MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

GX Works3

Beginner's Manual

MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

Version check

CONTENTS

1 BEFORE USING THIS PRODUCT

GX Works3 is an engineering tool for configuring the settings, programming, debugging, and performing the maintenance for programmable controllers such as MELSEC iQ-R series/MELSEC iQ-F series.

The usability is much better than the existing GX Works2 because the functions and their operability have been improved.
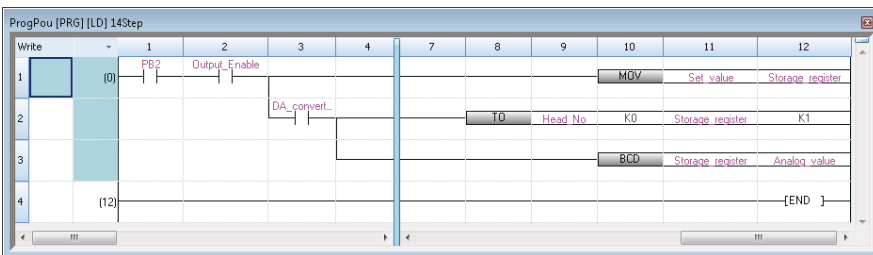
1.1 Main Functions of GX Works3

GX Works3 manages programs and parameters in each project for each CPU module.
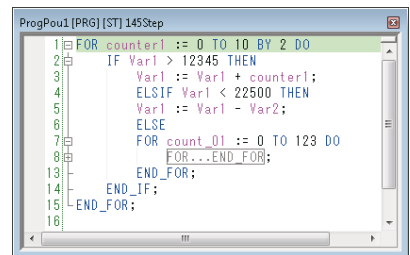
GX Works3 has the functions shown below.

Program creation function

Programs can be created in proper programming languages depending on the processing contents.

<Ladder program>

<ST program>
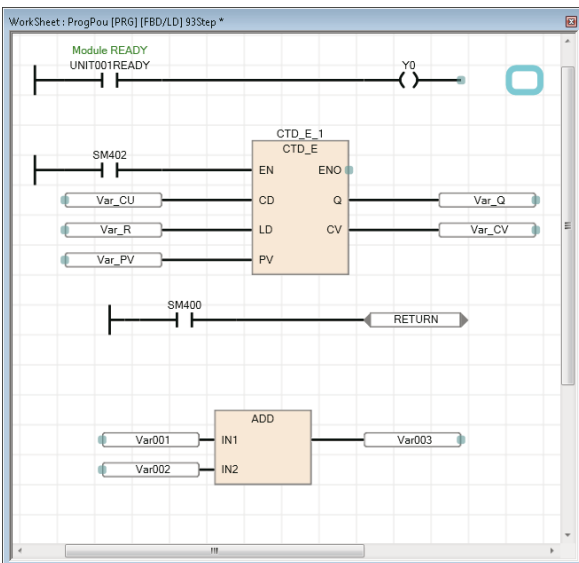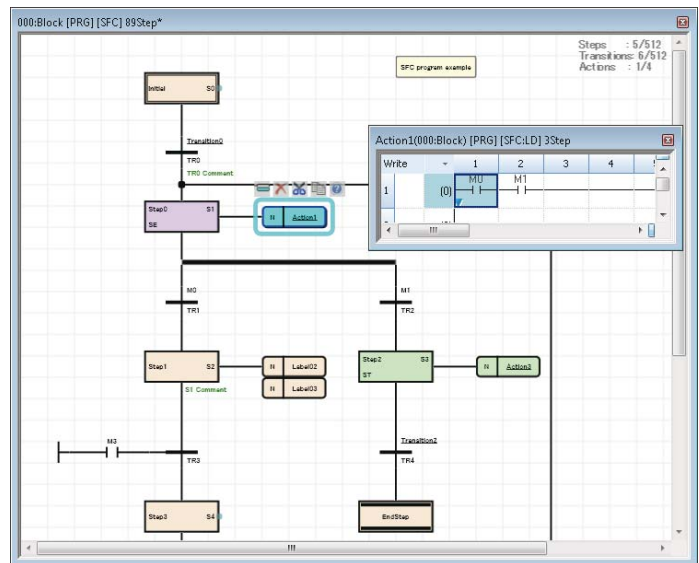

<FBD/LD program>

<SFC program>

Parameter setting function

Parameters of CPU module, I/O module, and Intelligent function module can be set by using this function.

Write to/Read from PLC function

The created sequence programs can be written to/read from a CPU module with the Write to PLC/Read from PLC function. In addition, the sequence programs can be modified while the CPU module is in RUN state by the performing online program change function.
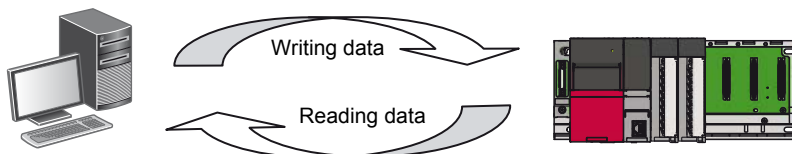
Monitor/debug function

Data such as device values during operation can be monitored by writing a created sequence program to a CPU module. If a CPU module is not connected, programs can be debugged by using the virtual programmable controller (the Simulation function).
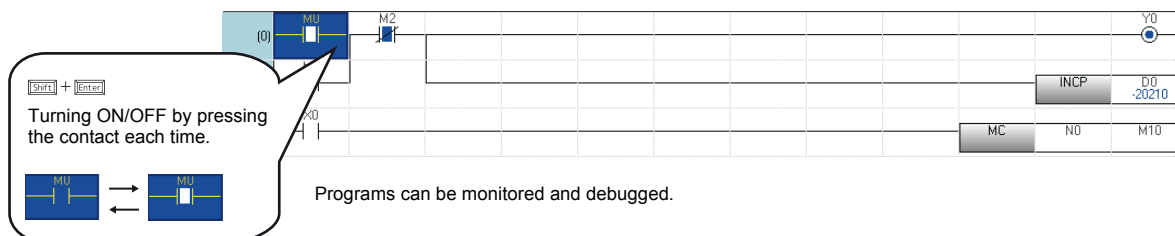
Diagnostic function

The current error status and the error history of the CPU module or the network can be diagnosed. By using the Diagnostic function, recovery work can be completed in a short time.

The detailed information of modules, such as Intelligent function module, can be obtained by using the System Monitor function. This helps to shorten the recovery time when an error occurs.

1.2 RnSFCPU Supported Functions

GX Works3 is supported by MELSEC iQ-R series RnSFCPU.

In this manual, a project for RnSFCPU is defined as a 'safety project', and a project other than one for RnSFCPU is defined as a 'standard project'.

Safety supported function list

GX Works3 provides the functions to create a safety project.

Purpose	Function name
To perform user authentication before opening a project in order to prevent illegal access from users with no authority.	User Authentication
To perform user authentication before accessing a CPU module in order to prevent illegal access from users with no authority.	
To check if the data in RnSFCPU is the one written by the user.	Check Safety Data Identity
To switch the safety operation mode of RnSFCPU.	Switch Safety Operation Mode

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

1.3 Procedure from Project Creation to CPU Module Operation

The operating procedure from program creation to a CPU module operation in GX Works3 is shown below.

For the operation methods of CPU modules, refer to the following manuals.

📖 MELSEC iQ-R CPU Module User's Manual (Application)

📖 MELSEC iQ-F FX5 User's Manual (Application)

```
                    ┌─────────────────────┐
                    (        Start         )
                    └─────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 1. Create a project                            │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 2. Set the parameters.                         │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 3. Create a program.                           │
├──────────────────────────────────────────────┤
│ Create a Program Organization Unit (POU).      │
├──────────────────────────────────────────────┤
│ Set an execution order and an execution type.  │
├──────────────────────────────────────────────┤
│ Set the global labels/local labels.            │
├──────────────────────────────────────────────┤
│ Edit the program of each POU.                  │
├──────────────────────────────────────────────┤
│ Perform conversion.                            │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 4. Perform debugging with simulator.*1         │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 5. Connect a personal computer to CPU module,  │
│    and set the connection destination.         │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 6. Write parameters/programs to a CPU module.  │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 7. Check the operation.                        │
├──────────────────────────────────────────────┤
│ Monitor the execution status and device        │
│ contents of the sequence program to check      │
│ the operation.                                 │
├──────────────────────────────────────────────┤
│ Check the error occurrence in CPU module.      │
└──────────────────────────────────────────────┘
                              ⇩
┌──────────────────────────────────────────────┐
│ 8. Operate the system.                         │
└──────────────────────────────────────────────┘
```
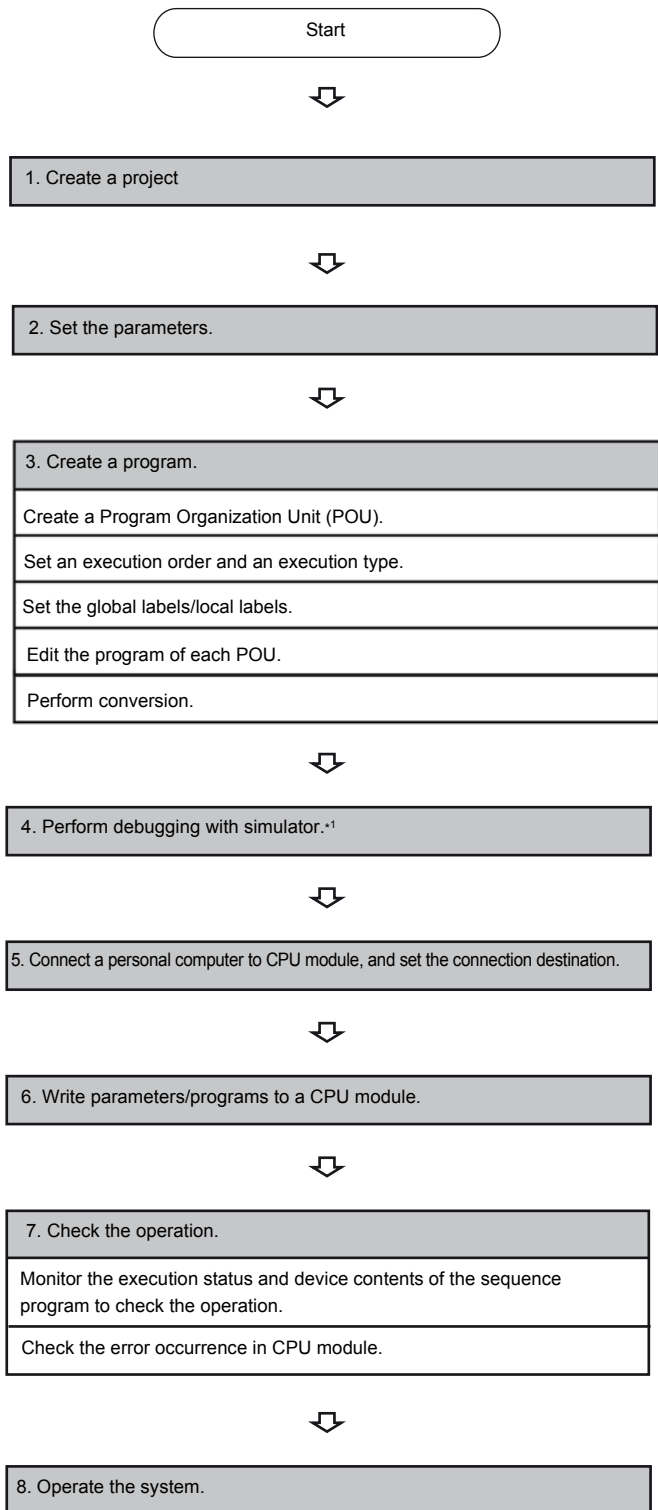
For safety projects refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

1.4 Displaying Help

Open the Help to learn about operations and functions, and check the error codes of a CPU module.

Operating procedure

Select [Help] ⇨ [GX Works3 Help] (❷).
e-Manual Viewer starts and a manual is displayed.

Find Help function

Enter a character string in ❷ [▼] on the toolbar and press the ⟦Enter⟧ key to start searching in the e-Manual Viewer.
The entered character string can be searched in the manuals which have been registered in the e-Manual Viewer.

Help of instructions/FBs and special relays/special registers

The corresponding location in the manual can be displayed from each program editor or screen.

■Program editor
- Place the cursor on the instruction (ladder editor: the cell with the instruction, ST editor: the character string of the instruction), press the ⟦F1⟧ key.
- Place the cursor on the element on the FBD/LD editor, and press the ⟦F1⟧ key.
- Place the cursor on the FB cell on the ladder editor, and press the ⟦F1⟧ key
- Place the cursor on the element on the SFC diagram editor, and press the ⟦F1⟧ key.

■"Enter Ladder" screen and argument editing screen
Click the [Manual] button on each screen.

■Element Selection window
Select the instruction or the module FB in the list, and press the ⟦F1⟧ key.

1.5 Connection Configurations between Personal Computer and CPU Module

The configurations when connecting a personal computer and a CPU module are shown below.

Connection via USB port

GX Works3
(SW1DND-GXW3-E)

USB miniB type

RCPU
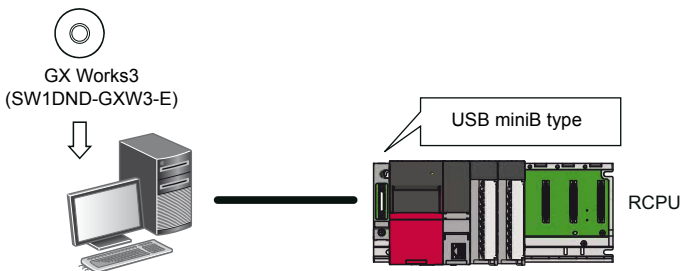
FX5CPU does not support this connection.
The USB cables of which the operation is ensured by Mitsubishi Electric Corporation are shown below.
When using a USB cable for the first time, install the USB driver.
For details, refer to the following section.

Product name	Model	Manufacturer
USB cable (USB A type — USB B type)	AU230	BUFFALO KOKUYO SUPPLY INC.
USB cable (USB A type — USB miniB type)	KU-AMB530	SANWA SUPPLY INC.
	KU-AMB550	
USB adapter (USB B type — USB miniB type)	AD-USBBFTM5M	ELECOM Co., Ltd.

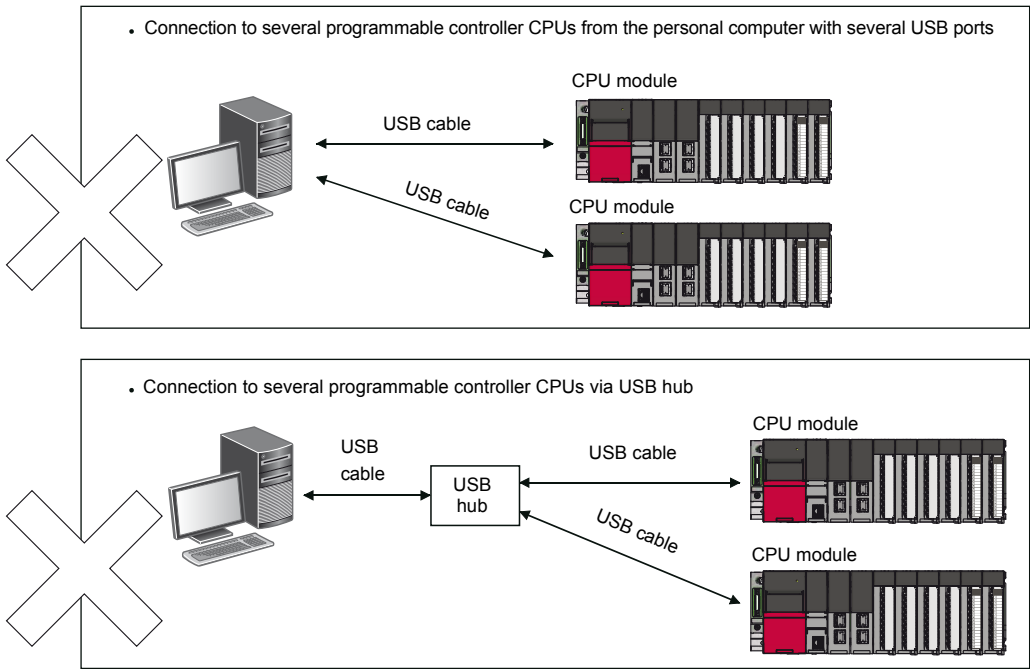For any considerations when accessing a CPU module, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)
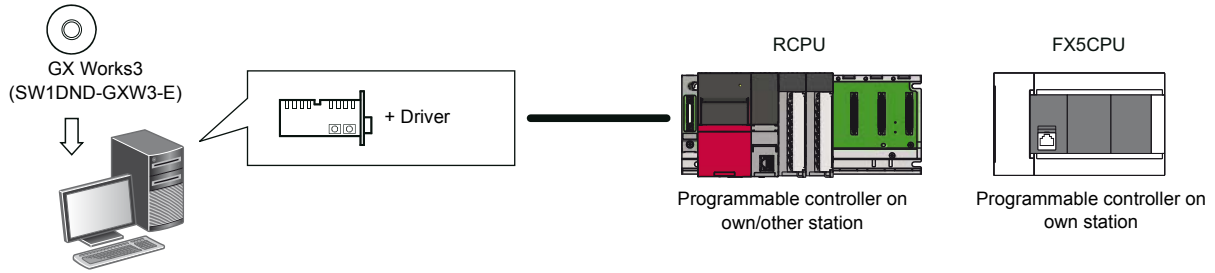
■Configuration of USB connection

Only one CPU module can be connected to a personal computer at the same time.

Connection to a CPU module is not applicable for the following configuration.

<Inapplicable configurations>

- Connection to several programmable controller CPUs from the personal computer with several USB ports

CPU module

USB cable

USB cable

CPU module

- Connection to several programmable controller CPUs via USB hub

USB cable

USB hub

USB cable

CPU module

USB cable

CPU module

Connection via Ethernet board

Use an Ethernet board that is built-in to a personal computer or commercially available.

Connection via serial port
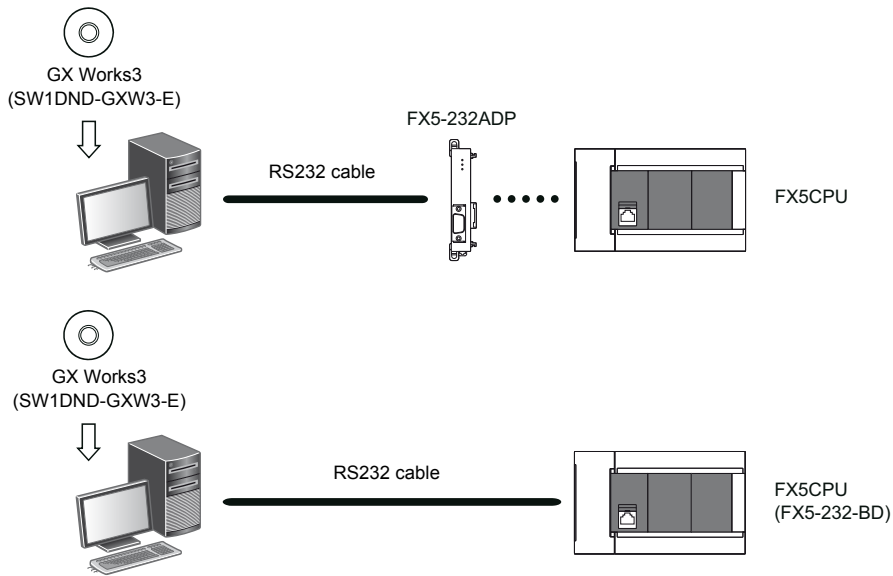
RCPU does not support this connection.

Product name	Model	Manufacturer
RS-232 cable	FX-232CAB-1	Mitsubishi Electric Corporation

1 BEFORE USING THIS PRODUCT
1.5 Connection Configurations between Personal Computer and CPU Module

1.6 USB Driver Installation Procedure

To communicate with a CPU module via USB, installing a USB driver is required.

The procedure of USB driver installation is as shown below.

If multiple MELSOFT products are installed previously, refer to their installed location.

Windows® XP

Operating procedure

1. Connect the personal computer and a CPU module with a USB cable, and power ON the programmable controller.

2. Select "Install from a list or specific location (Advanced)" on the "Found New Hardware Wizard" screen.

3. Select "Search for the best driver in these locations" on the next screen. Select "Include this location in the search", and specify 'MELSOFT\Easysocket\USBDrivers' in the folder where GX Works3 has been installed.

Precautions

If the driver cannot be installed, check the following settings on Windows®.

The USB driver may not be installed when "Block—Never install unsigned driver software" is selected in [Control Panel] ⇨ [System] ⇨ [Hardware] ⇨ [Driver Signing].

Select "Ignore — Install the software anyway and don't ask for my approval", or "Warn — Prompt me each time to choose an action" in [Driver Signing], and execute the USB driver installation.

Windows Vista®

Operating procedure

1. Connect the personal computer and a CPU module with a USB cable, and power ON the programmable controller.

2. Select "Locate and install driver software (recommended)" on the "Found New Hardware Wizard" screen.

3. Select "Browse my computer for driver software (advanced)" on the "Found New Hardware" screen.

4. Select "Search for the best driver in these locations" on the displayed screen. Select "Include subfolders" and specify 'MELSOFT\Easysocket\USBDrivers' in the folder where GX Works3 has been installed.

Precautions

When "Windows can't verify the publisher of this driver software" is displayed during the installation, select "Install this driver software anyway".

Windows® 7 or later

Operating procedure

1. Connect the personal computer and a CPU module with a USB cable, and power ON the programmable controller.

2. Select [Control Panel] ⇨ [System and Security] ⇨ [Administrative Tools] ⇨ [Computer Management] ⇨ [Device Manager] from Windows® Start[*1]. Right-click "Unknown device" and click "Update Driver Software".

3. Select "Browse my computer for driver software" on the "Update Driver Software" screen, and specify 'MELSOFT\Easysocket\USBDrivers' in the folder where GX Works3 has been installed on the next screen.

*1 Select [All apps] on the Start screen or [Start] ⇨ [All Programs].

MEMO

2 SCREEN CONFIGURATION AND BASIC OPERATIONS

This chapter explains the screen configuration and basic operations of GX Works3.

2.1 Starting and Exiting GX Works3

This section explains the operation methods for starting and exiting GX Works3.

Start

Operating procedure

Select [MELSOFT] ⇨ [GX Works3] ⇨ [GX Works3] from Windows® Start[*1].

*1 Select [All apps] on the Start screen or [Start] ⇨ [All Programs].
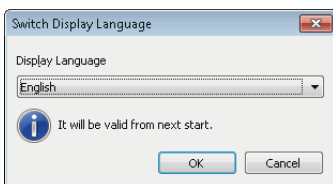
Exit

Operating procedure

Select [Project] ⇨ [Exit GX Works3].

> **Point**
>
> GX Works3 can also be started/exited from MELSOFT Navigator.

2.2 Switching Displayed Language

Since GX Works3 supports displaying in multiple languages, switching the language, such as on the menu bar, is available on a personal computer.

Window

[View] ⇨ [Switch Display Language]

Precautions

If the display language differs from the one for the operating system, the text may get cut off.
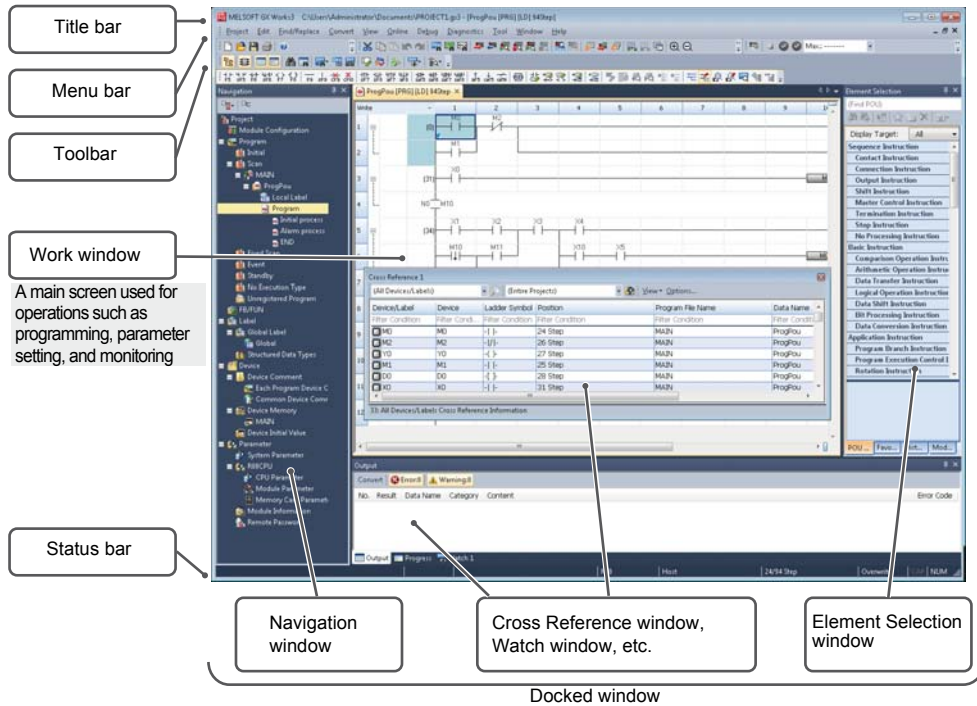
2.3 Screen Configuration

This section explains the screen configuration that is displayed of GX Works3 starts up.

Main frame

The main frame configuration is shown below.

The following screen shows a main frame configuration on which a work window and docked windows are displayed.

Title bar

Menu bar

Toolbar

Work window
A main screen used for operations such as programming, parameter setting, and monitoring

Status bar

Navigation window

Cross Reference window, Watch window, etc.

Element Selection window

Docked window

Window operation

■Displaying docked windows

[View] ⇨ [Docking Window] ⇨ [(target item)]

> **Point**
>
> When the docked window is not displayed by selecting it from the menu, select [Window] ⇨ [Reset Window Layout Back to Initial Status].

■Switching docked window and work window

The windows or files can be switched by pressing the [Ctrl] + [Tab] keys.

Select a particular window or file by pressing the [Ctrl] + [←]/[→]/[↑]/[↓] keys.
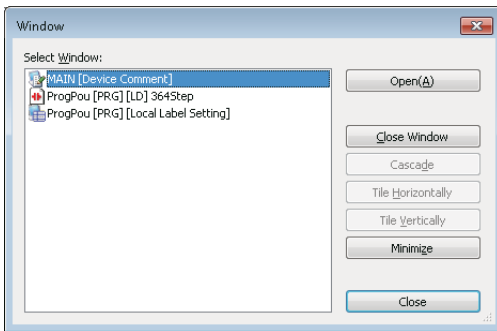
■Arranging work windows

The list of open windows is displayed.

Open and arrange the specific window.

Arranging the windows improves display efficiency while opening multiple windows.
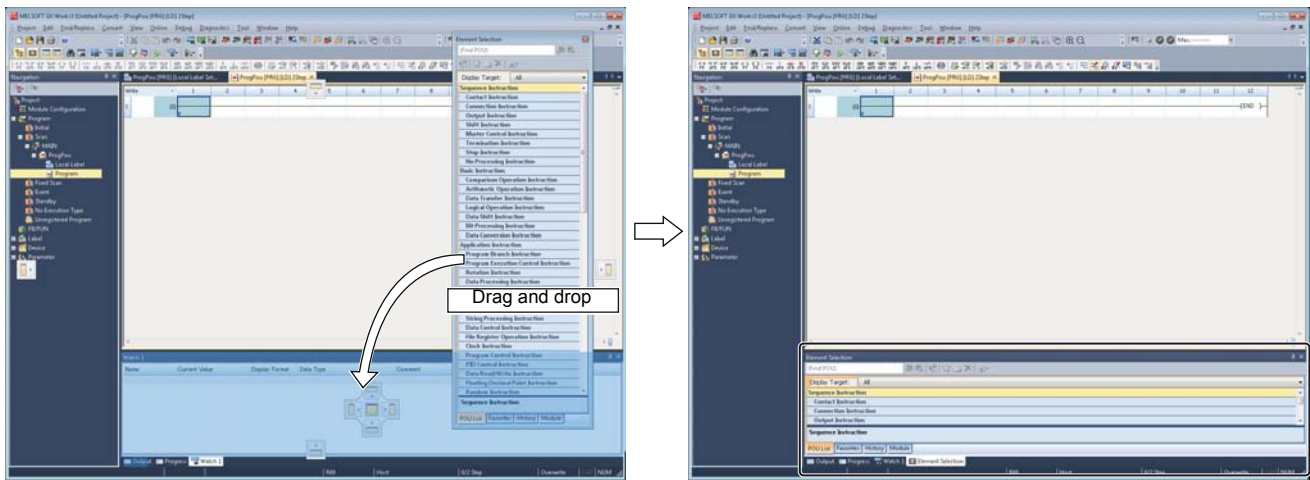
Window

[Window] ⇨ [Window]

■Docking/floating dockable windows

- Docked display: Drag the title bar of a floating dockable window and drop it to the guidance to dock the main frame.

