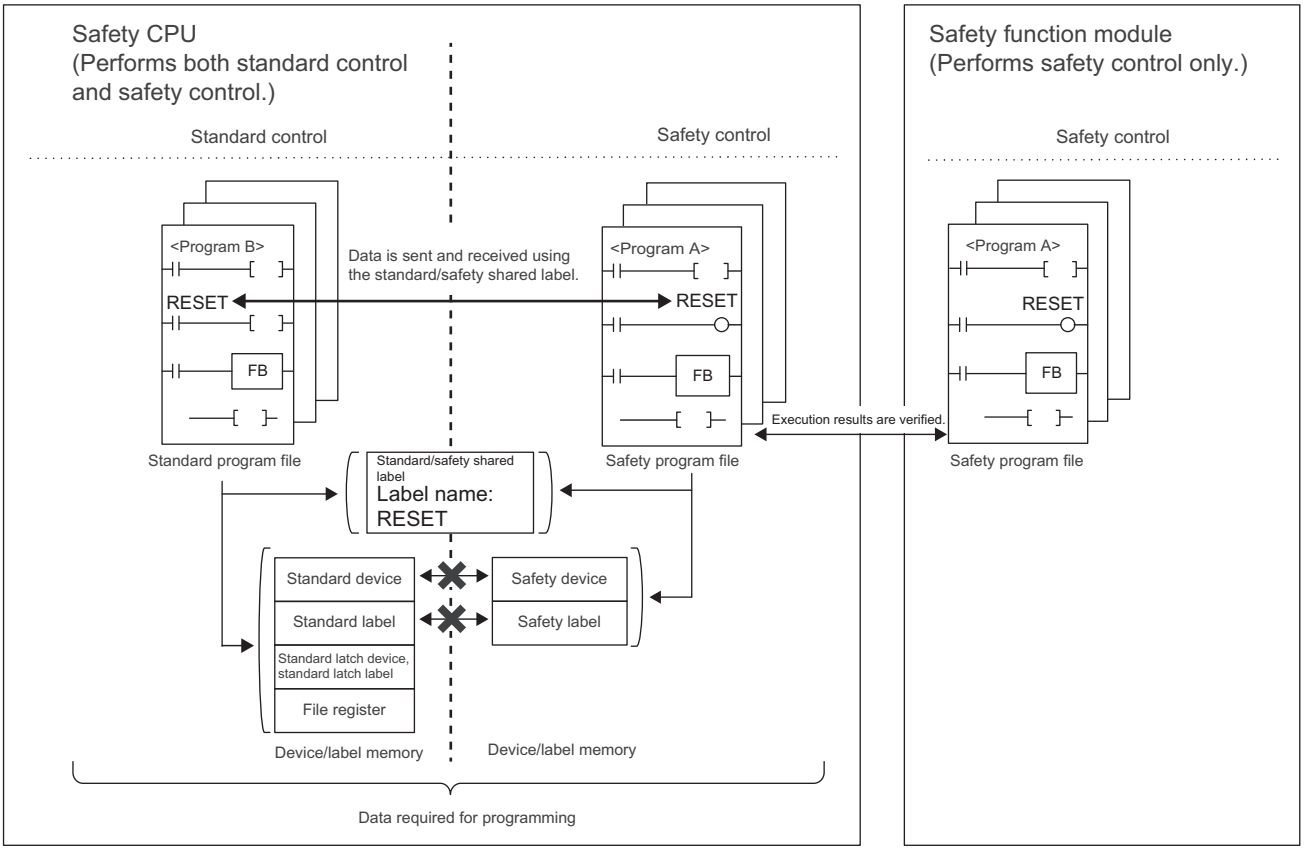
Item	Safety program	Standard program
Programming language	Ladder	Ladder, ST, FBD/LD, SFC
Program execution type	Fixed scan execution type	• Initial execution type • Scan execution type • Fixed scan execution type • Event execution type • Standby type
Number of executable programs	32	252 (including safety programs)
Applicable user device	• Safety input (SA\X) • Safety output (SA\Y) • Safety internal relay (SA\M) • Safety link relay (SA\B) • Safety timer (SA\T) • Safety retentive timer (SA\ST) • Safety counter (SA\C) • Safety data register (SA\D) • Safety link register (SA\W)	• Input (X) • Output (Y) • Internal relay (M) • Latch relay (L) • Link relay (B) • Link special relay (SB) • Annunciator (F) • Edge relay (V) • Timer (T) • Long timer (LT) • Retentive timer (ST) • Long retentive timer (LST) • Counter (C) • Long counter (LC) • Data register (D) • Link register (W) • Link special register (SW)
Applicable system device	• Safety special relay (SA\SM) • Safety special register (SA\SD)	• Special relay (SM) • Special register (SD) • Function input (FX) • Function output (FY) • Function register (FD)

Restriction

- The safety devices cannot be used in standard programs.
- An index modification and indirect specification cannot be performed in safety programs.

2.6.3 Standard/safety shared labels

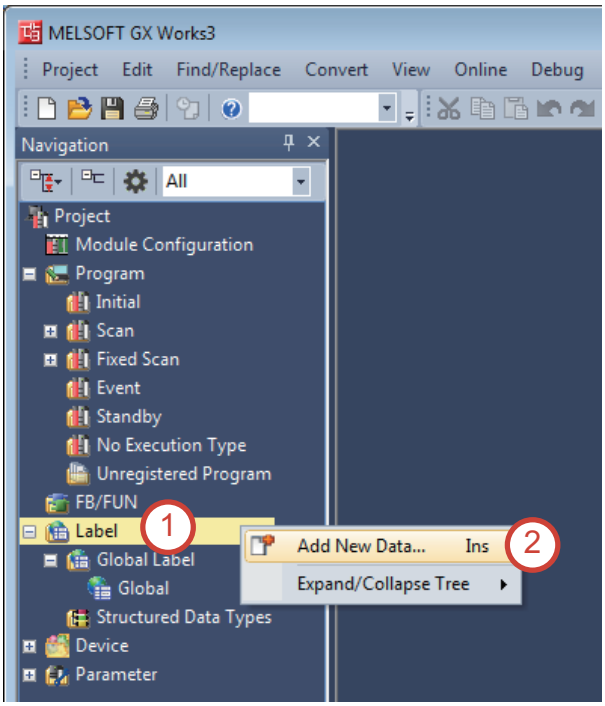
A standard/safety shared label is used to send and receive data between safety programs and standard programs.
The following figure shows the data flow using a label, RESET, as an example.
When the label, RESET, is set as a standard/safety shared label, this label can be used in both Program A (safety program) and Program B (standard program).
Data can be sent and received using the standard/safety shared label.



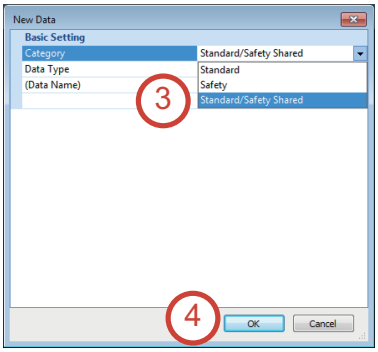
Creating a standard/safety shared label

The following describes the procedure for creating a standard/safety shared label.

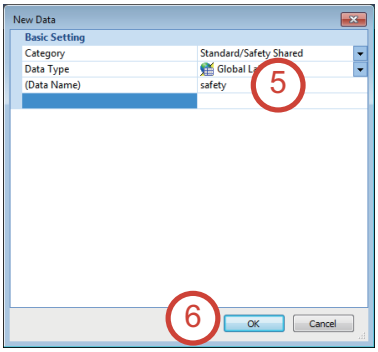
Operating procedure



1. Double-click [Project] → [Label] in the Navigation window. And, right-click on "Label".
2. Select [Add New Data].



3. Click the drop-down button of "Category", and select "Standard/Safety Shared".
4. Click the [OK] button.



5. Enter the data name.

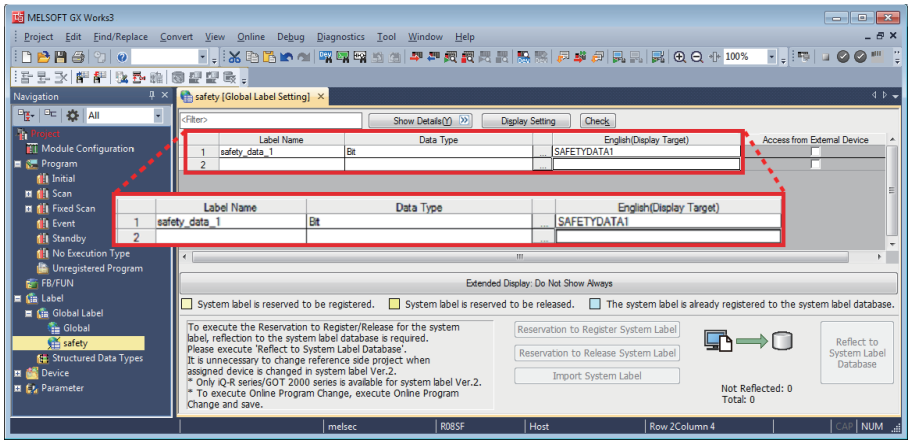
Data Name: safety

6. Click the [OK] button.

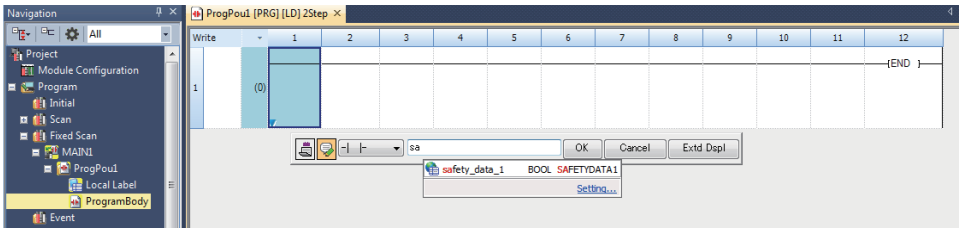
7. Set the following label. This label can be referenced in the programs.

Label Name: safety_data_1 (optional)

Data Type: Bit



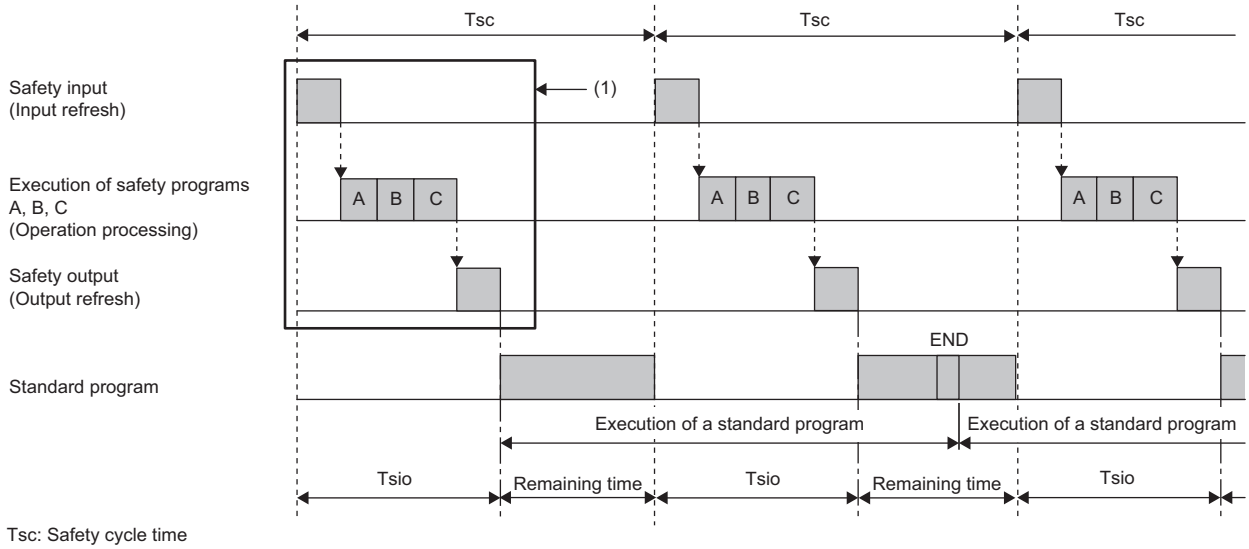
8. The label (safety_data_1) in Step 7 can be used in both safety programs and standard programs.



2.6.4 Safety program execution timing

Safety programs are executed at every safety cycle time (refer to the figure below). Safety cycle processing is performed in the following order: safety input (refresh) → safety program → safety output (refresh).

Standard programs (+ END processing) are executed within the remaining time of the safety cycle time after safety programs are executed. If a standard program does not end within the remaining time of one safety cycle time, the rest of the program is executed in the remaining time of the next safety cycle time.



Tsc: Safety cycle time
Tsio: Safety programs A, B, C + Safety input/output processing time

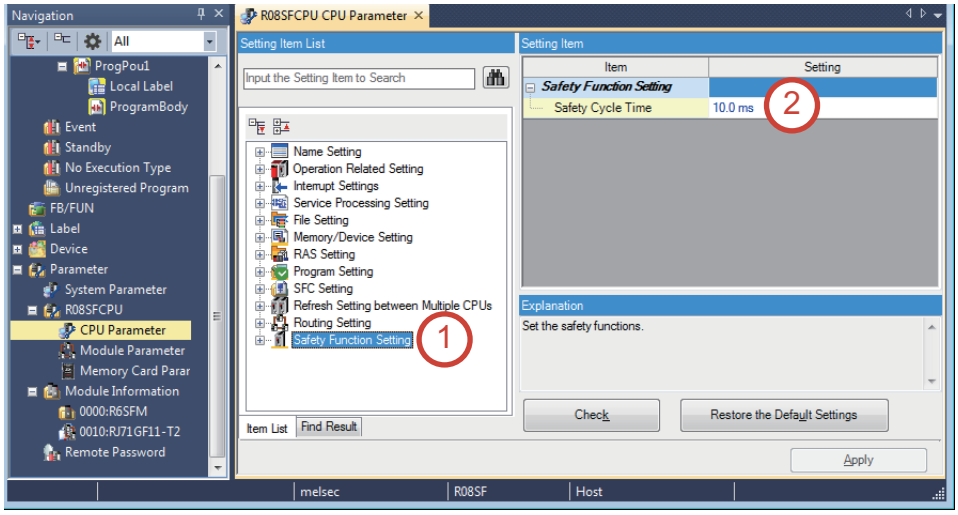
(1): The processing time is stored in the following areas.
Safety CPU: SD1890, SD1891
Safety function module: Un\G62, Un\G63

Setting a safety cycle time

A safety cycle time is set as follows.

Operating procedure

1. Double-click [Parameter] → [CPU Parameter] in the Navigation window. Then, double-click [Safety Function Setting].
2. Set the safety cycle time. Use the default value here.

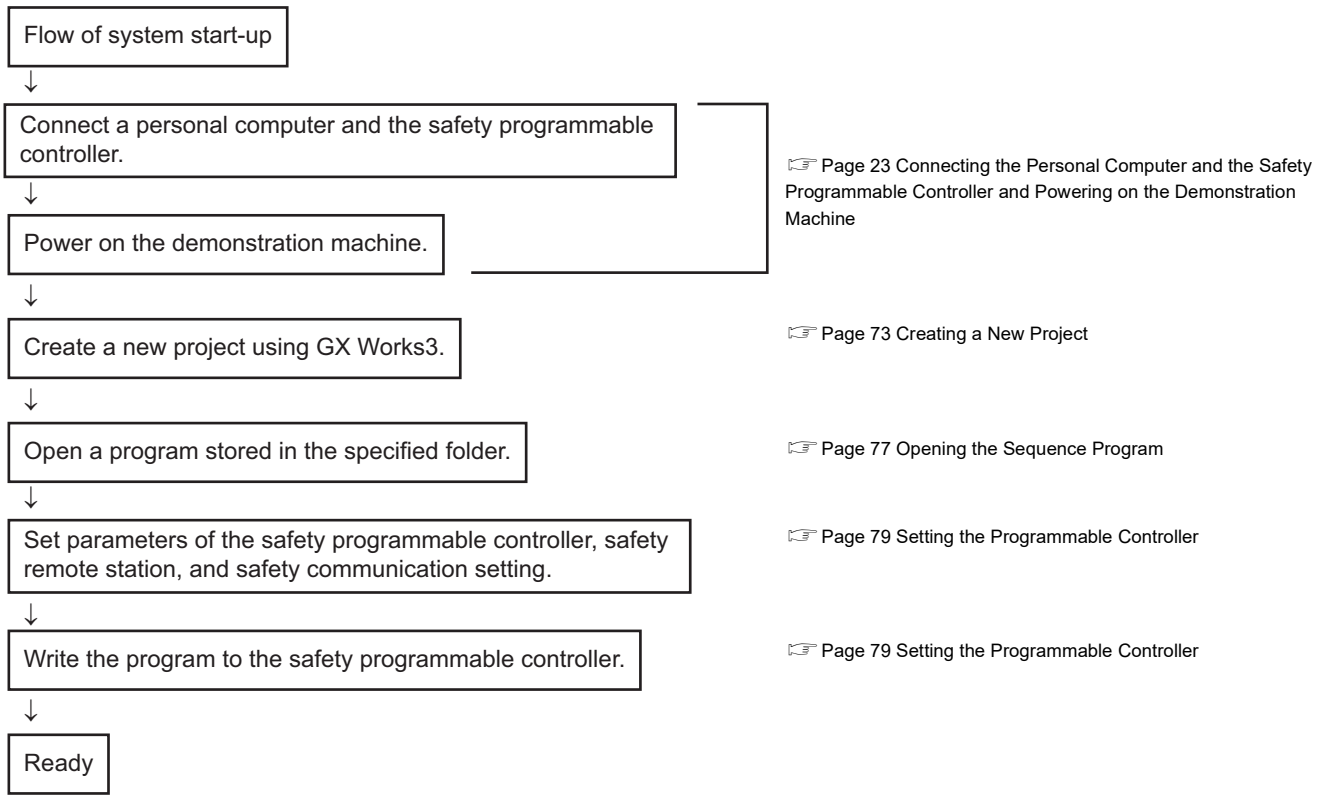


Displayed items

Item	Description	Setting range	Default
Safety Cycle Time	Set a timing (safety cycle time) for executing safety programs and safety input/output processing.	1.0 to 1000.0 ms (in increments of 0.1 ms)	10.0 ms

2.7 Overall Flow of Training (System Start-up)

The following is the overall flow of training to be described on Page 73 PREPARING THE DEMONSTRATION MACHINE.

