MITSUBISHI ELECTRIC

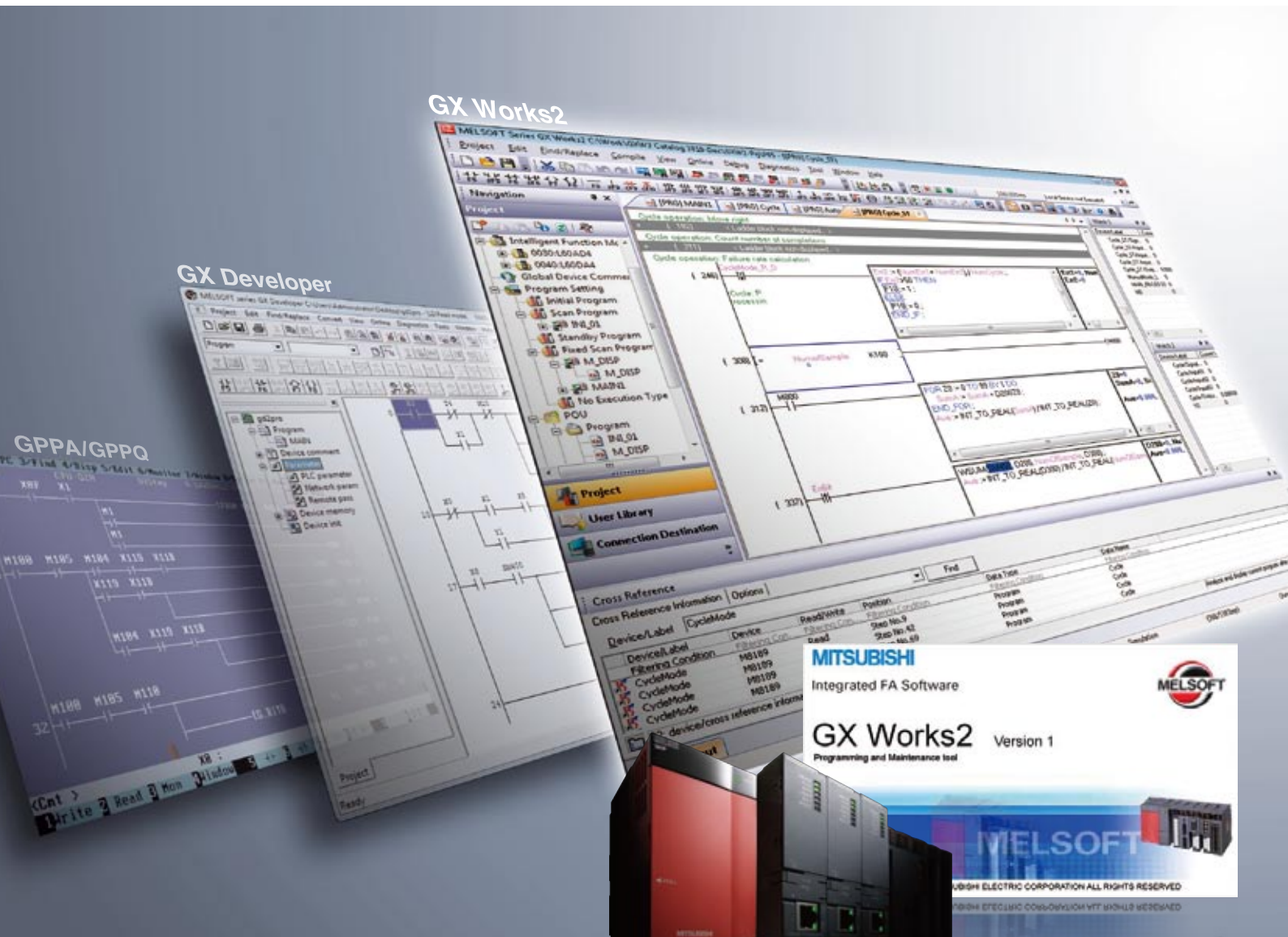## *Changes for the Better*

iQ Platform Compatible
Programmable Controller Engineering Software
MELSOFT GX Works2

GX Works2

GX Developer

GPPA/GPPQ

MITSUBISHI
Integrated FA Software

MELSOFT

GX Works2 Version 1
Programming and Maintenance tool

MITSUBISHI ELECTRIC CORPORATION ALL RIGHTS RESERVED

GX Works2

World-Class PLC Engineering Software

compatible with
Windows®7

iQ Platform

Mitsubishi FA Integrated Concept

World-Class PLC Engineering Software

## Ultimate evolution of PLC engineering software

Now an easy-to-use engineering software is no surprise.

In addition to its sophisticated usability, the engineering software GX Works2 deploys

the global mainstream concepts of "segmenting" and "structuring"

for fundamental improvement of programming efficiency.

The world-standard engineering style begins with GX Works2.

GX Wor
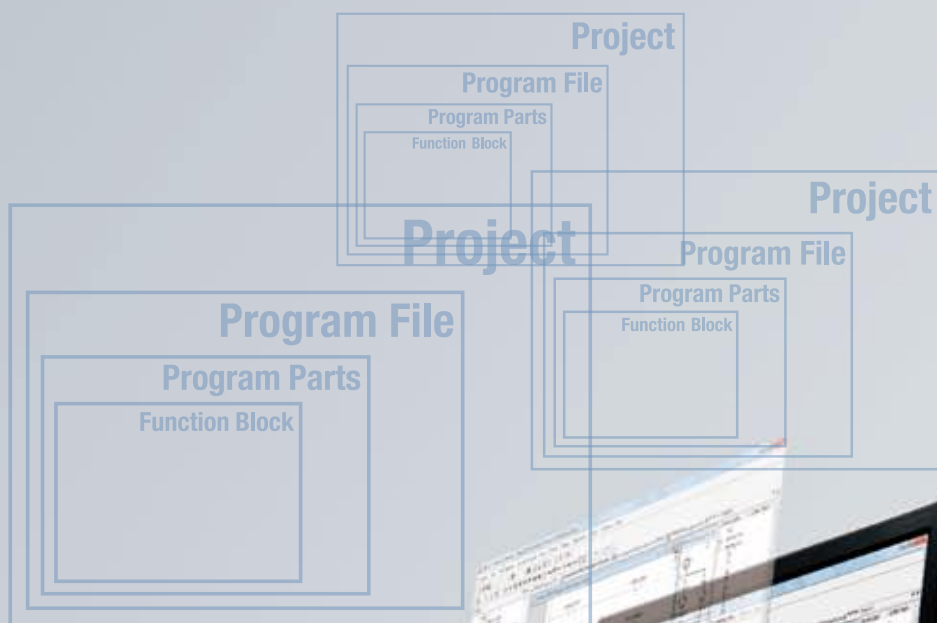
All-in-one package

All capabilities required for PLC engineering including the configuration function of the intelligent function module and simulation function are integrated in a single package.

The all-in-one GX Works2 package supports entire engineering such as system design, programming, debug and maintenance.

GX
Configurator
Function
Configuration

GX
Developer
Function
Programming

GX
Simulator
Function
Simulation

Integration
GX Works2

Make full use of MELSEC

GX Works2 enables you to easily make a full use of high-function and high-performance CPUs and modules.

When new modules or functions came up, the update data is readily available from your local Mitsubishi representative to keep GX Works2 up-to-date.

CC-Link IE Field
CC-Link IE Control
CC-Link

Inherits customer assets

Your legacy GX Developer programs can be used in GX Works2 without any modification. Also, programs written by GX Works2 to the programmable controller can be read using GX Developer. For example, even if GX Developer is installed in the production site's PC, the data created and read with GX Developer can be used with GX Works2 installed in the development office's PC.

Create projects in GX Developer

GX Developer ⟷ **GX Works2**

Read and use them in GX Works2

Sophisticated usability

GX Works2 has further improved favorable functions of GX Developer.