Drag a dockable window to the guidance

A new tab appears after the window is docked.

- Floating display: Drag the title bar of a docked window and drop it to the arbitrary position to float from the main frame.

■Docking/floating work windows

- Docked display: Select the floating work window and select [Window] ⇨ [Docking].
- Floating display: Select the docked work window and select [Window] ⇨ [Floating].

Navigation window

Navigation window is the screen that displays the content of a project in a tree format.

Operations such as creating new data and displaying editing screens can be performed on the tree.

Window

[View] ⇨ [Docking Window] ⇨ [Navigation] (📑)
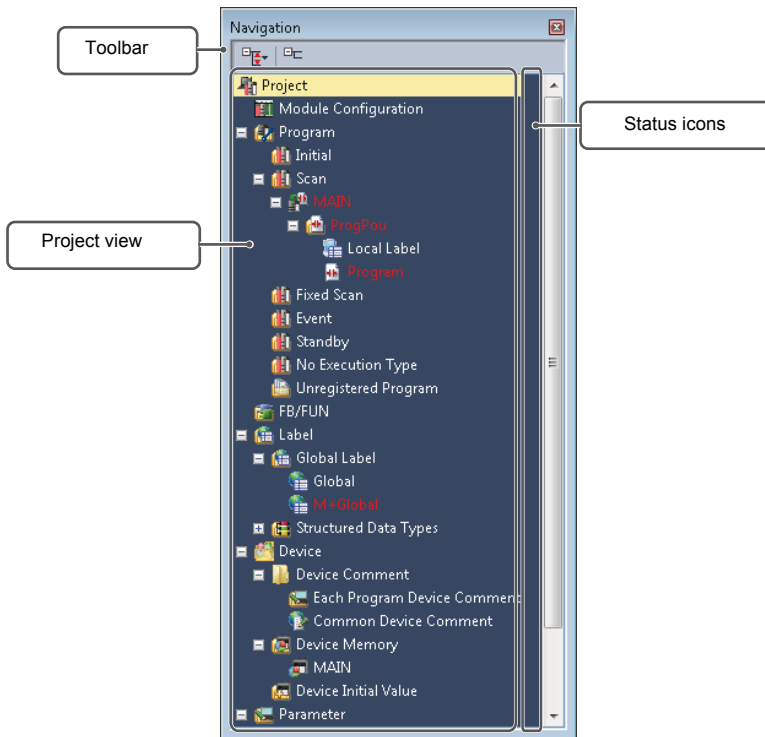
The character color on the Project view displays red when the program is not converted.

Displayed items

Name	Description
Status icons	Displays icons which indicate status of the project.

Sorting data

Sort the data displayed in tree format.

Operating procedure

Select a program file, then right-click and select [Sort] ⇨ [(sort type)] from the shortcut menu.

> **Point** 🔍
>
> Data can be sorted by dragging and dropping the data or selecting [Order] ⇨ [Move Up]/[Move Down] from the shortcut menu.

Creating folders

Create a folder for grouping and managing the created data.

Operating procedure

1. Select a program file and select [Project] ⇨ [Data Operation] ⇨ [New Folder]/right-click and select [New Folder] from the shortcut menu.

2. Change a folder name.

3. Select the program to be stored, and drag and drop it onto the created folder.

Simple display

Click ▣ on the toolbar to hide the unused folders.

Status icons

The icons that indicate the state of the project are as follows:

Icon	Status	Display timing	Item	Description
❌	Parameter mismatched	Offline	Module folder	Displays when a mismatch was detected between the system parameters and the property of module.
⚠	Unconfirmed required settings		Module parameter	Displays when the [Apply] button has never been pressed on the setting screen of module parameter (network) that is required to be set.

Element Selection window

The Element Selection window is the window that displays elements (such as instructions and standard functions/function blocks) for program creation in a list format.

Window

[View] ⇨ [Docking Window] ⇨ [Element Selection] (▦)
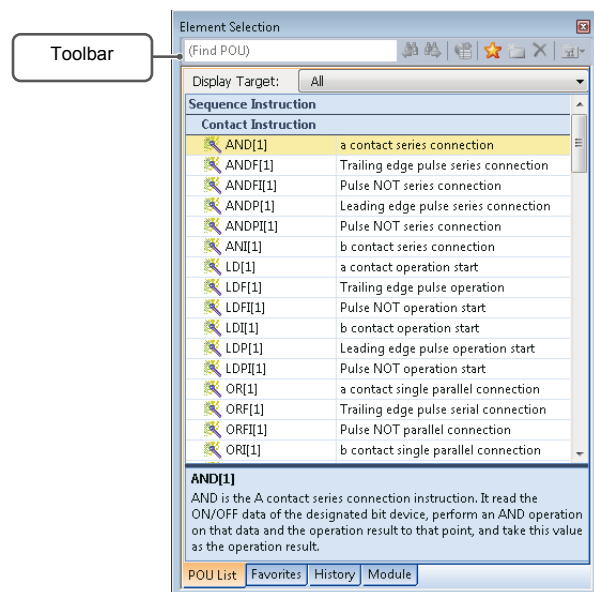
Toolbar

- The focus is moved to the element of which character string match with the entered character string (element name or keyword included in the element description) to the toolbar.
- The elements which are included in the selected category is displayed from the display target.
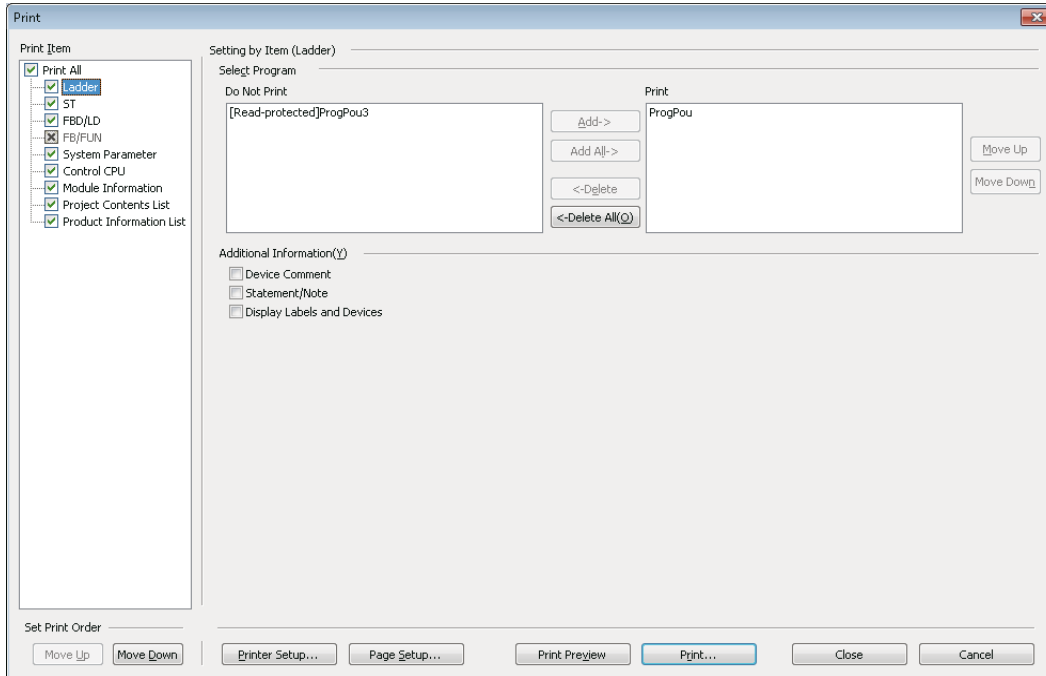
For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

2.4 Printing Data

This section explains how to print the data created in GX Works3.

Window

[Project] ⇨ [Print] (🖨)

When no data exist or only read-protected data exist in "Print" and "Do Not Print" list, ✕ is displayed on the checkbox of the Print Item.

Operating procedure

1. Select the data to be printed, and configure each setting.

2. Set the printer and page by clicking the [Printer Setup] button and [Page Setup] button.

3. Click the [Print] button.

Check the print images of each data.
For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

3 PROJECT MANAGEMENT

This chapter explains the basic operations and the project management.

3.1 Project File and Data Configuration

The projects created in GX Works3 are saved in workspace formats or single file formats.
The data created in the project is displayed on the Project view.

File format

Workspace format

A workspace manages multiple projects at once.
When configuring a system composed with multiple CPU modules, a project file needs to be created for each CPU module.
Multiple project files in a same system can be managed by saving in workspace format.

For the configuration of workspace/project, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Single file format

Single file format is a format that does not need a workspace.
Projects can be managed without being aware of the folder configuration and the file configuration by saving projects in the single file format.
Thereby, operations such as changing project names, copying and pasting projects, and sending and receiving data, can easily be performed using an application such as Windows® Explorer.

Data configuration

Data displayed on the Project view

The data displayed on the Project view in tree format are as shown below. (The data names are default.)

■Module configuration data

Figure	Item	Description
Module Configuration	Module Configuration Diagram	A data that displays target system of a project graphically.

■Program data

Figure	Item	Description

Program
  Initial — Execution type
  Scan
    StandardProgram — Program file
      ProgPou — Program block
        Local Label — Local labe
        Program — Program
      ProgPou1
        Local Label
        WorkSheet — Worksheet (Program)
    MAIN
      000:Block — Block
        Local Label
        Program — Program
  Fixed Scan — Execution type
    SafetyProgram — Program file (For safety)
      ProgPou2
        Local Label
        Program
  Event — Execution type
  Standby
  No Execution Type
  Unregistered Program — Unregistered program
	Execution types	A setting for when a program operates.
		When executing programs in a CPU module, the programs require to be registered to any of the execution types.

	Program file	A file that manages programs. Create the file in unit of execution process. The created files are written to a CPU module in unit of program files.
	Program block (POU)	A data that composes a program.
	Local label	A label data that can be used only in the defined program block.
	Program	A program data that is created using Ladder Diagram or Structured Text.
	Worksheet (Program)	A program data that is created using Function Block Diagram/Ladder Diagram.
	Block	Data that composes an SFC block.
	Program	SFC diagram data that is created using Sequential Function Chart.
	Program file (For safety)	A file that manages a safety program.
	Unregistered program	A folder that temporarily stores program files of which execution type is undefined. The stored program files will not be executed even when writing them to a programmable controller.

FB/FUN
  FBFILE — FB file
    FbPou — Function block
      Local Label — Local label
      Program — Program
    FbPou1
      Local Label
      WorkSheet — Worksheet (Program)
  FBFILE1 — FB file (For safety)
    FbPou2
      Local Label
      Program
  FUNFILE — FUN file
    FunPou — Function
      Local Label — Local label
      Program — Program
    FunPou1
      Local Label
      WorkSheet — Worksheet (Program)
  FUNFILE1 — FUN file (For safety)
    FunPou2
      Local Label
      Program
	FB file	A file that manages function blocks.
		The FB files are written to a CPU module in unit of FB file.

	Function block (POU)	A data that configures the program of function block.
	Local label	A label data that can be used only in the defined function block.
	Program	A function block data that is created using Ladder Diagram or Structured Text. This data is referred to as 'FB program' in this manual.
	Worksheet (Program)	A function block data that is created using Function Block Diagram/Ladder Diagram.
	FB file (For safety)	A file that manages function blocks of a safety program.
	FUN file	A file that manages functions. The function files are written to a CPU module in unit of FUN file.
	Function (POU)	A data that configures programs of function.
	Local label	A label data that can be used only in the defined function.
	Program	A function data that is created using Ladder Diagram or Structured Text. This data is referred to as 'FUN program' in this manual.
	Worksheet (Program)	A function data that is created using Function Block Diagram/Ladder Diagram.
	FUN file (For safety)	A file that manages functions of a safety program.

■Label data

Figure	Item	Description
Global label — Module label — Safety global label — Standard/safety shared global label — System structure — Function — Local label	Global label	A label data that can be accessed from all the program blocks and function blocks in the project.
	Module label	A label to access I/O signals or buffer memory of modules.
	Safety global label	A global label for a safety program.
	Standard/safety shared global label	A global labels that can be used in both standard programs and safety programs.
	System structure	A structure registered in the system label database.
	Defined structure	A data that defines structure as data type. This can be used as a data type for all labels which can be defined in the project except for recursive definitions in the defined structure.
	Structures required for module labels	The structures required for module labels are registered automatically.

■Device data

Figure	Item	Description
Each program device comment — Common device comment — Device memory — Device initial value	Each program device comment	A device comment data that can be used in the program files which have the same name.
	Common device comment	A device comment data that can be commonly used in multiple programs.
	Device memory	A data that includes the values to be written to/read from devices in a CPU module.
	Device initial value	A data that defines values which are set to devices when CPU module is in RUN.

■Parameter data

The structure of the tree and the creation methods:

■Other data

| Figure	Item	Description
Module POU (Shortcut) — Remote password	Module POU (Shortcut)	A shortcut to the module POU that has been registered to the Element Selection window.
	Remote password	By setting a password for the CPU module, accessing from the modules other than specified RJ71EN71, serial communication module, and built-in Ethernet CPU can be prohibited.

3.2 Creating Project File

This section explains basic operations of GX Works3 such as creating, opening, and saving projects.

Creating project

For a safety project, registering a user is required when creating a new project since a user information for the User Authentication function is needed.

Window

[Project] ⇨ [New] (🗋)
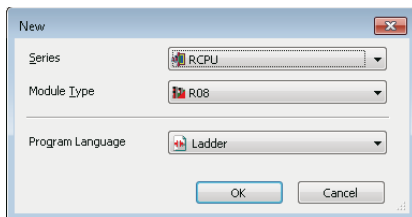
Operating procedure

Set the items and click the [OK] button.

■Unsupported series by GX Works3

When the series (QCPU (Q mode), LCPU, FXCPU) which are not supported by GX Works3 is selected, GX Works2 is started up and create a new project in it.

When GX Works2 is installed on the personal computer, it will be started up automatically.

If it is not installed, execute the 'setup.exe' in the installation DVD-ROM (Disk2) of GX Works3.

■Creating a project for RnENCPU

RnENCPU consists of the two slots that are the CPU part and the network part.

Only CPU parts is placed after creating a new data on the Module Configuration Diagram. Place a CPU extension module (_RJ71EN71) on the Module Configuration Diagram/in the "I/O Assignment Setting" of system parameter, then set the network part.

Creating new project by data read from programmable controller

When the Read from PLC function is performed without creating a new project, a new project is created by data read from the CPU module and Intelligent function modules.

When a user information is registered to the project, the user authentication is required.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Opening project

Read the project saved on the personal computer or another data storage device.

When a user information is registered to the project, the user authentication is required.

Window

[Project] ⇨ [Open] (🗁)
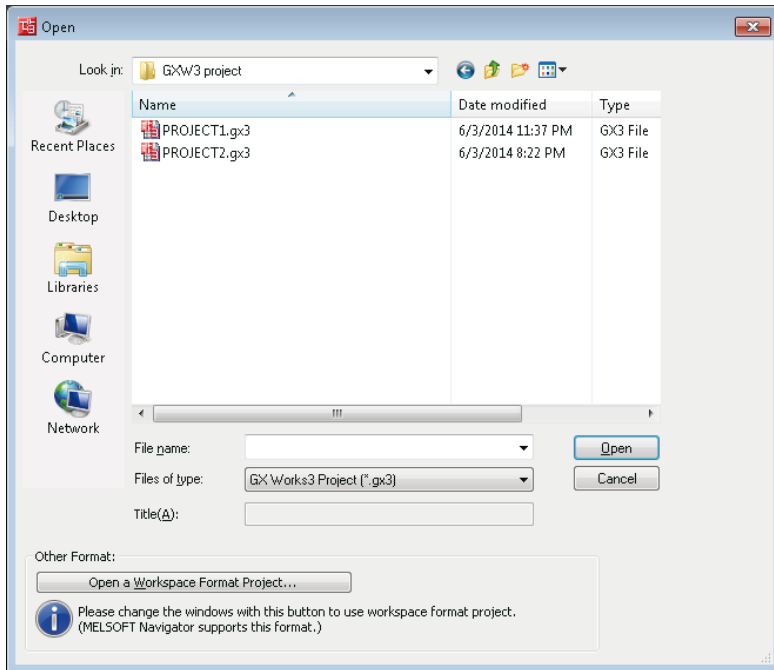
Operating procedure

Set the items and click the [Open] button.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Saving project

Save the project on the personal computer or another data storage device.

Saving projects under the specified name

Window

[Project] ⇨ [Save As]
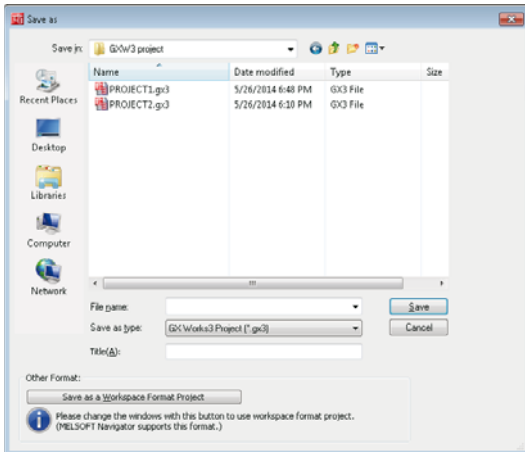
When saving the project with the workspace format, click the [Save as a Workspace Format Project] button to switch the screen.

Operating procedure

Set the items and click the [Save] button.

Overwriting projects

Operating procedure

Select [Project] ⇨ [Save] (💾).

Deleting project

Delete the project saved on the personal computer or another data storage device.

Window

[Project] ⇨ [Delete]
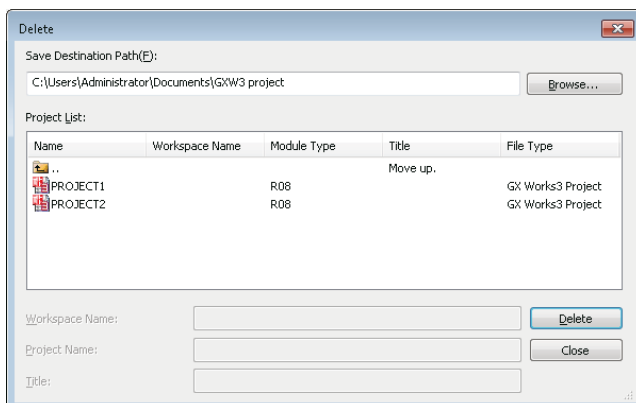
Operating procedure

Select the project (🏠) to be deleted, and click the [Delete] button.

3.3 Creating Data

This section explains how to create each data.

Project data

■Character strings that cannot be used

Character strings used for application function names, common instruction names, special instruction names, instructions and so on are referred to as the reserved words. Reserved words may not be used for names. When the character strings defined as reserved words is used for names, an error occurs when performing registration or conversion.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

■Maximum number of data that can be created in one project

The number of data that can be created in each data type is as follows:

Data type name	RCPU	FX5CPU
Program block	2048	2048
Function block and function	8192	960
FB file	256	15
Other data	800	800

Precautions

For data names, use the characters in the Unicode Basic Multilingual Plane.

If the characters outside the Unicode Basic Multilingual Plane are specified, they may not be edited in the program.

Creating projects

Create new data in a project.

Window

Select the data on the Project view, then select [Project] ⇨ [Data Operation] ⇨ [New Data] (🖪)/right-click and select [New Data] (🖪) from the shortcut menu.
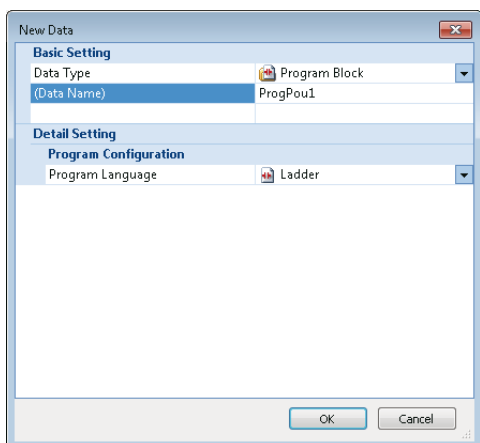
Operating procedure

Set the each item and click the [OK] button.

For the setting items when "Function Block" or "FB File" is selected as data type, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

• When function block and function data are added by the above method, the FB file and FUN file will be in the unconverted state.

• Once the FB file and FUN file is changed from the converted state to the unconverted state, all programs in which the function blocks and functions are used will be in the unconverted state.

• SFC data and program blocks written in programming languages except for SFC (Ladder, ST, FBD/LD) cannot exist in a same program file.

Editing projects

Changing a data name

Operating procedure

1. Select the data of which data name is to be changed on the Project view.

2. Select [Project] ⇨ [Data Operation] ⇨ [Rename Data]/right-click and select [Rename Data] from the shortcut menu.

3. Change the data name and press the ⟦Enter⟧ key.

Copying/pasting data

Utilize the data of project being edited or other projects.

The elements can be pasted only to the place where is able to create a same type of data.

If the module type is different between the copy source and the copy destination, the data can not be pasted.

Operating procedure

1. Select the data of the copy source on the Project view.

2. Select [Project] ⇨ [Data Operation] ⇨ [Copy Data] (📋)/right-click and select [Copy Data] (📋) from the shortcut menu.

3. Select the target folder (one-level upper hierarchy of the copy source data) on the Project view or other project.

4. Select [Project] ⇨ [Data Operation] ⇨ [Paste Data] (📋)/right-click and select [Paste Data] (📋) from the shortcut menu.

If the same data name exists in the folder where the data is to be pasted, the pasted data is named automatically.

Point🔎

If the module type is different between the copy source and the copy destination, it can be utilized by opening each editor and copy the corresponding data.

Precautions

• The pasted program will be in the unconverted state.

• The structures/function blocks used in the global label cannot be copied.
  If the same structure/function block name does not exist in the folder where the data is to be pasted, the pasted data will be an undefined data type.

• Pasting of global label data is canceled when the maximum number of labels (20480) is exceeded. Adjust the number of global labels in the copy destination and the copy source, and retry pasting data.

■Program file

When copying a program file, the program blocks under the selected program file will be copied.

When pasting data to other project, the common device comments can also be copied by setting the following option.

• [Tool] ⇨ [Options] ⇨ "Edit" ⇨ "Copy" ⇨ "Operational Setting"

Deleting data

Delete the data of the project that is opened.

Operating procedure

1. Select the data to be deleted on the Project view.

2. Select [Project] ⇨ [Data Operation] ⇨ [Delete Data]/right-click and select [Delete Data] from the shortcut menu.
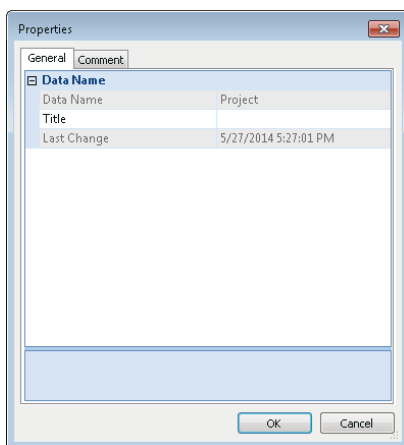
Property

Display the properties of data such as folders, parameters, and programs.

Titles and comments can be added to each data.

Window

Select a data on the Project view, then [Project] ⇨ [Data Operation] ⇨ [Properties] ( )/right-click and select [Properties] ( )
from the shortcut menu.

Operating procedure

Set the items and click the [OK] button.

3.4 Further project management functions

Changing Module Type of Project

Change the module type of the project being edited to other module type.

When a revision has been registered in the project revision, the revision will be succeeded after the change of module type.

FX5CPU does not support this function.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Verifying Projects

Verify a open project with the data of other project.

Use this function to check whether the program contents are consistent, or the modifications are reflected etc.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Project Revision

Register the project revision and manage the revision information.

The old project status can be restored using the registered revision information.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Managing Profile

Manage the registration status of profiles.

Profiles are the data in which the connected device information (such as model names) is stored.

The profiles are managed by each personal computer, and shared within GX Works3 and MELSOFT Navigator. Therefore, profiles registered in GX Works3 are applied to MELSOFT Navigator.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

3.5 Projects created in GX Works2 and different versions of GX Works3

Open the project created in GX Works2 by changing the module type with GX Works3.

This function is supported by the projects of Universal model QCPU/Universal model High-speed Type QCPU/FXCPU (FX3U/FX3UC) only.

For details and for considerations for using the projects created with GX Works3 in different versions of GX Works3, refer to the following manual.

📖 GX Works3 Bedienungsanleitung (SW1DND-GXW3-E)

4 MODULE CONFIGURATION DIAGRAM AND PARAMETERS

In GX Works3, parameters of a programmable controller can be set on the Module Configuration Diagram, as if to configure the actual system.

The parameters can be configured on the Project view in the same manner as GX Works2.

About Module Configuration Diagram

By using the Module Configuration Diagram, the following operations can easily be performed.

Item
Display an actual programmable controller system configuration visually
Set parameters for modules
Input start XY in batch[*1]
Input default points in batch[*1]
Check a power supply capacity and I/O points[*1]
Check a system configuration

*1 Not supported by FX5CPU.
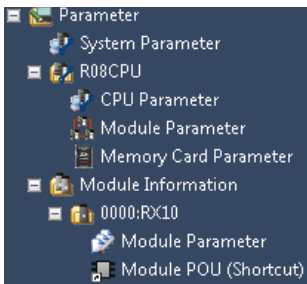
For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

4.1 Setting Parameters

To operate a programmable controller, setting parameters for the modules is required.

The following explains the settings of parameters on the Project view.

Project view	Item	Description
	System Parameter	Set the items which are required to configure the system such as a module configuration. The 'system' here indicates the system configured with a main base unit, extension base unit, and RQ extension base unit connected with the extension cable for RCPU, and the system configured with a module and adapter connected to the module for FX5CPU.
	(Parameter of control CPU)	Set the operation of the function of a CPU module itself. This includes the file setting, memory/device setting, and program setting.
	Module Information	Parameters that is set to an I/O module and Intelligent function module. This includes initial values and refresh settings of each module. There are two kinds of parameters; 'Module Parameter' and 'Module Extended Parameter'. • Module parameter: A parameter that is set to an I/O module and Intelligent function module. The initial setting values and refresh settings are included. • Module extended parameter: A parameter that is set to a specific Intelligent function module. This parameter is read/written separately from module parameters.

Common operations of parameter settings

Operation for parameter editor

The parameter items of the system parameter, control CPU parameter, and module information are displayed corresponding to their purpose.

Set the items refer to the information displayed in "Explanation".

Enter the keyword to search from the setting items and "Explanation".

Checking parameters

There are two methods for checking parameters:

• Check if there is an input error on the parameter editor.

  Click the [Check] button on the parameter editor.

• Check if there is an error in the parameter set in the project.

  Select [Tool] ⇨ [Check Parameter].

Setting system parameters

Set the parameters such as I/O Assignment Setting, Multiple CPU Setting, and Synchronization Setting within the Modules that affect whole system.

FX5CPU does not support the Multiple CPU Setting and Synchronization Setting within the Modules.

For details on the setting items of the parameters, refer to the following manuals.

• I/O Assignment Setting: 📖 MELSEC iQ-R Module Configuration Manual, MELSEC iQ-F FX5 User's Manual (Application)

• Multiple CPU Setting: 📖 MELSEC iQ-R CPU Module User's Manual (Application)

• Synchronization Setting within the Modules: 📖 MELSEC iQ-R Inter-Module Synchronization Function Reference Manual

Setting parameters

Operating procedure

1. Double-click "Parameter" ⇨ "System Parameter" on the Project view.

2. Select the items to be set in the [I/O Assignment] tab, [Multiple CPU Setting] tab, or [Synchronization Setting within the Modules] tab.

3. Set the items and click the [OK] button.

■When module is deleted in I/O Assignment Setting
The parameter of the deleted module is displayed as "Unset" on the Project view. To restore the state of the parameter (to display in I/O Assignment Setting again), select the mount position on the "Properties" screen.

■When I/O Assignment Setting is read from the read mounting status
Mounting status (Number of CPU modules, the I/O Assignment Setting (module name/point), Base/Power/Extension Cable Setting) cannot be read properly to the extension base units where its number is incorrectly set.