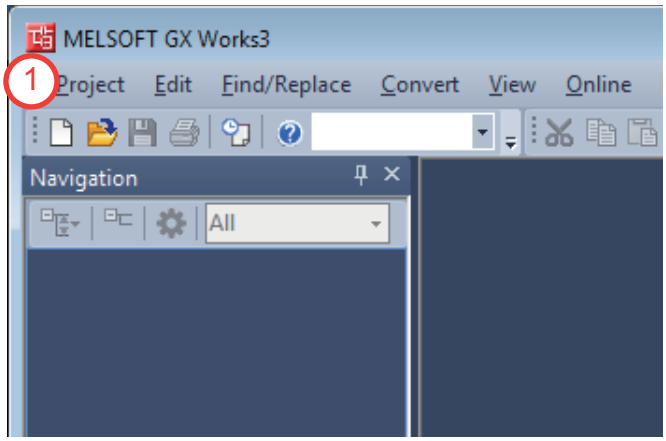


3 PREPARING THE DEMONSTRATION MACHINE

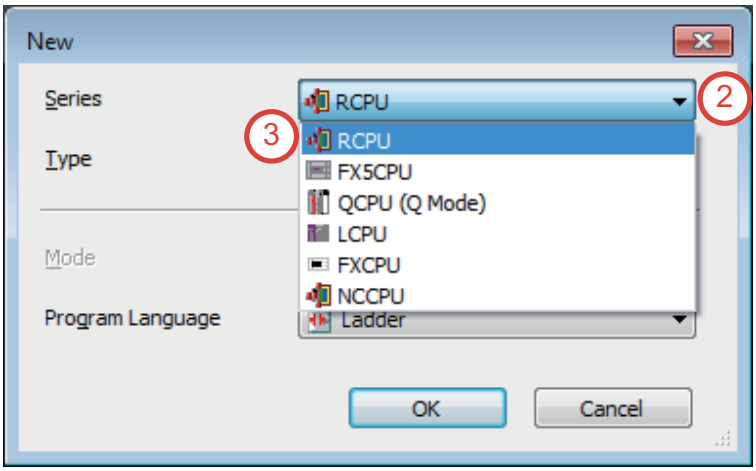
The demonstration machine can be operated by writing sequence programs to the safety programmable controller and setting parameters to the safety remote station.

3.1 Creating a New Project

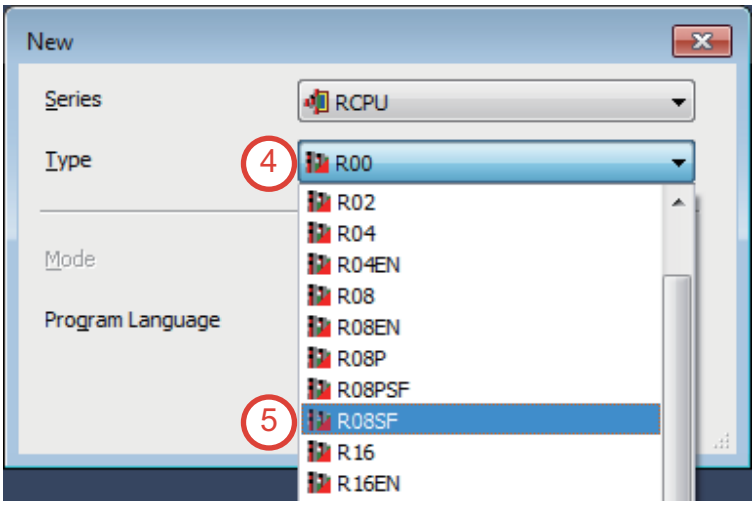
Operating procedure



1. Click on the toolbar or select [Project] → [New] (Ctrl + N) from the menu.

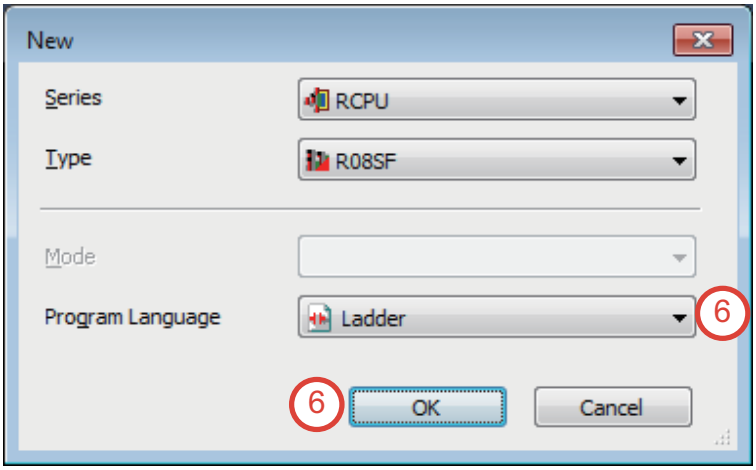


2. The "New" window appears. Click the drop-down button of "Series".
3. Select "RCPU" from the drop-down menu.

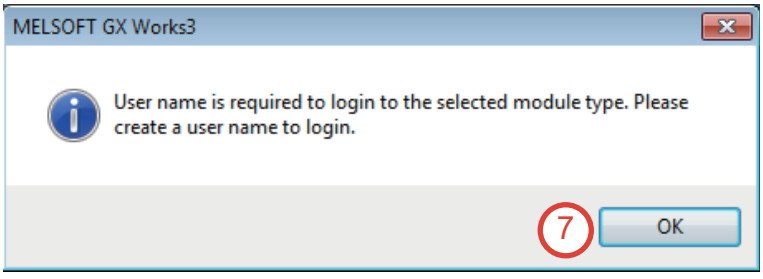


4. Click the drop-down button of "Type".

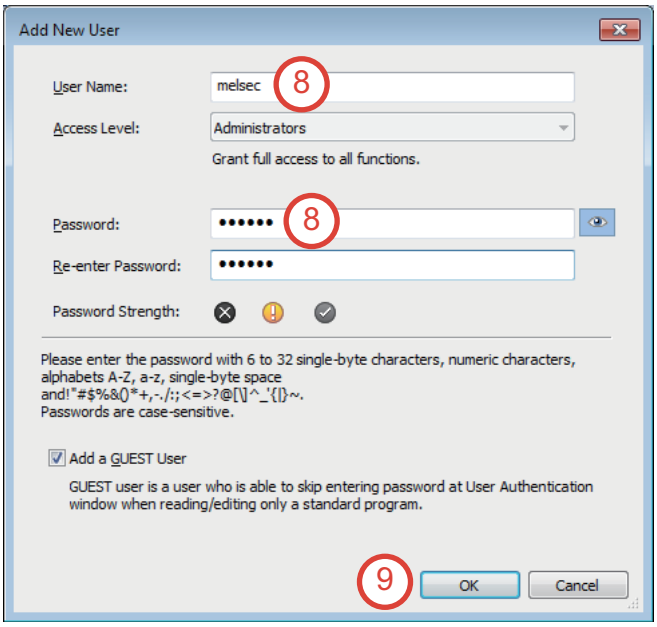
5. Select "R08SF" from the drop-down menu.

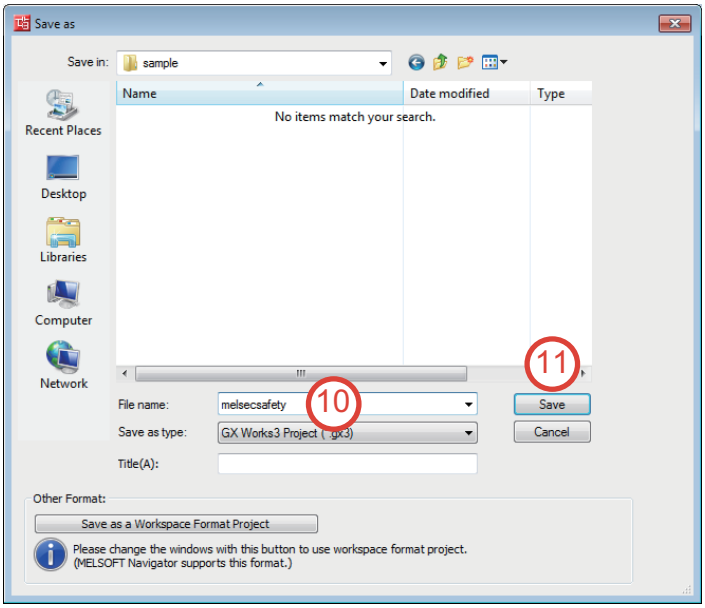


6. Click the drop-down button of "Program Language". Select "Ladder" from the drop-down menu. Then, click the [OK] button.



7. Click the [OK] button.





8. Enter the user name, password, and re-enter password.

User Name: melsec

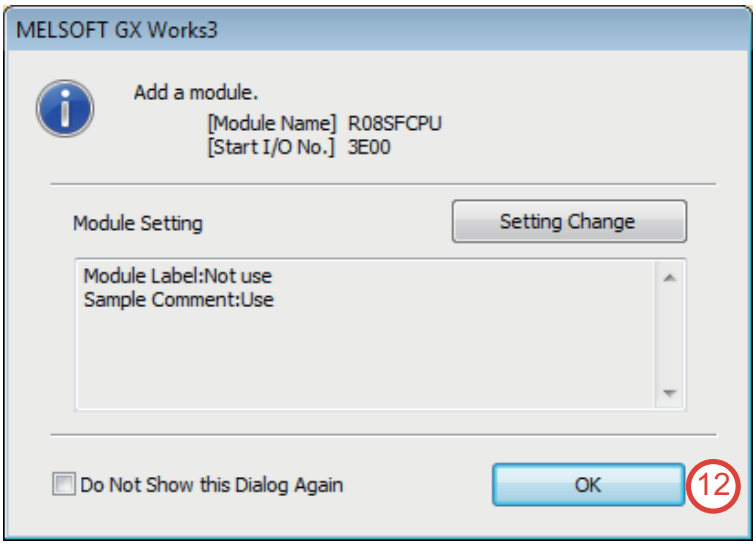
Password: melsec

9. Click the [OK] button.

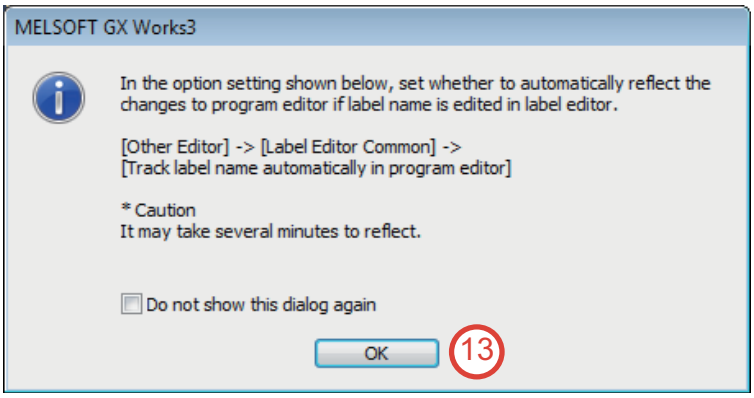
10. Enter the file name.

File name: melsecsafety

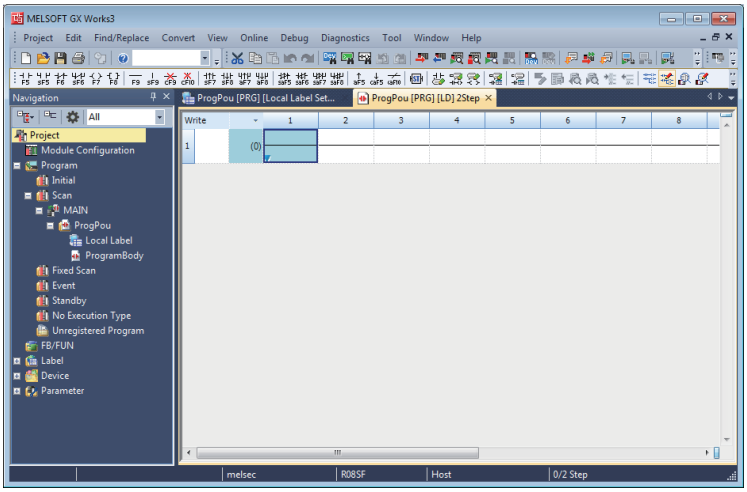
11. Click the [Save] button.



12. Click the [OK] button.



13. The dialog box that confirms an addition of the label of selected module ("R08SF" here) appears. Click the [OK] button.

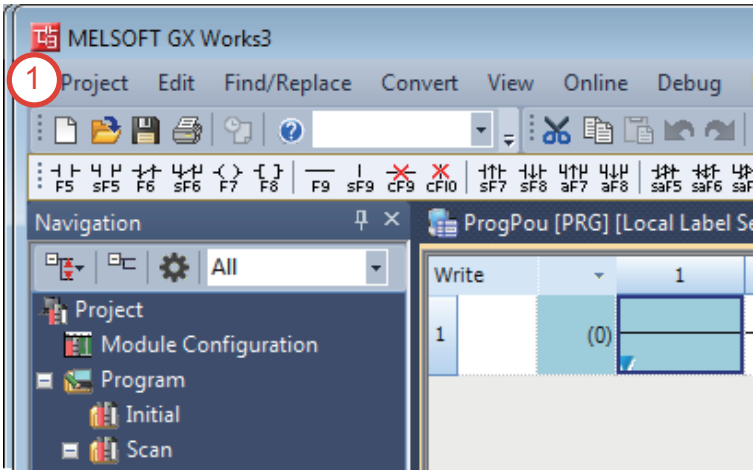


14. A new project is created.

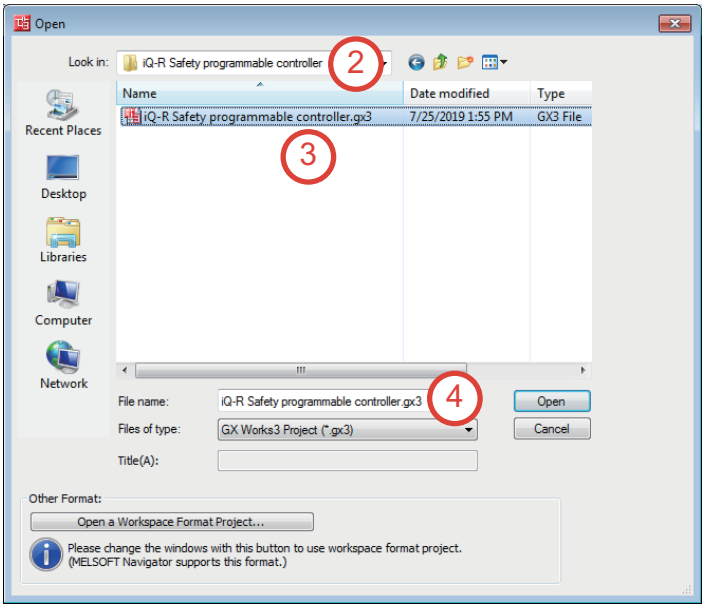
3.2 Opening the Sequence Program

This section describes how to open the sequence program "iQ-R Safety programmable controller" stored in the specified folder.

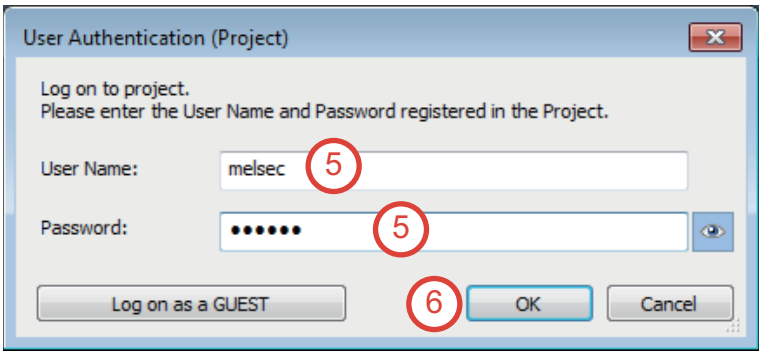
Operating procedure



1. Click on the toolbar or select [Project] → [Open] from the menu.



2. The "Open" window appears. Specify the location where the sequence program "iQ-R Safety programmable controller" is stored.
3. Click the sequence program "iQ-R Safety programmable controller".
4. Click the [Open] button to open the specified sequence program.