GX Works2 has also improved performance and each function now responds more quickly.
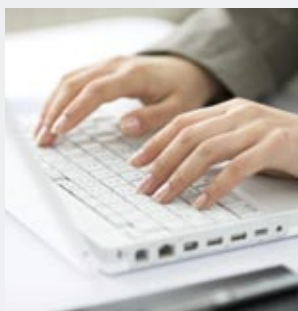
IEC61131-3 compliant

GX Works2 conforms to the global engineering tool standard IEC61131-3 and supports segmented and structured programming defined by this standard. The languages including SFC, ST(structured text), and ladder can be freely chosen and used in the mix according to the situation and purpose.

IEC61131-3

GX

INDEX

Works2

Ultimate "Easy-to-use" user interface

The programming tool of GX Works2 is designed for ease-of-use and can program with intuitive operations.
Its comfortable operation environment further improves design efficiency.

Ladder display offers much greater visibility ·· P.7

Utilizing sample comment saves time to input comments ············ P.11

Distinguish similar devices without bother ··· P.11

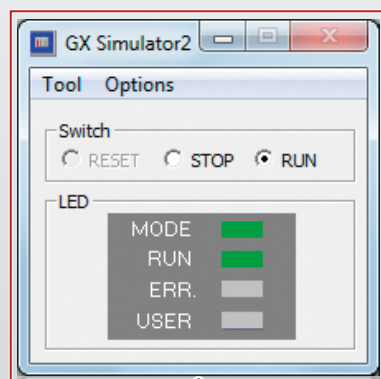**Enhancing program readability with wrapping ladder block function··· P.10**

Incorporate a useful setting function from GX Configurator ·············· P.13

Program title display guides you·································· P.21

Tree view offers easy-to-understand processing flow··························· P.22

Setting connection destinations between multiple settings········· P.23

Offline debugging without PLC ·· P.15
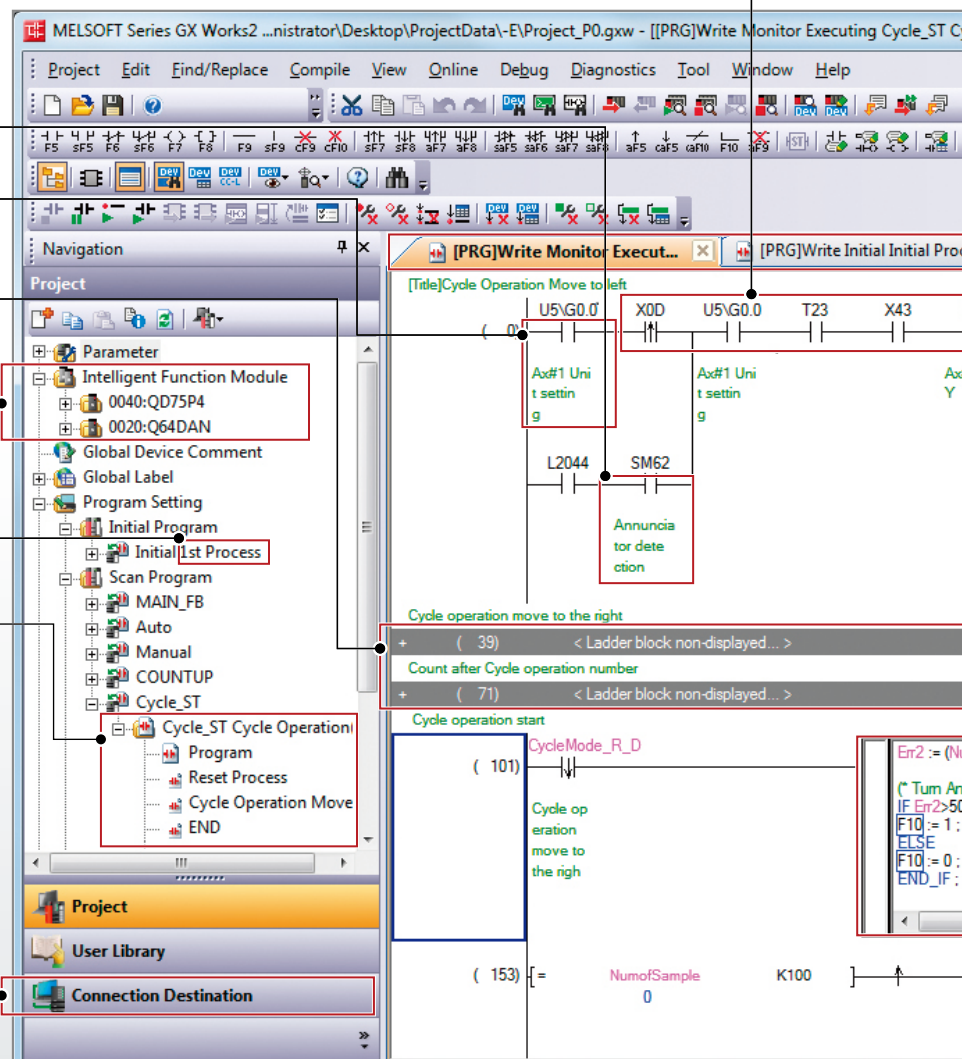
Cross Reference interacts with ladder display ························· P.9

Detailed project security management ····························· P.33

Help information guides you operation method with a single key stroke·········· P.24

Tab window
Switching between the program editor and parameter setting screen can be easily operated using "tabs".
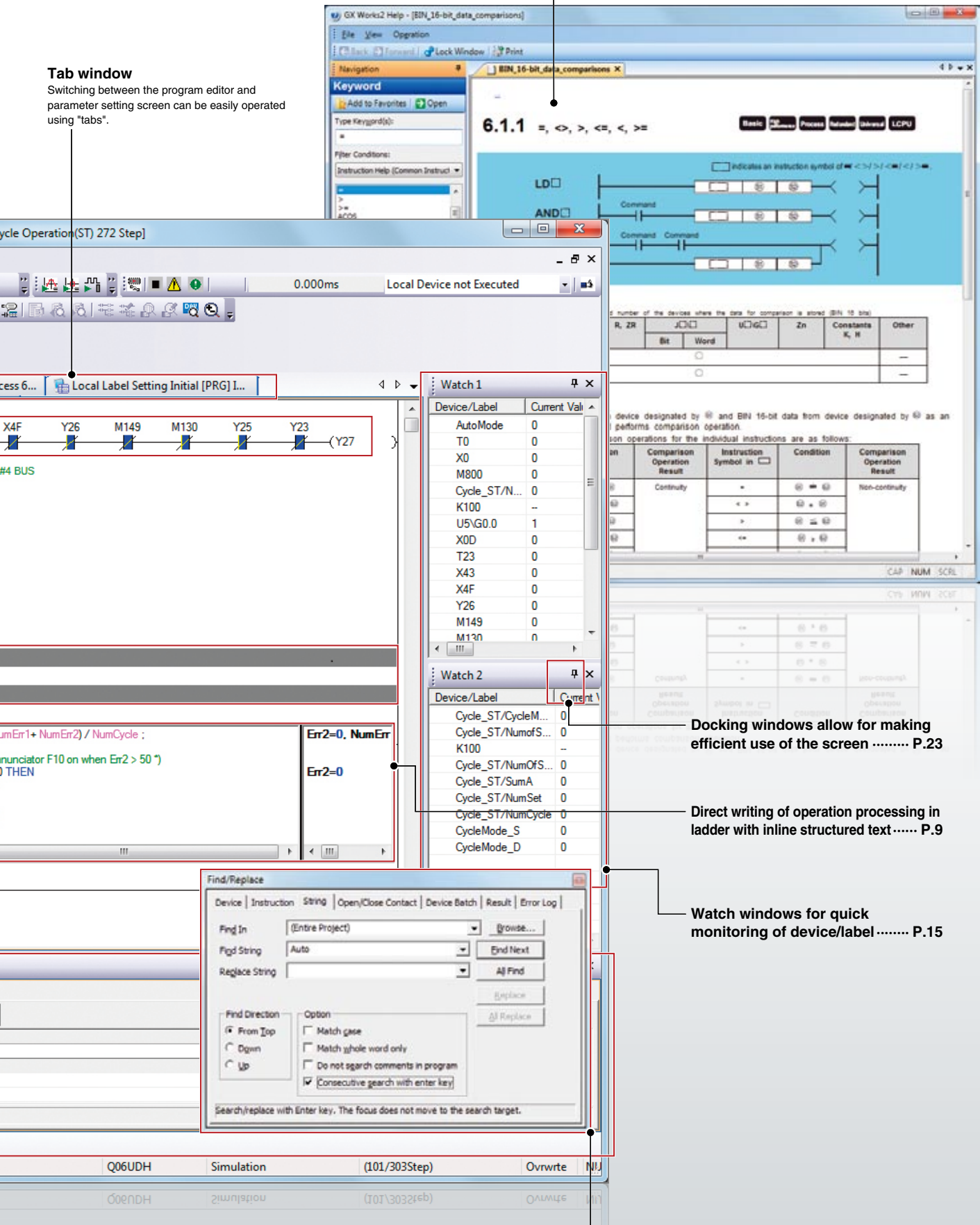
Docking windows allow for making efficient use of the screen ········· P.23