Setting parameters of control CPU

Set the parameters related to CPU module (the host CPU for a multiple CPU configuration).

For details on the setting items of the parameters, refer to the following manuals.

- CPU parameters, memory card parameters: 📖 MELSEC iQ-R CPU Module User's Manual (Application), MELSEC iQ-F FX5 User's Manual (Application)
- Module parameters: 📖 MELSEC iQ-R Ethernet User's Manual (Application), MELSEC iQ-F FX5 User's Manual (Application)

Setting parameters

Operating procedure

1. Double-click "Parameter" ⇨ "(PLC type of the project)" ⇨ "CPU Parameter"/"Module Parameter"/"Memory Card Parameter" on the Project view.

2. Set the items on the parameter editor.

3. Click the [Apply] button or [OK] button.

Precautions

For the setting values of the parameters, use the characters in the Unicode Basic Multilingual Plane.

If the characters outside the Unicode Basic Multilingual Plane are specified, they may not be edited in the program.

- File Register Setting in File Setting: File Name
- Initial Value Setting in File Setting: Global Device Initial Value File Name
- Program Setting in Program Setting: Program Name
- FB/FUN File Setting in Program Setting: FB/FUN File Name

Setting parameters of I/O module and Intelligent function module

Set the parameters of MELSEC iQ-R series/Q series I/O module and Intelligent function module supported by GX Works3.
Set the switch settings and refresh settings of MELSEC-Q series module on the parameter editor.
For details of the items for parameters, refer to the user's manual of each module.
For details (setting parameters, setting network configuration and target devices, checking refresh devices assigned to modules),refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Other settings of Intelligent function module

Display the setting information of the start XY addresses, initial settings, and auto refresh settings of Intelligent function modules in a list.The settings except for the parameter setting of the Intelligent function module can be configured with a module tool or a dedicated tool.
For details (checking/changing the number of Intelligent function module parameters, module dedicated menus for the parameter editor, parameter interaction with MELSOFT Navigator), refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

4.2 Predefined Protocol Support Function

Start the Predefined Protocol Support Function from GX Works3, and set the protocol and read/write data from/to a module.
For details, refer to the following manuals.
📖 MELSEC iQ-R Serial Communication Module User's Manual (Application)
📖 MELSEC iQ-R Ethernet User's Manual (Application)
📖 MELSEC iQ-F FX5 User's Manual (Serial Communication)
📖 MELSEC iQ-F FX5 User's Manual (Ethernet Communication)
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

5 REGISTERING LABELS

This chapter explains the overviews and registration methods of labels.

5.1 About Labels

There are four types of label; labels registered on the label editor (global label and local label), a module label which is prepared as the dedicated label for each module (global label), and a system label which is interacted with MELSOFT Navigator.
Global labels can be registered as system label.

Type	Description	Creation method
Global label	Labels that can be used in all programs in a project. There are two types of global label; a global label that can be used either in standard programs or in safety programs, and a standard/safety shared global label that can be used in both programs.	Create them on the global label editor.
Local label	Labels that can be used in each program.	Create them on the local label editor.
Module label	Labels in which the I/O signals and buffer memory of a module to be used are already defined. By using the module labels, easy-to-use programs can be created without considering the internal address in the module. This label can be used in standard programs only.	Add module labels when adding the module information. Module labels are created as standard global labels.
System label	Labels that can be shared among iQ Works supported products. These labels are controlled by MELSOFT Navigator.	Register standard global labels as system labels on the global label editor.

For details on the label types, classes, and data types, refer to the following manuals.
📖 MELSEC iQ-R Programming Manual (Program Design)
📖 MELSEC iQ-F FX5 Programming Manual (Program Design

5.2 Registering Labels

This section explains how to register the labels.

Configuration of label editor

This section explains the configuration of the label editor.
The editor to be displayed will differ depending on the label types.

> **Point** 🔎
>
> The display format and details of operation settings for each function can be set by setting the following option.
> [Tool] ⇨ [Options] ⇨ "Other Editor" ⇨ "Label Editor Common"

■Global label

Project view ⇨ "Label" ⇨ "Global Label" ⇨ "(global label)"

■Local label

Project view ⇨ "Program" ⇨ "(execution type)" ⇨ "(program file)" ⇨ "(program block)" ⇨ "Local Label"

●Toolbar

●Label editor (global editor)

- • Click the [Display Setting] button to select the items to be displayed.
- • Click the [Check] button to check errors before converting programs.
- • When the data type is structure or function block, the corresponding hierarchy of labels is displayed.

Editing rows

■Adding rows

When using the New Declaration (After) function, the selected label is copied and added it to the row right after the specified row, with a value appended.

If a value is already appended after the label name, the data is copied with an incremented value.

When devices are set for global labels, the data is copied with an incremented device number.

For adding blank rows or setting increment regulation (decimal/hexadecimal), set the following option.

• [Tool] ⇨ [Options] ⇨ "Other Editor" ⇨ "Label Editor Common" ⇨ "Editor Setting"

Operating procedure

Select [Edit] ⇨ [New Declaration (Before)]( )/[New Declaration (After)]( ).

■Deleting rows (deleting labels)

Operating procedure

Select [Edit] ⇨ [Delete Row]( ).

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Entering information

Label name

Set label names except for the following names:

• A label name that includes a space.
• A label name that begins with a numeral.
• A label name which is same as the one used for devices.

Precautions

For label names, constants, and device initial values, use the characters in the Unicode Basic Multilingual Plane.

The label names and constants that specifies the characters other than the Unicode Basic Multilingual Plane cannot be used in programs.

The initial values specified with the characters outside the Unicode Basic Multilingual Plane may not be edited in the program.

For details refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

5.3 Registering Module Labels

This section explains how to register the module labels.

Registering to global label

Module labels are registered by clicking the [Yes] button on the confirmation screen displayed after performing either of the following operations.

- Place a module on the Module Configuration Diagram and fix the parameters.
- Add a new module from the Project view.

The registered module labels are displayed in "Global Label" in the Project view and in the [Module] tab of the Element Selection window.

When using a module label in a program, enter a module label name directly or drag and drop it from the Element Selection window.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

5.4 Registering System Label

This section explains how to register the global labels as the system labels.
Only standard global labels support system labels.

System label

Using the system labels controlled by MELSOFT Navigator enables programming with the same label names among the iQ Works supported products (GX Works3, MT Developer2, GT Designer3).
Once a workspace is saved with MELSOFT Navigator, a database to manage system labels is created in the workspace.
System labels cannot be used in a workspace without the system label database.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Registering labels in system label database

Disclose standard global labels created with GX Works3 as system labels.
When registering in the system label database at the first time, create a workspace with MELSOFT Navigator and save projects of GX Works3 in the workspace in advance.

Operating procedure

1. Display the global label editor.

2. Select the labels to be registered as system label, and click the [Reservation to Register System Label] button.

3. Click the [Reflect to System Label Database] button.

The "Check before registering in system label data base" screen is displayed.

4. Check the list of labels to be registered, and click the [Register] button.

Releasing system labels

Release the relation with the system label database, and restore system labels to normal global labels.

Operating procedure

1. Display the global label editor.

2. Select the labels of which relation is to be released from the labels registered as system labels.

3. Click the [Reservation to Release System Label] button.

4. Click the [Reflect to System Label Database] button.
The "Check before registering in system label data base" screen is displayed.

5. Check the list of labels to be released, and click the [Register] button.

Verifying system label information

Compare the system label information of GX Works3 projects to the system label database, and check if there is any difference. If differences exist, correct the system label information of the GX Works3 projects, and synchronize the information with the system label database.

Operating procedure

1. Select [Edit] ⇨ [System Label] ⇨ [Execute Verification Synchronous with System Label].

2. Check and correct information on the "Execute Verify and Synchronize with system label" screen.

3. Click the [Reflection] button.

Importing the changes of system label database

Import the changed contents to the GX Works3 projects when the system labels used in a project have been changed in other projects.

Importing the changes automatically

Operating procedure

Click the [Yes] button on the message to confirm whether or not import the changed contents, which appears when any of the following operations is performed in a state where a system label change notification has been received.
 • Opening a project
 • Saving a project
 • Reflecting labels to system label database
 • Displaying the "Online Data Operation" screen
 • Starting the Simulation function
Click the [No] button to import them after checking the changed contents.

Importing after checking the changes

When the system label information in the GX Works3 projects is different from the system label database, the icon to notify the changes is displayed at the lower-left corner of the GX Works3 screen.

Check the contents that have been changed when the icon is displayed. In addition, import the changed contents to the GX Works3 projects.

Operating procedure

1. Select [Edit] ⇨ [System Label] ⇨ [Check the changes of System Label Database].

2. Check the information on the "Import Change Contents of System Label Database" screen.

3. Click the [Import] button.

6   CREATING PROGRAMS

This chapter explains how to create a program.

6.1   Programming Functions

Features and types of programming language

The programming languages supported by GX Works3 are as follows:

Program language	Name	Description	Creation method of program	Language specification
Ladder[*1]	Ladder Diagram	A graphic language using ladder programs composed of contacts and coils. The inline structured text functions to edit ST programs on the ladder editor can be used.	☞ Page 39 Creating Ladder Programs	📖 MELSEC iQ-R Programming Manual (Program Design)
ST	Structured Text	Control syntax such as selection branch by conditional syntax or repetitions by iterative syntax can be controlled, as in the high-level language such as C language. By using these syntax, concise programs can be written.	☞ Page 56 Creating ST Programs	
FBD/LD	Function Block Diagram/Ladder Diagram	A graphic language for creating a control program only by placing and connecting an element.	☞ Page 60 Creating FBD/LD Programs	
SFC	Sequential Function Chart	A graphic language for clarifying execution orders and execution conditions.	☞ Page 66 Creating SFC Programs	

*1   Safety programs are supported.

Features and types of POU

The POUs which can be used in a program are as follows.

POU	Description
Function block	Outputs an operation result in accordance with values of the internal memory.
Function	Always outputs the same operation result against the same input value.

Inputting global devices/local devices

To use global devices and local devices individually, enter the devices as follows:

Note that FX5CPU does not support local devices.

- Standard global device: Enter a device name (Example: D10)

  Safety global device: Prefix 'SA\' to the device name (Example: SA\D10)
- Standard local device: Prefix '#' to the device name (Example: #D10)

  Safety local device: Prefix 'SA\#' to the device name (Example: SA\#D10)

For details of the global device/local device, refer to the following manual.

📖 MELSEC iQ-R CPU Module User's Manual (Application)

Entering global labels/local labels

When a label with the same name exists in both global labels and local labels, the label in a program is handled as follows:

- After a global label and a local label are registered, the label names are entered in the program: Treated as a local label.
- After a global label is registered, the label name is entered in the program, and then a local label with the same name is registered: Treated as a global label.
- After a local label is registered, the label name is entered in the program, and then a global label with the same name is registered: Treated as a local label.

The global labels and local labels can be distinguished by setting the different color on the "Color and Font" screen.

Creation procedure

1. Create data of program block.

2. Set an execution order and an execution type.

3. Create a program.

4. Check the created program.

5. Convert the created program.

For details, refer to the following section.

☞ Page 5 Procedure from Project Creation to CPU Module Operation

6.2   Program execution order/execution type settings

This section explains how to set an execution order and an execution type for a program.

Program execution order settings

Set an execution order of program block in a program file.

An SFC program is executed according to the block No. Check the block No. on an SFC block list.

Window

• [Convert] ⇨ [Program File Setting]

• Select a program file on the Project view, then right-click and select [Program File Setting] from the shortcut menu.
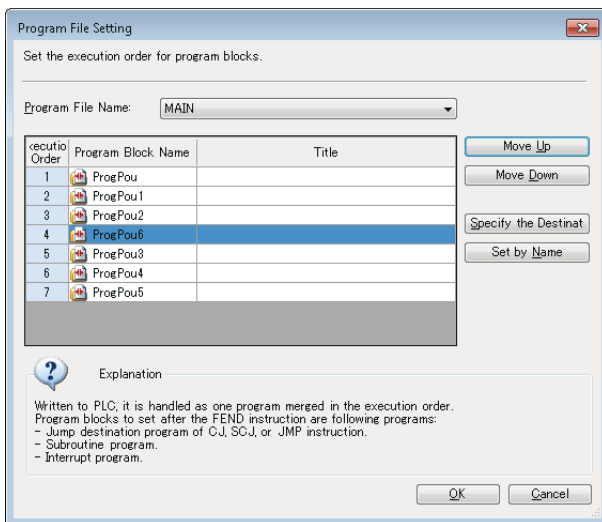
Operating procedure

1. Select a program file name.

2. Set an order to be executed to a program block, then click the [OK] button.

Program execution types

One of the following execution types can be specified to a program: Initial, Scan, Fixed Scan, Event, Standby, or No Execution Type.
For details, refer to the following manuals.
📖 MELSEC iQ-R CPU Module User's Manual (Application)
📖 MELSEC iQ-F FX5 User's Manual (Application)
Only the Fixed Scan can be specified in safety programs.

Setting method

To set the execution type, right-click the program name of which execution type is to be set, and select [Register Program]
from the shortcut menu or drag and drop it on the Project view.
The execution type set on the Project view is applied to "Program" of the CPU parameter.

6.3 Creating Ladder Programs

This section explains the method for creating a ladder program.
The details on the specification of ladder program are described in the following manual. Please read it in advance.
📖 MELSEC iQ-R Programming Manual (Program Design)

6

Point

The display format and detailed operations for each function can be set by the following option setting.
[Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor"

Configuration of ladder editor

Window

Project view ⇨ "Program" ⇨ "(execution type)" ⇨ "(program file)" ⇨ "(program block)" ⇨ "Program"

●Toolbar

●Ladder editor

Labels pointing to parts of the ladder editor:
- Line statment
- Line statment
- Line statement displayed in the tree
- P statement
- I statement
- Wrapping symbol (wrapping destination)
- Step number
- Outline display
- Pointer input area
- Left power rail
- Number of contacts displayed in a column
- Note
- Separation bar (horizontal)
- Device assigned to label
- Operand
- Fb instance
- Wrapping symbol (wrapping source)
- Inline structured text box
- Separation bar (vertical)
- Right power rail

<1 cell display>   <Wrap display>

Displayed items

Item	Description	Related operation
Mode display area	An area that displays mode such as Write/Read/Write Mntr/Read Mntr.	■Switching mode ☞ Page 42 Read mode/Write mode/Monitor read mode/Monitor write mode
Step No.	The start Step No. of a ladder block.	—
Device assigned to label	A device assigned to a label. Editing and searching/replacing labels displayed on a ladder editor are available. A device with any of the following conditions is not displayed. • A device that is assigned by converting the program • When a label is used for array elements • When using a structure label	■Settings ☞ Page 31 Registering Labels ■Show/Hide [View] ⇨ [Display Device] (🔍)
Alias	An alternative name for a label. Editing and searching/replacing can be performed for the labels displayed on the ladder editor.	
Comment	A comment set to a device/label.	■Entering elements ☞ Page 48 Entering comments/statements/notes ■Show/Hide [View] ⇨ [Comment Display]/[Statement Display]/[Note Display]
Line statement	A comment that is appended to a ladder block.	
Line statement displayed in the tree	A line statement that is displayed in the tree of the Project view.	
P statement	A comment that is appended to a pointer number.	
I statement	A comment that is appended to an interrupt pointer number.	
Note	A comment that is appended to a coil/application instruction in the program.	
Inline structured text box	An area that can edit ST programs on the ladder editor.	■Insertion ☞ Page 46 Inserting inline structured text
FB instance	An entity of a function block used in a ladder program.	■Insertion 📖 GX Works3 Operating Manual (SW1DND-GXW3-E)
Operand	A value or label name/device name to be operated.	—
Outline display	A symbol that indicates the status (collapse/expand) of a ladder block	■Show/Hide • [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor" ⇨ "Ladder Diagram" ⇨ "Display Format" • [View] ⇨ [Outline] ⇨ [Show/Hide of Outlines]
1 cell display	The rest of a device/label name is omitted by ellipses "..." in order for the name to be fit in one cell.	■Switching display [View] ⇨ [Change Display Format of Device/Label Name] ⇨ [1 Cell Display]/[Wrapping Ladder Display]
Wrap display	A long device/label name is wrapped to be fit in one cell. If the label name still cannot be displayed in one cell, the rest of the name is omitted by ellipsis "...".	
Left power rail	The power rails of a ladder program.	—
Right power rail		
Tool hint	The information on device/label where the mouse cursor is placed over is displayed.	■Changing display contents [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor" ⇨ "Tool Hint"
Number of contacts displayed in a column	The maximum number of cells which are occupied with contacts, coils, and instructions. When the maximum number of contacts is exceeded, the line will be wrapped automatically.	■Changing number of contacts [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor" ⇨ "Ladder Diagram" ⇨ "Display Format"
Wrapping symbols	The wrapping symbols are displayed at wrapping source and wrapping destination. The same numbers (serial numbers) are assigned to the wrapping source symbol and the wrapping destination symbol that are created in pairs. Wrapping lines cannot be created on the input and output circuits of an FB instance.	—

Read mode/Write mode/Monitor read mode/Monitor write mode

The program cannot be edited directly when the mode is switched to the Read mode/Monitor read mode.

However, performing any of the following operations changes the programs.

 • When the source function block name is changed or the function block is deleted
 • When input/output labels of the source function block are changed and converted
 • When the devices/labels are replaced with the replacement function by specifying the whole project

To prohibit editing the program, use the security function.

Entering ladder programs

This section explains how to enter a ladder program.

For details of ladder symbols, refer to the following manuals.

📖 MELSEC iQ-R Programming Manual (Program Design)

📖 MELSEC iQ-F FX5 Programming Manual (Program Design)

Inserting contacts, coils, instructions, arguments

Operating procedure

■Inserting from the element entry dialog

Enter an instruction and arguments on the element entry dialog[*2] displayed by selecting a cell[*1] to be entered or edited, and double-clicking or pressing the ⟦Enter⟧ key.

 *1   For the "Insert mode" (press the ⟦Enter⟧ key to switch to the Overwrite mode), instructions are inserted on the cursor position. Therefore, if an instruction is already inserted in the selected cell, the existing instruction will be moved back.
 *2   The cursor position on the ladder editor can be moved by pressing the ⟦Ctrl⟧ + ⟦←⟧/⟦→⟧/⟦↑⟧/⟦↓⟧ keys.
    To select an instruction/argument, press the ⟦Alt⟧+⟦←⟧/⟦→⟧ keys.
    Options of instructions/labels can be displayed by pressing the ⟦Ctrl⟧+⟦Space⟧ keys.

■Inserting from the "Enter Ladder" screen with description

Select an instruction[*1] and enter arguments on the "Enter Ladder" screen displayed by clicking the [Extd Dspl] button on the element entry dialog.

 *1   The frequently used instructions can be registered as "Favorites" by right-clicking and selecting [Add to Favorites] from the shortcut menu. The instructions added to "Favorites" can be selected in the lowest cell of "List" in the pull-down list.

■Inserting from the menu/toolbar

Select a cell to where an element is added on the ladder editor, then select [Edit] ⇨ [Ladder Symbol] ⇨ [(element)]. It can also be added by selecting from the toolbar.

■Inserting from the Element Selection window

Select a contact, coil, or instruction displayed in the Element Selection window, and drag and drop it on the ladder editor. After that, edit the arguments.

■Editing arguments directly

Select a cell where an argument is inserted, and press the ⟦F2⟧ key to edit the argument.

■Switching methods for contacts/instructions

Select a contact/instruction to be switched, and select [Edit] ⇨ [Easy Edit] ⇨ [Switch Ladder Symbol Invert]/[Switch Pulse/ Switch SET and RST Instructions] or follow the methods shown below.

Switching contacts and instructions	Shortcut key	Pull-down list
Switching open/close contact, raising/falling pulse		Select a symbol from the pull-down list displayed when clicking the blue triangle at the bottom left in the cell.
Switching operation result rising/falling pulse		
Switching SET/RST instructions		—

Drawing lines

Draw a line in the program.

If a line has already been drawn, the line will be deleted.

Operation	Draw line
Drag and drop	Click the icon displayed when the mouse is close to the element. Drag it until the line is drawn.
Keyboard	[Ctrl] + [←]/[→]/[↑]/[↓] keys
	Press the [Ctrl] + [Shift] + [←]/[→] keys to enter horizontal lines consecutively from a cursor position to the next contact/coil/line connection point.

Inserting function blocks

Paste a function block as a part, and then name (FB instance name) and insert it into a sequence program.

For the creation methods of a program of a function block, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E).

Operating procedure

1. Drag and drop a function block element to an arbitrary cell on the sequence program from the Project view or Element Selection window.

2. Select which to register the function block either as a global label or as a local label in the list of "FB Instance Name" screen. When the function block is pasted, the FB instance name is automatically registered as a label on the selected label setting screen.

3. Connect the input and output to the FB instance.

■Displaying FB instance

On the pasted FB instance, label names of I/O variables and their corresponding data types are displayed.
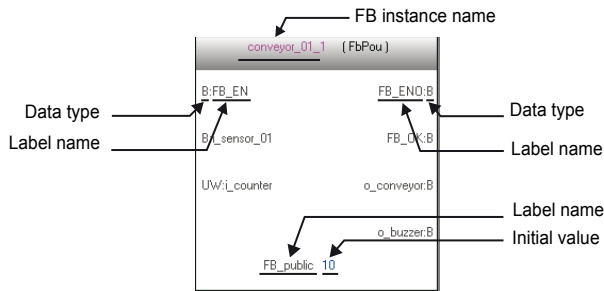
The following are the representation of data types.
• B : Bit
• W : Word
• D : Double word [signed]
• E : FLOAT (Single Precision)
• L : FLOAT (Double Precision)
• S : String

The initial values set on the label editor when creating FB program are also displayed. The initial values set to each FB instance are not displayed.
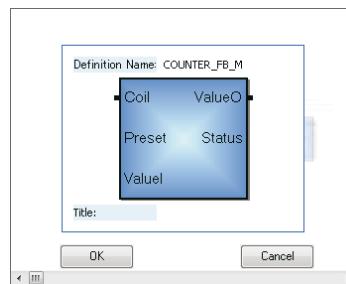
■Editing FB instance names

Operating procedure

1. Move the cursor on an FB instance.

2. Select [Edit] ⇨ [Edit FB Instance].

3. Enter a new FB instance name.

■Replacing FB instances

Operating procedure

1. Move the cursor on an FB instance.

2. Select [Edit] ⇨ [Change FB/FUN Data].

3. Scroll the displayed screen and select the function block to be replaced, and click the [OK] button.

■Creating input and output circuits of FB instances

Create input and output circuits of the FB instance pasted to a sequence program.
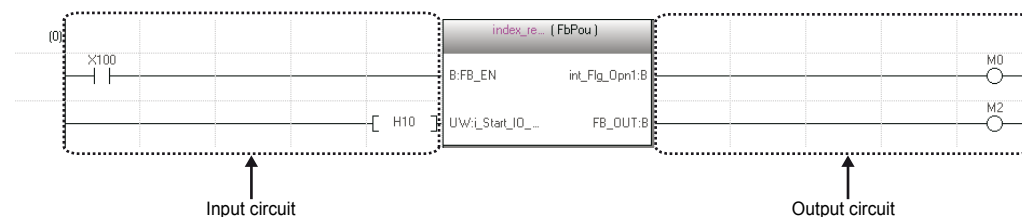
The number of contacts occupied by input circuits/output circuits of an FB instance differs depending on the setting of the following option.
• [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor" ⇨ "Ladder Diagram" ⇨ "Display Format" ⇨ "Display Connection of Ladder Diagram"

Setting of the number of displayed contacts	Number of contacts in input circuit	Number of contacts in output circuit
9 contacts	4 contacts	3 contacts + 1 coil
11 contacts	5 contacts	4 contacts + 1 coil
13 contacts	6 contacts	5 contacts + 1 coil
17 contacts	8 contacts	7 contacts + 1 coil
21 contacts	10 contacts	9 contacts + 1 coil
33 contacts	16 contacts	15 contacts + 1 coil
45 contacts	22 contacts	32 contacts + 1 coil

Instructions that exceed the number of occupied contacts cannot be entered.

When instructions cannot be placed by changing the number of displayed contacts, the ladder block may not be displayed properly.

Operating procedure

1. Select [Convert] ⇨ [Convert] (📝).

The ladder block is converted, and lines are connected to the input and output labels of the FB instance.

2. Edit the input circuits.

Enter an element to the input circuit in the same manner as creating normal ladder programs. Create a program in accordance with the data type of input variable.

***3.*** Enter elements to the output circuit in the same manner as the input circuit.

Edit the program other than function blocks as well. After complete editing, convert the program.

■Considerations for using function block

- A single function block can be pasted to a single ladder block.

  The output of an FB instance cannot be directly connected to the input of another FB instance.

  When connecting function blocks each other, use a coil to initially receive the output of a single function block, and then connect the contact of the coil to the input of the other function block.
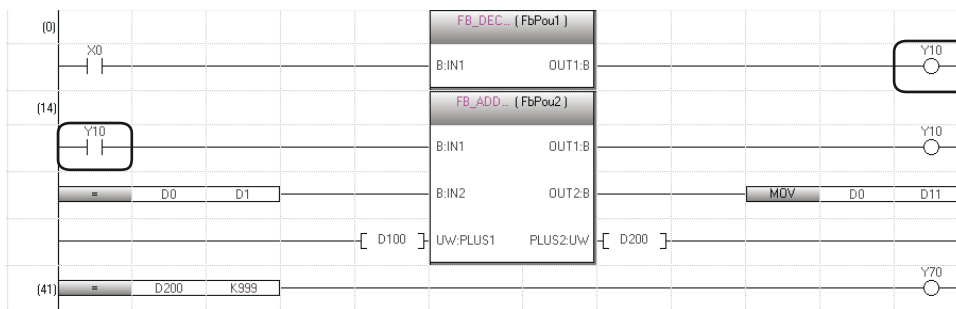
- When the label settings of a function block is changed, convert the program or all programs.

■Considerations for using function block that the class of label is "VAR_IN_OUT"

- If the version of GX Works3 is 1.011M or earlier, use the same device/label to both the input and output which are connected to the label of 'VAR_IN_OUT' ,otherwise, the program does not execute properly.
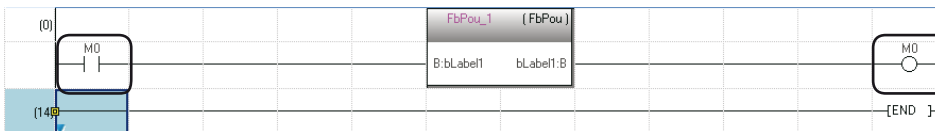
- The subroutine type function blocks that the devices/labels for the input and the output connecting to to the label of 'VAR_IN_OUT' are not same, the verification results are mismatched. It is due to the difference of the version of GX Works3 which was used for converting all programs (Version 1.011M of earlier, and Version 1.015R or later). In that case, convert all programs using the same version of GX Works3.

- For the version of GX Works3 is 1.015R or later, the macro/subroutine type function blocks will be an error when the multiple coils exist on the left side of "VAR_IN_OUT" in a program.
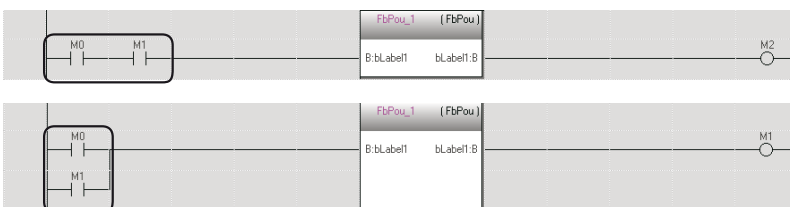
Inserting functions

Insert a function in a ladder program.

For the creation methods of functions, refer to the following section.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Operating procedure

1. Drag and drop a function element to an arbitrary cell on the sequence program from the Project view or Element Selection window.

2. Connect an input and an output to the function.

■Adding/deleting arguments

Only for functions of which number of arguments can be changed, the arguments can be added/deleted.

Operating procedure

1. Move the cursor on a function.

2. Select [Edit] ⇨ [I/O Argument] ⇨ [Increment Argument] (🔼)/[Delete Argument] (🔽).

■Replacing functions

Operating procedure

1. Move the cursor on a function.

2. Select [Edit] ⇨ [Change FB/FUN Data].

3. Scroll the screen and select the function block to be replaced, and click the [OK] button.
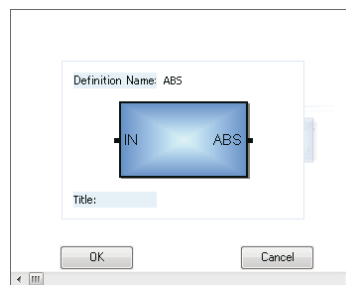
Inserting inline structured text

Inline structured text is a function to edit/monitor a program by creating an inline structured text box that displays an ST program, at the coil instruction area on the ladder editor.