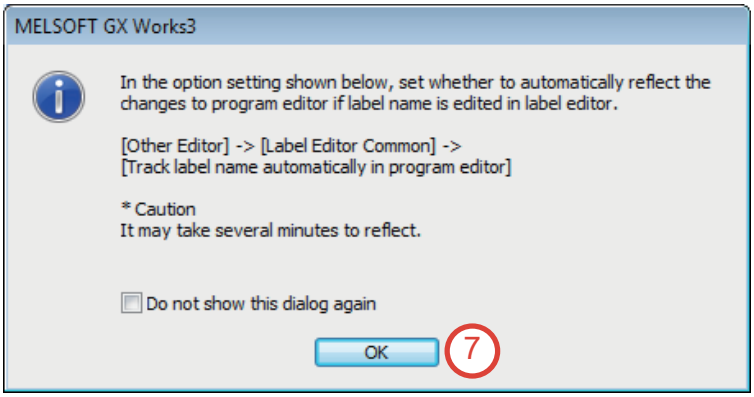


5. The "User Authentication" window appears. Enter the following user name and password.

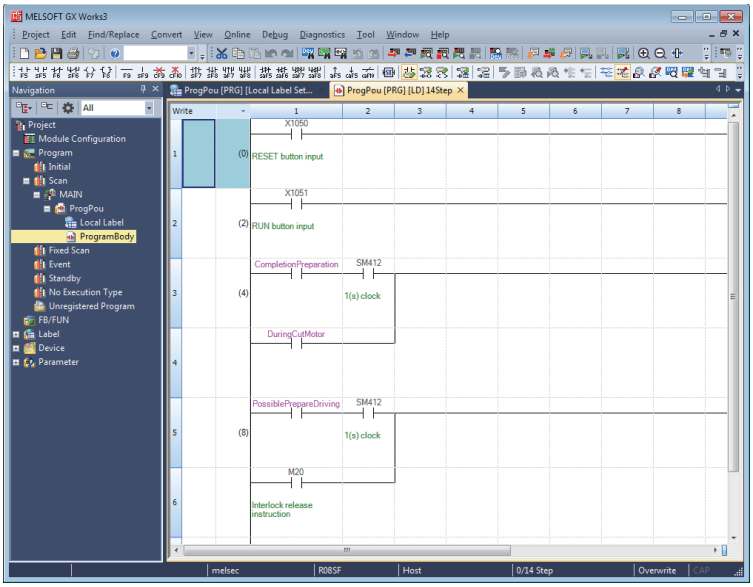
User Name: melsec

Password: melsec

6. Click the [OK] button.



7. The dialog box that confirms an addition of the label of selected module ("R08SF" here) appears. Click the [OK] button.



8. The sequence program (ladder) is displayed.

3.3 Setting the Programmable Controller

The retrieved sequence program includes parameter settings such as the network refresh settings (refer to Page 39 Network refresh settings). However, writing the retrieved program to the demonstration machine is not enough to operate as a safety programmable controller.
Perform the following operations.

Initializing all data in the programmable controller

For the operation method, refer to the following.
☞ Page 40 Initializing all data in the programmable controller

Converting the entire project

For the operation method, refer to the following.
☞ Page 43 Converting the entire project

Setting the CC-Link IE Field Network slave station

These parameters have already been set to the retrieved sequence program. Execute only "Parameter write" on the "Parameter Processing of Slave Station" window.
For the setting method, refer to the following.
☞ Page 48 Setting the CC-Link IE Field Network slave station

Enabling the CC-Link IE Field Network safety remote station

For the operation method, refer to the following.
☞ Page 54 Enabling the CC-Link IE Field Network safety remote station

Setting the CC-Link IE Field Network safety communication parameters

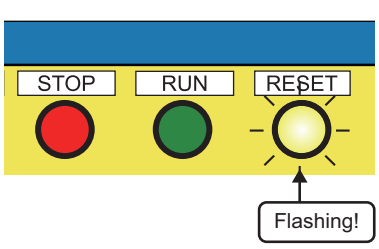
For the setting method, refer to the following.
☞ Page 57 Setting the CC-Link IE Field Network safety communication parameters
These parameters have already been set to the retrieved sequence program, and therefore the safety communication setting is not required.

Writing parameters to the programmable controller

For the operation method, refer to the following.
☞ Page 60 Writing parameters to the programmable controller after setting the CC-Link IE Field Network safety communication parameters

Checking the demonstration machine operation controller

After setting above, check that the indicator lamp of the operation preparation switch (RESET) is flashing.
Flashing of the lamp indicates the normal operation of the demonstration machine.



Precautions

If the indicator lamp of the operation preparation switch (RESET) is off, the demonstration machine may have failed. Immediately stop the operation, and report to the instructor.

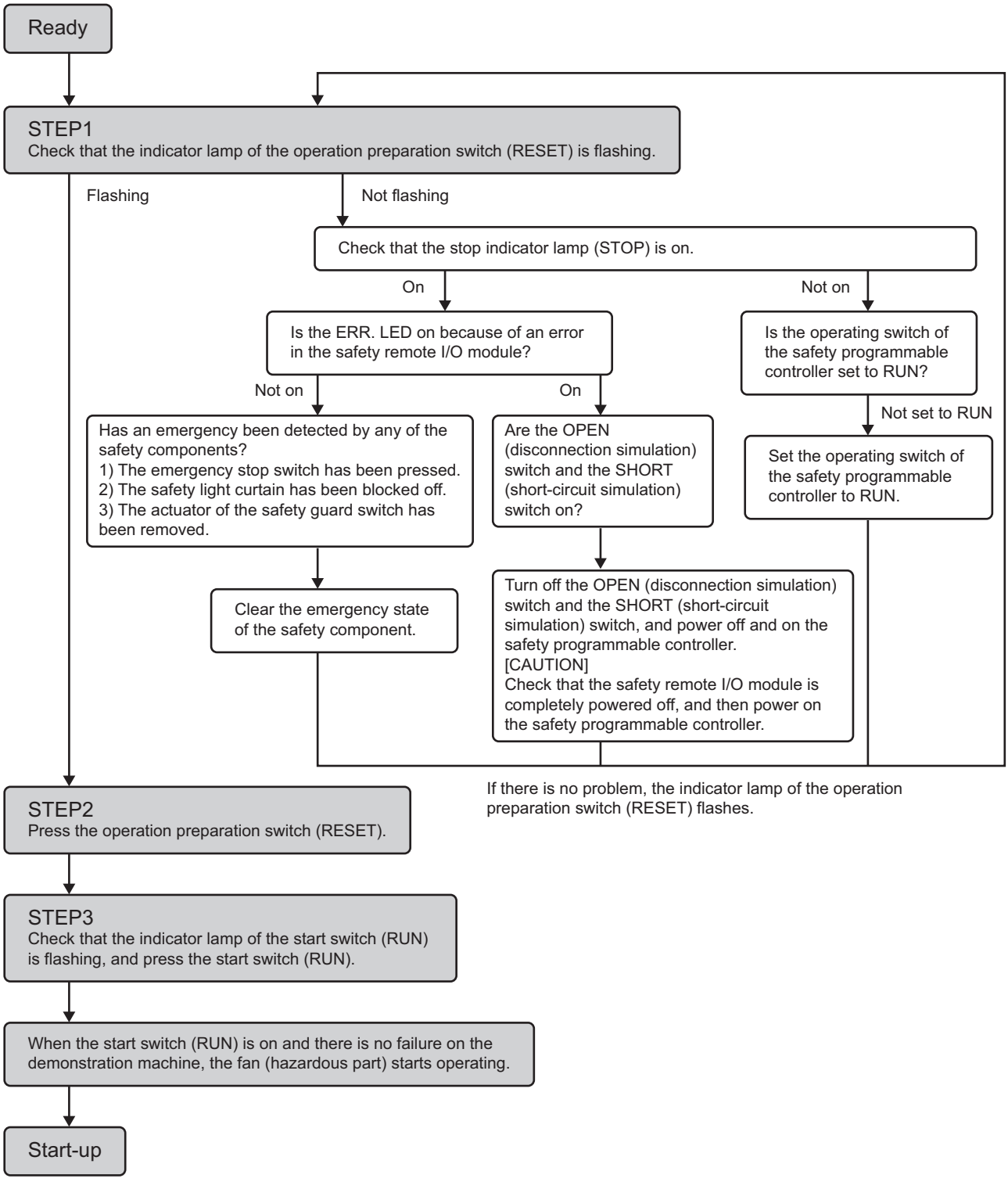
MEMO

4 OPERATION

4.1 Operating the Safety System Demonstration Machine

4.1.1 Starting the demonstration machine

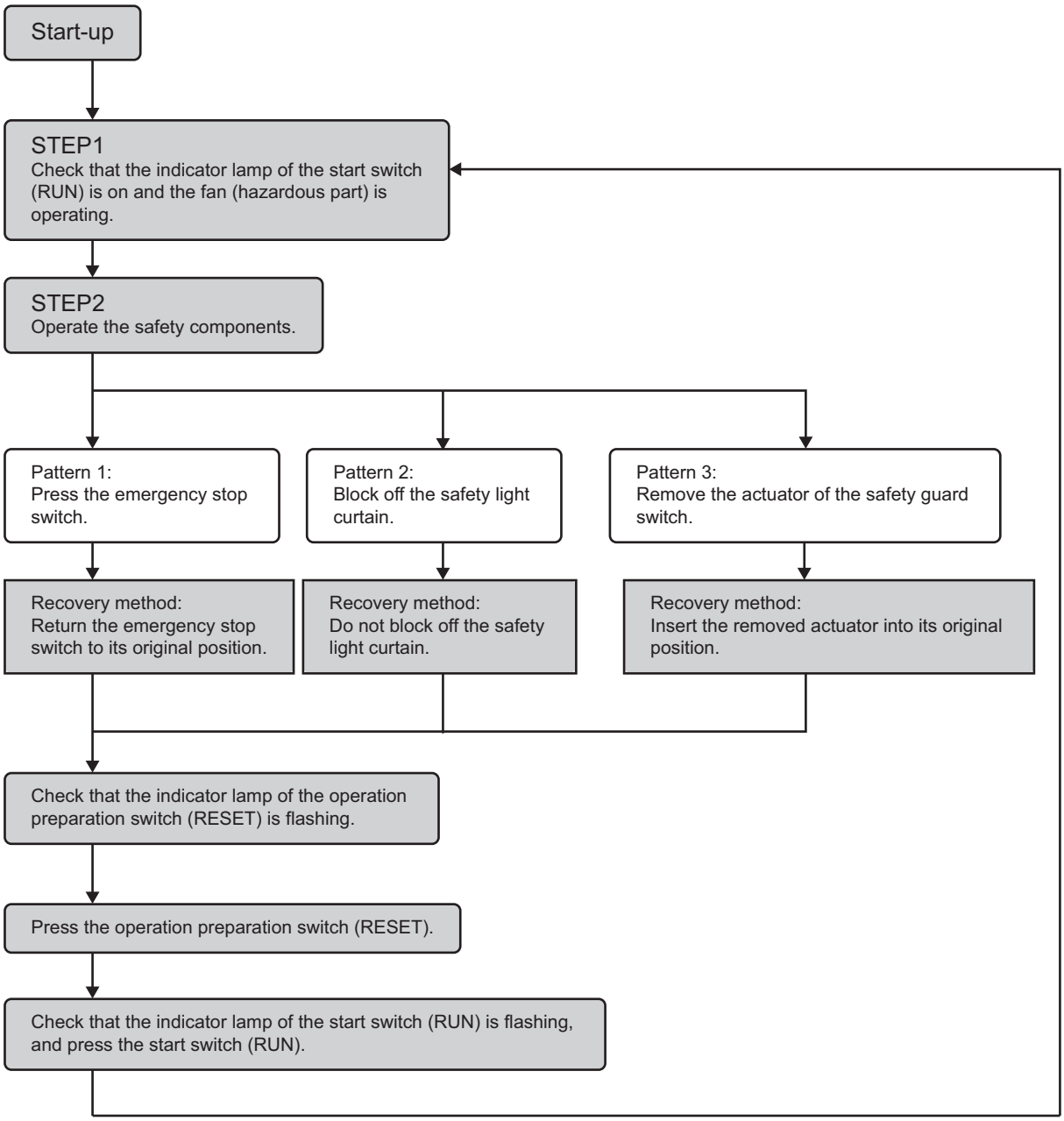
Check that the indicator lamp (yellow) of the operation preparation switch (RESET) is flashing, and perform the following operations.



4.1.2 Operating the demonstration machine

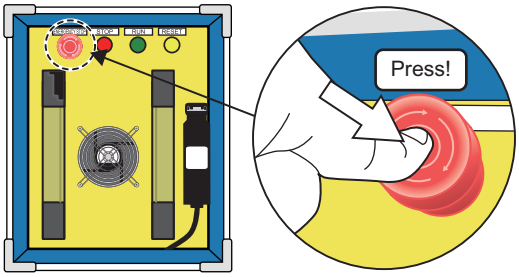
Check that the demonstration machine has started normally, and then operate the safety components.

The following shows the operating procedure of the demonstration machine, including the three operations (pattern 1, pattern 2, and pattern 3) of the safety components.



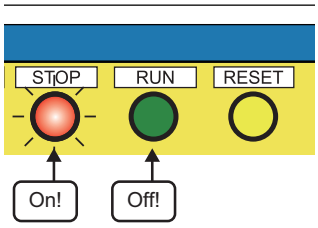
Operating procedure

■Pattern 1: Press the emergency stop switch.

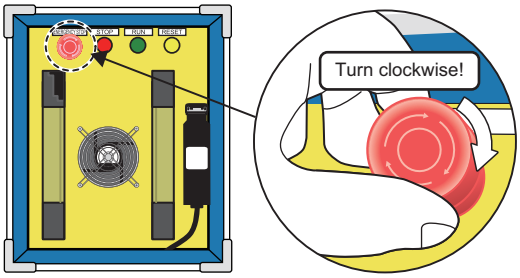


1. Press the emergency stop switch of the demonstration machine (safety component side).

Application: To discover hazards and stop the demonstration machine.

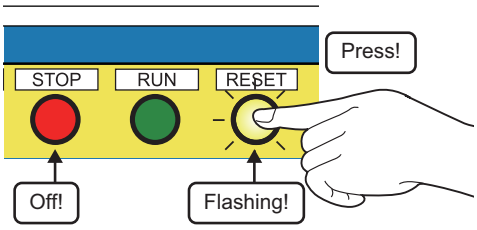


2. The fan stops. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on. The SA\X0, SA\X1, SA\Y0, and SA\Y1 LEDs of the safety remote I/O module used in the demonstration machine (safety programmable controller side) turn off.

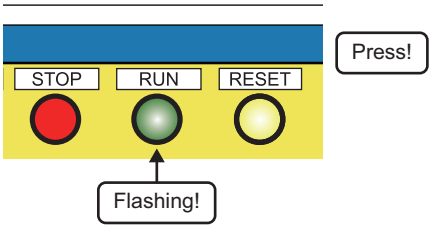


3. Return the emergency stop switch to its original position.

(Turn the emergency stop switch clockwise.)

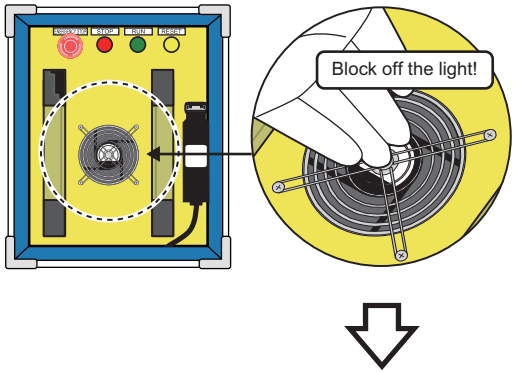


4. Check that the stop indicator lamp (STOP) is off and the indicator lamp of the operation preparation switch (RESET) is flashing, and then press the operation preparation switch (RESET).



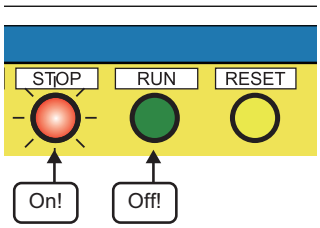
5. Check that the indicator lamp of the start switch (RUN) is flashing, and press the start switch (RUN). The demonstration machine recovers, and the fan starts its operation again.

■Pattern 2: Block off the light from the safety light curtain.

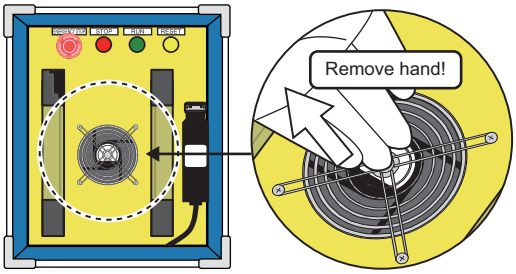


1. Bring your hand near the fan of the demonstration machine (safety component side), and block off the light from the safety light curtain.

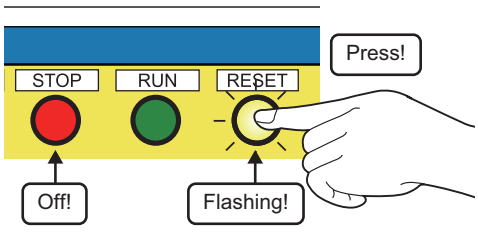
Application: To detect a person entering from the opening.