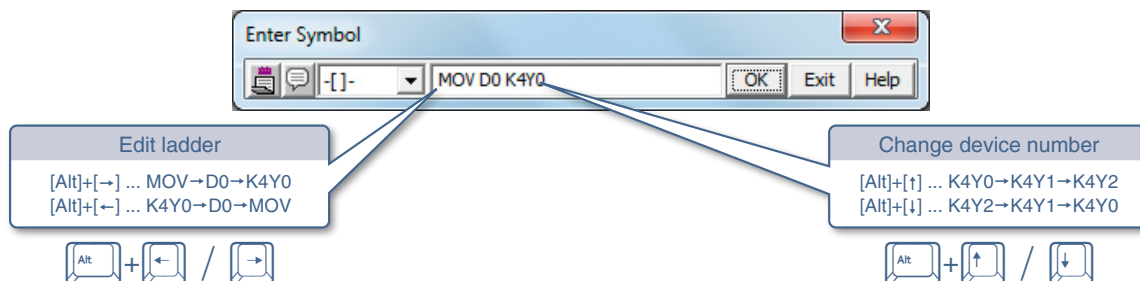**Direct writing of operation processing in ladder with inline structured text** ······ P.9

Watch windows for quick monitoring of device/label ········ P.15

Easy continuous device search with familiar-to-use operation ··················· P.8

GX Works2 Help - [BIN_16-bit_data_comparisons]

File   View   Operation

Back   Forward   Lock Window   Print

Navigation

Keyword

Add to Favorites   Open

Type Keyword(s):

Filter Conditions:

Instruction Help (Common Instruct

BIN_16-bit_data_comparisons ×

6.1.1 =, <>, >, <=, <, >=

Basic Process Redundant Universal LCPU

indicates an instruction symbol of =, <>, >, <=, <, >=.

LD□

AND□   Command

Command Command

	R, ZR	J□\□	U□\G□	Zn	Constants K, H	Other
	Bit	Word				
		○				—
		○				—

device designated by ⊚ and BIN 16-bit data from device designated by ⊚ as an
performs comparison operation.
on operations for the individual instructions are as follows:

	Comparison Operation Result	Instruction Symbol in □	Condition	Comparison Operation Result
	Continuity	=	⊚ = ⊚	Non-continuity
		< >	⊚ , ⊚	
		>	⊚ ≤ ⊚	
		<=	⊚ , ⊚	

CAP NUM SCRL

ycle Operation(ST) 272 Step]

0.000ms   Local Device not Executed

cess 6...   Local Label Setting Initial [PRG] I...

Watch 1

Device/Label	Current Valu
AutoMode	0
T0	0
X0	0
M800	0
Cycle_ST/N...	0
K100	--
U5\G0.0	1
X0D	0
T23	0
X43	0
X4F	0
Y26	0
M149	0
M130	0

X4F   Y26   M149   M130   Y25   Y23
(Y27)

#4 BUS

Watch 2

Device/Label	Current V
Cycle_ST/CycleM...	0
Cycle_ST/NumofS...	0
K100	--
Cycle_ST/NumOfS...	0
Cycle_ST/SumA	0
Cycle_ST/NumSet	0
Cycle_ST/NumCycle	0
CycleMode_S	0
CycleMode_D	0

umErr1+ NumErr2) / NumCycle ;

nunciator F10 on when Err2 > 50 ")
THEN

Err2=0, NumErr

Err2=0

Find/Replace

Device | Instruction | String | Open/Close Contact | Device Batch | Result | Error Log

Find In   (Entire Project)   Browse...

Find String Auto   Find Next

Replace String   All Find

                                         Replace

Find Direction   Option   All Replace
● From Top   □ Match case
○ Down   □ Match whole word only
○ Up   □ Do not search comments in program
              ☑ Consecutive search with enter key

Search/replace with Enter key. The focus does not move to the search target.

Q06UDH   Simulation   (101/303Step)   Ovrwrte   NU
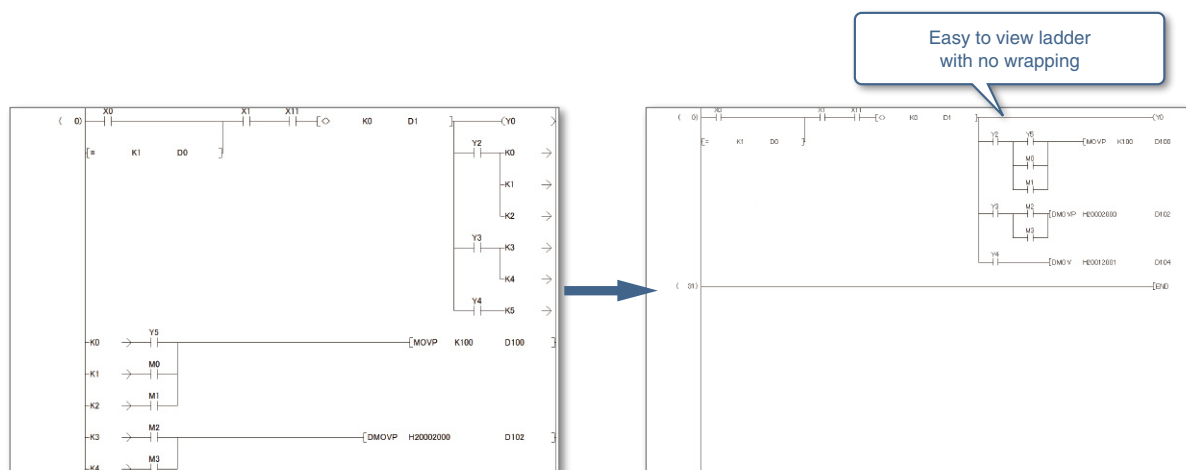
▶ Ladder Input

1 Simple key operation makes an easy ladder creation

A ladder can be easily modified and edited with convenient key combinations such as [Alt]+[←]/[→] or [Alt]+[↑]/[↓].

Enter Symbol

-[ ]- ▼ | MOV D0 K4Y0 | OK | Exit | Help

Edit ladder

[Alt]+[→] ... MOV→D0→K4Y0
[Alt]+[←] ... K4Y0→D0→MOV

[Alt] + [←] / [→]

Change device number

[Alt]+[↑] ... K4Y0→K4Y1→K4Y2
[Alt]+[↓] ... K4Y2→K4Y1→K4Y0

[Alt] + [↑] / [↓]

2 Ladder display offers much greater visibility

A greater number of contacts than ever can be displayed in a single line with fewer wrapping, improving visibility of ladders.

Easy to view ladder with no wrapping

POINT The number of contacts displayed in a single line can be changed to 9, 11, 13, 17 or 21.

3 Edit lines with simple key operation

Lines can be edited only with the keyboard keys.

Press [Ctrl] + [→] to draw a line.
(Press [Ctrl] + [⇧Shift] + [→] to draw a line to the coil consecutively.)