With this function, a numeric value operation or a character string process can be created easily in the ladder program.

Up to 2048 characters can be entered in an inline structured text box. (Two characters are used as the line feed.)

Note that this function cannot be used in a safety program and a safety FB/FUN.

Operating procedure

Select [Edit] ⇨ [Inline Structured Text] ⇨ [Insert Inline Structured Text Box] (![ISTB]).

The editing method of the inline structured text program is the same as that of Structured Text. (⌲ Page 57 Entering programs)

Precautions

- Both an FB and inline structured text box cannot be placed in a ladder block.
- Inline structured text box cannot be connected to the input/output of FB instance.
- The label of which data type is pointer cannot be used in the inline structured text.
- If the row that includes an inline structured text box is deleted, the whole ladder block is deleted including an inline structured text.

Pasting from each screen

Paste a label name/device name by dragging and dropping from the editor such as label editor and device comment editor.

By dragging and dropping a bit type label/device in a blank cell, a contact is inserted automatically and its label name/device name is displayed.

Additionally, when dragging and dropping a bit type label/device to the right end of the cell, a coil is inserted automatically and its label name/device is displayed.

A word type device/label can be pasted by dragging and dropping on the operand of an instruction.

Registering undefined labels

When an undefined label is entered, the "Undefined Label Registration" screen is displayed and it can be registered on the label editor.

Checking the duplicated coils

Check the duplicated coils in the same program when entering a coil in the program.

Set whether to check the duplicated coils by setting the following option.

- [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "Ladder Editor" ⇨ "Enter Ladder" ⇨ "Operational Setting"

For the check target instructions/devices of duplicated coils, refer to the following section.

Displaying MC/MCR instructions

When the MC instruction is inserted to a ladder program, the double-line symbol is displayed on the left vertical line. As for MCR instruction, the left vertical line is delimited.
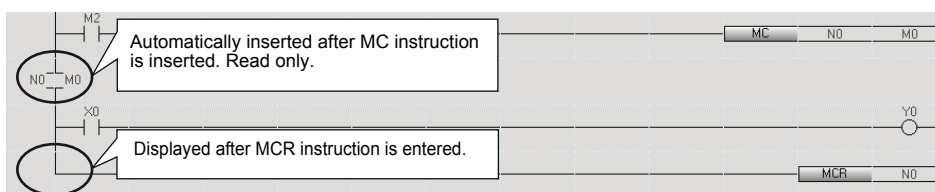
Entering comments/statements/notes

This section explains the basic operations for editing comments, statements, and notes.
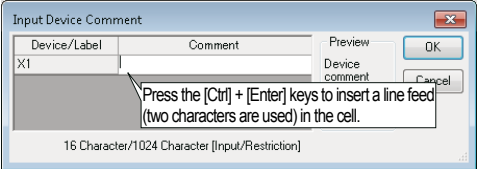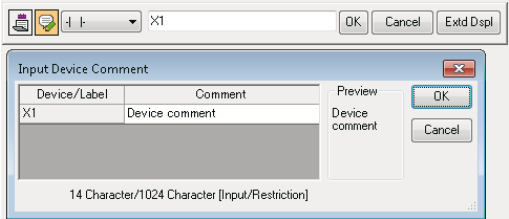
Entering/editing comments

Enter or edit a device/label comment.

To check the entered comments on the ladder editor, change the setting to display comments.

 • [View] ⇨ [Comment Display]

The device comments edited or added on the ladder editor are reflected to the device comments set to the following option.

 • [Tool] ⇨ [Options] ⇨ "Project" ⇨ "Device Comment Reference/Reflection Target"

Entering/editing method	Operating procedure
On the "Input Device Comment" screen	1. Select [Edit] ⇨ [Documentation] ⇨ [Edit Device/Label Comment] (icon). 2. Select the cell and press the [Enter] key or double-click it. 3. Enter a comment in the "Comment" column. After entering comments is completed, select [Edit] ⇨ [Documentation] ⇨ [Edit Device/Label Comment] (icon) again.
On the element entry dialog	1. Select a cell and press the [Enter] key. 2. Click on the element entry dialog and click the [OK] button. 3. Enter the comment to "Comment" column.
With the keyboard	1. Display the comments. 2. Select the cell and press the [F2] key twice. 3. Enter a comment directly.
From each editor	Label editor: GX Works3 Operating Manual (SW1DND-GXW3-E) Device comment editor: Page 83 Creating device comments

Entering/editing statements

Add a comment to a ladder block using the statement (line statement, P statement, or I statement) in order to make the processing flow easy to understand.
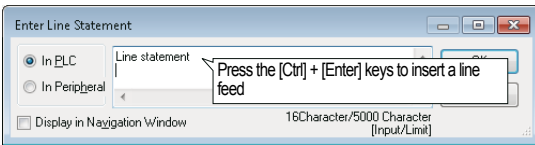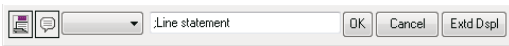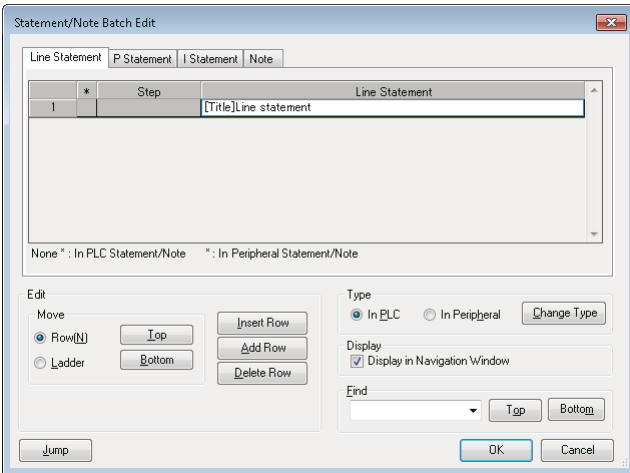
To check the entered statements on the ladder editor, change the setting to display the statements.

 • [View] ⇨ [Statement Display]

For details on the statements, refer to the following manuals.

 MELSEC iQ-R Programming Manual (Program Design)

 MELSEC iQ-F FX5 Programming Manual (Program Design)

Entering/editing method	Operating procedure
On the Enter Statement screen	1. Select [Edit] ⇨ [Documentation] ⇨ [Statement] (icon). 2. Select the cell and press the ⏎Enter⏎ key, or double-click it. 3. Enter a statement. Before entering P statement/I statement, select the cell of a pointer number or interrupt pointer number. When "Display in Navigation Window" is selected, "[Title]" is added in front of the line statement. After entering statements is completed, select [Edit] ⇨ [Documentation] ⇨ [Edit Statement] (icon) again.
On the element entry dialog	1. Select the cell and press the ⏎Enter⏎ key. 2. Enter a statement after entering ';' for 'In PLC' and ';*' for 'In Peripheral'. When displaying a statement on the Navigation window, enter [Title] after ';' or ';*'. For P statement/I statement, enter a statement following the entry of the displayed pointer number or interrupt pointer number.
On the "Statement/Note Batch Edit" screen	1. Select [Edit] ⇨ [Documentation] ⇨ [Statement/Note Batch Edit] (icon). 2. Enter a statement. [Insert Row] button: Inserts a row above the cursor position. [Add Row] button: Inserts a row below the cursor position.
With the keyboard	1. Select the cell of a statement, and press the ⏫F2⏫ key. 2. Enter a statement directly.

Precautions

';' cannot be prefixed to a line statement.

■Editing statements
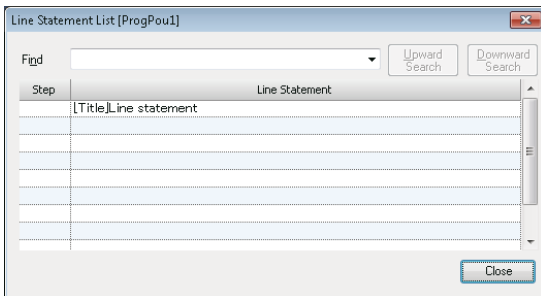After editing a statement, the program will be in the unconverted state.

■Displaying list

Display the line statements used in the ladder program in a list.

The cursor is moved to the location where the selected line statement is used.

Window

[Find/Replace] ⇨ [Line Statement List] (icon)

■Line statement to be displayed in the tree

Select a line statement and select [Edit] ⇨ [Document] ⇨ [Show/Hide of Navigation Window] to switch display/hide the line statement on the Navigation window.

When copying/deleting the line statement displayed in the tree, the ladder blocks before the next line statement in the tree are copied/deleted.

Double-click a line statement in the tree to move the cursor to the corresponding ladder block.
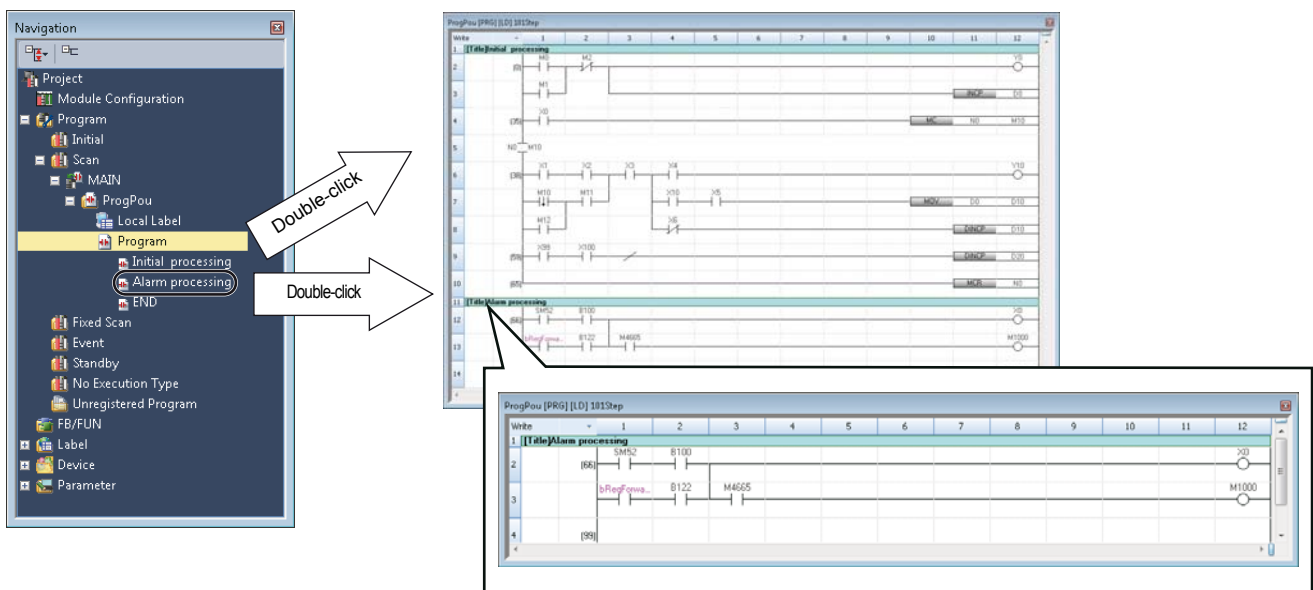
■Consideration when using statements in an FB program

When the name of a statement used in an FB program is changed, all programs in which the function block is used in the unconverted state.

Entering/editing notes

Append a comment to coils/application instructions using Note in the program in order to make it easier to understand the content of program.
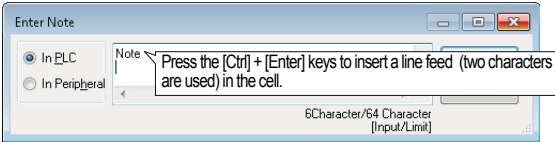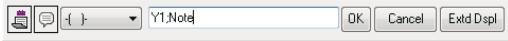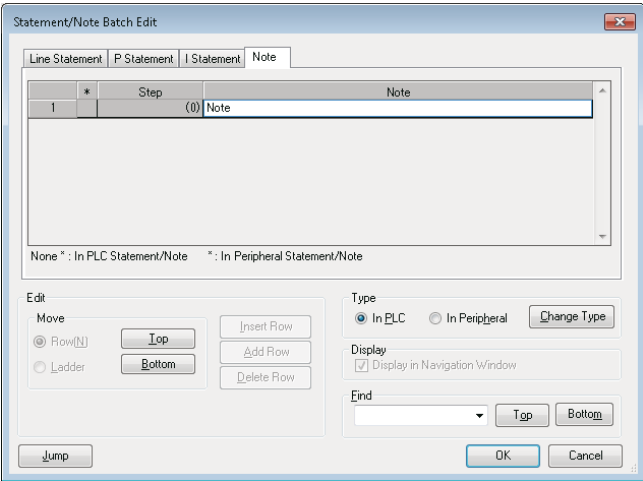
To check the entered notes on the ladder editor, change the setting to display the notes.

• [View] ⇨ [Note Display]

For details on the notes, refer to the following manuals.

[BUCHICON] GX Works3 Operating Manual (SW1DND-GXW3-E)MELSEC iQ-R Programming Manual (Program Design)

📖 MELSEC iQ-F FX5 Programming Manual (Program Design)

Entering/editing method	Operating procedure
On the "Enter Note" screen	1. Select [Edit] ⇨ [Documentation] ⇨ [Edit Note] (🖼). 2. Select the cell and press the ⌈Enter⌋ key or double-click it. 3. Enter a note. **Enter Note** ○ In PLC ○ In Peripheral Note: Press the [Ctrl] + [Enter] keys to insert a line feed (two characters are used) in the cell. 6Character/64 Character [Input/Limit] After entering notes is completed, select [Edit] ⇨ [Documentation] ⇨ [Edit Note] (🖼) again.
On the element entry dialog	1. Press the ⌈Enter⌋ key. 2. Enter notes following the displayed device/instruction after entering ';' for 'In PLC' and ';*' for 'In Peripheral'. Y1;Note OK Cancel Extd Dspl
On the "Statement/Note Batch Edit" screen	1. Select [Edit] ⇨ [Documentation] ⇨ [Statement/Note Batch Edit] (🖼). 2. Enter a note. **Statement/Note Batch Edit** Line Statement / P Statement / I Statement / Note 		*	Step	Note	 	1		(0)	Note	 None * : In PLC Statement/Note * : In Peripheral Statement/Note Edit — Move: ○ Row(N) ○ Ladder [Top] [Bottom] [Insert Row] [Add Row] [Delete Row] Type: ○ In PLC ○ In Peripheral [Change Type] Display: ☑ Display in Navigation Window Find: [____] [Top] [Bottom] [Jump] [OK] [Cancel] [Insert Row] button: Inserts a row above the line statement. [Add Row] button: Inserts a row below the line statement.
With the keyboard	1. Select the cell of a note, and press the ⌈Enter⌋ key. 2. Enter a note directly.

Inserting/deleting NOP instruction

Insert or delete a NOP instruction to adjust Step No. of a program.

The Step No. changed by the NOP instruction is reflected to the ladder editor after converting the program.

Operating procedure

■Batch insertion

1. Select a cell to be insert.

2. Select [Edit] ⇨ [NOP Batch Insert].

3. Set the number of NOPs on the "NOP Batch Insert" screen and click the [OK] button.

■Batch deletion

1. Select [Edit] ⇨ [NOP Batch Delete].

2. Click the [Yes] button.

Copying/pasting elements

Cutting/coping

Select an instruction, range, or ladder block, and cut/copy it.

Select a row when copying a function/function block.

Pasting

Paste a cut/copied element.

For "Insert mode" (press the ⏎Enter key to switch for "Overwrite mode"), the rung is inserted above the position of the cursor.

For "Overwrite mode", the row/column will be inserted automatically and pasted by selecting [Edit] ⇨ [Insert and Paste].

Precautions

If the elements as shown below are selected to set a range, the vertical line on the right side cannot be pasted.

The vertical line on the right side is not pasted.
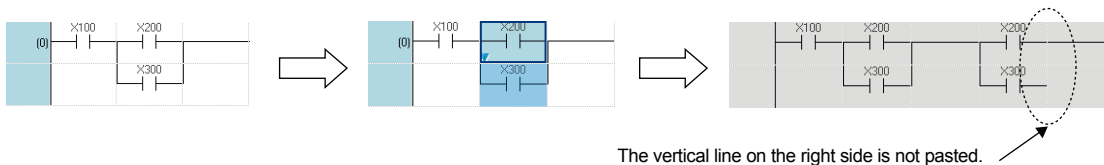
In such case, draw a vertical line after pasting the elements.

Pasting device number/label name consecutively

Increment (+1) and paste a device number and label name consecutively in the cut/copied ladder block.

Operating procedure

1. Select [Edit] ⇨ [Continuous Paste].

2. Set the items on the "Continuous Paste" screen, and click the [Execute] button.

Changing ladder blocks temporarily

Change the operation of specific ladder block temporarily.

Using the temporary changing function, the program for debugging can be changed without losing the source program, therefore the debug process will be improved efficiently.

Precautions

When opening the project, which contains the temporarily changed ladder program, in GX Works2 Version 1.008J or earlier, the background color of disabled ladder block is not changed. Besides, the Apply the Changes operation and the Restore the Changes operation can not be performed.
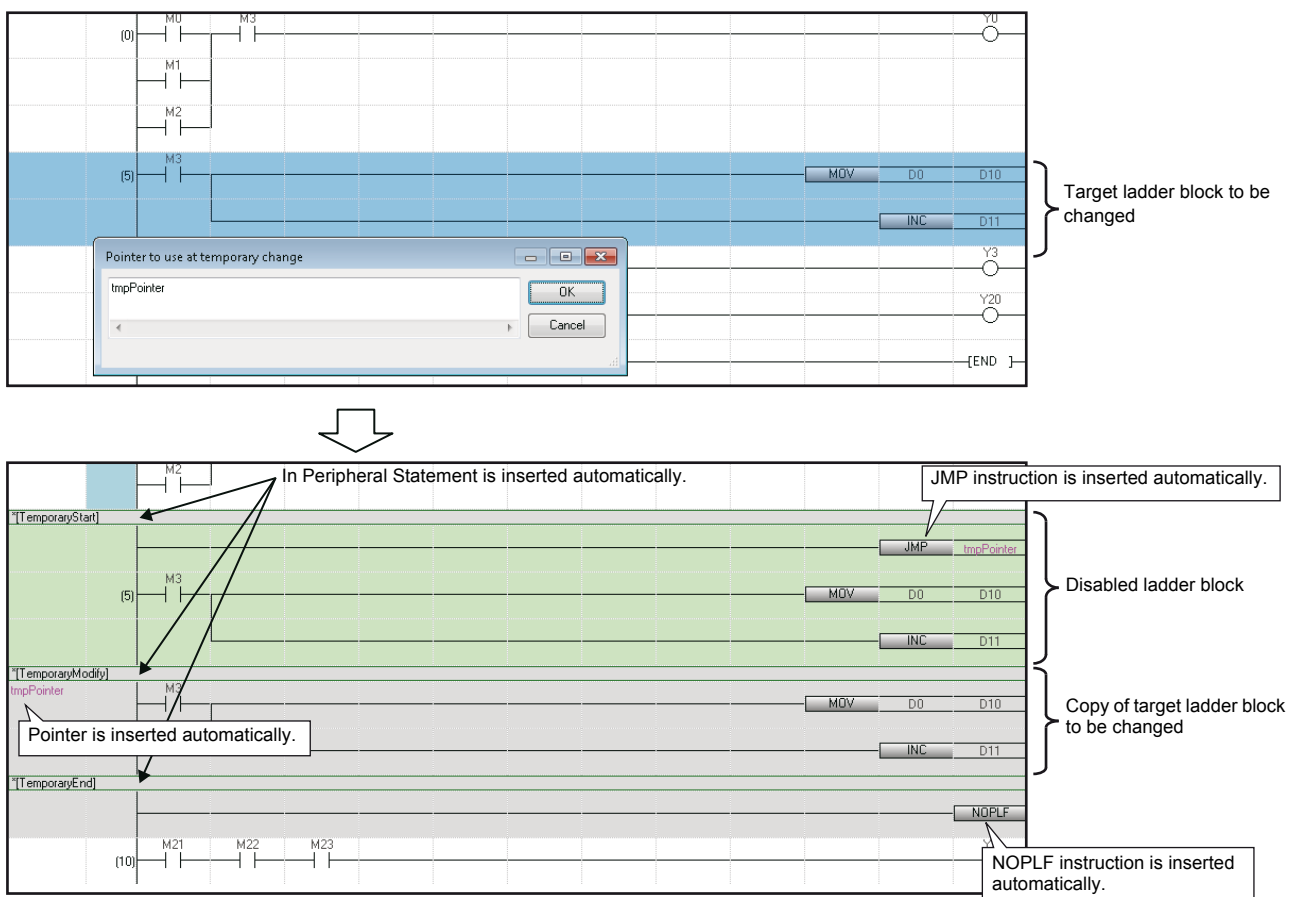
Temporary changing

Operating procedure

1. Select the ladder block to be changed, and then select [Edit] ⇨ [Temporarily Change Ladders] ⇨ [Temporarily Change Ladders] (≣).

2. Enter the pointer to be used.

When specifying a label for pointer, create the label in advance.

Peripheral statement/JMP instruction/Pointer/NOPLF instruction are inserted automatically as shown below and the selected ladder block is disabled. Besides, the copy of ladder block is created immediately below the disabled ladder block.

3. Edit the copied ladder block.

Precautions

In a program of function/function block, a pointer device can not be used temporarily. Only pointer type label is applicable.

Applying/restoring the changes

The changed ladder program is applied if no problem is found with the operation. If any problems are found, the change is restored.

Operating procedure

Select the ladder block from [TemporaryStart] statement to [TemporaryEnd] statement, and then select [Edit] ⇨ [Temporarily Change Ladders] ⇨ [Apply the Changes] (眉)/[Restore the Changes] (眉).

Considerations for editing the temporarily changed ladder block

When the temporarily changed ladder block was edited with the contents listed in the following table, the program may not be performed normally.

Description	
Statement	Delete/cut a statement.
	Insert a ladder block between the [TemporaryModify] statement row and the temporarily changed ladder block (which is the row setting a pointer).
	Delete the [TemporaryEnd] statement row and NOPLF instruction.
	Insert a ladder block/a statement/NOPLF instruction between the [TemporaryEnd] statement row and NOPLF instruction.
	Insert a statement before and after the [TemporaryStart] statement row.
JMP instruction, Pointer	Edit/delete a JMP instruction or a pointer.
Ladder block	Edit a disabled ladder block.
	Delete a disabled/temporarily changed ladder block.
	Copy and past a disabled/temporarily changed ladder block.

# Searching for/replacing data in program

The search functions that can be used in ladder editor are as follows.

Function name	Description
Simple search for instruction devices/labels	Searches a device/label and moves the cursor on it.
Jump	Moves the cursor on a specified Step No.
Cross reference	Checks devices, label declaration locations, and referenced locations in a list.
Device list	Checks the usage of devices being used.
Search and replace	• Finds and replaces a device name, label name, instruction name, and character strings. • Changes open/close contact. • Replaces devices in a batch.

Simple search for instruction devices/labels

Search for a device/label and move the cursor on the ladder editor.

Operating procedure

1. Press the ⟦Space⟧ key on the ladder editor.

2. Enter the device/label and click the [Find] button on the "Find" screen.

Jump

Specify a Step No., and move the cursor on a ladder editor.

Operating procedure

1. Select [Find/Replace] ⇨ [Jump].

2. Specify a Step No. on the "Jump" screen, and click the [OK] button.

Displaying instruction help

Check the instructions used in the ladder program on e-Manual Viewer.
To check the instructions, the files of the corresponding programming manual requires to be registered to e-Manual Viewer.

Operating procedure

1. Select the cell where the target instruction is entered.

2. Press the ⟦F1⟧ key.

6.4 Creating ST Programs

This section explains how to create an ST program.

The details on the specification of ST program are described in the following manual. Please read it in advance.

📖 MELSEC iQ-R Programming Manual (Program Design)

Configuration of ST editor

ST editor is a language editor in text format for creating programs in Structured Text.

Spaces, tabs, and line feeds can be entered between keywords and variable names of the ST control syntax.

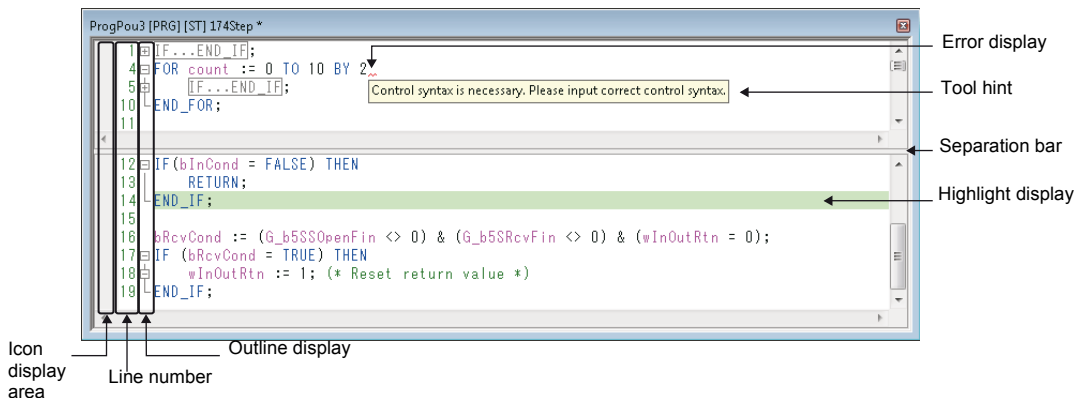Terms and symbols that configure the program is referred to as a token.

Window

Project view ⇨ "Program" ⇨ "(execution type)" ⇨ "(program file)" ⇨ "(program block)" ⇨ "Program"

●Toolbar

●ST editor

Displayed items

Item	Description	Related operation
Icon display area	The area to display icons.	■Icon type
Line number	The line numbers of a program.	■Changing display contents [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "ST Editor" ⇨ "Editor Display Items"
Highlighted display	The line on which the cursor is placed is highlighted.	
Error display	A syntax error of the program is displayed.	
Outline display	Symbols to display/hide the text blocks are displayed.	■Show/Hide • [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "ST Editor" ⇨ "Editor Display Items" • [View] ⇨ [Outline] ⇨ [Show/Hide of Outlines]
Tool hint	The information where the mouse cursor is placed over is displayed.	■Changing display contents [Tool] ⇨ [Options] ⇨ [Program Editor] ⇨ "ST Editor" ⇨ "Tool Hint"

■Icon type

Icon	Description
→	This icon is displayed on the line jumped from the Cross Reference window.
⊗	This icon is displayed on the error line jumped from the Output window.

■Colors of programs (default)

Figure	Description	Default color
	(1) Syntax	Blue
	(2) Device	Black
	(3) Operator	Black
	(4) Global label	Magenta
	(5) Error	Red
	(6) Local label	Magenta
	(7) Constant	Black
	(8) String constant	Black
	(9) Comment	Green

■Keywords for collapse and automatic indent

A line can be outlined and displayed collapsed by using the keywords shown below. Additionally, pressing the ⌷Enter⌷ key in a control syntax inserts an indent automatically.

Category	Start	End	Automatic indent
Comment texts	(*	*)	×
	/*	*/	×
Selection statement	IF	END_IF	○
	CASE	END_CASE	○
While loop	FOR	END_FOR	○
	WHILE	END_WHILE	○
	REPEAT	END_REPEAT	○

Entering programs

This section explains how to enter an ST program.

For the functions/instructions used in ST programs, refer to the following manuals.

📖 MELSEC iQ-R Programming Manual (Program Design)

📖 MELSEC iQ-F FX5 Programming Manual (Program Design)

Point

Press the ⌷Ctrl⌷ + ⌷Shift⌷ + ⌷=⌷ keys to enter an assignment operator (:=).

Precautions

When an ST editor is set to read-only or monitoring, the program cannot be edited.

Inserting instructions, functions, and control syntaxes

Instructions, functions, and control syntaxes can be entered by entering text using keyboard or by dragging and dropping them. The input control syntaxes, operators, devices, and TRUE/FALSE are changed to the upper-case characters automatically. Labels can be entered with aliases.

■Specification method for data type of device

Normally, the data type of a word device is handled as INT (Word [Signed]) on the ST editor.