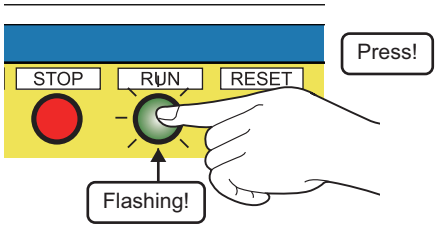
2. The fan stops. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on. The SA\X2, SA\X3, SA\Y0, and SA\Y1 LEDs of the safety remote I/O module used in the demonstration machine (safety programmable controller side) turn off.



3. Remove your hand, and stop blocking off the light.

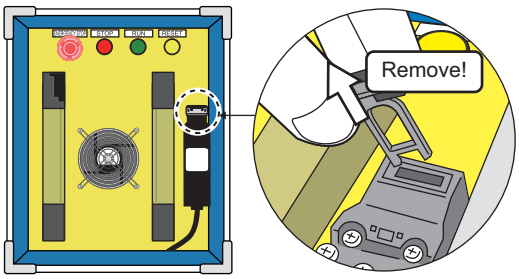


4. Check that the stop indicator lamp (STOP) is off and the indicator lamp of the operation preparation switch (RESET) is flashing, and then press the operation preparation switch (RESET).



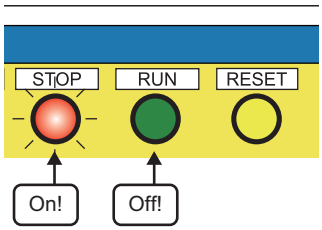
5. Check that the indicator lamp of the start switch (RUN) is flashing, and press the start switch (RUN). The demonstration machine recovers, and the fan starts its operation again.

■Pattern 3: Remove the actuator of the safety guard switch.

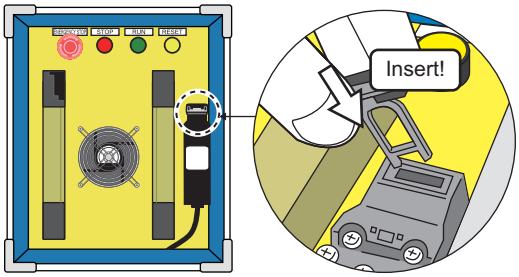


1. Remove the actuator of the safety guard switch of the demonstration machine (safety component side).

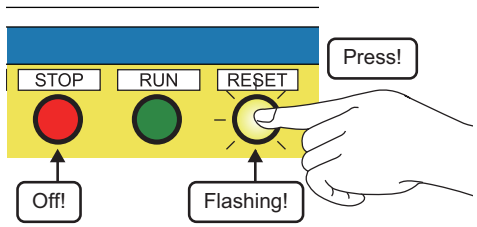
Application: To detect opening of the safety guard.



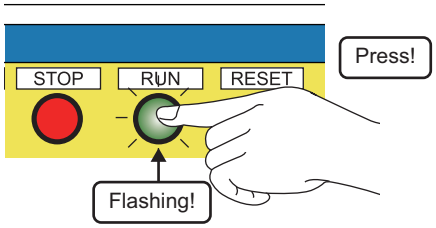
2. The fan stops. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on. The SA\X6, SA\X7, SA\Y0, and SA\Y1 LEDs of the safety remote I/O module used in the demonstration machine (safety programmable controller side) turn off.



3. Insert the removed actuator into its original position.



4. Check that the stop indicator lamp (STOP) is off and the indicator lamp of the operation preparation switch (RESET) is flashing, and then press the operation preparation switch (RESET).



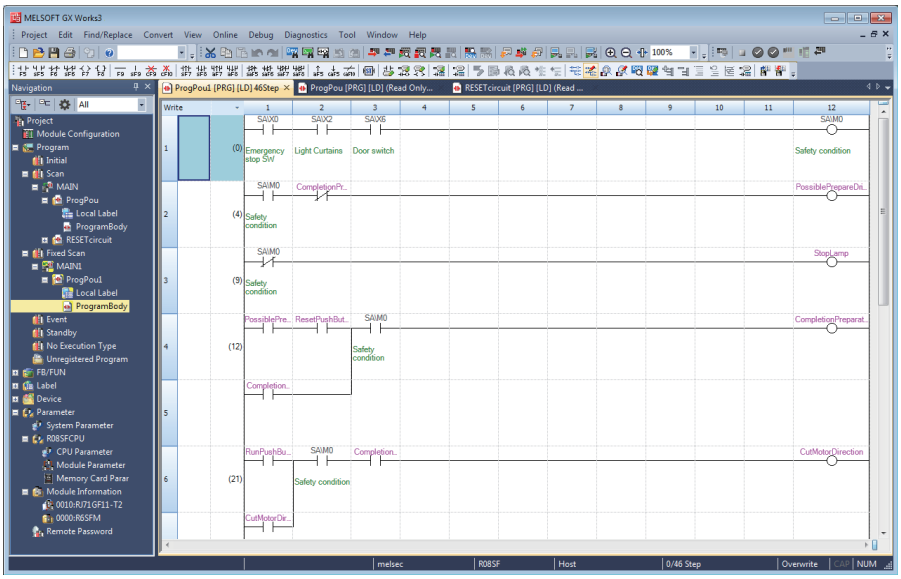
5. Check that the indicator lamp of the start switch (RUN) is flashing, and press the start switch (RUN). The demonstration machine recovers, and the fan starts its operation again.

4.1.3 Ladder monitor

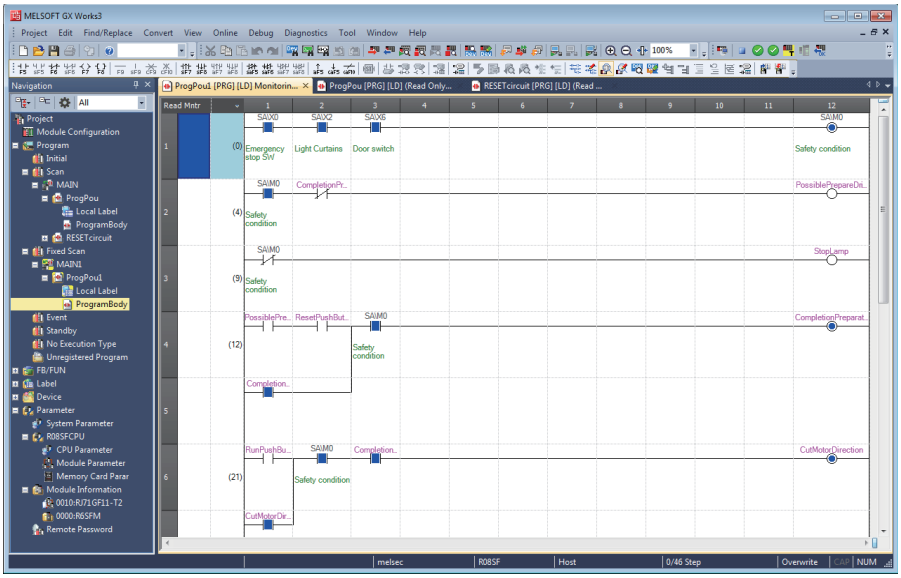
The non-safety status caused by the safety component operations described on Page 82 Operating the demonstration machine can be checked using the ladder monitor function of GX Works3.

Window

1. Double-click [Project] → [Program] → [Fixed Scan] → [MAIN1] → [ProgPou1] → [ProgramBody] in the Navigation window to open the fixed scan execution type program.



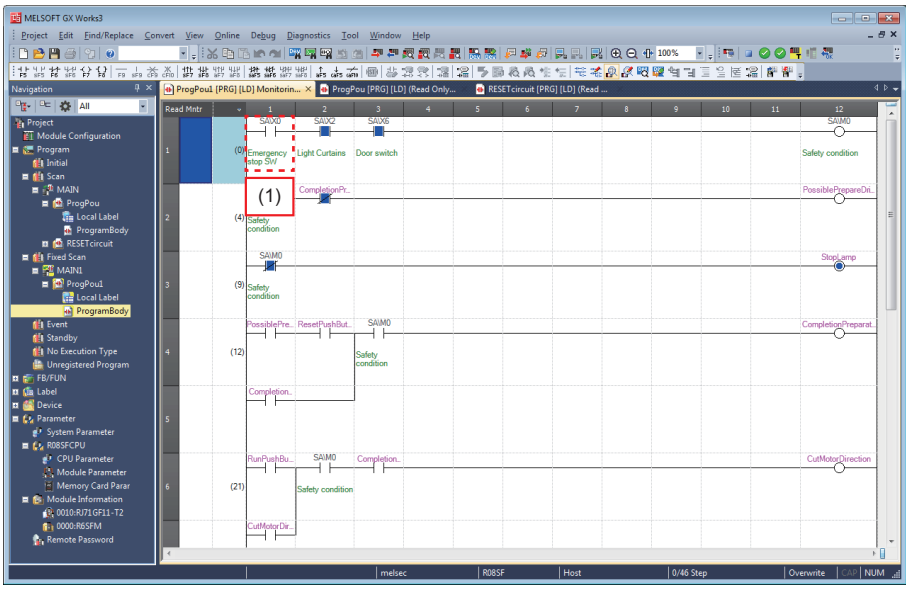
2. Click on the toolbar or select [Online] → [Monitor] → [Monitor Mode] from the menu. The window switches to the monitoring mode.



The ladder monitor windows displayed during each safety component operation are shown below:

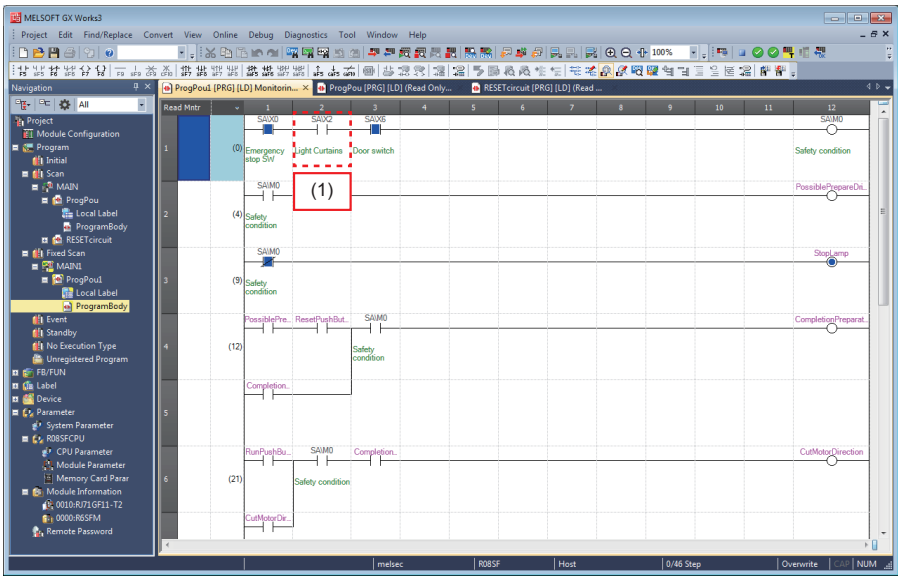
Pattern 1: Press the emergency stop switch.

(1) The device for the emergency stop switch, SA\X0, turns off.



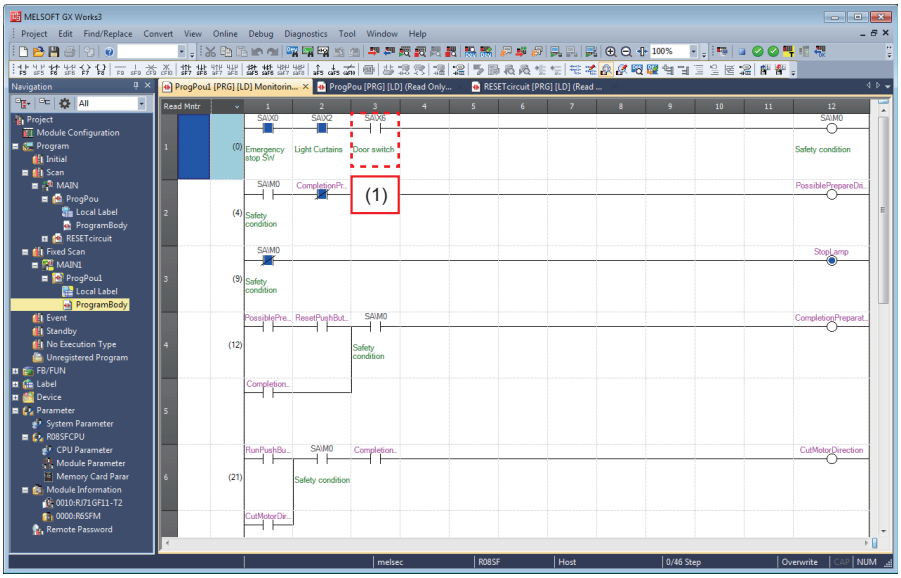
Pattern 2: Block off the light from the safety light curtain.

(1) The device for the safety light curtain, SA\X2, turns off.



Pattern 3: Remove the actuator of the safety guard switch.

(1) The device for the safety guard switch, SA\X6, turns off.



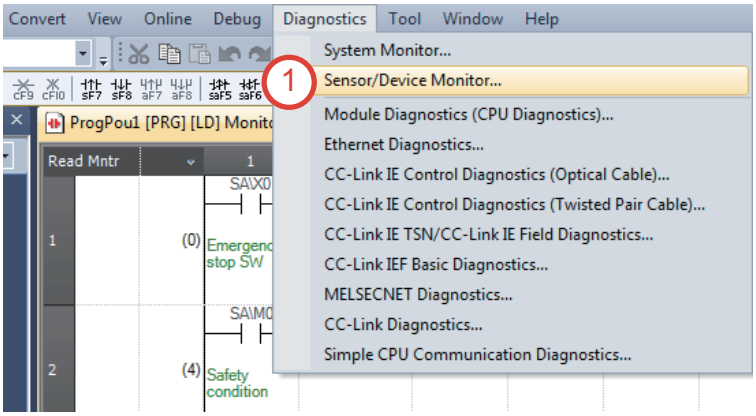
5 DIAGNOSTICS AND MAINTENANCE

5.1 Checking the Diagnostic Result at Error Occurrence Using GX Works3

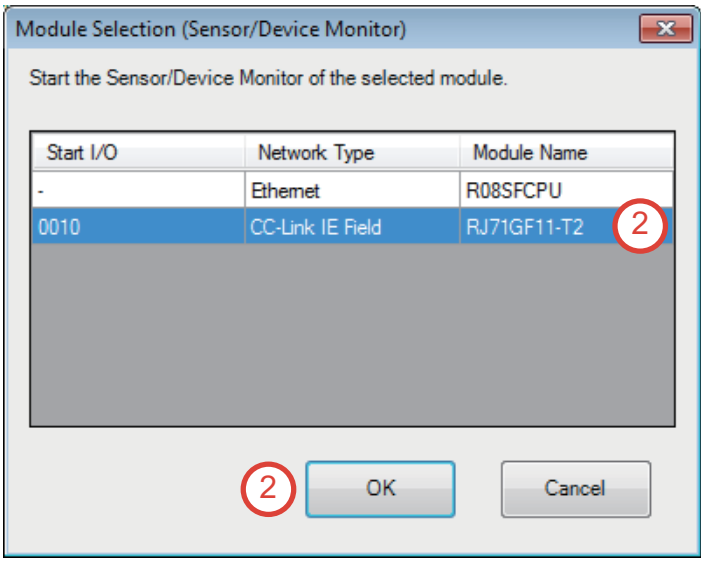
5.1.1 Diagnostic function of the safety programmable controller

An error (disconnection, short circuit) of the safety remote I/O module connected can be checked using the sensor/device monitor function of GX Works3.

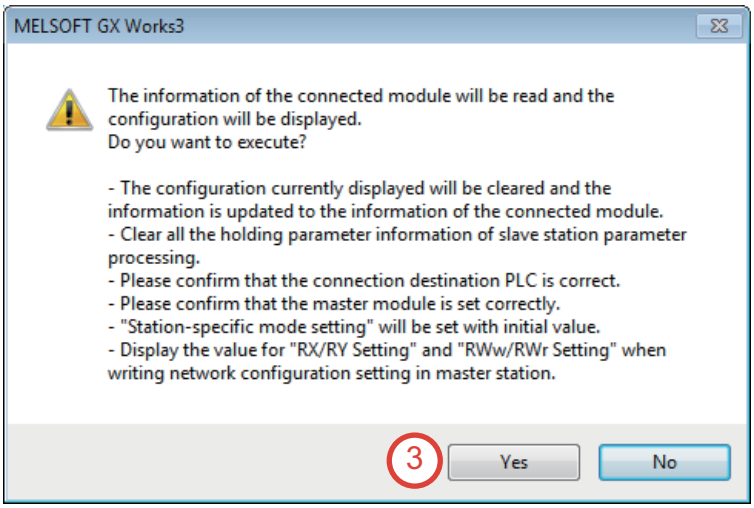
Operating procedure



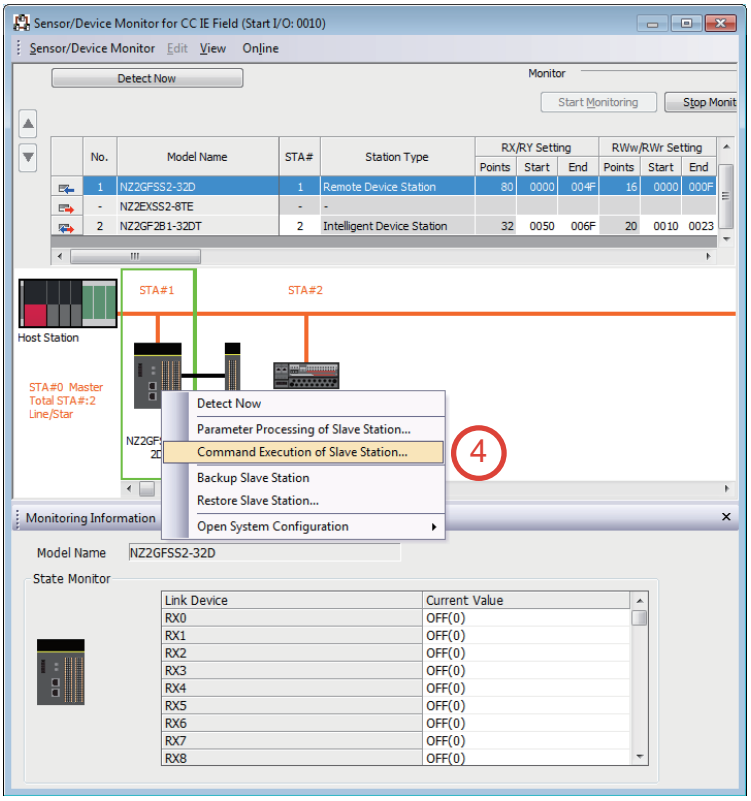
1. Select [Diagnostics] → [Sensor/Device Monitor] from the menu.