Edit line

You are no longer required to switch to Edit Line mode.
Press [Ctrl] + [→] where no line is drawn to draw a line.
Press [Ctrl] + [→] where a line is drawn to delete the line.
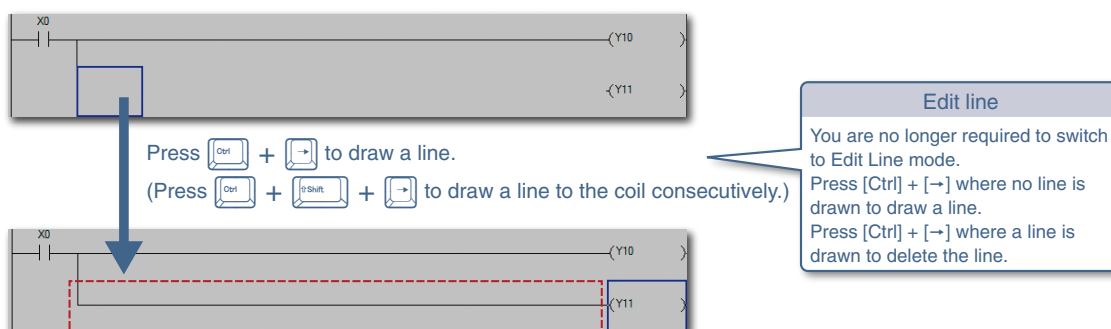
4 Easy ladder edit with command/label input support function

Ladders can be easily edited just by choosing from candidates of instructions and labels.
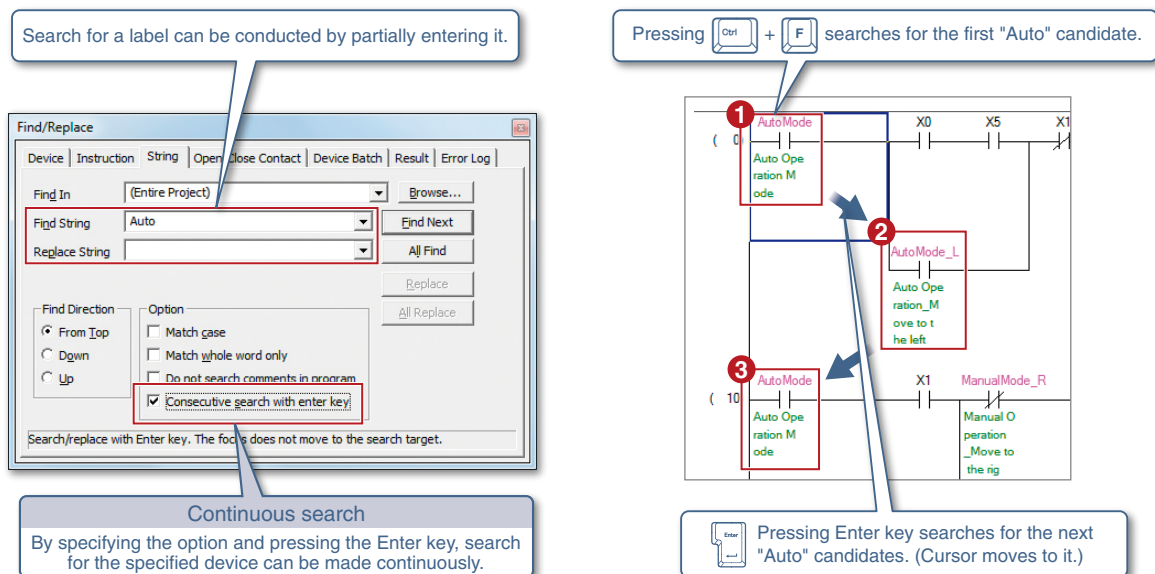The information of arguments are also shown to reduce errors during ladder input.

Explanation of candidate

The details of each instruction can be understood at a glance from explanation of each candidate.

Explanation of argument type

Explanations of arguments are also displayed so that a ladder can be edited without any help.

Automatic display of candidates

Just enter the first character of an instruction to display the instruction candidate list. You do not need to remember all instructions any more.

Explanation of label

Candidates for a label are also given so that a ladder can be edited without remembering all labels.

POINT

This function saves time to display and confirm help information during command input.
Pressing the [F1] key displays the instruction help screen.

5 Easy continuous device search with familiar-to-use operation

By specifying the search option, you can continuously search for the candidates by pressing the Enter key.
This is particularly useful when a specified device is used many times in the program.

Search for a label can be conducted by partially entering it.

Pressing [Ctrl] + [F] searches for the first "Auto" candidate.

Continuous search

By specifying the option and pressing the Enter key, search for the specified device can be made continuously.

Pressing Enter key searches for the next "Auto" candidates. (Cursor moves to it.)

POINT

Search for devices can also be made in the similar manner by switching the ladder display to the device display.

▶ Ladder Input

6 Cross Reference interacts with ladder display

Cross Reference function is used to search for devices/labels used in the project.
The docking windows enable to display the Cross Reference window and program editor vertically.

Automatically displays the Cross Reference information of the device at the cursor position.

Jump to another step using this device/label can be made by double-clicking it.

Double-click

| POINT | The used locations of devices or labels in the program can be confirmed with intuitive operation. |

7 Direct writing of operation processing in ladder with inline structured text

Operation processing can be written directly in a ladder.
Creation of a multi-line ladder or FB(Function Block) in another program editor is not necessary anymore.

Example of numeric operation
[Using ladder only]

[Using Inline ST(structured text)]

Example of character string processing
[Using ladder only]

[Using Inline ST(structured text)]
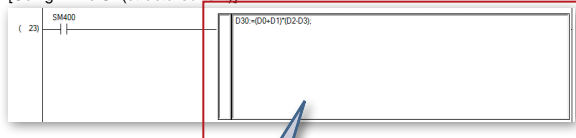
ST edit area
The current value can be monitored and changed.

Described program in just one line using Inline ST!

| POINT | Troublesome numeric operations and character string processing can be described easily. |

8   Enhancing program readability with wrapping ladder block function

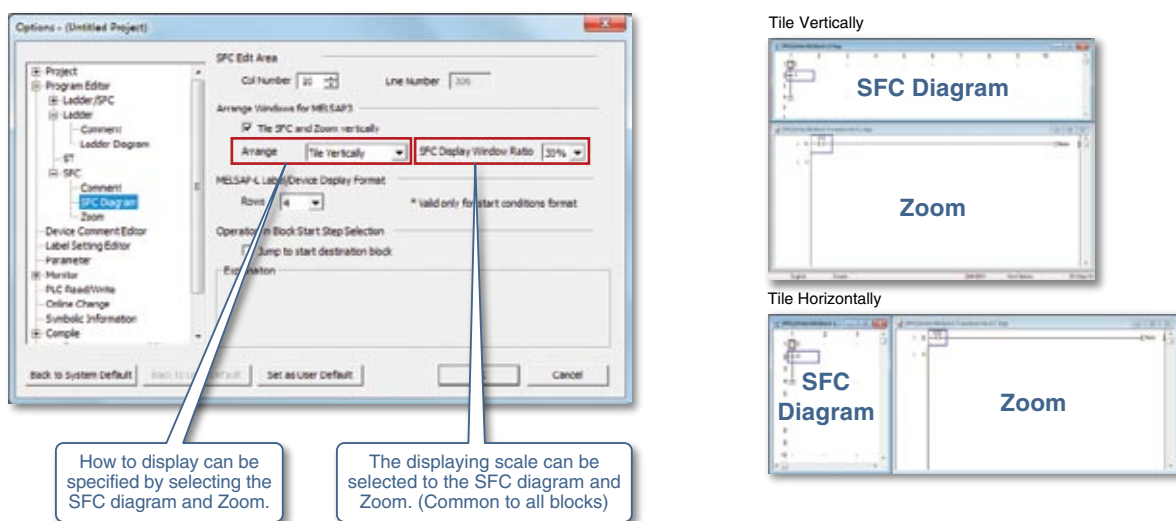By wrapping a ladder block, a long and hard-to-read ladder program can be displayed in a compact form.