By adding a suffix that indicates data type (type specifier) to a device name, the devices in which 32-bit integer or real number is stored can be described directly in the operation formula without defining labels.

For details, refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

Inserting function blocks

Insert a function block to an ST program.

For the creation methods of a program in a function block, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Operating procedure

1. Drag and drop a function block to an arbitrary position on an ST editor from the Project view or Element Selection window.

2. Enter the information of a label (FB instance) on the "Undefined Label Registration" screen.

3. Enter the values for the input variables and output variables.
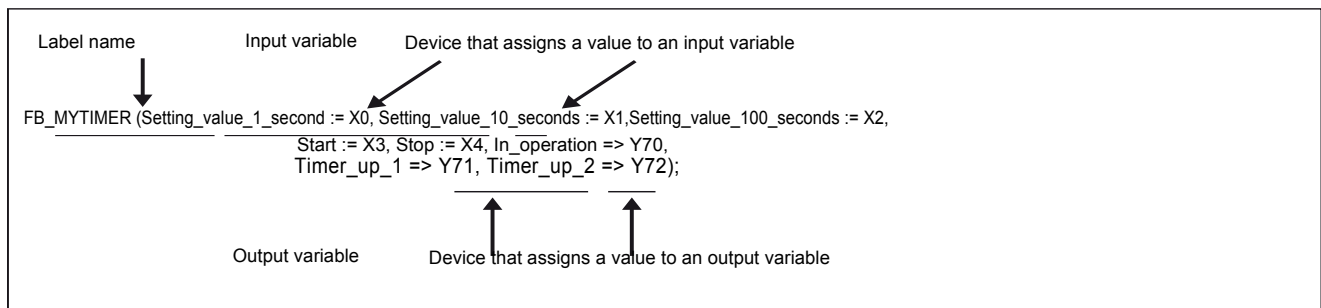
Ex.

When the defined function block is "MYTIMER"

[Details of defined function block]

Label name: FB_MYTIMER

Input variable: Setting_value_1_second, Setting_value_10_seconds, Setting_value_100_seconds, Start, Stop

Output variable: In_operation, Timer_up_1, Timer_up_2

The example of entering ST program are shown below.

```
Label name          Input variable      Device that assigns a value to an input variable

FB_MYTIMER (Setting_value_1_second := X0, Setting_value_10_seconds := X1,Setting_value_100_seconds := X2,
            Start := X3, Stop := X4, In_operation => Y70,
            Timer_up_1 => Y71, Timer_up_2 => Y72);


Output variable    Device that assigns a value to an output variable
```

The output of the function block can be obtained by specifying the output variable name with a period (.) suffixed to the function block name.

Enter an instruction to obtain the output after performing the function block call.

```
Y70: = FB_MYTIMER. In operation;
```

Inserting functions

Insert a function in an ST program.

For the creation methods of FUN programs, refer to the following section.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Operating procedure

1. Drag and drop a function to an arbitrary location on the ST editor from the Project view or Element Selection window.

2. Enter the arguments.

Inserting indention

A tab is inserted as an indentation at the head of a new line automatically when a line feed is inserted during program editing.

The tabulator length can be set in the following option setting.

• [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "ST Editor" ⇨ "Edit Operation"

Inserting comments

Enter a comment which does not affect the program processing. Or, comment out/uncommented the already entered programs in a batch.

■Entering comments

- When the line is one: Enter a comment after entering slashes '//'.
- When specifying the range: Enclose the comment in '/*' and '*/', or '(*' and '*)'.

■Batch comment out/uncomment of a program

1. Select a range to be commented out or uncommented. (Multiple lines can be selected.)

2. [Edit] ⇨ [Comment Out of Selected Range] ( ) /[Disable Comment Out of Selected Range] ( )

Registering undefined labels and displaying syntax templates

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Searching for/replacing data in program

The search functions that can be used in ST editor are as follows.

Function name	Description
Jump	Specifies a line number on an ST editor, and move to the corresponding line.
Cross reference	Checks devices[1], label declaration locations and referenced locations in a list.
Device list	Checks the usage of devices being used[1].
Search and replace	• Searches for and replaces a device name[1], label name, instruction name, and character strings. • Changes open/close contact. • Replaces devices in a batch.

*1   Search with a device name except for the device suffix part.

Jump

Specify a line number and move the cursor on a ST editor.

1. Select [Find/Replace] ⇨ [Jump].

2. Enter a line number of the program on the "Jump" screen, and click the [OK] button.

Displaying instruction help

Check the instructions used in an ST program on e-Manual Viewer.

To check the instructions, the files of the corresponding programming manual requires to be registered to e-Manual Viewer.

The applicability of help display is shown below.

Token type	Applicability
Operator, Control syntax, FB,Constant, variable, comment	×
Function	○

1. Place the cursor on the token of the target instruction.

2. Press the F1 key.

6.5 Creating FBD/LD Programs

This section explains how to create an FBD/LD program.

The details on the specification of FBD/LD program are described in the following manual. Please read it in advance.

📖 MELSEC iQ-R Programming Manual (Program Design)

> **Point** 🔑
>
> The display format and detailed operations for each function can be set by the following option setting.
> [Tool] ➪ [Options] ➪ "Program Editor" ➪ "FBD/LD Editor"

## Configuration of FBD/LD editor

FBD/LD editor is a graphical language editor to create programs by combining Function Block Diagram language with Ladder Diagram language.

Programs can be created only by placing the prepared elements vertically and horizontally, and connecting them.
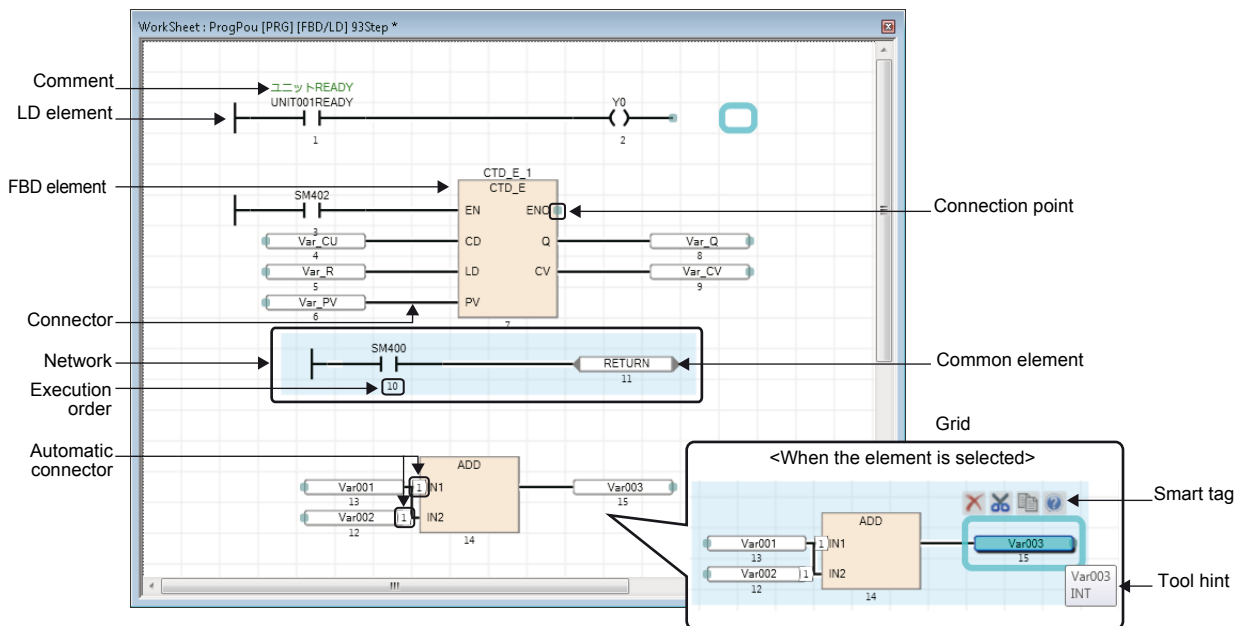
Window

Project view ➪ "Program" ➪ "(execution type)" ➪ "(program file)" ➪ "(program block)" ➪ "(worksheet)"
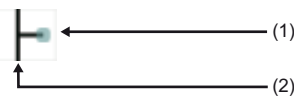
● **Toolbar**
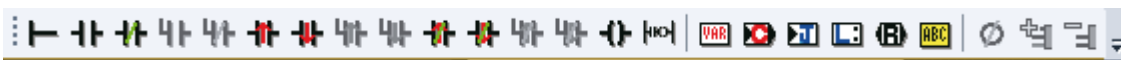
●**FBD/LD editor**

Displayed items
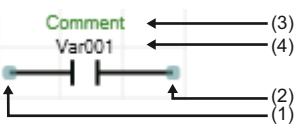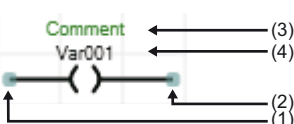
Item	Description	Related operation
Comment	A comment set to a device/label.	■Show/Hide [View] ➪ [Comment Display]
LD element	An element that constitutes a ladder program.	■Element type 📖 Page 61 LD element
FBD element	An element that constitutes an FBD program.	■Element type 📖 Page 62 FBD element
Common element	A common element used regardless of program language.	■Element type 📖 Page 62 Common element
Connector	A line that connects the connection points between elements. It is displayed by placing an element to be connected closer to the connection point on the connection target.	—

Item	Description	Related operation
Network	A single network (a single block) composed of all elements connected together.	■Releasing from a network Select the element to be released, and move it with the [Shift] key held down.
Execution order	The execution order of a program is displayed.	■Show/Hide [View] ⇨ [Display Execution Order]
Automatic connector	When a connector cannot be displayed due to the conditions where an element is placed, a number is displayed automatically. The same number of automatic connector indicates that they are connected.	—
Connection point	A terminal point to connect elements with a connector. By adding an element while a connection point is being selected, the element can be added with it connected already.	■Inverting contact 📖 GX Works3 Operating Manual (SW1DND-GXW3-E)
Grid	A grid line that serves as makers to place the elements.	■Show/Hide [View] ⇨ [Grid Display]
Smart tag	An operation button displayed around the selected element. Relevant functions can be performed by clicking the button.	■Show/Hide [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ FBD/LD Editor" ⇨ "Smart Tag"
Tool hint	The information on device/label and FB/FUN where the mouse cursor is placed over is displayed.	■Changing display contents [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "FBD/LD Editor" ⇨ "Tool Hint"

Elements

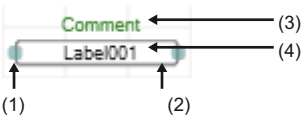The elements that can be used in FBD/LD program are shown below:
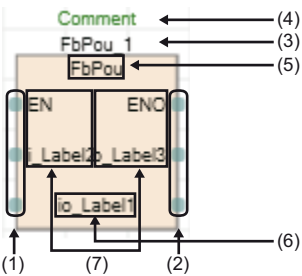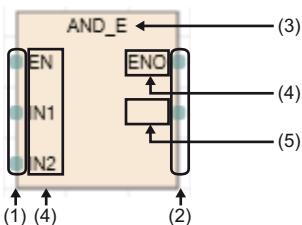
■LD element

Element	Name of each part	Description
Left power rail element	(1) Output connection point (2) Left power rail	The position of a left power rail can be placed at will, and it will be the starting point for creating a ladder program.
Contact element	(1) Input connection point (2) Output connection point (3) Label comment/device comment[*1] (4) Device/label	Specify the device/label. It transmits the ON/OFF signal according to the specified information. For details on the element, refer to the following manuals. 📖 MELSEC iQ-R Programming Manual (Program Design) 📖 MELSEC iQ-F FX5 Programming Manual (Program Design)
Coil element		Specify the device/label. It outputs the signal to the specified device/label according to the transmitted ON/OFF signal. For details on the element, refer to the following manuals. 📖 MELSEC iQ-R Programming Manual (Program Design) 📖 MELSEC iQ-F FX5 Programming Manual (Program Design)

*1 Displaying/hiding a comment is switched by the following option setting.
    [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ FBD/LD Editor" ⇨ "Comment" ⇨ "Display Label/Device Comment"

■FBD element
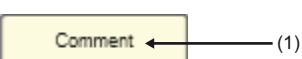
Element	Name of each part	Description
Variable element Comment (3) Label001 (4) (1) (2)	(1) Input connection point (2) Output connection point (3) Label comment/device comment[*1] (4) Device/label	Specify the device/label. Information can be obtained/stored in the specified device/label. It is switched to a constant element by entering a constant.
Constant element (2) 100 (1)	(1) Output connection point (2) Constant value	Specify a constant. The specified constant can be output. It is switched to a variable element by entering a device/label.
Function block element Comment (4) FbPou_1 (3) FbPou (5) EN ENO i_Label2 o_Label3 io_Label1 (1) (7) (2) (6)	(1) Input connection point (2) Output connection point (3) FB instance name (label) (4) Label comment (5) Data type (6) Input/output label (VAR_IN_OUT) (7) Input/output label (other than VAR_IN_OUT)	Indicates a block for function corresponding to the data type. It is used with an FB instance name assigned to each element. For details on the element, refer to the following section. 📖 GX Works3 Operating Manual (SW1DND-GXW3-E)
Function element AND_E (3) EN ENO (4) N1 (5) N2 (1) (4) (2)	(1) Input connection point (2) Output connection point (3) Data type (4) Input/output label (argument) (5) Return value	Indicates a block for function corresponding to the data type. The name is not displayed in the return value. For details, refer to the following section. 📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

*1 Displaying/hiding a comment is switched by the following option setting.
[Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ FBD/LD Editor" ⇨ "Comment" ⇨ "Display Label/Device Comment"

■Common element
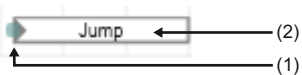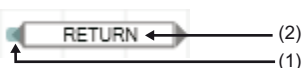
For a jump element and a return element, inverting contact on its connection point is not available.

Element	Name of each part	Description
Jump element Jump (2) (1)	(1) Input connection point (2) Label[*1]	It is used to jump the execution processing from a jump element to a jump label element.
Jump label element Jump (1)	(1) Label[*1]	Enter a label to be specified as the jump destination.
Connector element CONNECTOR (3) (2) (1)	(1) Input connection point (2) Output connection point (3) Connector label	It is used instead of a connector when placing a network in the display range/print range on the editor. The same connector label indicates that they are connected.
Return element RETURN (2) (1)	(1) Input connection point (2) Character string, "RETURN" (Uneditable)	It is used to suspend the processing in the middle of processing.
Comment element Comment (1)	(1) Comment display area	It is used to enter a comment. Double-click it with a mouse cursor placed on the frame of the element in order for the size to be adjusted automatically according to the character string.

*1 Only local label of which data type is pointer can be specified.

Entering programs

This section explains how to enter an FBD/LD program.

Adding elements

Operating procedure

■Using the edit box

Select[*1] a cell that the element is to be added, then enter a label name or data type of FB/FUN directly.

An element name and label name can be edited directly by selecting a placed element and pressing the ⌷F2⌷ key.

The following items can be entered:

- Device/label
- Constant
- FB/FUN

*1 The options of instruction/label can be displayed by pressing the ⌷Ctrl⌷ + ⌷Space⌷ keys.
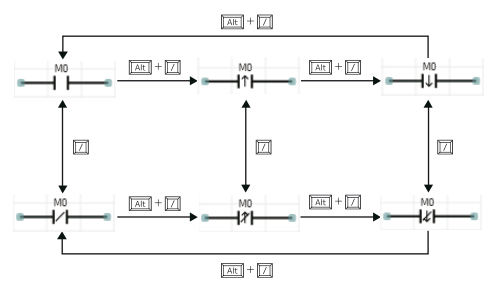
■Inserting from the menu/toolbar
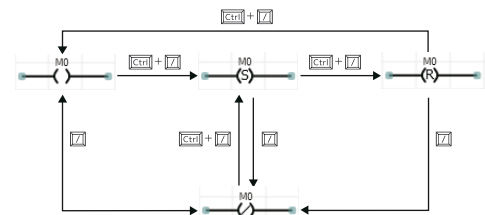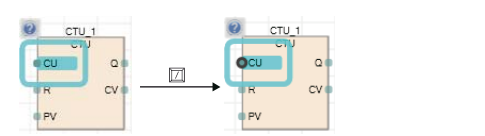
Select a cell to which an element is to be added on the FBD/LD editor, then select [Edit] ⇨ [Add Element] ⇨ [(element)]. It can also be added by selecting from the toolbar.

■Inserting from the Element Selection window

Select an element from the Element Selection window, and drag and drop it on the FBD/LD editor.

■Switching methods for contacts/instructions

Select a contact/instruction to be switched, and select [Edit] ⇨ [Easy Edit] ⇨ [Invert Contact (Open/Close)](🗘)/[Switch Pulse](🗘)/[Switch SET and RST](🗘) or follow the methods shown below.

Switching contacts and instructions	Shortcut key	Remarks
Switching open/close contact, raising/falling pulse		—
Inverting contact, switching SET/RST instructions		—
Inverting contact on connection point of FB/FUN		Only when the data type of the connection point is one of the following: • Bit • Word [Unsigned]/Bit String [16-bit] • Double Word [Unsigned]/Bit String [32-bit] • ANY_BIT • ANY_BOOL

■Specification method for data type of device

On the FBD/LD editor, word device as the data type can be specified.

By adding a suffix that indicates data type (type specifier) to a device name, the data type can be identified.

For details, refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

Common operations of elements

Operation		Operating procedure	
		Mouse	**Keyboard**
Select	To select a single element	Click an element to be selected.	Move the cursor on an element to be selected.
	To select multiple elements	• Click multiple elements with the Ctrl/Shift key held down. • Click the background of the FBD/LD editor, and drag it diagonally.	Select multiple elements by moving the cursor with the Shift key held down.
	To select a network	Click an element, and select [Edit] ⇨ [Select Network].	Select an element and press the Ctrl + Shift + A keys.
	To select whole elements	The operation is same as the one for selecting multiple elements.	Press the Ctrl + A keys.
Change a name		Double-click the element of which name is to be changed, and enter a name.	Select the element of which name is to be changed, and press the Enter *1/F2 key, or enter a name.
Move		Click the element to be moved, and drag and drop it on the desired position. (By moving an element with the Shift key held down, it can be separated from the network and moved.)	Select the element to be moved, and press the Ctrl + Shift + ←/→/↑/↓ keys.
Connector	To connect	• Click a connection point, and drag it to a target connection point. • Click the element to be connected, and drag it closer to a target connection point.	—
	To replace	—	Select a connector with the Shift key held down, and drag and drop it on a connection point of an element.
	To insert an element	Click an element, and move it to a connected connector with the Shift key held down. (Only an element which has a connection point on the same level at the input/output side)	—

*1   For function element and function block element, this follows the operation for double-clicking, which is selected from [Tool] ⇨ [option] ⇨ "Program Editor" ⇨ "FBD/LD Editor".

Replacing function elements/function block elements

Operating procedure

1. Select a function element/function block element.

2. Select [Edit] ⇨ [Change FB/FUN Data], and enter the data type to be changed.

Point

The element also can be replaced by dragging an element from the Element Selection window and dropping it on the element to be changed.

For function elements, similarly, the data type can be changed by selecting a function element and entering a new data type directly.

Adding/deleting arguments

Only for functions of which number of arguments can be changed, the arguments can be added/deleted.

Operating procedure

1. Move the cursor on a function element.

2. Select [Edit] ⇨ [I/O Argument] ⇨ [Increment Argument]( )/[Delete Argument]( ).

Updating undefined FBs/FUNs

When a definition of a pasted element is unsure due to its deletion or change, or an element without the definition information is pasted, it is displayed as shown below resulting in an error.

Select [Edit] ⇨ [Update FB/FUN], and update the definition information.

When the data type of FB/FUN has been changed, select [Edit] ⇨ [Update FB/FUN].

Inserting/deleting rows and columns

Operating procedure

■**Inserting a row**

Select a cell in the row to be inserted, then select [Edit] ⇨ [Insert Row].

A row will be inserted on the selected cell.

■**Deleting a row**

Select a cell in the row to be deleted, then select [Edit] ⇨ [Delete Row].

The row that contains the selected cell will be deleted. If the elements exist in the row that is same as the selected cell, the row will not be deleted.

■**Inserting/deleting a column**

Move the cursor in the network that a column will be inserted/deleted, then select [Edit] ⇨ [Insert Column of Network]/[Delete Column of Network].

A column is inserted/deleted within the range of network.

Pasting from each screen

Paste a label name/device name by dragging and dropping from the label editor and the device comment editor.

Registering undefined labels

When an undefined label is entered, the "Undefined Label Registration" screen is displayed and it can be registered on the label editor.

Searching for/replacing data in programs

The search functions that can be used in FBD/LD editor are as follows.

Function name	Description
Cross reference	Checks devices, label declaration locations, and referenced locations in a list.
Device list	Checks the usage of devices being used.
Search and replace	• Searches for and replaces a device name, label name, instruction name, and character strings. • Changes open/close contact. • Replaces devices in a batch.

Displaying help

Check the elements used in the FBD/LD program on e-Manual Viewer.

To check, the files of the corresponding programming manuals requires to be registered in e-Manual Viewer.

Operating procedure

1. Select the element to be checked.

2. Press the F1 key.

6.6 Creating SFC Programs

This section explains how to create an SFC program.

The details on the specification of SFC program are described in the following manual. Please read it in advance.

📖 MELSEC iQ-R Programming Manual (Program Design)

> **Point** 🔎
>
> The display format and detailed operations for each function can be set by the following option setting.
> [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "SFC Diagram Editor"

Creation procedure

1. Set the point of step relay(S) in the detailed setting in the "Device/Label Memory Area Detailed Setting" of CPU parameter. (The default point of step relay(S) is 0 points.)

2. Create new SFC data. (🖙 Page 20 Creating Project File)

3. Configure the following settings if needed.
 • the "SFC Setting" of CPU parameter.
 • The "Act at Block Multi-Activated" setting to program files
 • The "SFC information device"to blocks (Block information)

For details, refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

4. Open the SFC diagram editor, then create an SFC diagram. (🖙 Page 70 Creating SFC diagrams)

5. Edit a program of action/transition. (🖙 Page 80 Creating/displaying Zooms (action/transition))

Configuration of SFC diagram editor

The SFC diagram editor is a graphical language editor to show a sequence control as a state transition diagram.

By simply inserting the prepared SFC elements along the operation flow, the each element is connected automatically and a program can be created.

Window

Select "Program" ⇨ "(execution type)" ⇨ "(program file)" ⇨ "(block)" ⇨ "Program" on the Project view.

Immediately after creating a program, SFC elements that are necessary to create a program such as an initial step and end step are placed.

● **Toolbar**
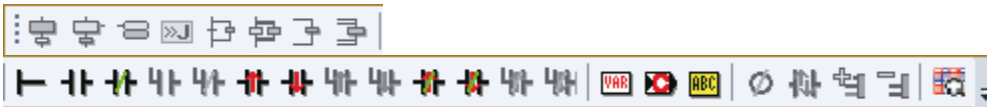
● **SFC diagram editor**

Displayed items

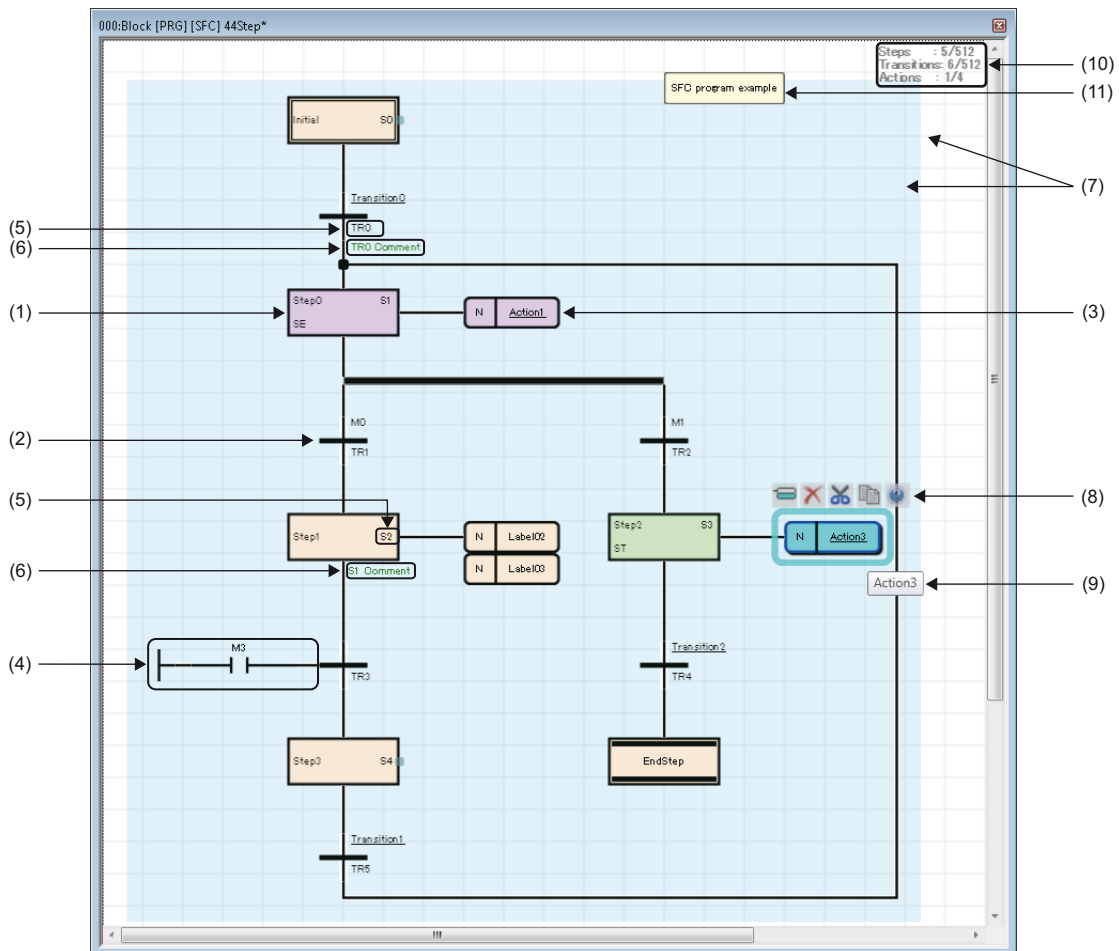| Item		Description	Related operation
SFC element	(1) Step	Indicates one processing of a program.	—
	(2) Transition	Indicates a condition (transition conditions) to move to the next step. Transitions are written in a Zoom or on an SFC diagram, and they can be displayed in multiple formats. For details, refer to the following section. 📖 GX Works3 Operating Manual (SW1DND-GXW3-E) Ladder Diagram, Structured Text, and Function Block Diagram / Ladder Diagram can be used in a Zoom.	■Displaying a start destination block [View] ⇨ [Open Zoom/Start Destination Block]
	(3) Action	Indicates an assigned operation output to a step. Actions are written in a Zoom or an SFC diagram, and they can be displayed in multiple formats. For details, refer to the following section. 📖 GX Works3 Operating Manual (SW1DND-GXW3-E) Ladder Diagram, Structured Text, and Function Block Diagram / Ladder Diagram can be used in a Zoom.	■Displaying a start destination block [View] ⇨ [Open Zoom/Start Destination Block]
(4) FBD/LD element		An FBD/LD element that can be used only for a transition. The elements that can be used on an SFC diagram differs from the one for an FBD/LD editor. For details, refer to the following manual. 📖 MELSEC iQ-R Programming Manual (Program Design)	■FBD/LD element type ☞ Page 61 Elements ■Editing method ☞ Page 63 Entering programs
(5) Step No./Transition No.		An assigned number to a step/transition automatically by conversion. 'S' (Step relay) of CPU module are assigned to steps. Step relays (S□) are used for SFC control instructions, the current value change in monitor/Watch window, and the data logging/Memory Dump function. The assigned number can be changed.	■Show/Hide [View] ⇨ [Display Step/Transition] ■Changing assigned numbers ☞ Page 79 Editing Step No./Transition No.
(6) Device comment		The device comment of a Step No. (S□)/Transition No. (TR□) is displayed. The device comment which was set to transitions/actions is not displayed.	■Input ■Show/Hide [View] ⇨ [Comment Display]
(7) Grid		A grid line that serves as makers to place the elements.	■Show/Hide [View] ⇨ [Grid Display]
(8) Smart tag		An operation button displayed around a selected element. Relevant functions can be performed by clicking the button.	■Show/Hide [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "SFC Diagram Editor" ⇨ "Smart Tag"
(9) Tool hint		Information where the mouse cursor is placed over is displayed.	■Changing display contents [Tool] ⇨ [Options] ⇨ "Program Editor" ⇨ "SFC Diagram Editor" ⇨ "Tool Hint"
(10) Information area		"Number of used/maximum number" of SFC elements are displayed. The font color is changed in red when the number of used reached to the maximum number. SFC elements cannot be created once the number reached to the maximum number. In that case, arrange the number of elements, for example, by deleting.	—
(11) Comment		Comments can be put on an SFC editor. The comments does not affect to the program. The frame size of a comment can be adjusted to match to the comment length by placing the mouse cursor on the frame and double-clicking it.	—

SFC element

The following shows elements which can be used in an SFC program.