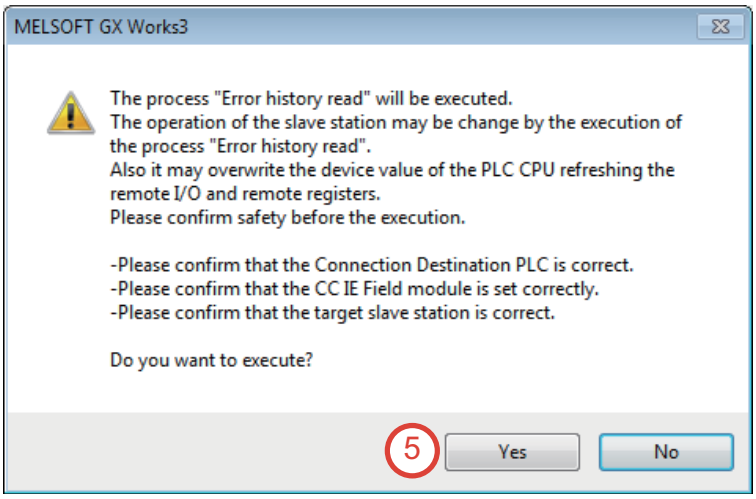
2. Select a module to be diagnosed, and click the [OK] button.



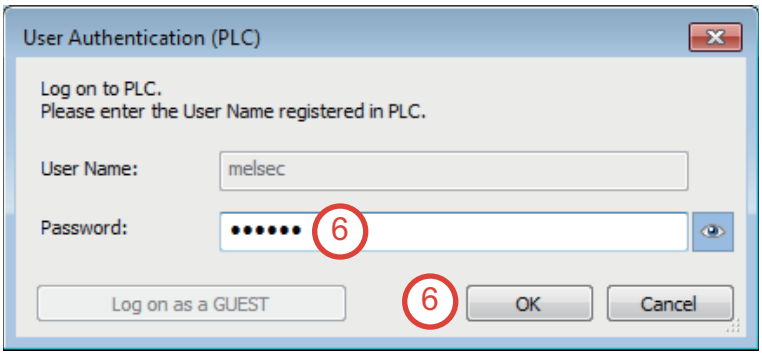
3. Click the [Yes] button.



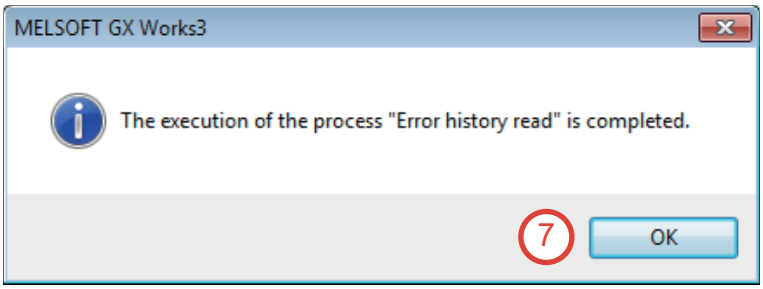
4. Select the safety remote I/O module "NZ2GFSS2-32D" in the list. Right-click on the module in the system configuration, and select [Online] → [Command Execution of Slave Station].



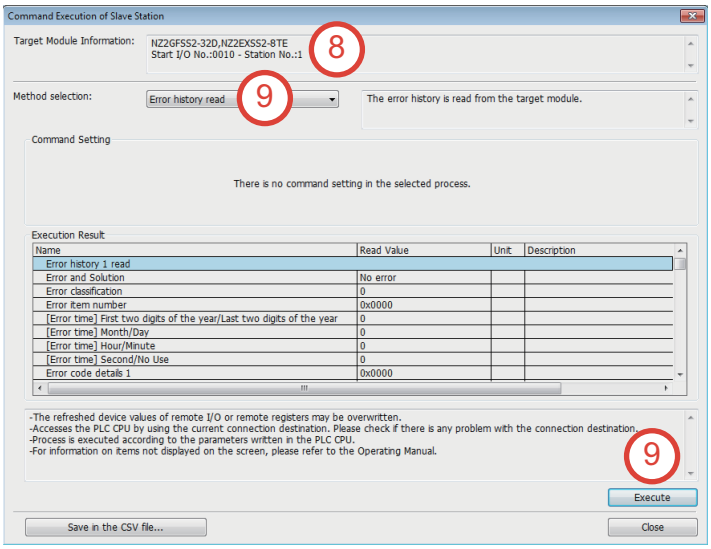
5. Click the [Yes] button.



6. Enter the password, and click the [OK] button.
Password: melsec

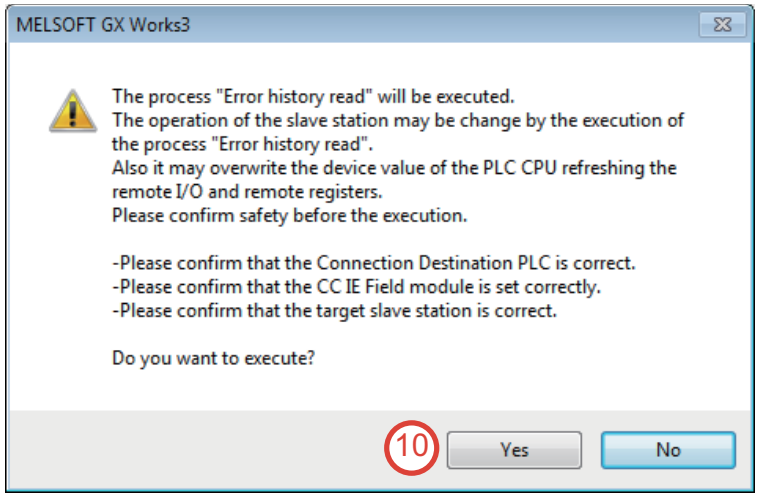


7. Click the [OK] button.



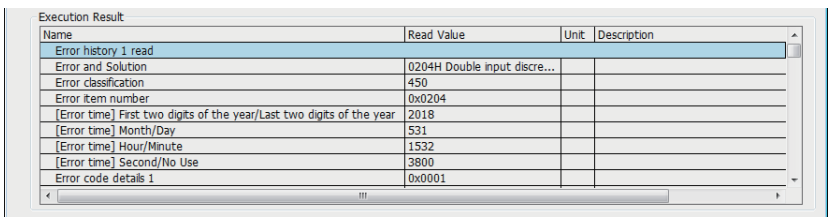
8. The "Command Execution of Slave Station" window appears.

9. Set "Method selection" to "Error history read", and click the [Execute] button.



10. Click the [Yes] button.

11. The error history of the safety remote I/O module is displayed in "Execution Result".



Item	Description	Example*1
Error and Solution	The error code and description of the error are displayed.	—
Error classification	The error classification of the safety error subset code is stored.	—
Error item number	The error item number of the safety error subset code is stored.	—
[Error time] First two digits of the year/ Last two digits of the year*2	The error date and time are displayed. (When the tens place of month, hour, and second is "0", "0" is omitted.)	2018
[Error time] Month/Day*2		531
[Error time] Hour/Minute*2		1532
[Error time] Second/No Use*2		3800
Error code details 1 to Error code details 7	The detailed information of some errors is stored. The data to be stored depends on the error. For details, refer to the following. CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual	—

*1 The values are the ones when an error occurs at 15:32:38, May 31th, 2018.

*2 The clock information of the error is based on the clock information acquired from the Safety CPU of the master station. When an error has occurred before the clock information is acquired, the error date and time are not recorded.

Point

- The error history records up to 15 errors. If 16 or more errors occur, the recorded error is deleted from the oldest.
- If the same error occurs successively, only the first error is stored into the error history.
- Even after the module power supply is turned off and on, the error history is held.
- The clock information of the error is based on the clock information acquired from the Safety CPU of the master station. To acquire the exact error date and time, match the clock information of the Safety CPU with the actual time.
- To initialize the error history, set "Method selection" to "Error history clear request" on the "Command Execution of Slave Station" window, and click the [Execute] button.

5.1.2 Checking an error (disconnection)

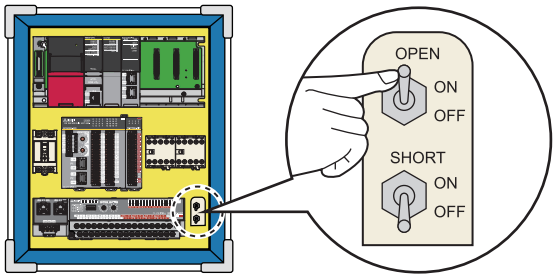
This section describes how to check a disconnection using the sensor/device monitor function by deliberately generating a disconnection on the demonstration machine.

Before the training, check that the fan of the demonstration machine (safety component side) is operating properly.

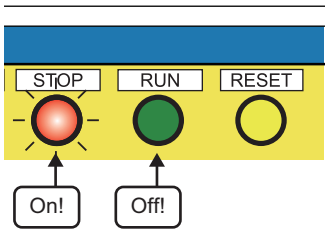
A disconnection is generated in the double wiring part. For details on the double wiring, refer to the following.

☞ Page 20 Wiring

Operating procedure



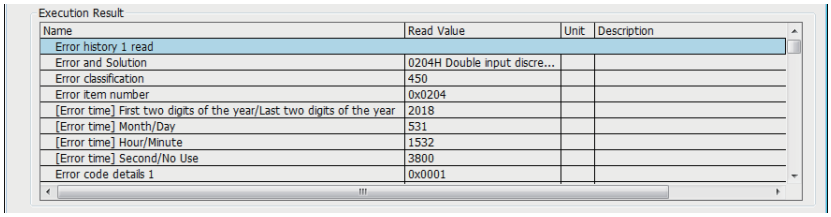
1. Turn on the OPEN (disconnection simulation) switch of the demonstration machine (safety programmable controller side).



2. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on.

3. The error is displayed in "Execution Result" as follows.

(The error (disconnection) is displayed as "Double input discrepancy detection error".)



Execution Result

Name	Read Value	Unit	Description
Error history 1 read			
Error and Solution	0204H Double input discre...		
Error classification	450		
Error item number	0x0204		
[Error time] First two digits of the year/Last two digits of the year	2018		
[Error time] Month/Day	531		
[Error time] Hour/Minute	1532		
[Error time] Second/No Use	3800		
Error code details 1	0x0001		

Item	Description
Error and Solution	0204H Double input discrepancy detection error
Error classification	450
Error item number	0x0204
[Error time] First two digits of the year/Last two digits of the year	2018
[Error time] Month/Day	531
[Error time] Hour/Minute	1532
[Error time] Second/No Use	3800
Error code details 1 to Error code details 7	The detailed information of some errors is stored. The data to be stored depends on the error. For details, refer to the following. 📖CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual

5.1.3 Checking an error (short circuit)

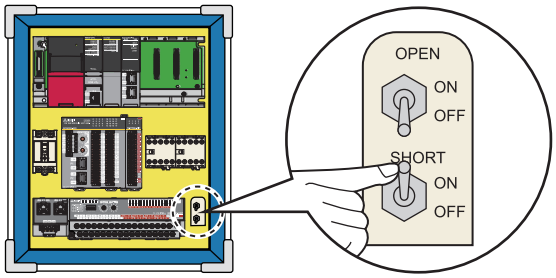
This section describes how to check a short circuit using the sensor/device monitor function by deliberately generating a short circuit on the demonstration machine.

Before the training, check that the fan of the demonstration machine (safety component side) is operating properly.

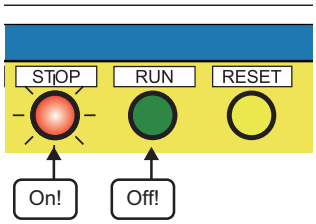
A short circuit is generated in the input dark test circuit. For details on the input dark test circuit, refer to the following.

☞ Page 20 Wiring

Operating procedure

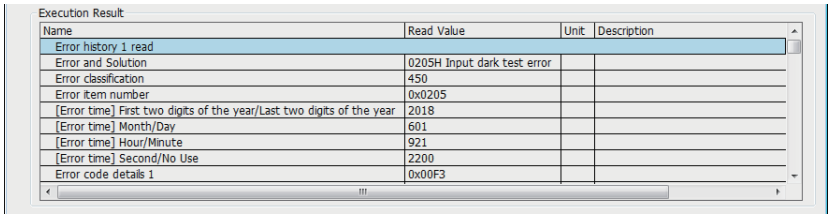


1. Turn on the SHORT (short-circuit simulation) switch of the demonstration machine (safety programmable controller side).



2. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on.

3. The error is displayed in "Execution Result" as follows.
(The error (short circuit) is displayed as "Input dark test error".)



Item	Description
Error and Solution	0205H Input dark test error
Error classification	450
Error item number	0x0205
[Error time] First two digits of the year/Last two digits of the year	2018
[Error time] Month/Day	601
[Error time] Hour/Minute	921
[Error time] Second/No Use	2200
Error code details 1 to Error code details 7	The detailed information of some errors is stored. The data to be stored depends on the error. For details, refer to the following. 📖CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual

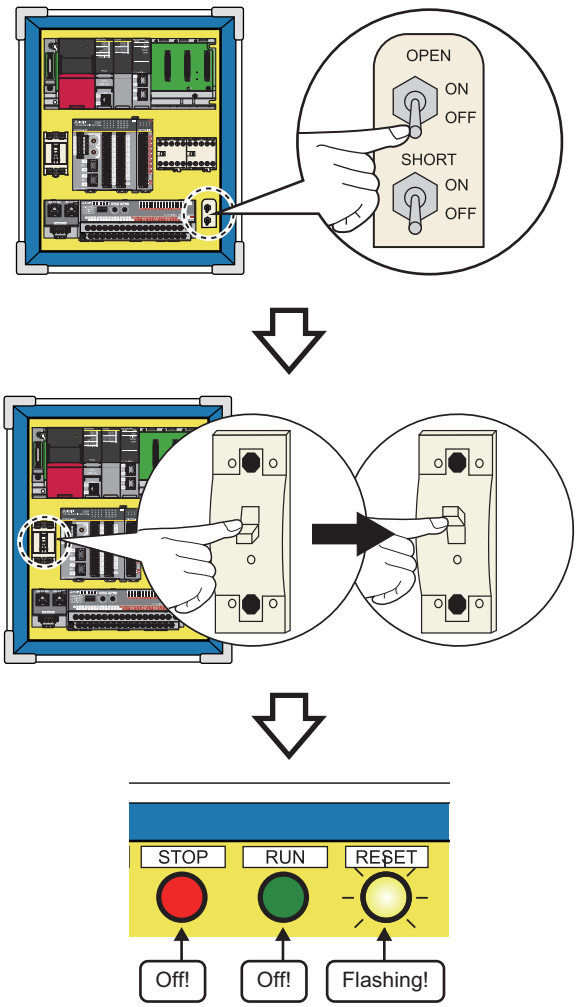
5.2 How to Recover from an Error

This section describes how to recover from errors described in Section 5.1.2 and Section 5.1.3.

5.2.1 Powering off and on the demonstration machine

This section describes the recovery procedure by powering off and on the demonstration machine.