> Right-click and select "Non-Display Ladder Block" from the menu to hide the ladder block.

> Right-click and select "Display Ladder Block" from the menu to display the hidden ladder block.

> **Hiding Ladder Block**
> Ladder blocks can be hidden.
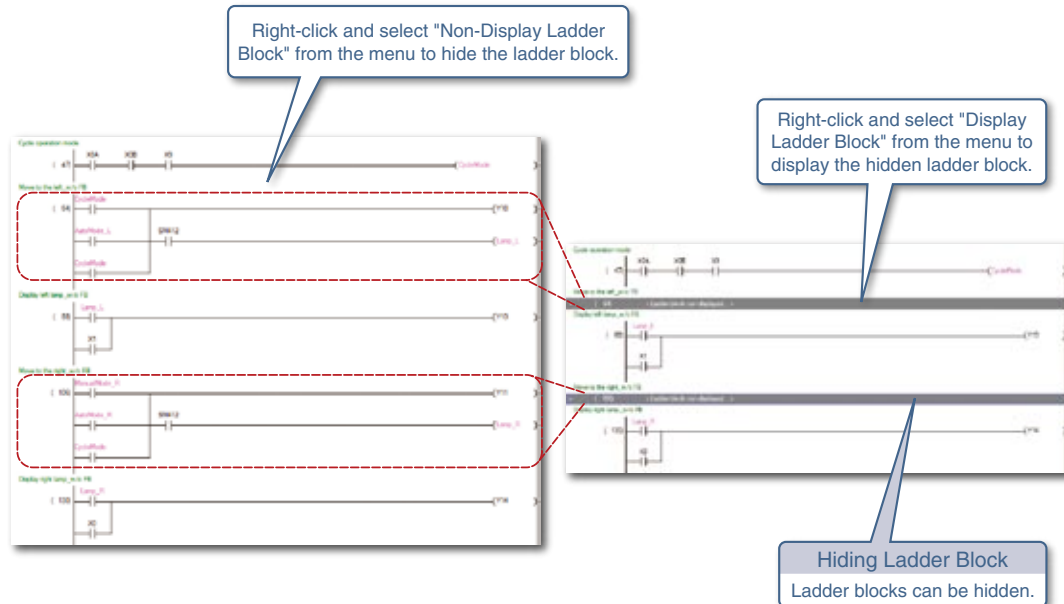
9   Easier to view SFC diagram and Zoom

The scale of the window can be changed to display the SFC diagram and Zoom.
Since the changed scale can be retained, the windows can be always displayed with the same layout.

> How to display can be specified by selecting the SFC diagram and Zoom.

> The displaying scale can be selected to the SFC diagram and Zoom. (Common to all blocks)

Tile Vertically

SFC Diagram

Zoom

Tile Horizontally

SFC Diagram

Zoom

▶ Comment

1 Utilizing sample comment saves time to input comments

Sample comments are provided for the special relays/registers of the CPU as well as the buffer memory/XY signal of the intelligent function module.

They can be copied as comments for the project and you do not need to enter them from scratch.

Comments can be easily utilized by right-clicking menu.

Right-click

■Choose the intelligent function module to utilize comment

■For X/Y comment

■For buffer memory

■For special relay/register
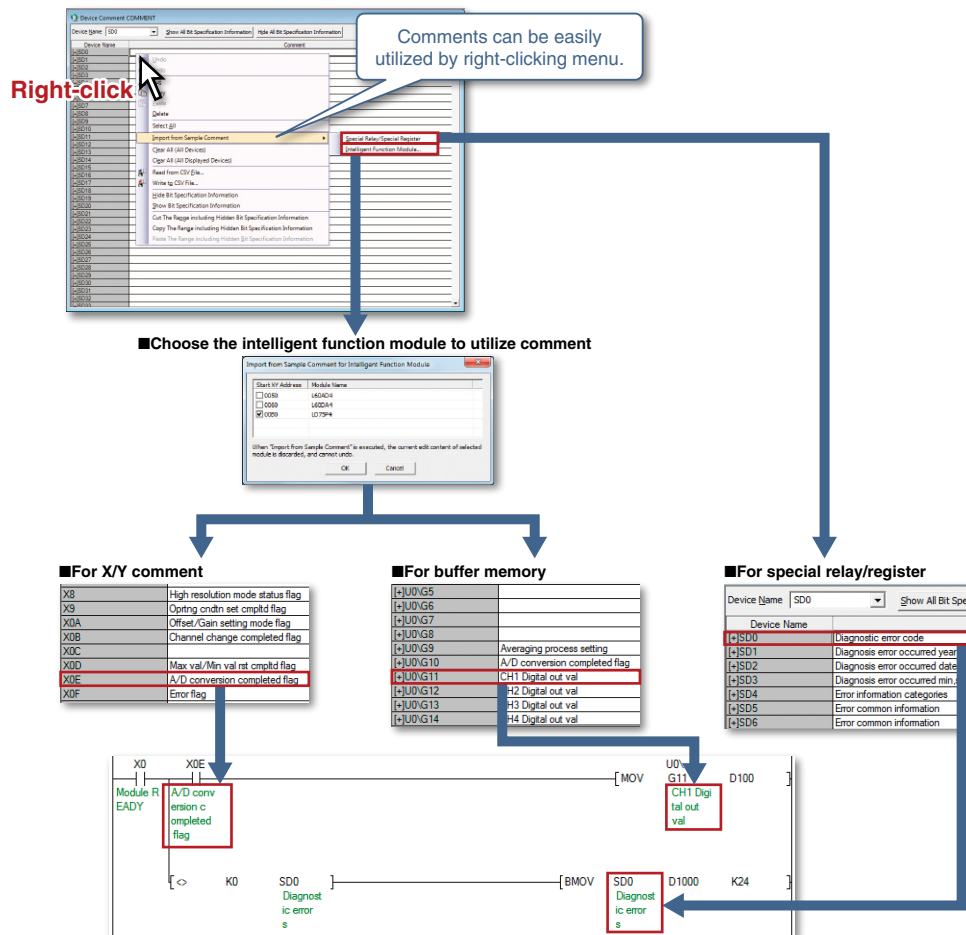
POINT	Time for entering device comments can be greatly saved by utilizing sample comments.

2 Distinguish similar devices without bother

A comment can be set for each bit of a word device and displayed on the ladder.
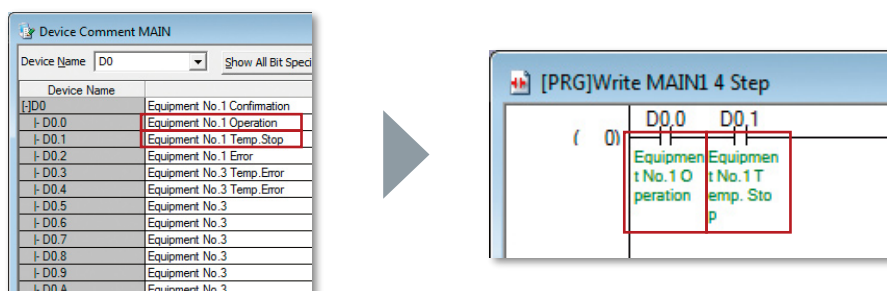
POINT	When a comment for each bit does not created, a comment created for the word device is displayed.

3 Utilize device comments created in other languages

Japanese, Chinese (Simplified and Traditional), and Korean comments can be displayed in GX Works2 English Edition for seamless interoperation with international sites.