For details on creatable numbers of block/each element, action, and each element, refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

Items		Description
Step (1) Step name (2) Step No. (S□) (3) Step attribute (4) Step attribute target	■Initial step 	Indicates the head of a block. An initial step is necessary in a block. The operation of a step can be changed by specifying the step attribute. For details, refer to the following manual. 📖 MELSEC iQ-R Programming Manual (Program Design)
	■Normal step 	Once a transition that places under a step is satisfied, the next step is activated. The operation of a step can be changed by specifying the step attribute. For details, refer to the following manual. 📖 MELSEC iQ-R Programming Manual (Program Design)
	■End Step 	Indicates the end of a block. Step No. is not assigned to an end step.
Transition (1) Transition name (2) Transition No. (TR□)	■Series transition 	Moves the processing to a next step.
	■Selection branch 	Indicates a branch displayed with a single line for selecting one processing.
	■Simultaneous branch 	Indicates a branch displayed with a double line for performing multiple processing simultaneously.
	■Jump 	Makes the execution processing jump to the specified step in the same SFC block. A jump and a connection line can be switched.
Action (1) N: Qualifier (2) Action name		Once the steps are activated, the assigned action will be executed. 'N' indicates that an action perform when the step is activated. Other than 'N' cannot be set.

Display format of action/transition

There are multiple display formats (types) for actions/transitions on the SFC editor in GX Works3.

Programs can be shown in the equivalent display formats to MELSAP3 and MELSAP-L (start condition format) in GX Works2 by changing the display formats (type).

Type	Target SFC element	Display format in GX Works2
Detailed expression	Action, transition	MELSAP3
Label/device		MELSAP-L (start condition format)
Direct expression	Transition only	—
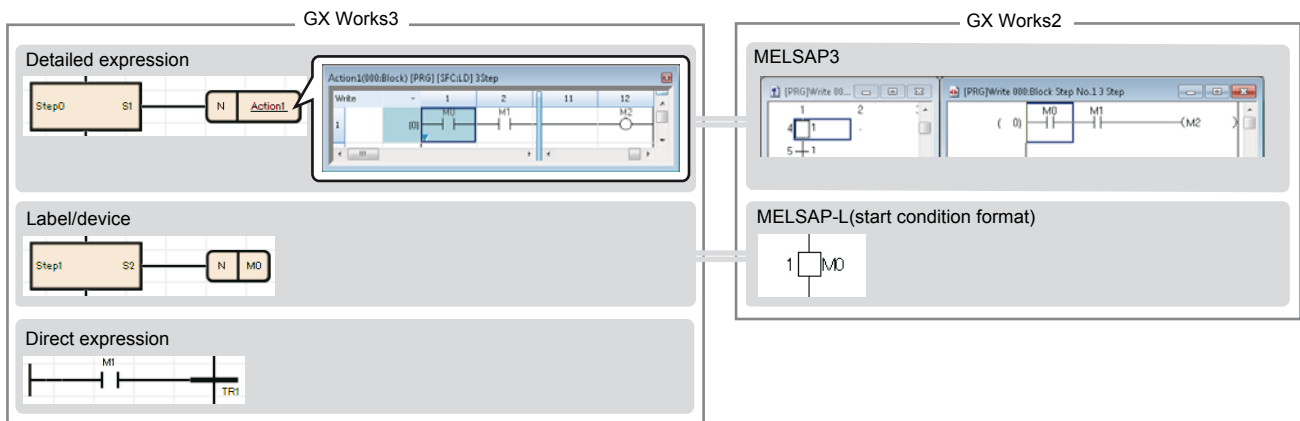
- Action name/transition name is underlined when selecting the detailed expression.
- "*" is displayed to the transition name that is not connected with an FBD/LD element

Creating SFC diagrams

This section explains how to create an SFC diagram.

Elements which can be inserted are different depending on selected places.

Since the size or place of each element/connection line are placed automatically, it cannot be freely changed.

Precautions

When the contents shown below were entered/selected, a red frame appears in the edit box and the settings cannot be configured.
- Duplicate step name/Step No./Transition No.
- Unusable step attribute
- Step name which cannot be specified as a jump destination

Inserting/editing steps

■Inserting a step

Select a step/transition/jump, then select [Edit] ⇨ [Insert] ⇨ [Step] (🖶).

■Changing a step name/step.No./step attribute/step attribute target

- Using a shortcut key (Step names only can be changed):
  Select a step, and press the 〚F2〛 key.
- On the "Step Properties" screen:
  Select a step, then select [Edit] ⇨ [Properties].
- From the menu:
  Select a step, then select [Edit] ⇨ [Modify] ⇨ [(each item)].
- Double-click:
  Double-click a step. The target to be changed is different depending on the place double-clicked.

By entering a Step No./number to the edit box for changing a step name, the entered number is set as the step name or the Step No.
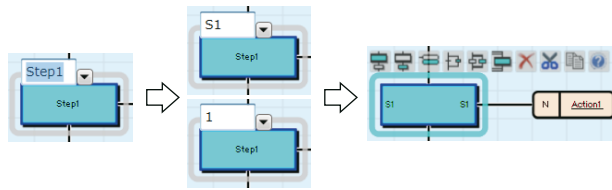
■Changing a normal step to an end step

Select a step to be chenged, then select [Edit] ⇨ [Modify] ⇨ [End Step/Jump].

All SFC diagram written below the changed step are deleted.

■Entering comments of Step No.

Enter a comment on the "Step Properties" screen/the device comment editor.

■Creating a step that makes another block activated

A step that activates another block when a step was activated (block start step) is creatable.

1. Insert a step.

2. Specify 'BC' or 'BS' for the step attribute.

3. Specify a block No. to be activated for the step attribute target.

To check the step, which is to be the specification source, from the block specified as the step attribute target, select [View] ⇨ [Open Start Source Block].

For details on the performance of step attribute (BC/BS), refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

■Creating a step that makes a step being held deactivated

A step that deactivates a step being held when a step was activated (reset step) is creatable.

1. Insert a step.

2. Specify 'R' for the step attribute.

3. Specify a step name to be deactivated for the step attribute target.

When 'S999' is specified to a step name, all steps being held will be the target.

For details on the performance of step attribute (R), refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

Inserting/editing transitions

■Inserting a transition

Select a step/transition/jump, then select [Edit] ⇨ [Insert] ⇨ [Transition] (🖳).

■Changing a transition name/Transition No.

• Using a shortcut key (Transition names only can be changed):

Select a transition, and press the F2 key.

• On the "Transition Properties" screen:

Select a transition, then select [Edit] ⇨ [Properties].

• From the menu:

Select a transition, then select [Edit] ⇨ [Modify] ⇨ [Name]/[Device].

• Double-click:

By double-clicking a Transition No. (☞ Page 69 SFC element), it can be changed. By double-clicking a transition name, the Zoom is created/displayed.

For a transition that a Zoom has been created, the data name of Zoom will not be changed if the transition name was changed. Modify the data name to match with the transition name on the "Zoom List" screen.

By entering a Transition No./number to the edit box of which the transition name is to be changed, the entered values are set as the transition name and the transition No.
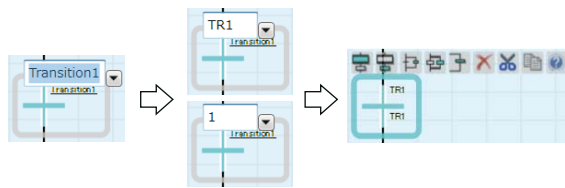
■Creating a transition

There are four ways of creation method for transitions.

Each transition has a different type. The type can be checked on the "Transition Properties" screen.

Creation method		Operating procedure	Type
In a Zoom	Create conditions with a program	☞ Page 80 Creating/displaying Zooms (action/transition)	Detailed expression
On an SFC diagram	Use TRUE/FALSE as conditions	Select a transition, then enter TRUE/FALSE in the transition name.	Label/device
	Use ON/OFF of bit device/bit type label as conditions	Select a transition, then enter a bit device/bit-specified word device, or a bit type label in the transition name.	Label/device
	Create a condition with FBD/LD element	Select [Edit] ⇨ [Modify] ⇨ [Direct Expression for Transition], then connect with an FBD/LD element.	Direct expression

■Entering comments of /Transition No.

Enter a comment on the "Step Properties" screen/device comment editor.

Inserting/editing actions

■Inserting an action

Select a step/an action, then select [Edit] ⇨ [Insert] ⇨ [Action] (🖢).

Multiple actions can be inserted in a step.

If all actions in a step are deleted, a transition is only checked all the time while a step is activated. Once the transition was satisfied, the next step is activated.

Steps without actions can be used when synchronizing the steps that are performing simultaneously etc.

■Changing an action name

Click the action, then select [Edit] ⇨ [Modify] ⇨ [Name]/press the F2 key.

For an action that a Zoom has been created, the data name of Zoom will not be changed if the action name was changed. Modify the data name to match with the action name on the "Zoom List" screen. (☞ Page 80 Creating/displaying Zooms (action/transition))

■Creating an action
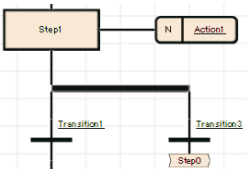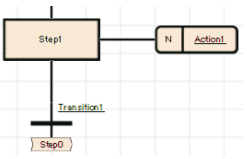
There are two ways of creation method for actions.

Each action has a different type. The type can be checked on the "Action Properties" screen.

Creation method		Operating procedure	Type
In a Zoom	Create an action with a program	☞ Page 80 Creating/displaying Zooms (action/transition)	Detailed expression
On an SFC diagram	Use ON/OFF of bit device/bit type label as an action	Select an action, then enter a bit device/bit-specified word device, or a bit type label in the action name.	Label/device

Inserting/editing jumps

■Inserting a jump

Insertion position	Method
	1. Select a transition, then select [Edit] ⇨ [Insert] ⇨ [Jump] (⊠J). 2. Select a step name of jump destination.
	1. Select a transition, then select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line]. 2. Select a step name of jump destination. All SFC diagram written below the inserted jump are deleted.

■Changing a jump destination

1. Select the transition which is immediately before the jump, then select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line].

Alternatively, select the jump, and press the F2 key.

2. Select the step name of jump destination which is to be changed.

■Switching a jump/connection line

Select a jump, then select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line].

To restore a connection line to a jump, select the connection line, then select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line].

Inserting/adding selection branches and simultaneous branches

■Inserting a branch below a step/transition

Select a step/transition, then select [Edit] ⇨ [Insert] ⇨ [Selection Branch] (⊞)/[Simultaneous Branch] (⊞).

When a selection branch/simultaneous branch was inserted, the lacking SFC elements are inserted automatically to make it be a proper SFC diagram.

■Adding a selection branch on the right side of a transition/selection condition

Select a transition/selection branch to which a new one will be added, then select [Edit] ⇨ [Insert] ⇨ [Selection Branch Leg] (⊞). (Multiple selections allowed.)
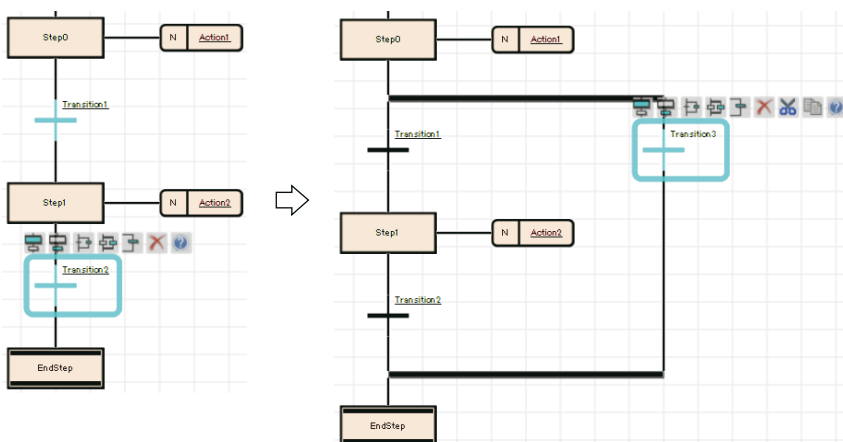
■Adding a simultaneous branch on the right side of a step/simultaneous branch

Select a step/simultaneous branch to which a new one is added, then select [Edit] ⇨ [Insert] ⇨ [Simultaneous Branch Leg] (⬚). (Multiple selections allowed.)
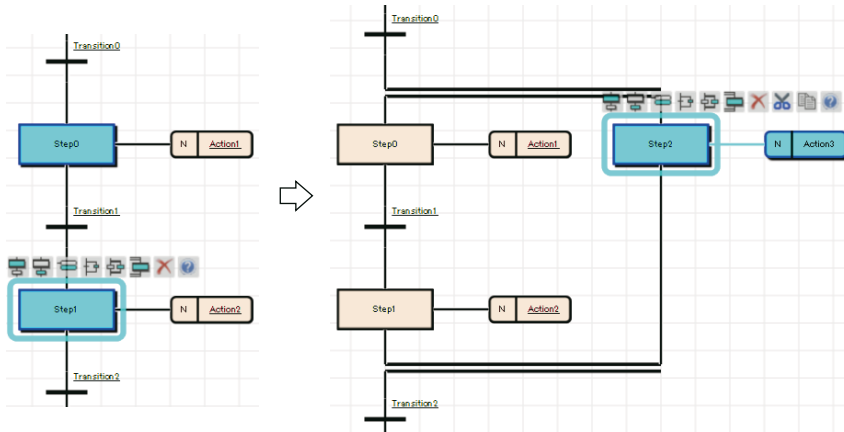
Common operations of SFC elements

Operation		Operating procedure	
		Mouse	Keyboard
Select	To select a single element	Click an element to be selected.	Move the cursor on an element to be selected.
	To select multiple elements	• Click multiple elements with the `Shift` key held down. • Click the background of the SFC diagram editor, and drag it diagonally.	Select multiple elements by moving the cursor with the `Shift` key held down.
	To select a network	Click an element, then select [Edit] ⇨ [Select Network].	Select an element, then press the `Ctrl`+`Shift`+`A` keys.
	To select whole elements	The operation is same as the one for selecting multiple elements.	Press the `Ctrl`+`A` keys.

Deleting/cutting/copying/pasting/moving SFC elements

Some elements cannot be used by itself on the SFC editor. When SFC elements were deleted/cut/pasted, the other elements, that is not the target for this change, may be deleted/pasted to make a normal SFC diagram.

For the following elements, the previous elements of them also are deleted. For other elements, the next elements are deleted together.

• End step
• Step/transition that are placed immediately before a branch
• The last step/transition in a branch

A selected element cannot be pasted onto the other place where is not connected with a line on an SFC diagram.

For copying FBD/LD elements between editors, only pasting from the FBD/LD editor to the SFC diagram editor is available.

Precautions

When a Zoom has already been created, the Zoom will not be deleted if a step/transition/action is deleted on an SFC diagram. Delete it on the "Zoom List" screen. (☞ Page 80 Creating/displaying Zooms (action/transition))

If the action that the Zoom has been created is copied, the Zoom is not copied to the destination.

■Step

- When deleting an end step, the transition placed immediately before the end step also is deleted. Thereby, the step that connects to the above transition is changed to an end step. If the element above of the end step is a branch, the branch also is deleted.
- Operation examples of cutting/pasting:

  If the step (1) was cut, the next transition (2) is deleted together. If the step is pasted with selecting the step (3), the lacking transition (4) of the step (3) will be inserted.
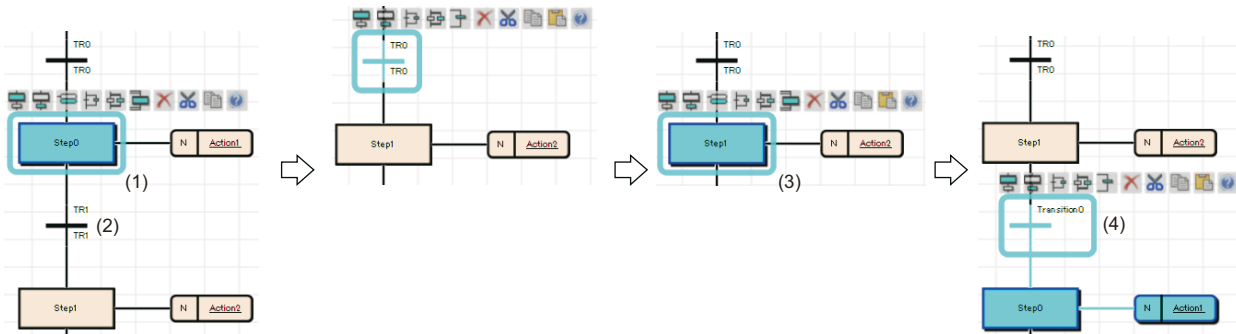
- Duplicate step names and Step No. cannot exist on an SFC diagram.

  When copying a step of which the step name is 'Step0' and the Step No. is 'S1' on a same SFC diagram, the step is pasted with a different name (Step1) and without the Step No. (S1). Step No. (S2) is assigned again by convention.
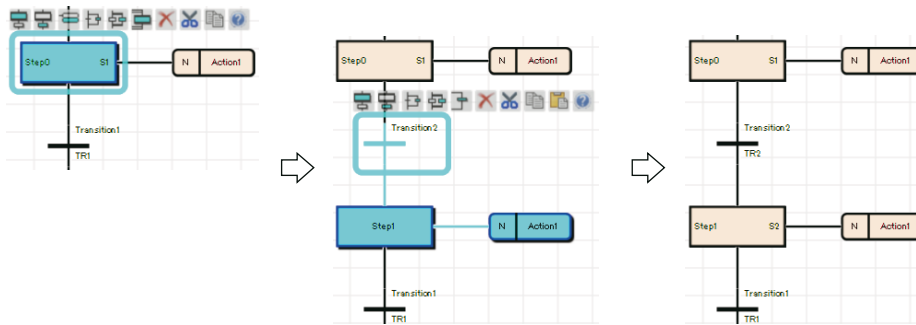
■Transition

Duplicate Transition No. cannot exist on an SFC diagram. When copying a Transition No. on a same SFC diagram, the Transition No. is pasted without Transition.No. Transition No. (TR□) is assigned again by convention.

■Action

Cut/copy an action, and paste it selecting a step/action of the destination.

Actions can be copied/moved by dragging and dropping. Note that the methods are different depending on the place where it will be dropped.

Method	Example
Drag and drop an action (Action3) onto a target action (Action1). The orders of those actions will be switched.	
Drag and drop an action (Action3) to the same height of a target action (Action1). The action (Action1) will be overwritten.	
Drag and drop an action (Action2) onto a target step (Step1). The action (Action2) will be moved. (An action (Action2) can be copied by dragging the action with pressing ⌜Ctrl⌟ key.)	

■Jump

- Deleting a jump only is not applicable. Switch the jump to a connection line first.
- It is not applicable to copy a jump only. Copy a jump source and a jump destination, and paste them.

  The following is an example image when selecting and pasting a transition (Transition0). When selecting an end step, it is pasted as well.
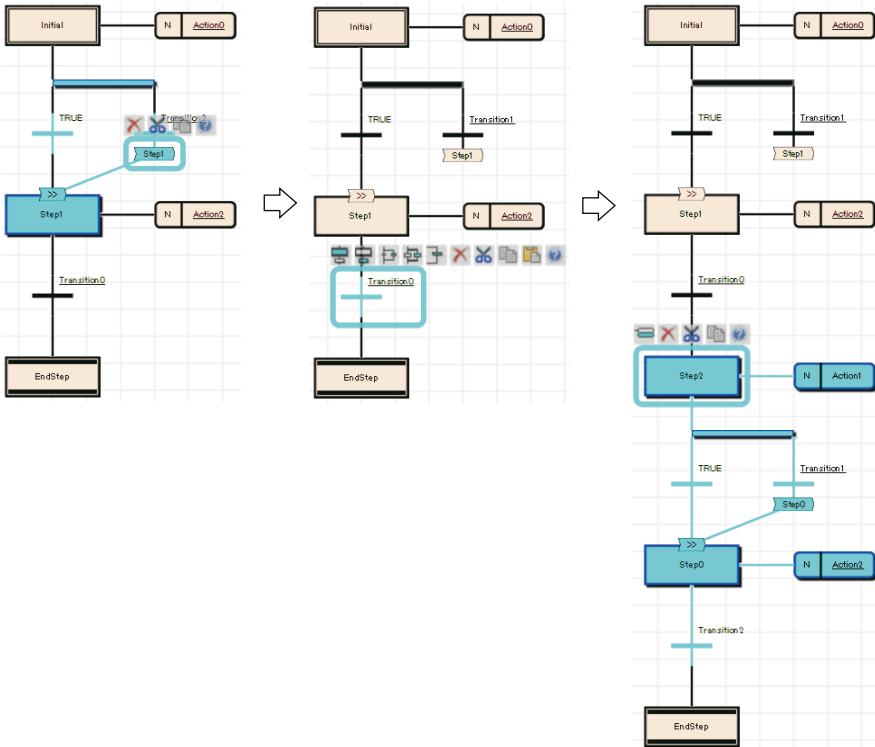
■Selection branch

Drag and drop a step or a transition onto the left/right side of a selection branch. The orders of those branches is switched.
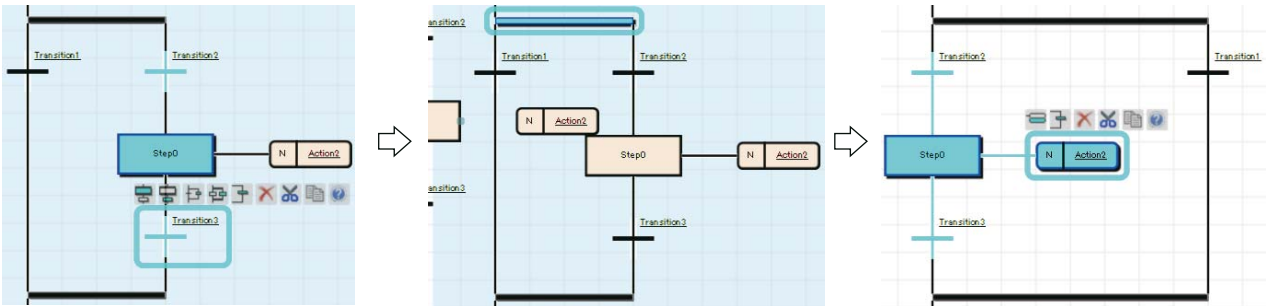
Precautions

The left side of transition is given priority to perform when both side of transitions were satisfied at a same time. Check the operation of SFC program before switching branches.

■Simultaneous branch

Drag and drop a step and a transition onto the simultaneous branch. The orders of those branch will be switched.
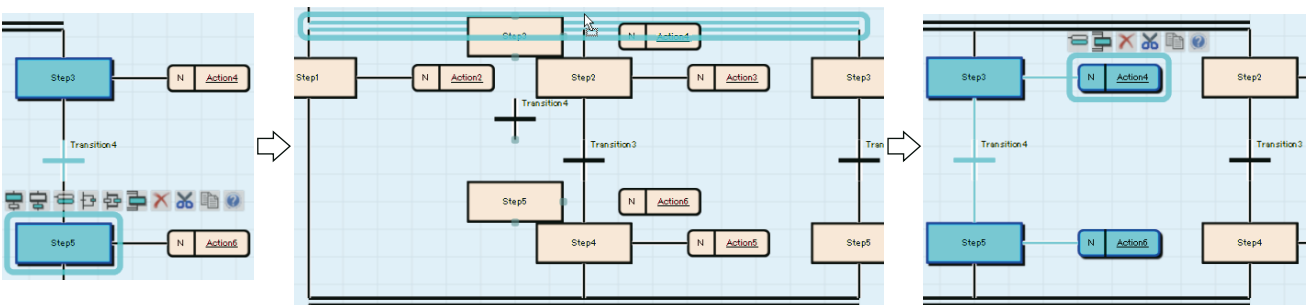
Changing SFC elements

■End step → normal step

For restoring a step which has been changed to an end step (exanple: Step1) once to a normal step, switch it to a jump, then switch the jump symbol to a connection line.

Ex.

1. Select an end step (Step1), and select [Edit] ⇨ [Modify] ⇨ [End Step/Jump]. Then select a step name (Step2) which has been placed under the branch before changing.

2. Select the added jump, then select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line].
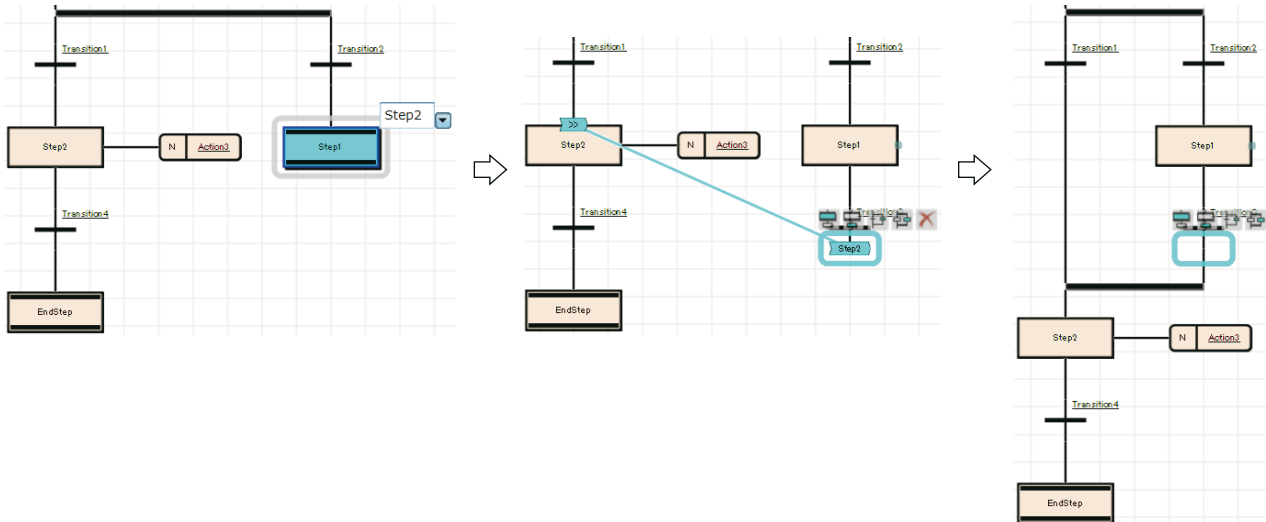
■End step → jump

After switching an end step to a jump on the selection branch, delete the unnecessary step.

Ex.

1. Select an end step to be changed (Step3), and select [Edit] ⇨ [Modify] ⇨ [End Step/Jump]. Then select a jump destination (Step0).

2. Delete the unnecessary step (Step3).
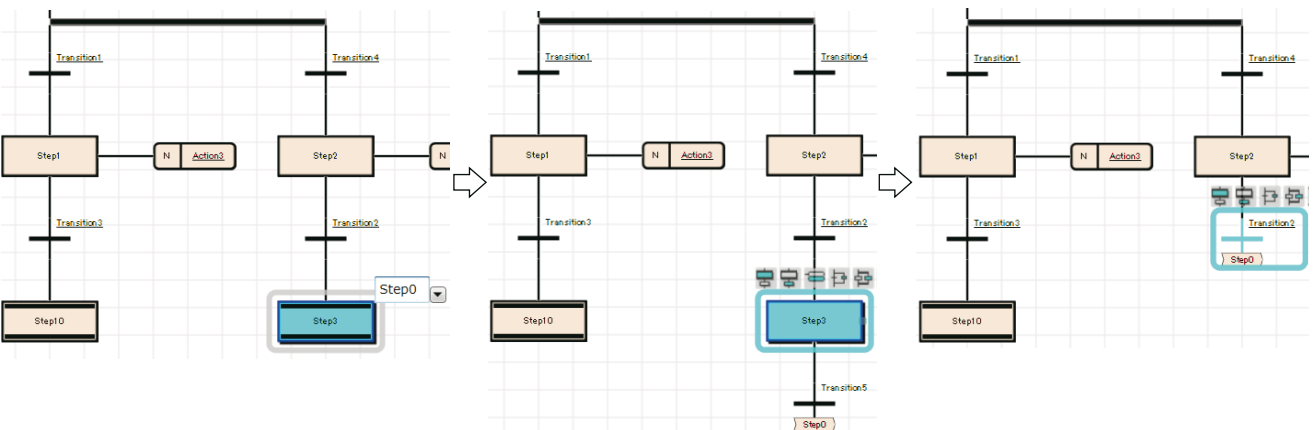
■Jump → end step

Ex.