Operating procedure



1. Turn off the OPEN (disconnection simulation) switch and the SHORT (short-circuit simulation) switch.

2. Turn off the main power supply, and turn it on again.

Point

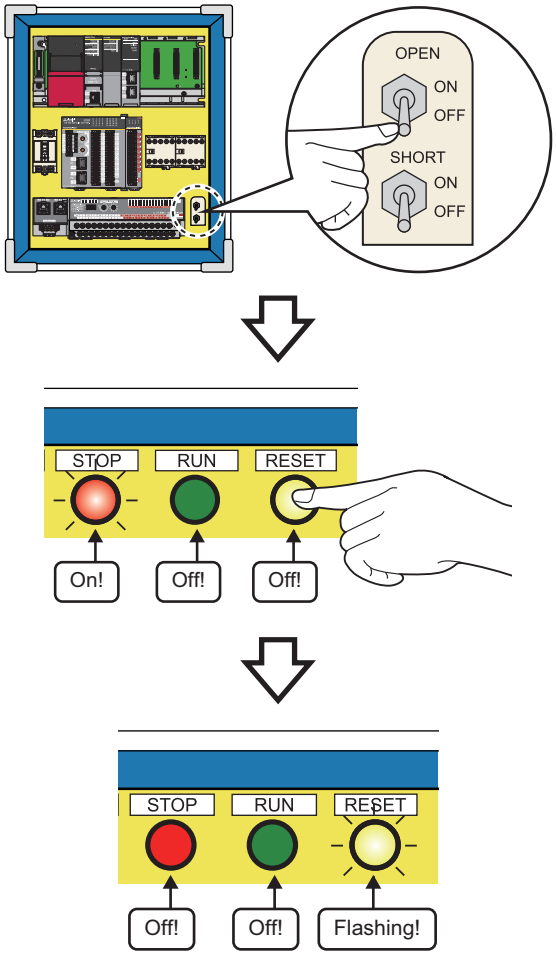
If the off time is short, the safety remote I/O module may not stop completely.

3. When the demonstration machine recovers, the indicator lamp of the operation preparation switch (RESET) flashes.

5.2.2 Holding down the operation preparation switch (RESET) for five seconds

This recovery method uses the function block in the program.
This section describes the recovery procedure and the program operation.
Program name: RESET (Program type: Scan execution type)
Function block name: M+RJ71GF11_RemoteReset

Operating procedure



1. Turn off the OPEN (disconnection simulation) switch and the SHORT (short-circuit simulation) switch.

2. Hold down the operation preparation switch (RESET) for five seconds. The function block, M+RJ71GF11_RemoteReset, starts up.

3. When the demonstration machine recovers, the indicator lamp of the operation preparation switch (RESET) flashes.

Program operation

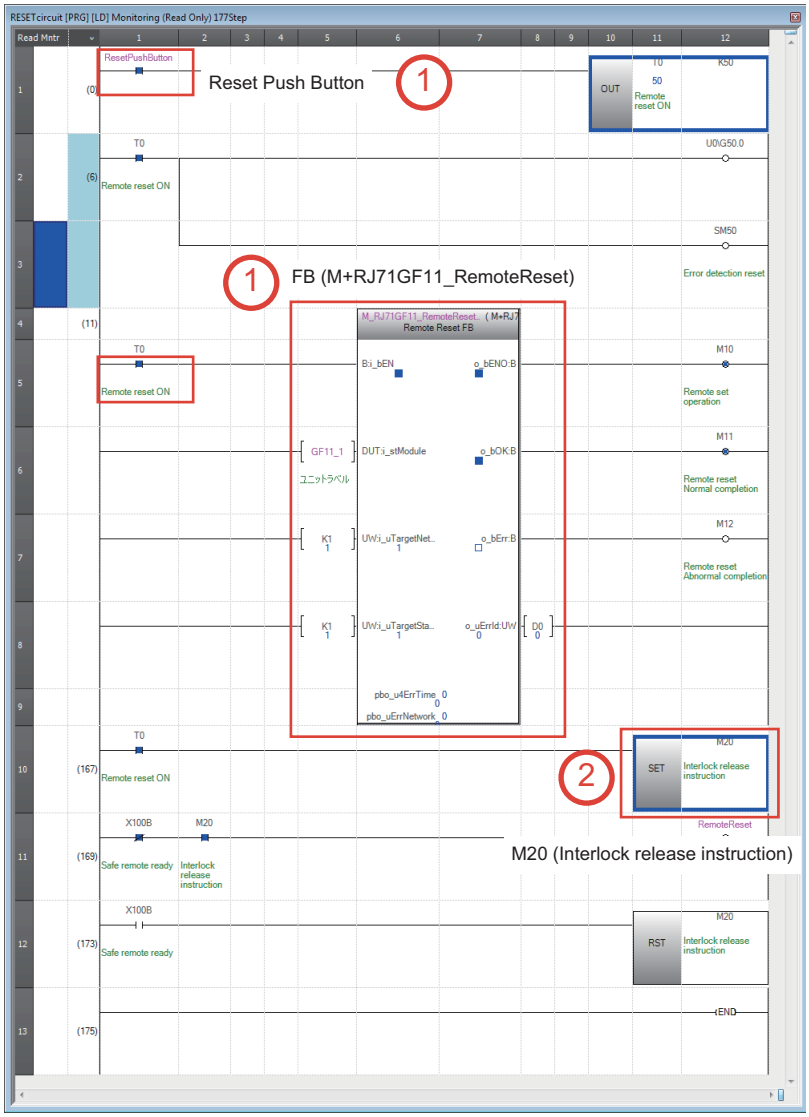
When the operation preparation switch (RESET) is held down, the program operates as follows.

1. The "ResetPushButton" label in the program turns on, starting up the function block, M+RJ71GF11_RemoteReset. M+RJ71GF11_RemoteReset sends a remote STOP request to the target station (safety remote I/O module) and then sends a remote RESET request.

For details on the function block, M+RJ71GF11_RemoteReset, refer to the following.

MELSEC iQ-R Ethernet/CC-Link IE Function Block Reference

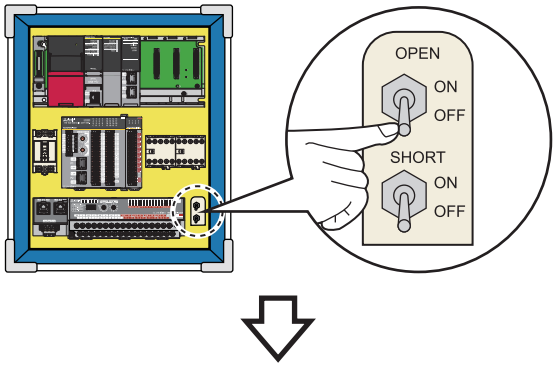
2. M20 (Interlock release instruction) turns on, and the interlock circuit is released.



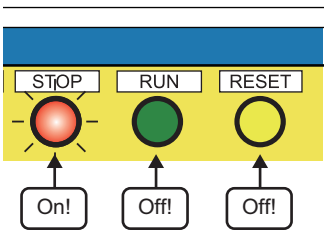
5.2.3 Using the auto recovery parameter

This recovery method uses the auto recovery parameter of the safety programmable controller.
This section describes the recovery procedure, auto recovery parameter setting, and recovery timing.
This method can be used to recover from a disconnection.
The auto recovery parameter has already been set to the program used in the demonstration machine.

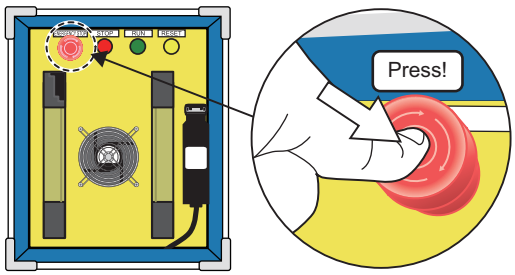
Operating procedure



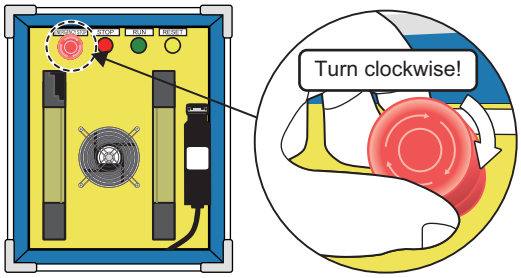
1. Turn off the OPEN (disconnection simulation) switch.



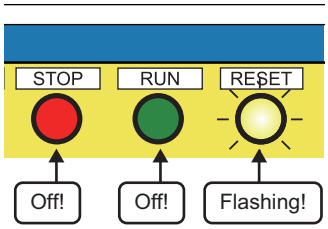
2. The fan stops. The indicator lamp of the start switch (RUN) turns off, and the stop indicator lamp (STOP) turns on.



3. Press the emergency stop switch of the demonstration machine (safety component side).



4. Return the emergency stop switch to its original position.
(Turn the emergency stop switch clockwise.)



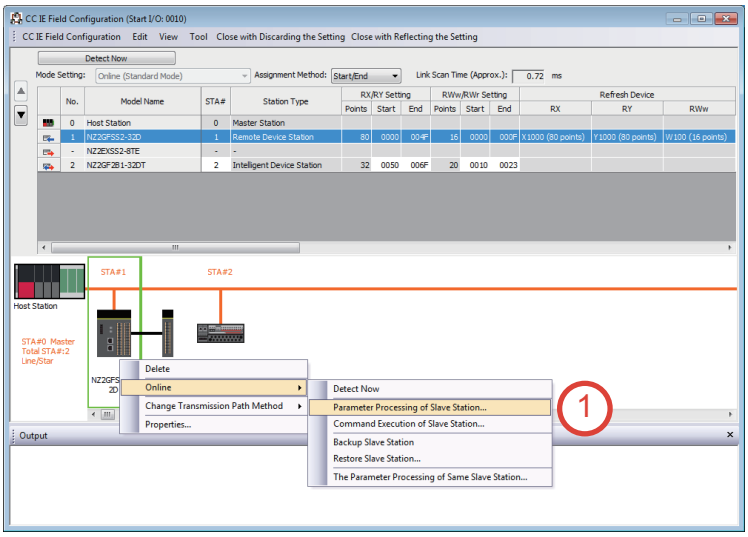
5. When the demonstration machine recovers, the indicator lamp of the operation preparation switch (RESET) flashes.

Auto recovery parameter setting

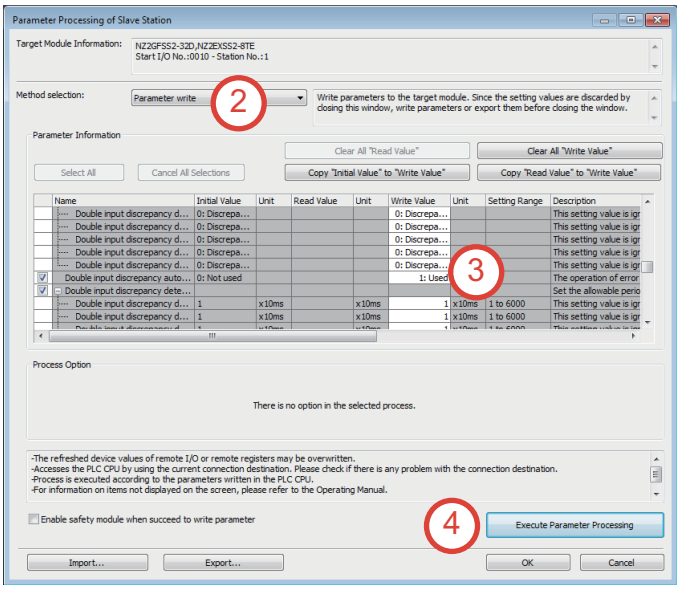
When the disconnection cause is eliminated by enabling the double input discrepancy auto recovery function, the demonstration machine automatically recovers to the normal state.
The reset operation of the safety remote I/O module to clear the error is not required.

■Double input discrepancy auto recovery function setting

Operating procedure



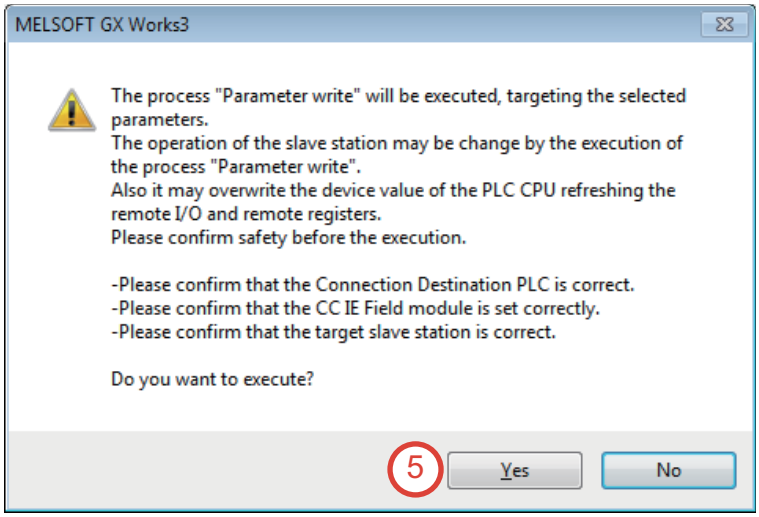
1. On the "CC IE Field Configuration" window, select "NZ2GFSS2-32D" in the list. Then, right-click on the module, and select [Online] → [Parameter Processing of Slave Station].



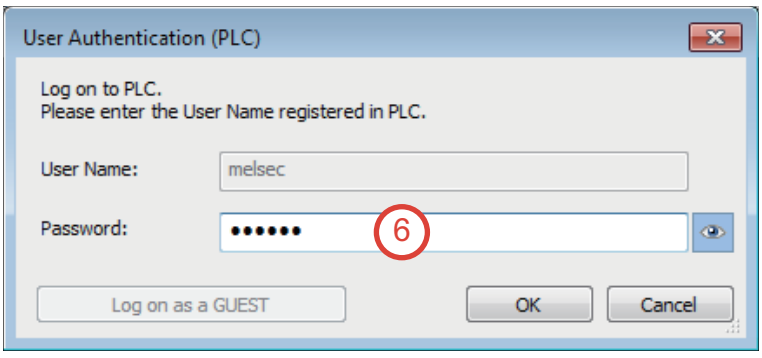
2. The "Parameter Processing of Slave Station" window appears. Set "Method selection" to "Parameter write".

3. Scroll down the window, and set "Write Value" of "Double input discrepancy auto recovery setting" to "1: Used". This parameter has already been set to the program used in the demonstration machine.

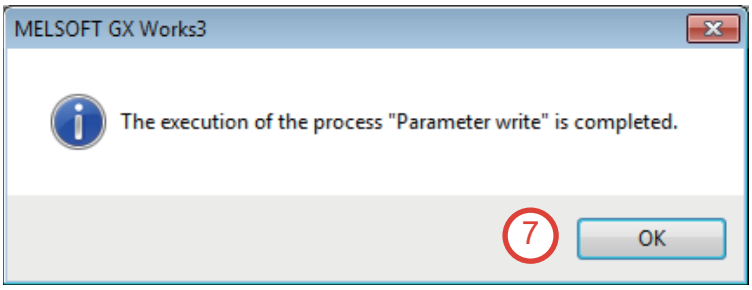
4. Click the "Execute Parameter Processing" button.



5. Click the [Yes] button.



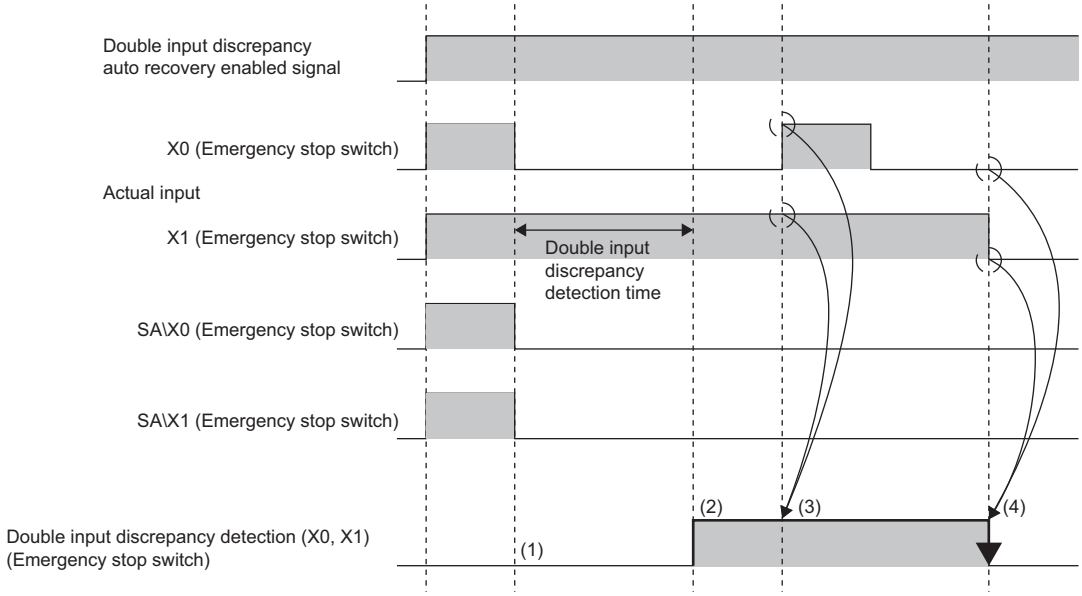
6. Enter the password.
Password: melsec



7. Click the [OK] button.

■Auto recovery timing

To clear the double input discrepancy detection error (disconnection), both actual input signals need to be turned off. The following figure shows the auto recovery timing from the double input discrepancy detection error.