GX Works2 Japanese Edition

GX Works2 English Edition

Project file used in GX Works2 Japanese Edition (with Japanese comments)

The Japanese comments can be viewed in GX Works2 English Edition
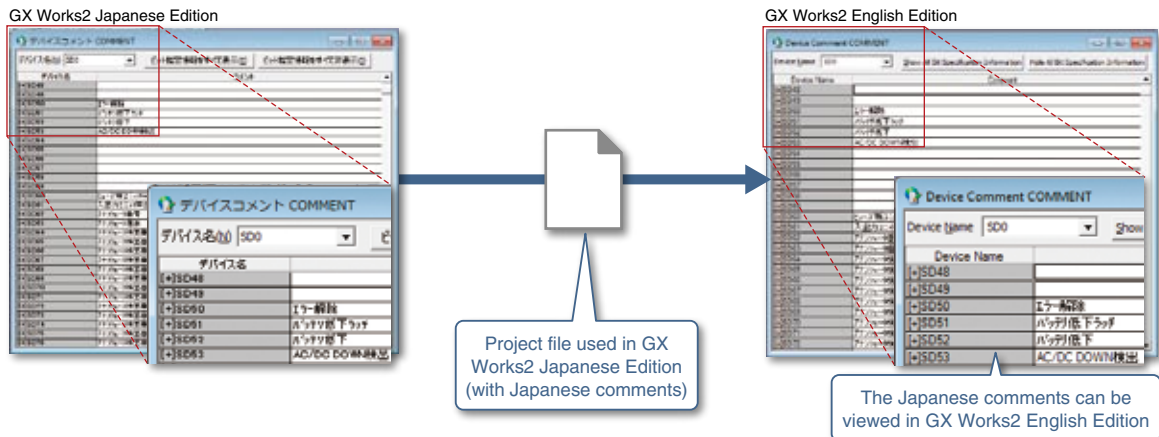
▶ Parameter Setting

1 Incorporate a useful setting function from GX Configurator

The setting function of the intelligent function module is now integrated with GX Works2.
The intelligent function module settings can be managed in a GX Works2 project.

■**Add new module screen**

Also reflected on the I/O assignment parameters.

Module is added to the project tree.

Click

Set the A/D conversion system.

Explanation of item is shown as guidance.

2 Automatically calculates device assignment of CC-Link

An equipment configuration diagram can be created by arranging illustrations with the mouse on the CC-Link Configuration window.
Devices are assigned automatically and listed in an easy-to-view manner.

Start from the toolbar.

The equipment configuration diagram can be created intuitively using the CC-Link Configuration window.

Display the device assignment list. Programming can be made while viewing device assignment.

POINT — **The device assignment information can be exported to a CSV file and then imported into the global label information, making it easy to utilize the information in label programming.**

3 Easy connection to serial communication device

Using the predefined protocol function of GX Works2, connection to a device you want to communicate with can be quickly made just by choosing it from the predefined protocol library.
Even if the external devices are not registered in the predefined protocol library, the desired protocol can be easily created.

Connection can be made to an equipment to communicate with just by choosing it.

The communication protocol can be easily created.
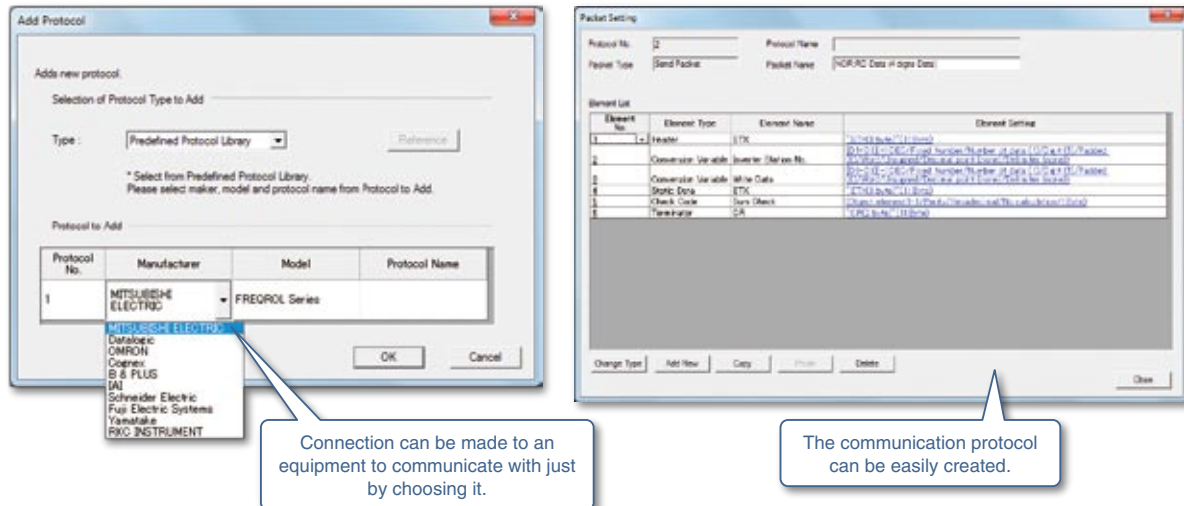
The line data, communication signals, and status monitor can be confirmed even if you do not have a line analyzer, making the debugging process easier.

The line data flowing through the communication line can be saved in the data area of the module. No equipment (e.g., line analyzer) is required.

Data including the executed protocol name, start/completion date/time, and execution result can be saved in the buffer memory of the module as history.
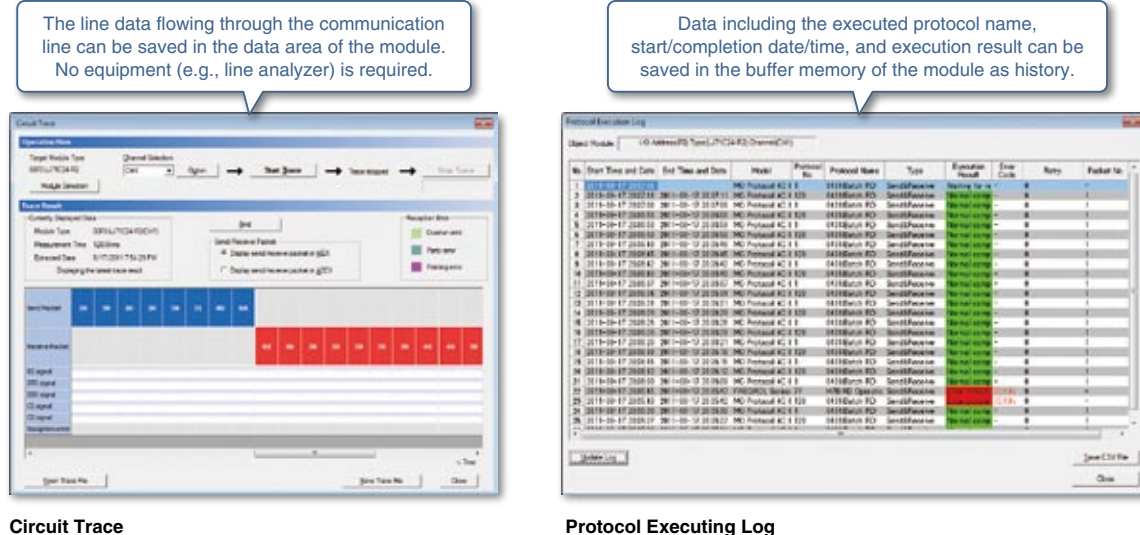
Circuit Trace

Protocol Executing Log

POINT   **Circuit trace function gives you a clear view of sent/received data.**

▶ Debugging

1 Offline debugging without PLC

The simulation function is now integrated with GX Works2.
The program operation can be easily checked on a personal computer.

Debugging can be performed with a PC right after programming without PLC.