Select a step which places before a jump, then select the [Edit] ⇨ [Modify] ⇨ [End Step/Jump].
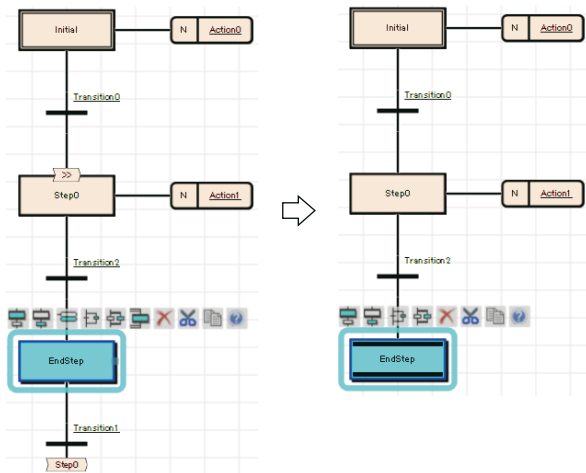
For a jump on a selection branch, insert a step before a jump to be changed, and change the step to an end step.

Ex.

1. Insert a step (Step3) before a jump to be changed.

2. Select the inserted step, then select [Edit] ⇨ [Modify] ⇨ [End Step/Jump].
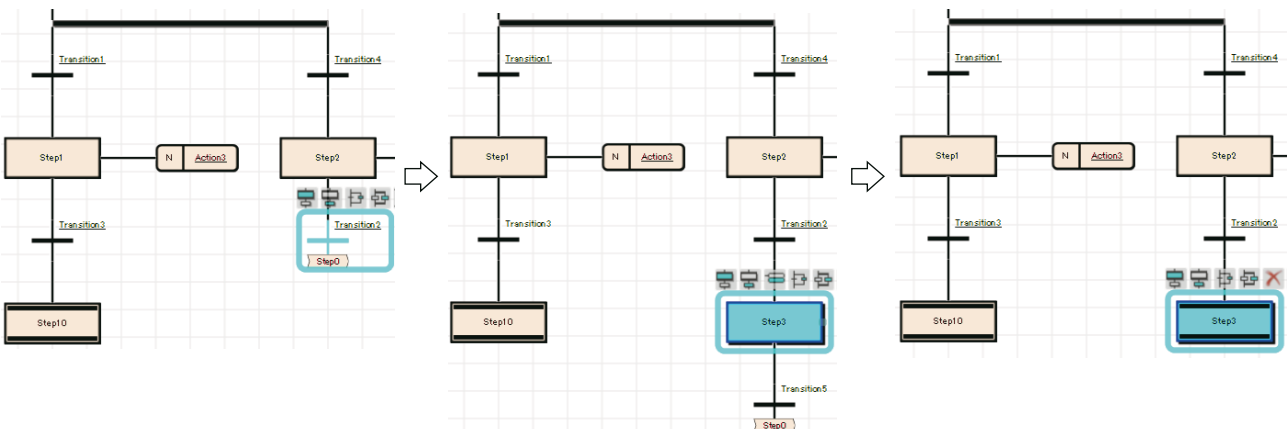
■Jump → selection branch (connection)

Change a jump destination to the step which is immediately after the branch to be connected, then switch it to a connection line.

Ex.

1. Select the transition (Transition5) that places immediately before a jump to be changed, and select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line]. Then, select the step (Step4) which will be connected with the connection line.

2. Select the jump and select [Edit] ⇨ [Modify] ⇨ [Switch between Jump Symbol and Connection Line].
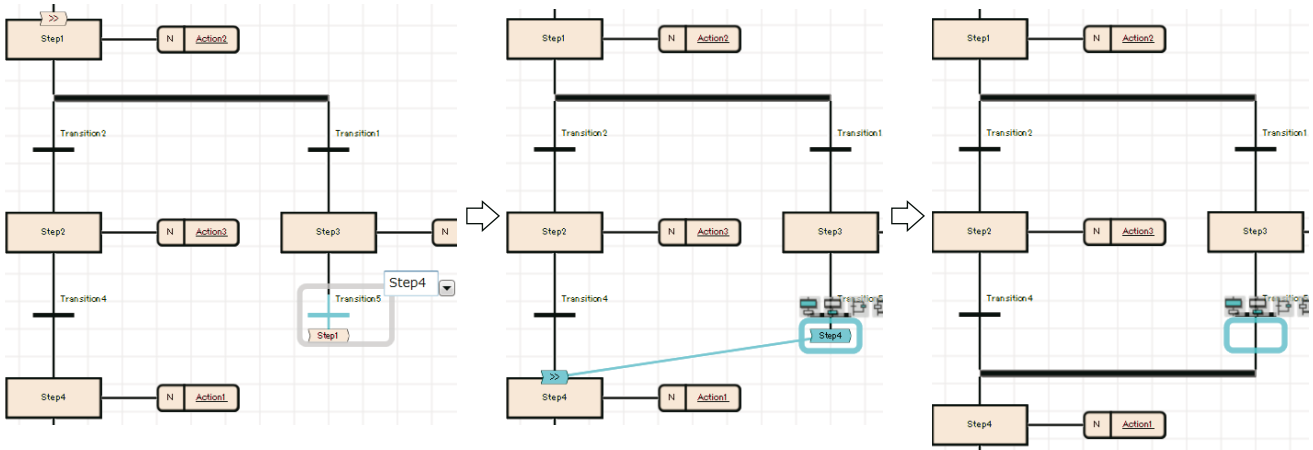
Converting blocks

Check whether there is any problems on an activated SFC diagram. The program in the Zoom will not be checked.

Operating procedure

Select [Convert] ⇨ [Convert Block].

Editing Step No./Transition No.

Step No. (S□)/Transition No. (TR□) in a block and its device comments can be checked/changed in a list.

Window

[Edit] ⇨ [Edit Step/Transition]
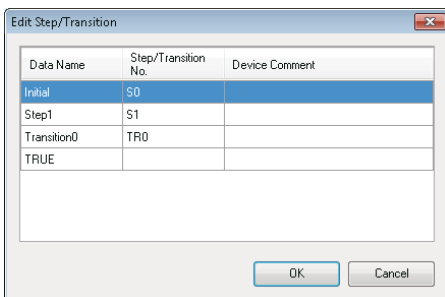
Operating procedure

Select a column of device to be changed, then change the device, and click the [OK] button.

Creating/displaying Zooms (action/transition)

Programs of actions/transitions can be created in languages corresponding to contents.

The method for entering programs is same as the one for each program language.

To display the SFC diagram which is to be the start source, select [View] ⇨ [Open Zoom Source Block].

Operating procedure

1. Double-click an action name/transition name on an SFC diagram.

2. Set each item on the "New Data" screen, then click the [OK] button.

The Zoom appears when the program has already been created.

Precautions

Some instructions cannot be used to actions/transitions. For details, refer to the following manual.

📖 MELSEC iQ-R Programming Manual (Program Design)

Displaying a Zoom list

Display a created Zoom in a list.

Displaying/deleting/changing name of Zoom is possible in a list.

Window

- Open the target SFC diagram editor, then select [View] ⇨ [Open Zoom List].
- Select "Program" ⇨ "(execution type)" ⇨ "(program file)" ⇨ "(block)" on the Project view, then right-click and select [Zoom List] from the shortcut menu.
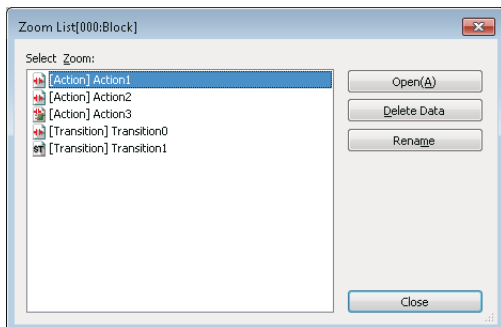
Displaying an SFC block list

Display a data name of a block, title, conversion status, and block information in a program file in a list.

For details on the block information, refer to the following manual.

Editing/creating blocks on SFC block list

To edit existing blocks, and to create new blocks are applicable on an SFC block list.

Operating procedure

Double-click an editing target block. When creating a new block, select an empty row.

Copying blocks

Operating procedure

1. Select a block to be copied, then select [Edit] ⇨ [Copy] (🔲).

2. Select a block to be pasted, then select [Edit] ⇨ [Paste] (🔲).

3. Select whether to change or overwrite its block No. on the confirmation screen, then click the [OK] button.

4. Select an item to be pasted on the "Contents to Paste" screen, then click the [OK] button.

Precautions

If "Step/Transition Comment" was selected on the "Contents to Paste" screen, steps/transition comments in the device comment are pasted after pasting all copied data. Thereby, steps/transition comments may not be pasted when the [Cancel] button was clicked during processing even if data pasting has been already completed.

Search

■Searching for block information
Search for block information (device/label) on an SFC block list.

Operating procedure

1. Select [Find/Replace] ⇨ [Block Information Find Device].

2. Enter a device/label to be searched, then click the [Find Next] button.

■Jump
Specify a block No. or a block name, and move the cursor on an SFC block list.

Operating procedure

1. Select [Find/Replace] ⇨ [Jump].

2. Select a block No./block name on the "Jump" screen, then click the [OK] button.

Displaying SFC diagrams

Display an SFC diagram of block, which is pointed with the cursor, from an SFC block list.

Operating procedure

1. Move the cursor on a block to be displayed.

2. Select [View] ⇨ [Open SFC Body], or double-click a block to be displayed.

Displaying local label editor

Display a local label editor of block, which is pointed with the cursor, from an SFC block list.

Operating procedure

1. Move the cursor on a block to be displayed.

2. Select [View] ⇨ [Open Label Setting].

Searching for/replacing programs

The search functions that can be used in the SFC diagram editor as follows:

Function name	Description
Cross reference	Checks devices, label declaration locations, and referenced locations in a list.
Device list	Checks the usage of devices being used.
Search and replace	• Searches for and replaces a device name, label name, instruction name, and character strings. • Changes open/close contact. • Replaces devices in a batch.

Precautions

- When a Zoom has been created, the data name of Zoom will not be changed if the character strings of transition name/action name are replaced on an SFC diagram. Change them on the "Zoom List" screen. (☞ Page 80 Editing Step No./Transition No.)
- Block information is not searched in the cross reference, device list, search and replace. Use "Block Information Find Device" (☞ Page 80 Displaying an SFC block list) when searching for block information.

Displaying the Help

Check the elements used in the SFC program on the e-Manual Viewer.

To check, files of the corresponding programming manuals requires to be registered in e-Manual Viewer.

Operating procedure

1. Select a check target element.

2. Press the ⌨F1 key.

6.7 Registering Device Comments

This section explains the features and setting methods for device comments.

Device comments

There are two types of device comments; Common device comment and device comment for each program ('Each program device comment'). GX Works3 supports the global device comment/local device comment of GX Works2, and the common comment/comment by program of GX Developer. Up to 16 comments can be set for one device. (📖 GX Works3 Operating Manual (SW1DND-GXW3-E))

Set the comments in Japanese, English, and Chinese and apply then by switching the language.

■ Difference between device comment and label comment

Device comment is a comment data to be added to devices, and read from/write to CPU module.

Label comment is a comment to be added to the defined labels.

Common device comment

Common device comment is a device comment that is created automatically when creating a new project.

Use this comment data when using device comments commonly in multiple programs.

The common device comments can be used if multiple programs do not exist.
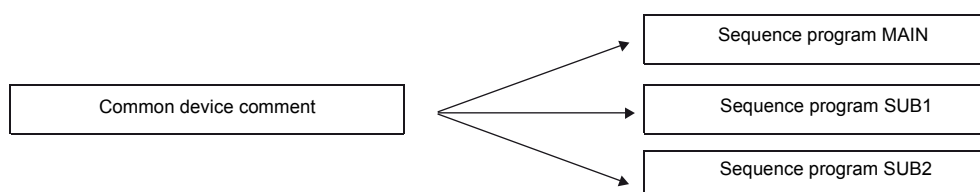
Each program device comment

'Each program device comment' is a device comment that can be created arbitrarily.

Create the device comments under the same data name as the program, and use them linked with the program.

Create a new each program device comment if necessary. (☞ Page 23 Creating Data)

```
┌────────────────────────────────────────┐                    ┌────────────────────────────────────────┐
│  MAIN Device comments for each program   │  ──────────────▶  │       Sequence program MAIN              │
└────────────────────────────────────────┘                    └────────────────────────────────────────┘
┌────────────────────────────────────────┐                    ┌────────────────────────────────────────┐
│  SUB1 Device comments for each program   │  ──────────────▶  │       Sequence program SUB1              │
└────────────────────────────────────────┘                    └────────────────────────────────────────┘
┌────────────────────────────────────────┐                    ┌────────────────────────────────────────┐
│  SUB2 Device comments for each program   │  ──────────────▶  │       Sequence program SUB2              │
└────────────────────────────────────────┘                    └────────────────────────────────────────┘
```
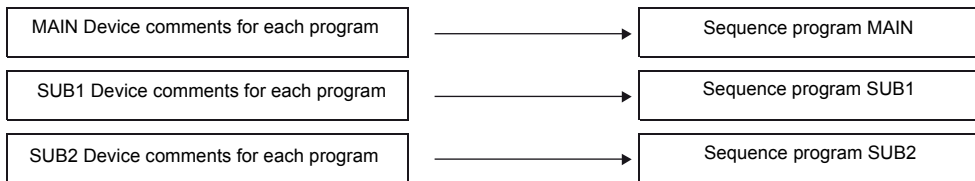
'Each program device comment' can be created under the different data name from the sequence program. However, the comment will not be linked with the sequence program.

To make the comments relate to the sequence program, the comments should have the same data names as the program name.

Precautions

For FX5CPU, 'each program device comment' cannot be written to the CPU module.

■Setting device comments for each program

When comments are set both in Common Device Comment and in Each Program Device Comment, specify the comment to be displayed on the program editor by setting the following option.

• [Tool] ⇨ [Options] ⇨ "Project" ⇨ "Device Comment Reference/Reflection Target"

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Applicable devices

For the device types and comment setting availability, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Configuration of device comment editor

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Creating device comments

Create device comments for each device on the device comment editor.

Adding device comments make it easy to understand the content of program processing.

When less number of characters are entered, the data size to be written to CPU module can be reduced.

Set the applicable number of characters in the following option.

• [Tool] ⇨ [Options] ⇨ "Other Editor" ⇨ "Device Comment Editor" ⇨ "Number of Device Comment Editing/Displaying Characters"

When creating device comments for each program, create a device comment data in advance. (☞ Page 23 Creating projects)

The comments can be entered on a ladder editor.

Operating procedure

1. Enter the device of which comment is to be set in "Device Name".

2. Enter a comment for "Comment".

Creating multiple comments and setting display target

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Detecting devices with empty cell

When comments are set in the multiple rows, detect the devices with empty cells.

Operating procedure

■Detect comments from device data being displayed on the device cmment editor

Select "Display Only the Mismatched Comment" in the filter condition on the device comment editor.

■Detect comments from all device data in the device comment data

Select [Edit] ⇨ [Detect the Mismatched Comment].

Double-click "NG" on the displayed "Detect the Matched Comment of All Devices" screen to edit the device comment editor.

Deleting unused device comments

Delete unused comments in a program in a batch. To delete the comments, open the device comment editor.

Operating procedure

Select [Edit] ⇨ [Delete Unused Device Comment].

Deletion targets

Device comment type	Deletion target
Common device comment	Unused device comments in all programs
Each program device comment	Unused device comments in the corresponding program
	Device comments in all programs

The comments specified to bit-specified word device are not deleted.

Clearing all device comments

Delete the comments set to device comment data in a batch.

Operating procedure

■Delete all device data in the device comment data

Select [Edit] ⇨ [Clear All (All Devices)].

■Delete device data being displayed on the device comment editor

Select [Edit] ⇨ [Clear All (Displayed Devices)].

Importing to/exporting from files

Export/import device comments from/to file.

When multiple comments are set, the comments selected in "Available" on the "Multiple Comments Display Setting" screen are output.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Searching device comments

When searching device comments, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Reading sample comments

Set the sample comments of special relays/special registers/CPU buffer memory and Intelligent function modules automatically.
Open the device comment editor in advance.
FX5CPU does not support sample comments of CPU buffer memory.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

6.8   Checking an Converting Programs

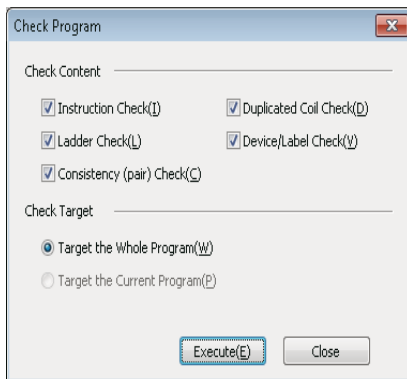## Check programs

You can check if improper input or inconsistency of programs exists.
FX5CPU does not support this function.

Window

[Tool] ⇨ [Check Program]

When the check result has an error, the error message is displayed on the Output window. Take corrective actions according to the displayed contents.
For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Compiling programs

The unconverted program name is displayed red in the Project view.

Converting/converting all programs

Convert the unconverted programs in the project. Check the program at the same time.

The differences in operation between "Convert" and "Rebuild All" are shown below:

Item	Conversion target	Label assignment target	Checking program
Convert	Newly added and changed location of the program	Newly added and changed labels	Whether or not to perform the Check Program function can be specified in "Basic Setting" by selecting [Tool] ⇨ [Options] ⇨ "Convert".
Rebuild All	All the programs in the project regardless of the change	Whether to retain or reassign the labels can be selected on the "Rebuild All" screen. However, newly added labels, or labels of which data types are changed will be reassigned even when "Retain" is selected.	Whether or not to perform the Check Program function can be specified on the "Rebuild All" screen.

Operating procedure

1. Select [Convert] ⇨ [Convert] (🔲)/[Rebuild All] (🔲).

2. For converting all programs, specify the respective items for "Label Assignment" and "Check Program" on the "Rebuild All" screen, and click the [OK] button.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Checking for errors and warnings

When the program is converted, the target programs and label settings are checked and the result is displayed on the Output window. The corresponding error location can be referred on the Output window.

Operating procedure

1. Double-click the error/warning message displayed on the Output window.

2. Check the corresponding error location and modify the error as instructed by the error/warning message.

6.9　Calculating Memory Size

This section shows how to calculate offline a memory size required when writing data in a project to a CPU module .

Window

[Tool] ⇨ [Confirm Memory Size (Offline)]
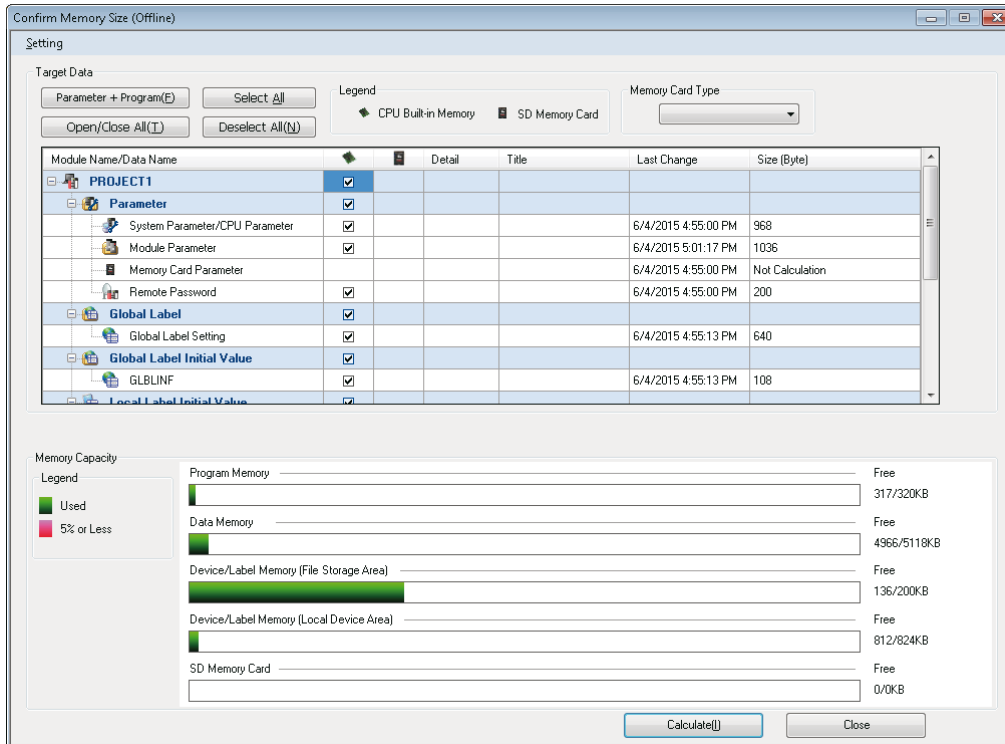
Operating procedure

1. When the data to be written to an SD memory card is included, select the corresponding SD memory card from the pull-down list of "Memory Card Type".

2. Select the file to be written, then click the [Calculate] button.

The methods of the detailed setting for a target file or each data are same as the one on the "Online Data Operation" screen. Refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

7 DEVICE MEMORY AND DEVICE INITIAL VALUES

The device memory managed by GX Works3 is a data that reads/writes values from/to the device memory on a CPU module.
By reading device memory, the state of device memory in a CPU module can be checked. It can be used for offline debugging.
Additionally, the current values of device memory in a CPU module can be changed in a batch by writing device memory to a CPU module.
Read/write device memory on the "Online Data Operation" screen.
When writing/reading the value of device memory to/from the CPU module, perform them on the "Online Data operation" screen in file units.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Applicable devices

For the devices that can be set on the Device Memory editor and its input method, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Writing device memory to global devices/local devices

Device memory does not distinguish the global devices and the local devices.
Write device memory to each device in a CPU module by each of the following methods.
FX5CPU does not support local devices.
 • Global device: Create device memory data with a different name from the one for the program file, and write it to a CPU module
 • Local device: Create device memory with a same name as the one for the program file, and write it to a CPU module

Setting device initial values

The device initial value managed by GX Works3 is a data that can be read from/write to the device in a CPU module.
For details of device initial values, refer to the following manuals.
📖 MELSEC iQ-R CPU Module User's Manual (Application)
📖 MELSEC iQ-F FX5 User's Manual (Application)

For details (configuration of device memory editor, setting device memory, registering to device memory), refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

MEMO

8 SEARCHING DATA

This section explains how to search for and replace character strings, devices, labels, instructions, etc. in each editor.

Function	Supported editor	Purpose
Find Device/Label Replace Device/Label	• Ladder editor • ST editor • FBD/LD editor • SFC diagram editor • Label editor	Used to search for/replace devices or labels in a program.
Find Instruction/ Replace Instruction	• Ladder editor • ST editor • FBD/LD editor • SFC diagram editor	Used for searching for/replacing instructions in a program.
Find String/Replace String	• Ladder editor • ST editor • FBD/LD editor • SFC diagram editor • Device comment editor • Label editor	Used for searching for/replacing character strings used in a program, label, and device comment.
Change Open/Close Contact	• Ladder editor • FBD/LD editor • SFC diagram editor	Used for switching the contact type of a specified device in a program from an open contact to a close contact, or from a close contact to an open contact.
Device Batch Replace	• Ladder editor • ST editor • FBD/LD editor	Used for searching for/replacing devices or labels in a program in batch.
Cross Reference	• Ladder editor	Used to check the device and label declaration location and referenced location in a list.
Device List	• ST editor • FBD/LD editor • SFC diagram editor • Label editor • Parameter editor	Used to check the usage of devices.
Search/Replace in a program	• Ladder editor	Used to search for devices and labels, or move to the corresponding row by specifying a Step No. in a ladder program.
	• ST editor	Used to move to the corresponding row by specifying a line number on an ST editor.
	• SFC diagram editor	Used to search for devices and labels, or move to the corresponding row by specifying a block number or a block name in an SFC block list.

- The Find/Replace window can also be displayed by selecting [View] ⇨ [Docking Window] ⇨ [Find/Replace] (🔍).
- Search/replace can also be switched by selecting from the pull-down list on the "Find and Replace" screen.
- One point of device can be searched/replaced when searching/replacing labels.
- The search starts from the top of the program in the inline structured text box regardless of the cursor position.
- After the All Find/Replace All function is performed, the results and error logs are displayed.

Precautions

- The program will be in converted state after the replacement.
- The Replace function cannot be performed during monitoring. Perform the function after ending the monitoring. However, it can be performed when the ladder editor is in the Monitor write mode.
- The Find/Replace function cannot be performed for the read-protected data. Perform the function after setting the data in editable mode by disabling the security.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

MEMO

9 SEGMENTING PROGRAMS

Segmenting a processing program which is used repeatedly in programs into elements, the elements can be utilized in sequence programs.

The efficient program development reduces program errors, thus the program quality will be improved.

Segmented program file is referred to as POU.

Besides, multiple POUs can be collected into a separate file from a project. The file is referred to as a library.

POUs

Two types of POU are able to utilize repeatedly; function blocks and functions.

■Function block

Function block is a program component (POU) created by segmenting a program, which outputs an operation result in accordance with a value of the internal memory and an input value, into components.

It is classified into the following three types.

POU	Description
Function block (User-created)	A function block which is created from a program using the labels which are defined as input labels, internal labels, and output labels.
Standard function block	A function block which can be used in general. It is prepared in GX Works3 in advance.
Module FB	A function block which is created by segmenting a dedicated processing for modules. It is prepared in GX Works3 in advance.

■Function

Function is a program component (POU) created by segmenting a program, which always outputs the same operation results against the same input value without internal memory.

It is classified into the following two types.

POU	Description
Function (User-created)	A function block which is created from a program using the labels which are defined as input labels and output labels
Standard function	A function which can be used in general. It is prepared in GX Works3 in advance.

Library

Library is an element collection of multiple POUs and structures. The elements in the library can be used in multiple projects.

■User library

User library is an element collection which is composed of created POUs and structures.

■Application library/sample library (MELSOFT Library)

MELSOFT Library (Sample Library) is an element collection that has been prepared by maker in advance.

To obtain the application library/sample library (MELSOFT Library), please consult your local Mitsubishi representative.

For details (creating functions and function blocks, use of user and sample library), refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

MEMO

10 SIMULATING PROGRAM

For information on CPU modules supporting the Simulation function, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Note that SFC program is not supported to the Simulation function.

The Simulation function debugs programs using a virtual programmable controller on a personal computer.

GX Simulator3 is used for the Simulation function.

This function is useful to check programs before operating them actually since it enables debugging without the connection with CPU module.

For the considerations for using the Simulation function, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)
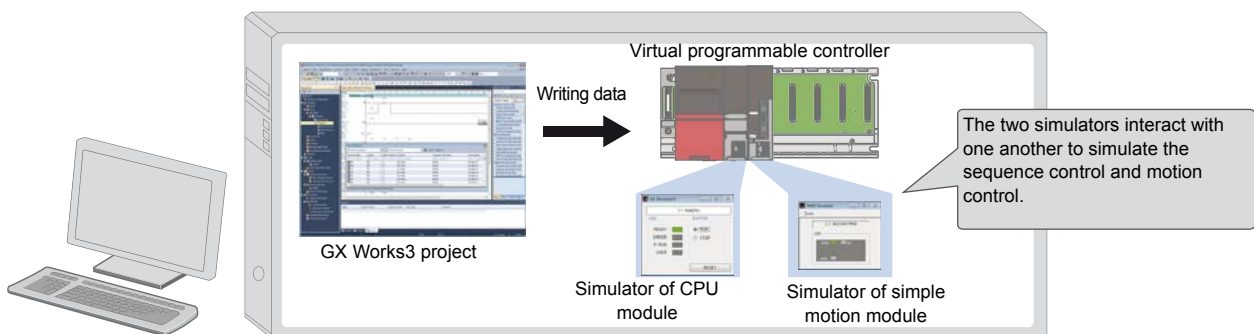
Safety and handling consideration

⚠ CAUTION

■The Simulation function simulates the actual module to debug a created sequence program. However, this function does not guarantee the operation of the debugged program.