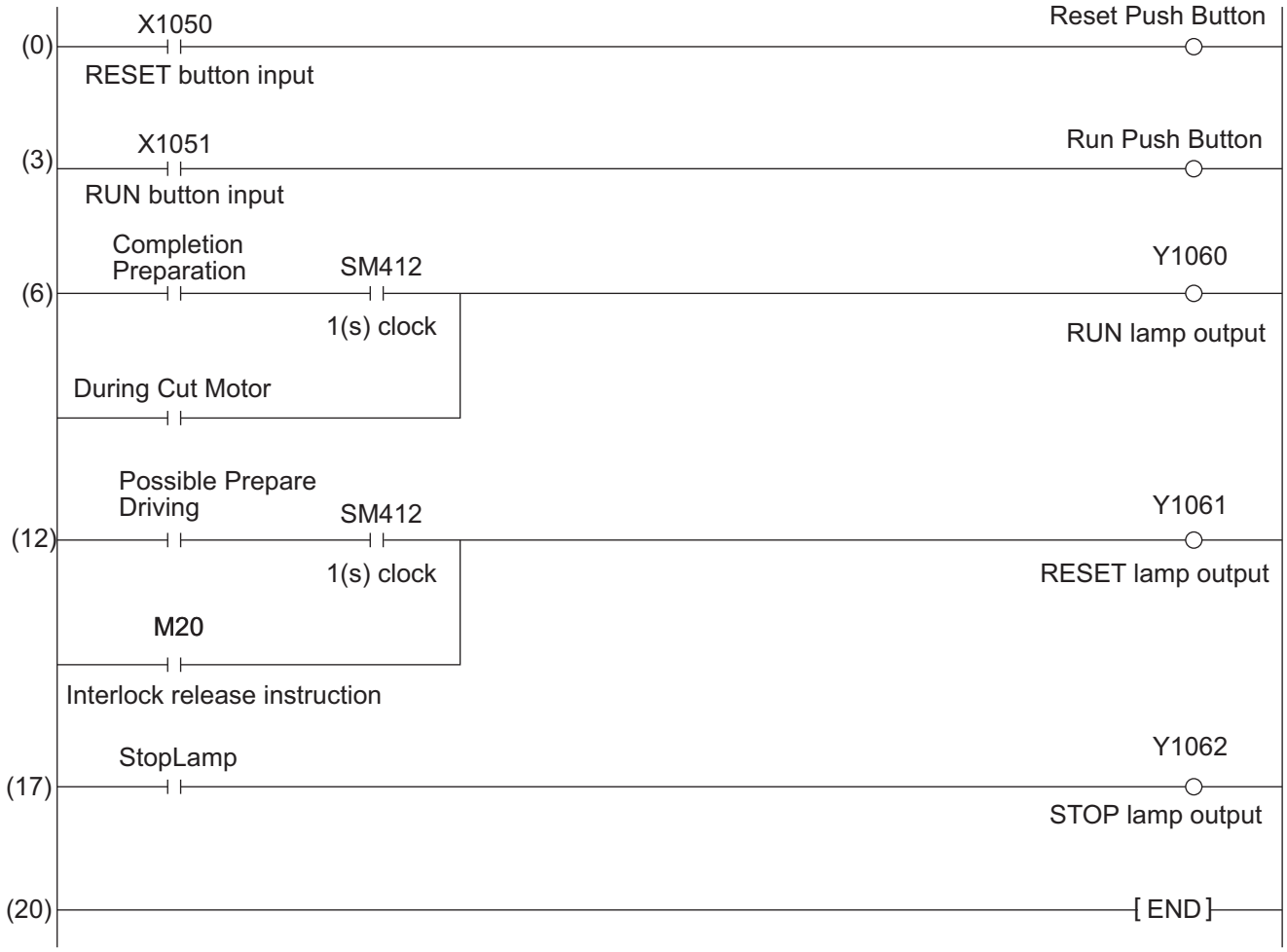
(1) Both SA\X0 and SA\X1 turn off when a discrepancy is detected.
(2) A double input discrepancy detection error occurs.
(3) When both X0 and X1 turn on, the auto recovery is not performed.
(4) When both X0 and X1 turn off, the auto recovery is performed.

APPENDICES

Appendix 1 Ladder Programs Used in This Manual

The following are the ladder programs used in this manual.

Operation program (Type: Scan execution type, Name: ProgPou)



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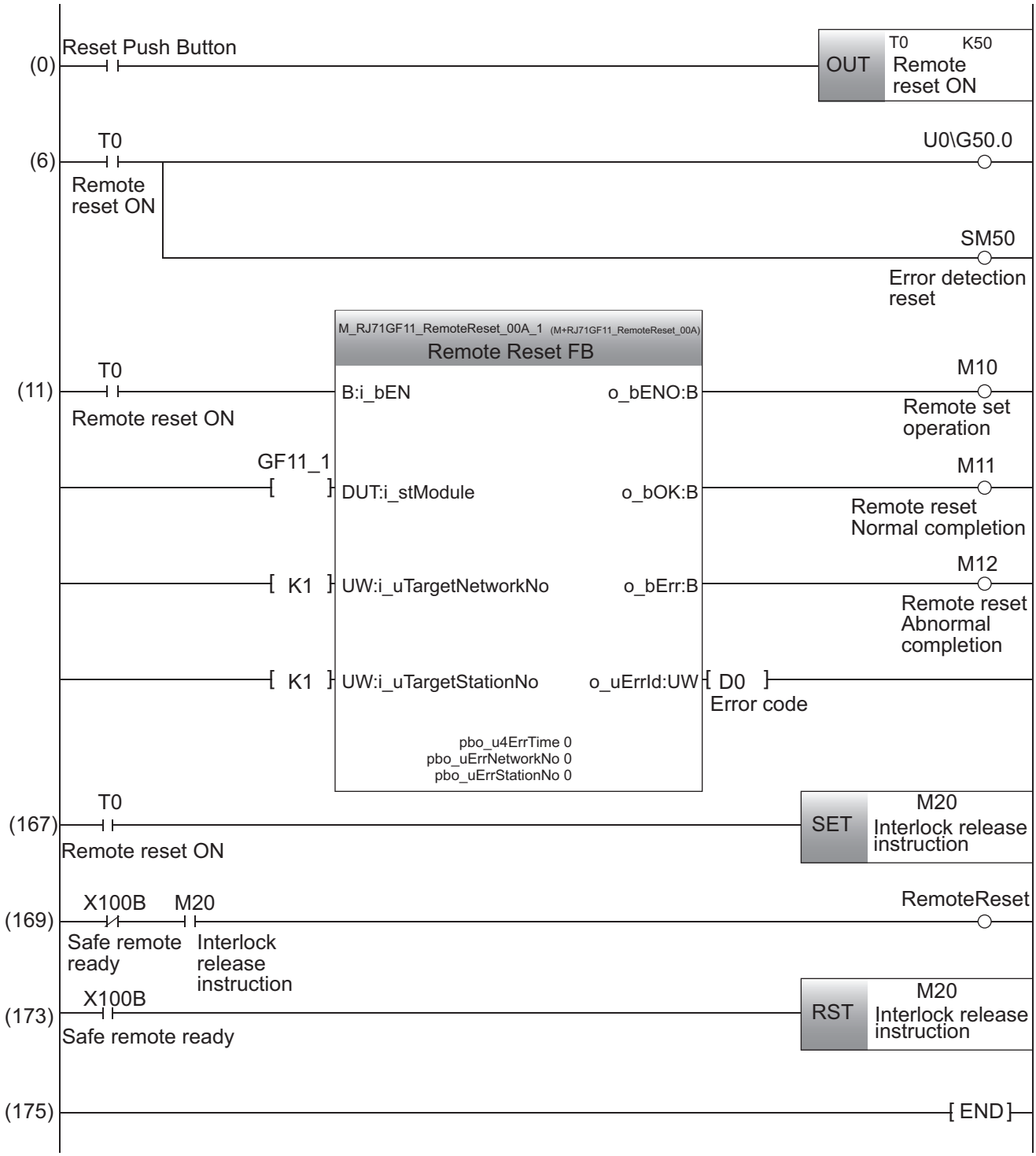
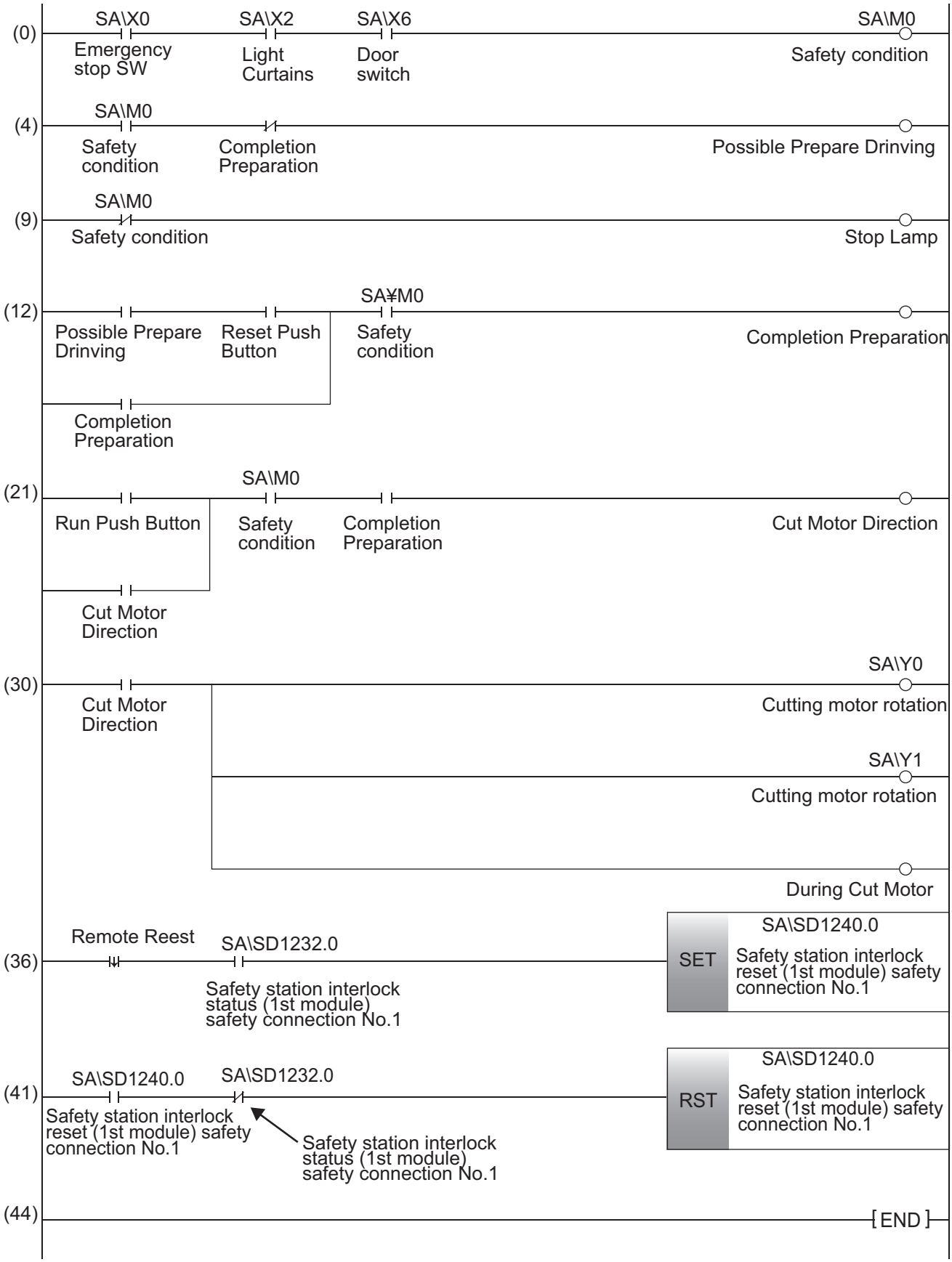
RESET program (Type: Scan execution type, Name: RESET program)



Safety program (Type: Fixed scan execution type, Name: ProgPou1)



A

Appendix 2 Profile Registration

If the following modules are not displayed in the module list on the "CC IE Filed Configuration" window, register their profiles.

- NZ2GFSS2-32D (Basic digital input module)
- NZ2EXSS2-8TE (Extension digital output module)
- NZ2GF2B1-32DT (Basic digital I/O combined module)

Point

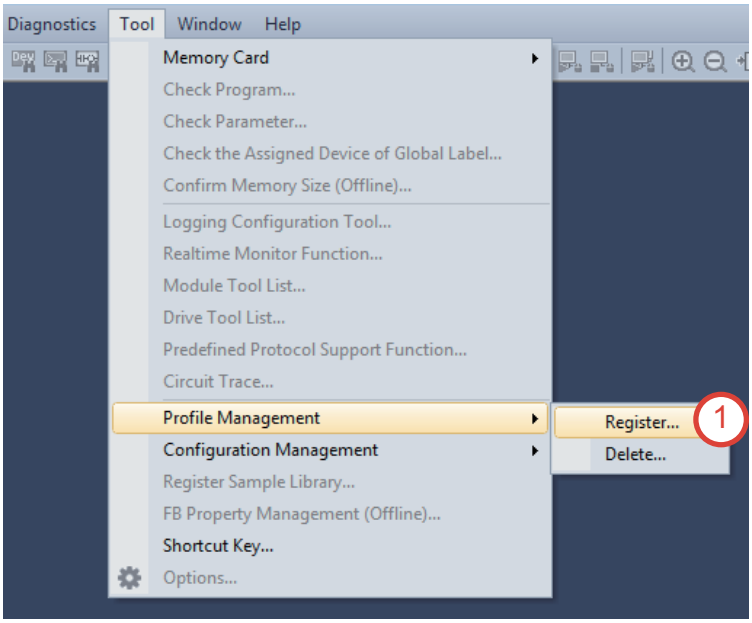
Before registering the profile, download the following profile data from the MITSUBISHI ELECTRIC FA Global Website.

- 0x0000_NZ2GFSS2-32D_1_en.zip
- 0x0000_NZ2EXSS2-8TE_1_en.cspp.zip
- 0x0000_NZ2GF2B1-32DT_1_en.CSPP.zip

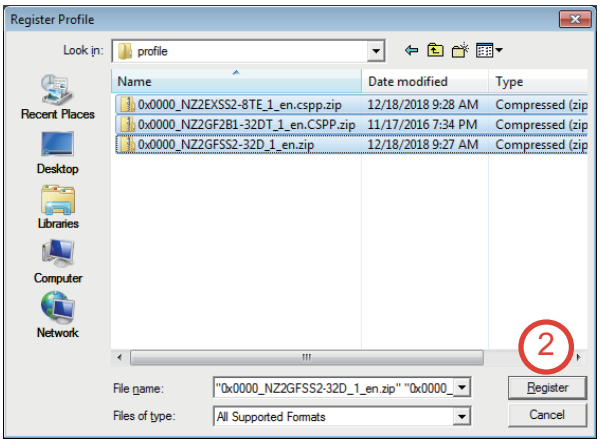
Restriction

Register profiles when no project is open.

Operating procedure

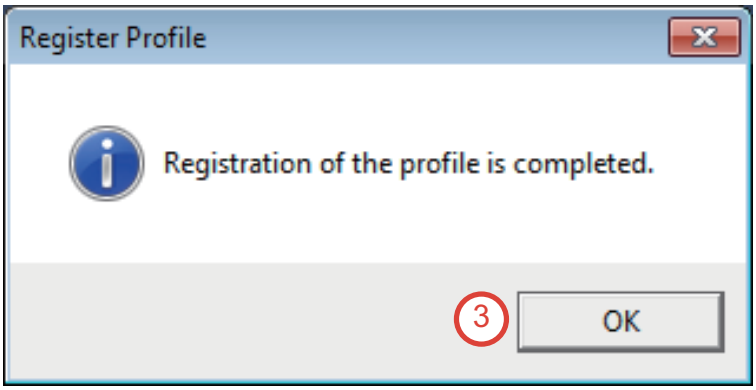


1. Select [Tool] → [Profile Management] → [Register] from the menu.



2. Select the following files, and click the [Register] button.

- 0x0000_NZ2GFSS2-32D_1_en.zip
- 0x0000_NZ2EXSS2-8TE_1_en.cspp.zip
- 0x0000_NZ2GF2B1-32DT_1_en.CSPP.zip



3. Click the [OK] button.

A

Appendix 3 User Management

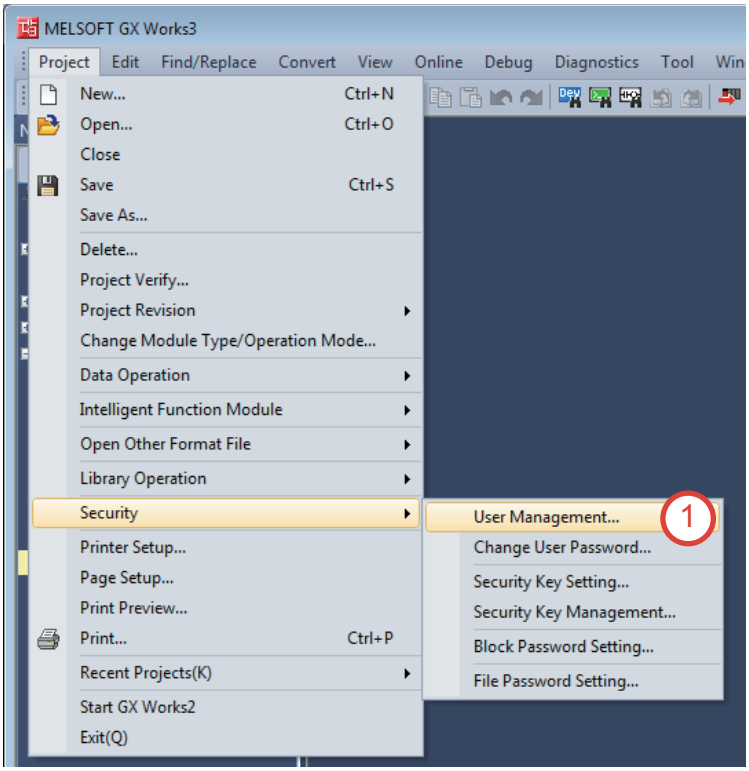
Three access levels (Administrators, Developers, Users) are provided for projects used in the safety programmable controller. These access levels can be set to users who log in to the projects.
When a project is opened, the login window appears. Depending on the access level of the user, operations are restricted.