Checking operation while actually viewing it allows for design without rework.
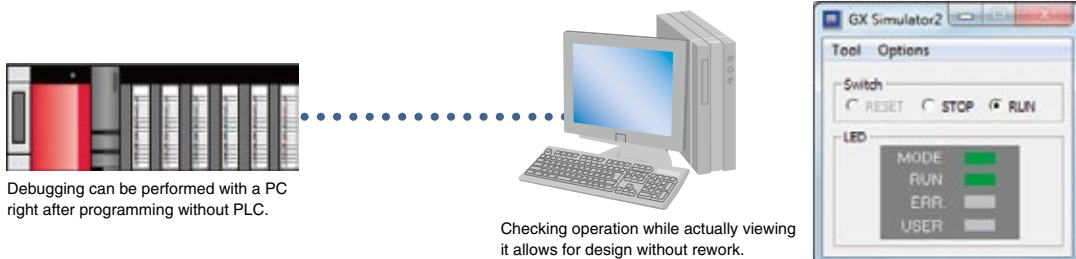
POINT **Up to 4 GX Works2 projects can be simulated concurrently on a single PC.**
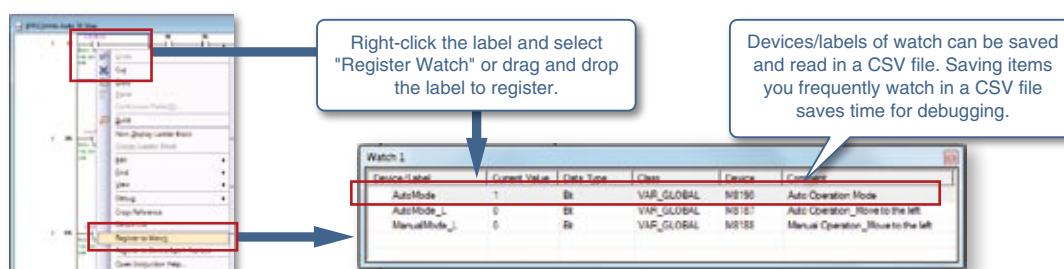
2 Simulation function provides sophisticated program debugging

A program can be executed in a step-by-step method using the simulation function, finding program errors more easily.

Debugging can be operated from the toolbar.

Break points can be set and checked in the docking window.
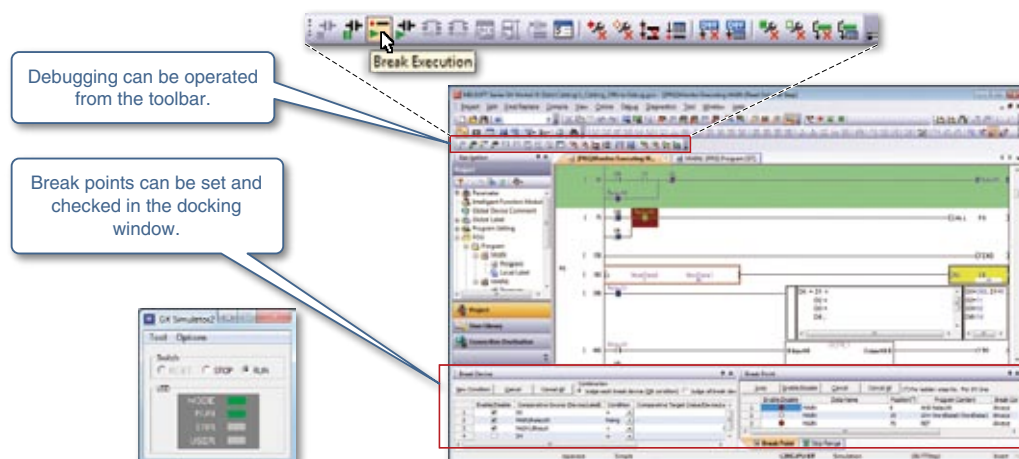
3 Watch windows for quick monitoring of device/label

Arbitrary devices/labels can be registered to monitor, saving time for debugging.
Devices/labels can be registered onto the watch window by right-clicking them on a ladder editor and selecting "Register Watch" or by dragging and dropping them, enabling smoother monitoring.

Right-click the label and select "Register Watch" or drag and drop the label to register.

Devices/labels of watch can be saved and read in a CSV file. Saving items you frequently watch in a CSV file saves time for debugging.

POINT **The current value of the device/label can be changed from the watch window.**

4 Easier-to-use sampling trace

A device value can be monitored according to a specified condition, and sample values before and after the condition is satisfied can be displayed in a timing chart.

Since word devices can be displayed in the trend graph, the device value changes can be viewed easily.

Track of device changes can be easily kept by saving trace results in a CSV file.

ON/OFF switching of bit devices can be checked in the chart.

Devices/labels can be easily registered.

Values of devices/labels at the time at the cursor location can be listed.

Changes of word devices can be checked with the trend graph.
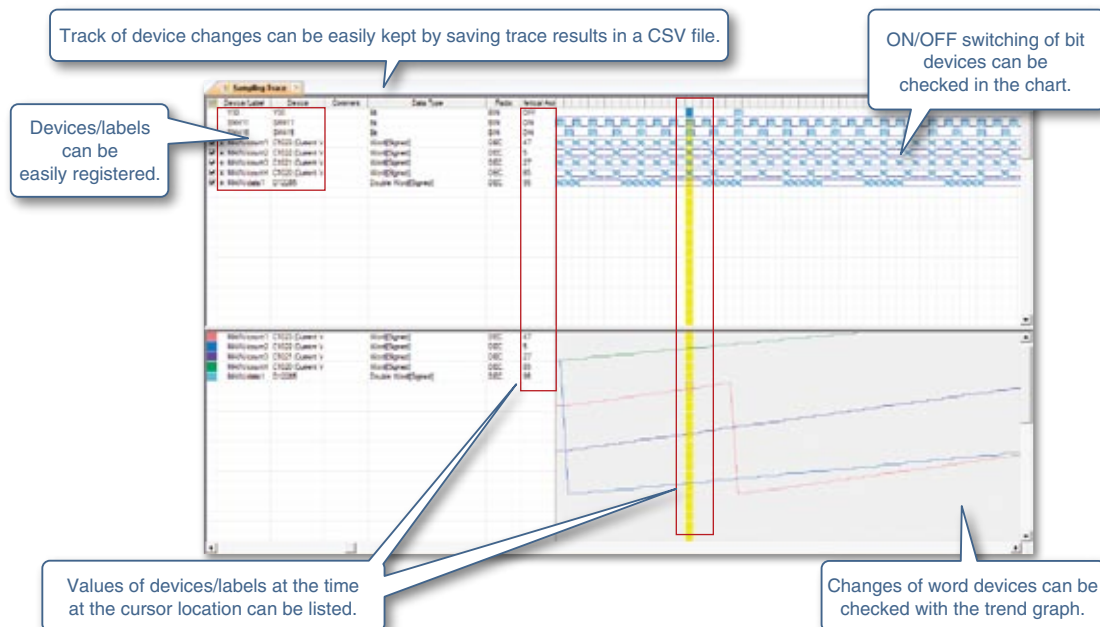
| POINT | The sampling trace can be also used in the simulation function. |

5 Visible positioning trace function

Status of the speed command (axis speed), two-axis interpolation, and simultaneous start (two axes) are traced and displayed in a graph.

The value of each axis can be visually checked during the online operation of the positioning module.
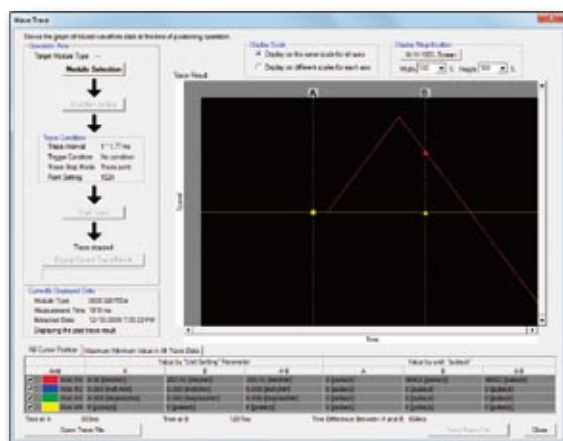
Trace function screen (Wave trace)
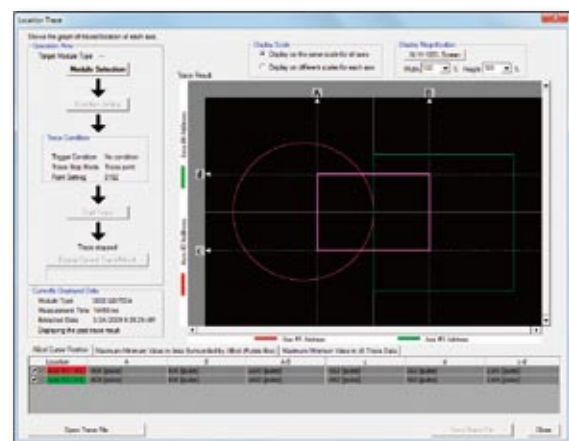
Trace function screen (Location trace)

▶ Operation and Maintenance

1 Improved verification function

Verify data of an open project against data of saved project to display the result in an easy-to-view format.
The parameters and the programs in the PLC connected to a personal computer also can be verified against the data of an open project.