■The Simulation function uses the memory for simulation to input and output data to/from the I/O module and Intelligent function module. Some instructions/functions and device memory are not supported. Therefore, the operation results obtained with the virtual programmable controller may differ from those obtained using the actual module.

After debugging programs using the Simulation function, the normal program debugging, which is performed with the module connected before the actual operation, is required.

Starting/Stopping Simulation

Start/stop the Simulation function. The connection destination is GX Simulator3 during simulation, and "Simulation ((system number of the simulator).(CPU number))" is displayed on the status bar.

Window

[Debug] ⇨ [Simulation] ⇨ [Start Simulation] (🖥️)/[Stop Simulation] (🖥️)

Operating procedure

Select the checkbox of the data to be written on the "Online Data Operation" screen displayed, and click the [Execute] button.

MEMO

10 SIMULATING PROGRAM

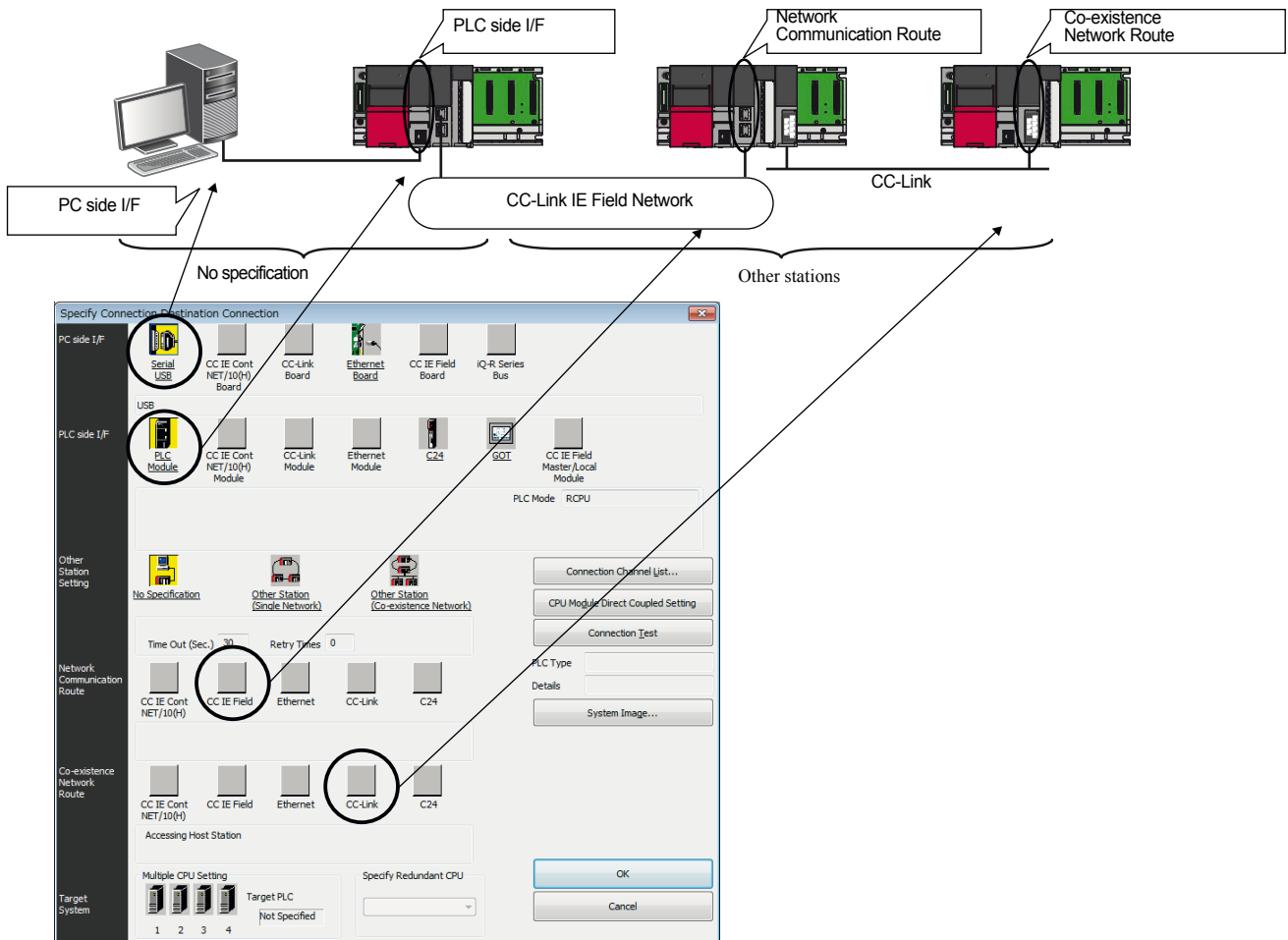# 11 SETTING ROUTE TO CPU MODULE

The module type of a project must be set to that of the CPU to be accessed.

Window

[Online] ⇨ [Specify Connection Destination]

- Double-click the items underlined on the screen to set the details of each item.
- The icons colored yellow indicate that the settings have been applied.
- For FX5CPU, the icons of the unsettable connection destination route are not displayed.

Item		Description
Other Station Setting	No Specification	Specify this to access the CPU module directly connected to a personal computer.
	Other Station (Single Network) [*1]	Specify this to access the CPU module on other station via only one kind of network (including a multi-tier system). Since Ethernet is regarded as equivalent to CC-Link IE Controller Network, CC-Link IE Field Network, and MELSECNET/10(H), specify "Single Network" for a system in which those are mixed.
	Other Station (Co-existence Network) [*1]	Specify this to access the CPU module on other station via two kinds of network.
Network Communication Route		Select the network type, network number, station number, and start I/O number of the network that is routed for accessing the CPU module on other station. The setting items differ depending on the selected network type.
Co-existence Network Route		Select the network type, network number, station number, and start I/O number of the network to access. The setting items differ depending on the selected network type.
Target System		Specify the access target in the multiple CPU system.

*1 To specify the own station, select "No Specification".

Display the illustration of the connection route

Click the [System Image] button to display the set connection route in an illustration to check the route.

11.1 Direct Connection

This section explains the setting method for accessing the CPU module directly connected to a personal computer.

Point

Click the [CPU Module Direct Coupled Setting] button on the "Specify Connection Destination" screen to change the settings to direct connection.

USB connection

FX5CPU does not support this connection.
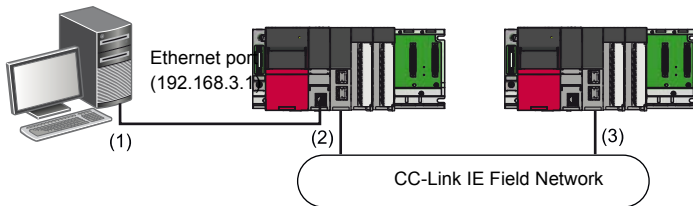
Ethernet connection

Point

For FX5CPU, the Ethernet adapter at the personal computer side, which is used for the Ethernet port direct connection, can be specified.
Click the [CPU Module Direct Coupled Setting] button on the "Specify Connection Destination" screen, and select an adapter displayed on the "CPU Module Direct Coupled Setting" screen.

11.2 Accessing via Network (Single Network)

This section shows the setting example for accessing a CPU module on other station via single network after accessing the Ethernet built-in CPU from GX Works3.

FX5CPU does not support it.

No.	Item	Item to be selected	Internal setting	Input value
(1)	PC side I/F	Ethernet Board	Network No.	—
			Station No.	—
			Protocol	TCP
(2)	PLC side I/F	PLC Module	Ethernet Port Direct Connection	—
	Other Station Setting	Other Station (Single Network)	Check at Communication Time	30 seconds
			Retry Times	0 time
(3)	Network Communication Route	CC IE Field	Network No.	1
			Station No.	0

Access via Ethernet module

The following shows the setting example for accessing the CPU module via CC-Link IE built-in Ethernet module from GX Works3.

It is same settings when accessing a CPU module via the network part of RnENCPU.

FX5CPU does not support it.
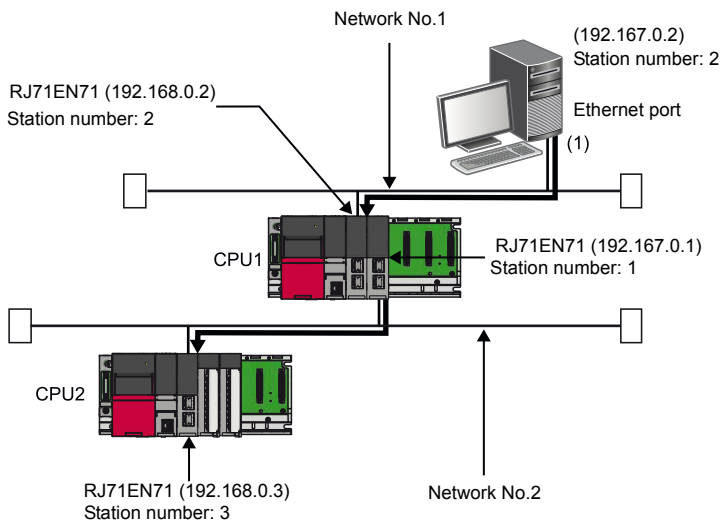
No.	Item	Item to be selected	Internal setting		Input value
(1)	PC side I/F	Ethernet Board	Network No.		1
			Station No.		2
			Protocol		TCP
(2)	PLC side I/F	Ethernet Module	PLC Type		RJ71EN71
			Network No.		—
			Station No.		1
			IP Address		192.167.0.1
			IP Input Format		DEC
			Station No. <-> IP Information		Automatic Response System
	Other Station Setting	Other Station (Single Network)	Check at Communication Time		30 seconds
			Retry Times		0 time
(3)	Network Communication Route	Ethernet	Access to other station in the same loop or multi-tier system	Network No.	2
				Station No.	3

Precautions

• When communicating with multiple GX Works3s, use TCP/IP or UDP/IP communication.

• For a multiple network system, setting the network dynamic routing is required.

📖 MELSEC iQ-R Ethernet User's Manual (Application)

11.3   Further methods for accessing the CPU module

Further setting methods for accessing the CPU module are:

• direct serial connection

• accessing via network (co-existence network). FX5CPU does not support it.

• accessing via serial communication module on a 1:1 or 1:n basis. FX5CPU does not support it.

• accessing via GOT transparent function

• accessing to multiple CPU system

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

12 WRITING/READING DATA TO CPU MODULE

Write the created data to/read from a CPU module or a memory card on the "Online Data Operation" screen.

Configuration of Online Data Operation screen

Window

[Online] ⇨ [Write to PLC] (🖫)/[Read from PLC] (🖫)/[Delete PLC Data]

The example of writing data is shown below.
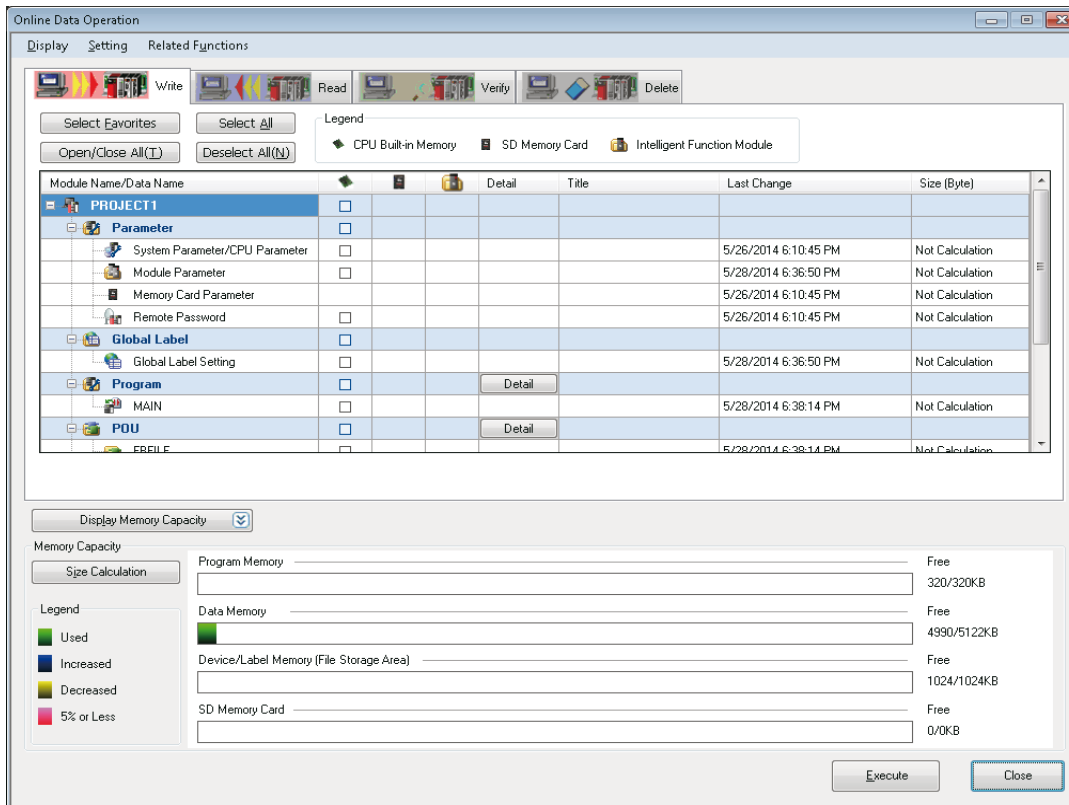
- The data name displayed in gray indicates that it is in the unconverted state.
- When a data is written to the programmable controller, the target memory capacity may be displayed smaller than the actual file size.
- Update the graph of the memory capacity by clicking the [Size Calculation] button.

Read/write/delete user data from/to the CPU built-in memory/SD memory card. Perform initialization to delete files in a CPU module or a memory card.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Writing data to a CPU module

1. Select the [Write] tab on the "Online Data Operation" screen.

2. Select a file to be written and a write target.

3. Click the [Detail] button to set the details such as a range to be written.

4. Click the [Execute] button.

After writing a safety program or a parameter to an RnSFCPU, manuals are displayed to clarify the information that requires to be confirmed by users for using a safety project safely.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

■Data to be written and write target

○: Writable, ×: Not writable

Data name		Write target		
		CPU built-in memory	SD memory card	Intelligent function module
System Parameter/CPU Parameter		○	○	×
Module Parameter		○	○	×
Module Extended Parameter		○	○	○
Memory Card Parameter		×	○	×
Remote Password		○	○	×
Global Label	Global Label Setting	○	○	×
	Global Label Assignment Information[1]	○	○	×
Program File		○	○	×
FB File/FUN File		○	○	×
Label Initial Value File[1]		○	○	×
Device Memory (File Register)		○	×	×
Device Initial Value		○	○	×
Device Comment[2]		○	○	×

*1 Not supported by FX5CPU.

*2 FX5CPU only supports common device comments and does not support each program device comments.

For the details on the availability of writing safety data, refer to the following manual.
📖 MELSEC iQ-R CPU Module User's Manual (Application)

Reading data from programmable controller

Read data from a CPU module.

1. Select the [Read] tab on the "Online Data Operation" screen.

2. Select the files to be read and read target.

3. Click the [Detail] button to set the details such as a range to be read.

Click the [Execute] button.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Deleting data in CPU module

Delete the data such as programs and parameters in the CPU module.

For a safety project, safety data can be deleted when the safety operation mode of RnSFCPU is in test mode.

Operating procedure

Select the file to be deleted from the list on the "Online Data Operation" screen, and click the [Execute] button.

Verifying Programmable Controller Data

The Verify with PLC function is used to compare the content of two projects or to locate the changes made in programs.

The projects set the security function can be verified when both the verify source data and the verify destination data are not read-protected.

To verify data between two projects, use the Project Verify function.

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

Writing Programs While CPU is in RUN

Before performing the online program change function, be sure to read and fully understand the descriptions in the following manual.

📖GX Works3 Operating Manual (SW1DND-GXW3-E)

Design instructions

⚠ WARNING

■When data change, program change, or status control is performed from a personal computer to a running programmable controller, create an interlock circuit outside the programmable controller to ensure that the whole system always operates safely.
Furthermore, for the online operations performed from a personal computer to a CPU module, the corrective actions against a communication error due to such as a cable connection fault should be predetermined as a system.

Startup/Maintenance Instructions

⚠ CAUTION

■The online operations performed from a personal computer to a running CPU module (program change while a CPU module is in RUN state, operating status change such as RUN-STOP switching, and remote control operation) have to be executed after the manual has been carefully read and the safety has been ensured. When changing a program while the CPU module is in RUN, it may cause a program corruption in some operating conditions. Fully understand the precautions described in this section.

MEMO

13 CHECKING OPERATION, PROTECTING DATA, DIAGNOSING AND MODULE OPERATION

13.1 CHECKING OPERATION OF PROGRAMS

The functions to check the execution status are as follows:

Purpose	Function name
A function to check the status of the programs being executed on the program editor.	Monitor
A function to check the current values of the device or buffer memory in batch.	Device/Buffer Memory Batch Monitor
A function to check the current values by registering devices and labels.	Watch
A function to check the processing time of programs being executed.	Program List Monitor[*1]
A function to check the number of executions of interrupt programs used in a program.	Interrupt Program List Monitor[*1]
A function to check the I/O signals and the current value of buffer memory by registering the module information of Intelligent function module.	Intelligent Function Module Monitor[*1]
A function to save and check the device values of a CPU module at any timing to a personal computer.	Memory Dump[*1]
A function to check the sampled data (memory dump result file) on the program editor.	Offline Monitor

*1 Not supported by FX5CPU.

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

13.2 PROTECTING DATA

The functions to save the data are as follows:

Purpose	Target	Function name
Prevents illegal access to programs (in POU unit). (Using password)	Project	Block password function
Prevents illegal access to programs (in program file unit). (Using security key)	Project	Security key authentication function
Prevents illegal execution of programs. (Using security key)	CPU module	
Prevents illegal access to projects. (Using password)	Safety project	User Authentication
Prevents illegal access to CPU module. (Using password)	CPU module (RnSFCPU only)	
Prevents illegal read/write operation for files. (Using password)	CPU module	File password function
Restricts access from other than specific communication route. (Using password)	CPU module	Remote password function
Identifies the IP address of external devices via Ethernet to block access from an illegal IP address. (Setting with module parameters)	CPU module	IP filter function

For details, refer to the following manual.
📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

13.3 DIAGNOSING MODULE

This function displays the state of modules, networks, and whole system. At an error occurrence, it displays an error content and corrective action.

The diagnostic functions of GX Works3 are as follows:

Function
System monitor (Not supported by FX5CPU)
Diagnosing CPU module
Diagnosing network

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

13.4 CHECKING/CHANGING CPU MODULE OPERATION

Check the operation status and change the operation of CPU module with GX Works3.

Purpose	Function name
Set the clock on CPU module.	Clock setting
RUN/STOP/PAUSE/RESET the CPU module connected to GX Works3.	Remote operation
To perform the functions of RnSFCPU.	Switch Safety Operation Mode Check Safety Data Identity
Check the usage of data memory.	Memory management
Clear the values of data memory.	Clear value

For details, refer to the following manual.

📖 GX Works3 Operating Manual (SW1DND-GXW3-E)

INDEX

TRADEMARKS

Microsoft, Windows, Windows Vista, Windows NT, Windows XP, Windows Server, Visio, Excel, PowerPoint, Visual Basic, Visual C++, and Access are either registered trademarks or trademarks of Microsoft Corporation in the United States, Japan, and other countries.

Intel, Pentium, and Celeron are either registered trademarks or trademarks of Intel Corporation in the United States and other countries.

Ethernet is a trademark of Xerox Corp.

The SD and SDHC logos are either registered trademarks or trademarks of SD-3C, LLC.

MODBUS is a registered trademark of Schneider Electric SA.

All other company names and product names used in this manual are either trademarks or registered trademarks of their respective companies.

REVISIONS

▲ MITSUBISHI ELECTRIC

HEADQUARTERS

Mitsubishi Electric Europe B.V. **EUROPE**
Mitsubishi-Electric-Platz 1
D-40882 Ratingen
Phone: +49 (0)2102 / 486-0
Fax: +49 (0)2102 / 486-1120

Mitsubishi Electric Europe B.V. **CZECH REP.**
Pekařská 621/7
CZ-155 00 Praha 5
Phone: +420 255 719 200
Fax: +420 251 551 471

Mitsubishi Electric Europe B.V. **FRANCE**
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 (0)1 / 55 68 55 68
Fax: +33 (0)1 / 55 68 57 57

Mitsubishi Electric Europe B.V. **IRELAND**
Westgate Business Park, Ballymount
IRL-Dublin 24
Phone: +353 (0)1 4198800
Fax: +353 (0)1 4198890

Mitsubishi Electric Europe B.V. **ITALY**
Viale Colleoni 7 Palazzo Sirio
I-20864 Agrate Brianza (MB)
Phone: +39 039 / 60 53 1
Fax: +39 039 / 60 53 312

Mitsubishi Electric Europe B.V. **NETHERLANDS**
Nijverheidsweg 23C
NL-3641RP Mijdrecht
Phone: +31 (0) 297 250 350

Mitsubishi Electric Europe B.V. **POLAND**
ul. Krakowska 48
PL-32-083 Balice
Phone: +48 (0) 12 347 65 00
Fax: +48 (0) 12 630 47 01

Mitsubishi Electric (Russia) LLC **RUSSIA**
2 bld. 1, Letnikovskaya st.
RU-115114 Moscow
Phone: +7 495 / 721 2070
Fax: +7 495 / 721 2071

Mitsubishi Electric Europe B.V. **SPAIN**
Carretera de Rubí 76-80 Apdo. 420
E-08190 Sant Cugat del Vallés (Barcelona)
Phone: +34 (0) 93 / 5653131
Fax: +34 (0) 93 / 5891579

Mitsubishi Electric Europe B.V. (Scandinavia) **SWEDEN**
Hedvig Möllers gata 6
SE-223 55 Lund
Phone: +46 (0) 8 625 10 00

Mitsubishi Electric Turkey Elektrik Ürünleri A.Ş. **TURKEY**
Fabrika Otomasyonu Merkezi
Şerifali Mahallesi Kale Sokak No:41
TR-34775 Ümraniye-İSTANBUL
Phone: +90 (216) 969 25 00
Fax: +90 (0)216 / 661 44 47

Mitsubishi Electric Europe B.V. **UK**
Travellers Lane
UK-Hatfield, Herts. AL10 8XB
Phone: +44 (0)1707 / 28 87 80
Fax: +44 (0)1707 / 27 86 95

Mitsubishi Electric Corporation **JAPAN**
Tokyo Building 2-7-3
Marunouchi, Chiyoda-ku
Tokyo 100-8310
Phone: +81 (3) 3218-2111
Fax: +81 (3) 3218-2185

Mitsubishi Electric Automation, Inc. **USA**
500 Corporate Woods Parkway
Vernon Hills, IL 60061
Phone: +1 (847) 478-2100
Fax: +1 (847) 478-0328

EUROPEAN REPRESENTATIVES

GEVA **AUSTRIA**
Wiener Straße 89
A-2500 Baden
Phone: +43 (0)2252 / 85 55 20
Fax: +43 (0)2252 / 488 60

OOO TECHNIKON **BELARUS**
Prospect Nezavisimosti 177-9
BY-220125 Minsk
Phone: +375 (0)17 / 393 1177
Fax: +375 (0)17 / 393 0081

INEA RBT d.o.o. **BOSNIA AND HERZEGOVINA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8116
Fax: +386 (0)1 / 513 8170

AKHNATON **BULGARIA**
4, Andrei Ljapchev Blvd., PO Box 21
BG-1756 Sofia
Phone: +359 (0)2 / 817 6000
Fax: +359 (0)2 / 97 44 06 1

INEA CR **CROATIA**
Losinjska 4 a
HR-10000 Zagreb
Phone: +385 (0)1 / 36 940 - 01/ -02/ -03
Fax: +385 (0)1 / 36 940 - 03

AutoCont C. S. S.R.O. **CZECH REPUBLIC**
Kafkova 1853/3
CZ-702 00 Ostrava 2
Phone: +420 595 691 150
Fax: +420 595 691 199

HANS FØLSGAARD A/S **DENMARK**
Theilgaards Torv 1
DK-4600 Køge
Phone: +45 4320 8600
Fax: +45 4396 8855

Electrobit OÜ **ESTONIA**
Pärnu mnt. 160i
EST-11317, Tallinn
Phone: +372 6518 140

UTU Automation Oy **FINLAND**
Peltotie 37i
FIN-28400 Ulvila
Phone: +358 (0)207 / 463 500
Fax: +358 207 / 463 501

UTECO A.B.E.E. **GREECE**
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +30 (0)211 / 1206-900
Fax: +30 (0)211 / 1206-999

MELTRADE Kft. **HUNGARY**
Fertő utca 14.
HU-1107 Budapest
Phone: +36 (0)1 / 431-9726
Fax: +36 (0)1 / 431-9727

OAK Integrator Products SIA **LATVIA**
Ritausmas iela 23
LV-1058 Riga
Phone: +371 67842280

Automatikos Centras, UAB **LITHUANIA**
Neries krantiné 14A-101
LT-48397 Kaunas
Phone: +370 37 262707
Fax: +370 37 455605

EUROPEAN REPRESENTATIVES

ALFATRADE Ltd. **MALTA**
99, Paola Hill
Malta-Paola PLA 1702
Phone: +356 (0)21 / 697 816
Fax: +356 (0)21 / 697 817

INTEHSIS SRL **MOLDOVA**
bld. Traian 23/1
MD-2060 Kishinev
Phone: +373 (0)22 / 66 4242
Fax: +373 (0)22 / 66 4280

Fonseca S.A. **PORTUGAL**
R. João Francisco do Casal 87/89
PT-3801-997 Aveiro, Esgueira
Phone: +351 (0)234 / 303 900
Fax: +351 (0)234 / 303 910

SIRIUS TRADING & SERVICES SRL **ROMANIA**
Aleea Lacul Morii Nr. 3
RO-060841 Bucuresti, Sector 6
Phone: +40 (0)21 / 430 40 06
Fax: +40 (0)21 / 430 40 02

INEA SR d.o.o. **SERBIA**
Ul. Karadjordjeva 12/217
SER-11300 Smederevo
Phone: +386 (026) 461 54 01

SIMAP SK (Západné Slovensko) **SLOVAKIA**
Dolné Pažíte 603/97
SK-911 06 Trenčín
Phone: +421 (0)32 743 04 72
Fax: +421 (0)32 743 75 20

INEA RBT d.o.o. **SLOVENIA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8116
Fax: +386 (0)1 / 513 8170

OMNI RAY AG **SWITZERLAND**
Im Schörli 5
CH-8600 Dübendorf
Phone: +41 (0)44 / 802 28 80
Fax: +41 (0)44 / 802 28 28

CSC- AUTOMATION Ltd. **UKRAINE**
4 B, Yevhena Sverstyuka Str.
UA-02002 Kiev
Phone: +380 (0)44 / 494 33 44
Fax: +380 (0)44 / 494-33-66

EURASIAN REPRESENTATIVES

TOO Kazpromavtomatika **KAZAKHSTAN**
UL. ZHAMBYLA 28,
KAZ-100017 Karaganda
Phone: +7 7212 / 50 10 00
Fax: +7 7212 / 50 11 50

MIDDLE EAST REPRESENTATIVE

EIM Energy **EGYPT**
3 Roxy Square
ET-11341 Heliopolis, Cairo
Phone: +202 24552559
Fax: +202 245266116

GIRIT CELADON Ltd. **ISRAEL**
12 H'aomanut Street
IL-42505 Netanya
Phone: +972 (0)9 / 863 39 80
Fax: +972 (0)9 / 885 24 30

ILAN & GAVISH Ltd. **ISRAEL**
24 Shenkar St., Kiryat Ariet
IL-49001 Petah-Tikva
Phone: +972 (0)3 / 922 18 24
Fax: +972 (0)3 / 924 0761

SHERF Motion Techn. Ltd. **ISRAEL**
Rehov Hamerkava 19
IL-58851 Holon
Phone: +972 (0)3 / 559 54 62
Fax: +972 (0)3 / 556 01 82

CEG LIBAN **LEBANON**
Cebaco Center/Block A Autostrade DORA
Lebanon-Beirut
Phone: +961 (0)1 / 240 445
Fax: +961 (0)1 / 240 193

AFRICAN REPRESENTATIVE

ADROIT TECHNOLOGIES **SOUTH AFRICA**
20 Waterford Office Park 189 Witkoppen Road
ZA-Fourways
Phone: + 27 (0)11 / 658 8100
Fax: + 27 (0)11 / 658 8101