Appendix 3.1 Adding, deleting, and changing a login user

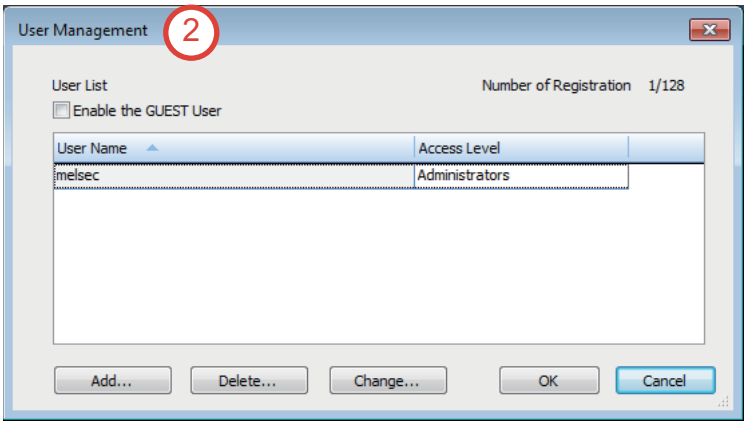
This section describes how to add, delete, or change a user who logs in the project used in the safety programmable controller.

How to open the "User Management" dialog box

Operating procedure



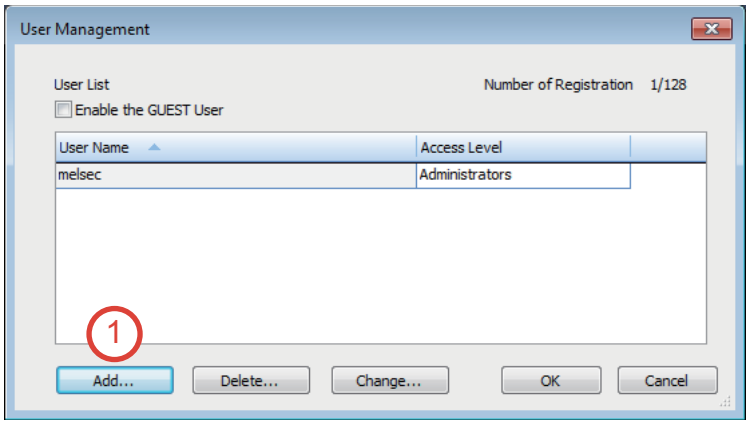
1. Select [Project] → [Security] → [User Management] from the menu.



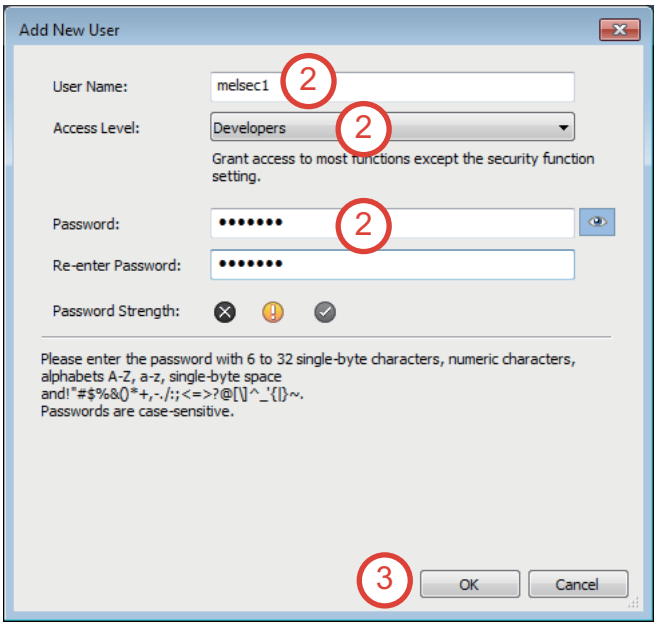
2. The "User Management" dialog box appears.

■Adding a login user

Operating procedure



1. Click the [Add] button.



2. The "Add New User" dialog box appears. Set the user name, access level, and password.

User Name: melsec1

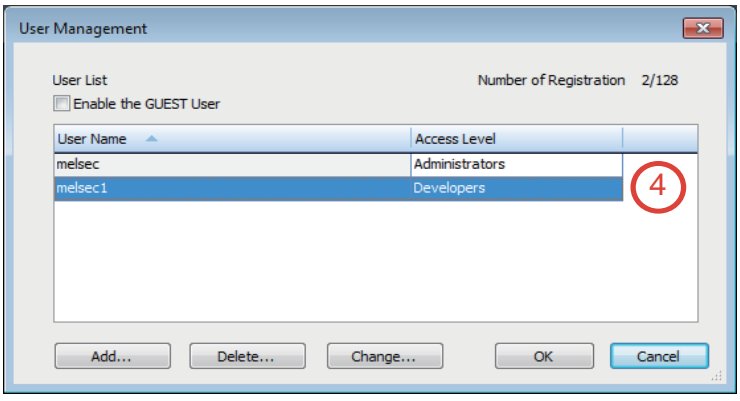
Access Level[*1]: Developers

Password: melsec1

*1 For the authority of each access level, refer to the following.

☞ Page 112 Access levels of users

3. Click the [OK] button.

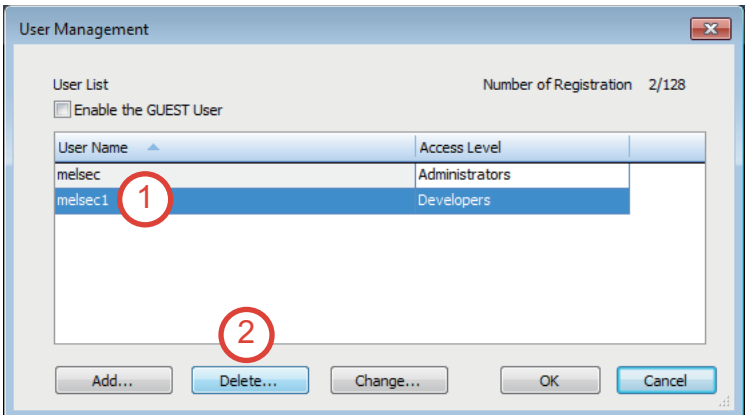


4. A new user is added.

A

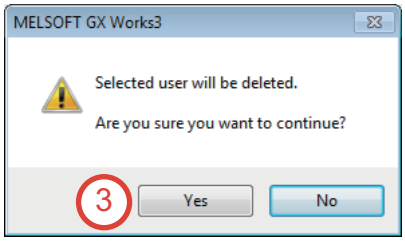
■Deleting a login user

Operating procedure

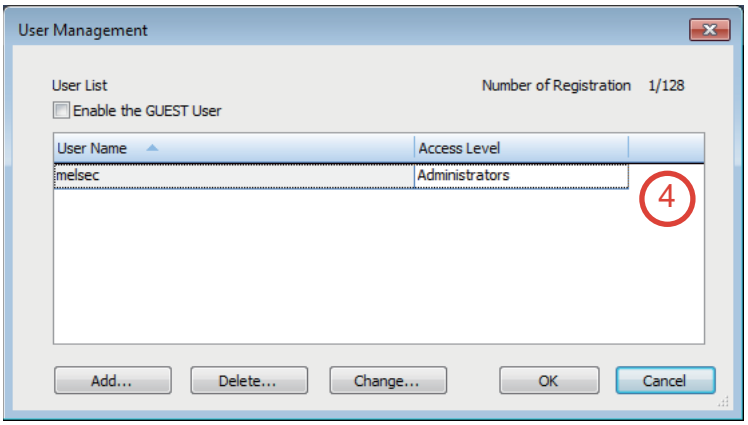


1. Select a user name to be deleted. Select "melsec1" here.

2. Click the [Delete] button.



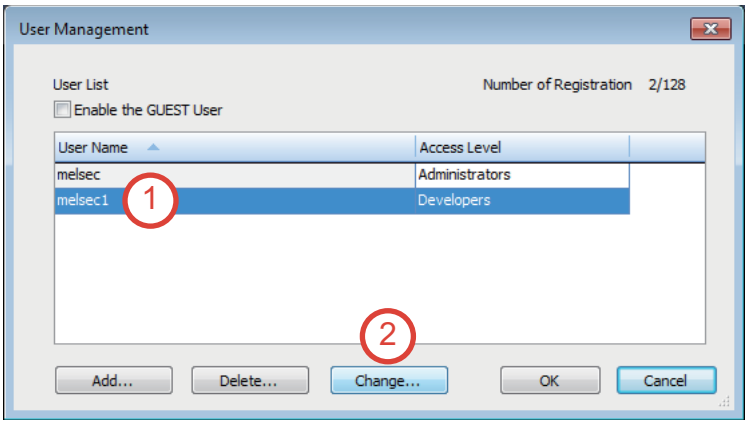
3. Click the [Yes] button.

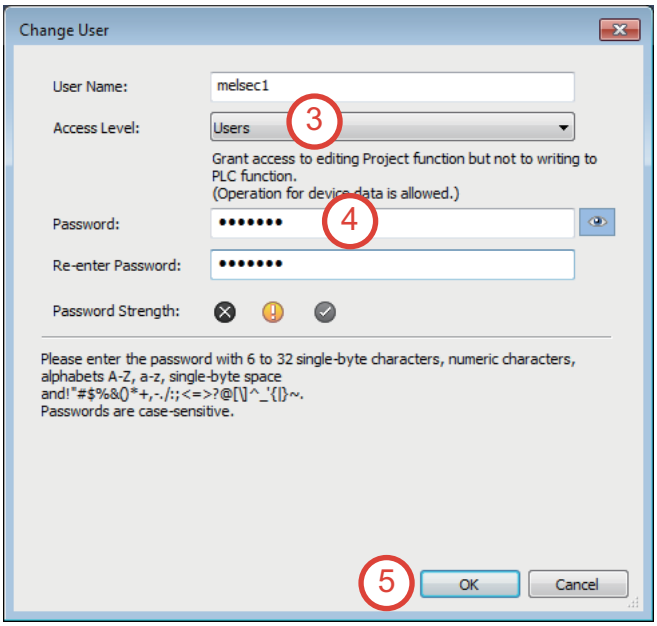


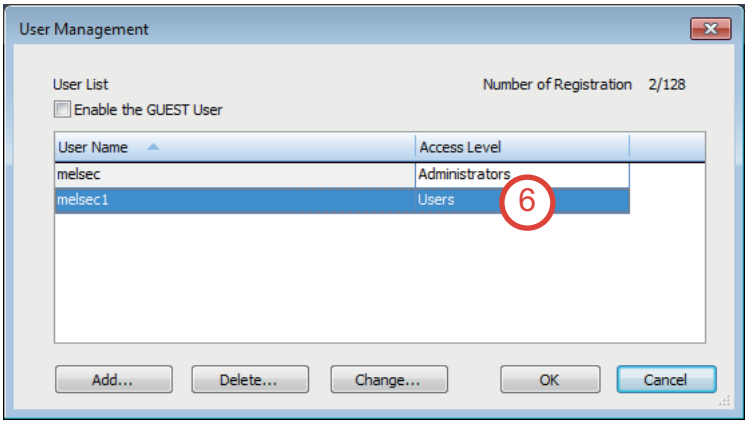
4. The user "melsec1" is deleted.

■Changing a login user

Operating procedure







1. Select a user name whose access level to be changed. Select "melsec1" here.

2. Click the [Change] button.

3. Set the access level. Select "Users"[*1] here.

*1 For the authority of each access level, refer to the following.

☞ Page 112 Access levels of users

4. Enter the password. (Password: melsec1)

5. Click the [OK] button.

6. The access level of the user "melsec1" is changed to "Users".

A

Appendix 3.2 Access levels of users

Access levels

An access level is an operation privilege granted to a user who logs in to the project and the CPU module.

Access level		Operation authority
High ↕ Low	Administrators	• Administrator level A user of this level can perform all operations including the user management of the project and the CPU module.
	Developers	• Developer level A user of this level can perform operations except for the user management and security setting.
	Users	• Operator level A user of this level can browse the project and monitor the CPU module.

Project function availability (operations that require user authentication)

The following table lists the project functions to be restricted depending on the access level of the user.

○: Available, ×: Not available

Function	Access level		
	Administrators	Developers	Users
Overwriting	○	○	×
User management	○	×	×
Deleting the user information of a project	○	×	×
Project revision history	○	○	×
Changing the module type and operation mode	○	×	×
Online program change	○	○	×

Appendix 4 Calculating Safety Response Time

Calculate the safety response time referring to the following.

📖MELSEC iQ-R Safety Application Guide

Appendix 1 Calculating Safety Response Time for System Configured with a Safety CPU

Appendix 2 Calculating Safety Response Time for System Connected to Multiple Safety CPUs

Appendix 5 Safety Programmable Controller

This section describes the specifications and functions of the safety programmable controller.

Appendix 5.1 General specifications

For details, refer to the following.

📖Section 4.1 General Specifications in the MELSEC iQ-R Module Configuration Manual

Appendix 5.2 Specifications of the CPU module

For details, refer to the following.

📖Section 2.1 CPU Module in the MELSEC iQ-R CPU Module User's Manual (Startup)

Appendix 5.3 Specifications of the power supply module

The specifications of the power supply module is the same between the safety programmable controller and the standard programmable controller.

For details, refer to the following.

📖Section 4.2 Performance Specifications of Power Supply Module in the MELSEC iQ-R Module Configuration Manual

Appendix 5.4 Specifications of the base unit

The specifications of the base unit is the same between the safety programmable controller and the standard programmable controller.

For details, refer to the following.

📖Section 4.3 Performance Specifications of Base Unit in the MELSEC iQ-R Module Configuration Manual

Appendix 5.5 Functions of the safety programmable controller

For details, refer to the following.

📖PART 5 WHEN USING THE SAFETY CPU in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 6 Safety Remote I/O Module

This section describes the specifications of the safety remote I/O module.

Appendix 6.1 Specifications of the safety remote I/O module

For details, refer to the following.

📖Chapter 2 SPECIFICATIONS in the CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual

Appendix 6.2 Terminal layout of the safety remote I/O module

For details, refer to the following.

📖Section 2.2 Performance Specifications in the CC-Link IE Field Network Remote I/O Module (With Safety Functions) User's Manual

Appendix 7 Clearing an Error of the Safety Programmable Controller

For details, refer to the following.

Section 6.3 Error Clear and Appendix 1 Error Codes in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 8 Parameter List

For the parameter list, refer to the following.

Appendix 10 Parameter List in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 9 Instructions

This section describes the instructions used in the safety programmable controller.

Appendix 9.1 Overview

- Instruction configuration
- Data specification method
- Execution condition
- Instruction processing time reduction
- Precautions on programming

For details, refer to the following.

PART 1 OVERVIEW in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

Appendix 9.2 List of instructions and FUNs/FBs

- CPU module instructions
- Module dedicated instructions
- Standard functions
- Standard function blocks

For details, refer to the following.

PART 2 LISTS OF INSTRUCTIONS AND FUN/FB in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

Appendix 9.3 CPU module instructions

For details, refer to the following.

PART 3 SEQUENCE INSTRUCTIONS, PART 4 BASIC INSTRUCTIONS, PART 5 APPLICATION INSTRUCTIONS in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

Appendix 9.4 Module dedicated instructions

For details, refer to the following.

PART 6 MODULE DEDICATED INSTRUCTIONS in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

MELSEC iQ-R Programming Manual (Module Dedicated Instructions)

Appendix 9.5 Standard functions

For details, refer to the following.

PART 7 STANDARD FUNCTIONS in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

Appendix 9.6 Standard function blocks

For details, refer to the following.

📖PART 8 STANDARD FUNCTION BLOCKS in the MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks)

Appendix 10 Safety Function Blocks

Safety function blocks are the manufacturer provided function blocks that have received the certifications of ISO 13849-1:2015 (PLe), IEC 62061:2012 (SIL3), and IEC 61508:2010 (SIL3).

Safety function blocks can only be used in the MELSEC iQ-R series Safety CPU.

For details, refer to the following.

📖MELSEC iQ-R Safety Function Block Reference

Appendix 11 Special Relay (SM)

For details, refer to the following.

📖Appendix 4 List of Special Relay Areas in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 12 Special Register (SD)

For details, refer to the following.

📖Appendix 5 List of Special Register Areas in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 13 Safety Special Relay (SA\SM)

For details, refer to the following.

📖Appendix 6 List of Safety Special Relay Areas in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 14 Safety Special Register (SA\SD)

For details, refer to the following.

📖Appendix 7 List of Safety Special Register Areas in the MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 15 Error Codes

For details, refer to the following.

📖Appendix 1 Error Codes in the MELSEC iQ-R CPU Module User's Manual (Application)

MEMO

Mitsubishi Programmable Controllers Training Manual
Safety Programmable Controller Basic Course

MODEL	SCHOOL-R-SAFETY-E
MODEL CODE	-
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