Select comparison source

Select comparison target

Click

Compare a saved project and the project being edited

List matching and mismatching of program files.

Detail Verify Result

Display detailed comparison results of mismatching programs.

Select mismatching portion.

Verification source (project being edited)

Verification target (saved project)

Show mismatching portion.

POINT **The verification result can be saved to a CSV file to facilitate revision of design documents.**

2 Prevent edit error by Read and Monitor modes

Erroneous operations in monitoring and searching are eliminated by supporting the Read and Monitor modes similar to GX Developer.

Write mode/monitor (write mode)
Enter Symbol screen opens by pressing Enter key.

Read mode/monitor mode
Find screen opens by pressing Enter key.

In the Write mode/monitor (write mode), online program change during conversion/compile can be performed to accelerate work.
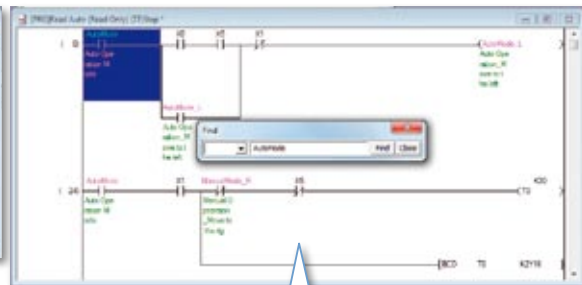
Mis-editing of ladder can be prevented. Pressing Enter key jumps to the next search candidate one by one.

POINT   The same key operation as GX Developer can be used to switch modes.

3 Easy-to-see monitor for intelligent function module

While watching the ladder program, the buffer memory of the intelligent function module can be monitored in the docking window.

Since the name of each address in the buffer memory is displayed, it is unnecessary to refer to the manual to see for what the buffer memory is used.

If there are multiple modules to monitor, they can be switched to display by using tabs.

Show the current values in an easy-to-view format.
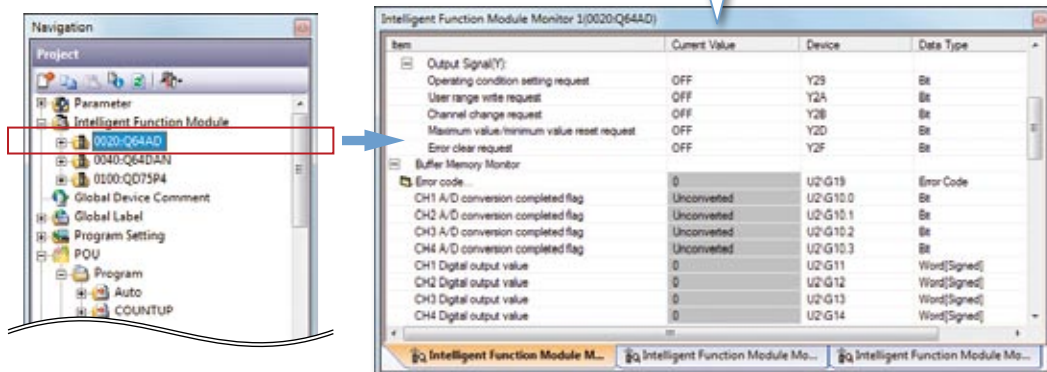
▶ Operation and Maintenance

4 Visible System monitor function and PLC diagnostics

Operation status of the entire programmable controller system is clearly displayed.
Faulty modules can be diagnosed and the detailed information can be displayed for the entire system, allowing for quick troubleshooting of errors.

> The operation status of each module can be checked at a glance.
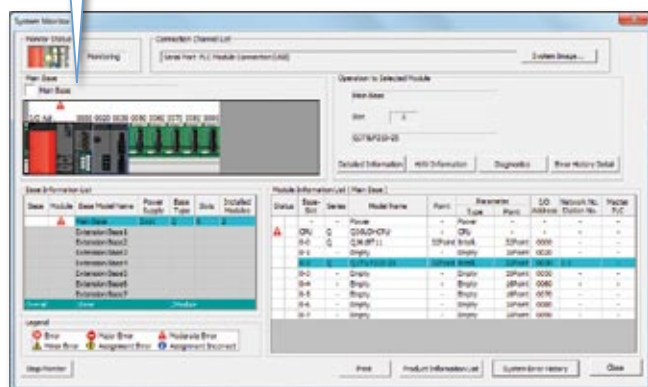
[Module error history collection function]
Error history of PLC and intelligent function module can be viewed in time series.
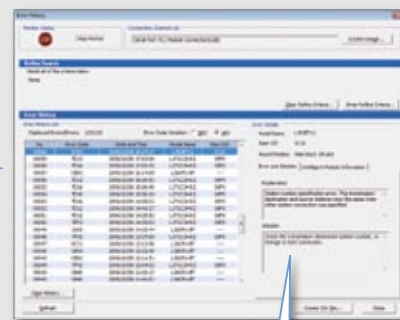
> Error details and solution are displayed to handle troubles without the manual.

[PLC diagnostics]
Error history of PLC can be quickly checked to respond to a failure immediately. Also remote operation can be performed onto the programmable controller CPU to reset it or format its memory.
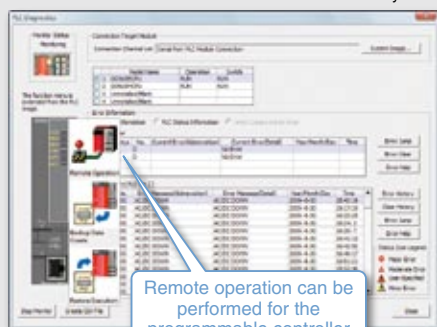
> Remote operation can be performed for the programmable controller CPU.

**[Module's detailed information]**
Display the module status, error details, and solution for the error. Immediate response can be made to a module failure.

[Network diagnostics]
Display the status of the entire network visually so that a line trouble and module error can be quickly found.
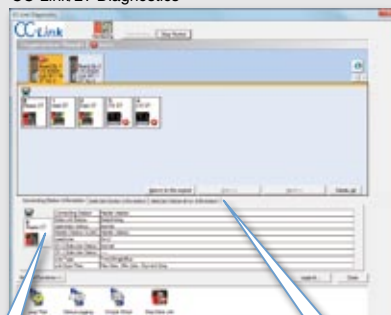Also, system monitoring of the PLC at another station can be started via network.

CC-Link IE Control Diagnostics

CC-Link/LT Diagnostics
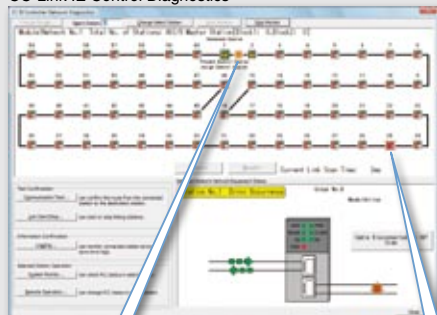
> Disconnection and/or misconnection can be easily found.

> A faulty station with a parameter setting error or an erroneous stop can be also easily detected.

> The selected module's information can be viewed.

> The selected module's error history can be viewed.

POINT   **The system can be diagnosed on a graphical screen which gives a feeling as if you are watching actual system and equipment.**

5 Rich print functions

Items to print can be specified in details.

Also, multiple programs can be printed in a single operation.

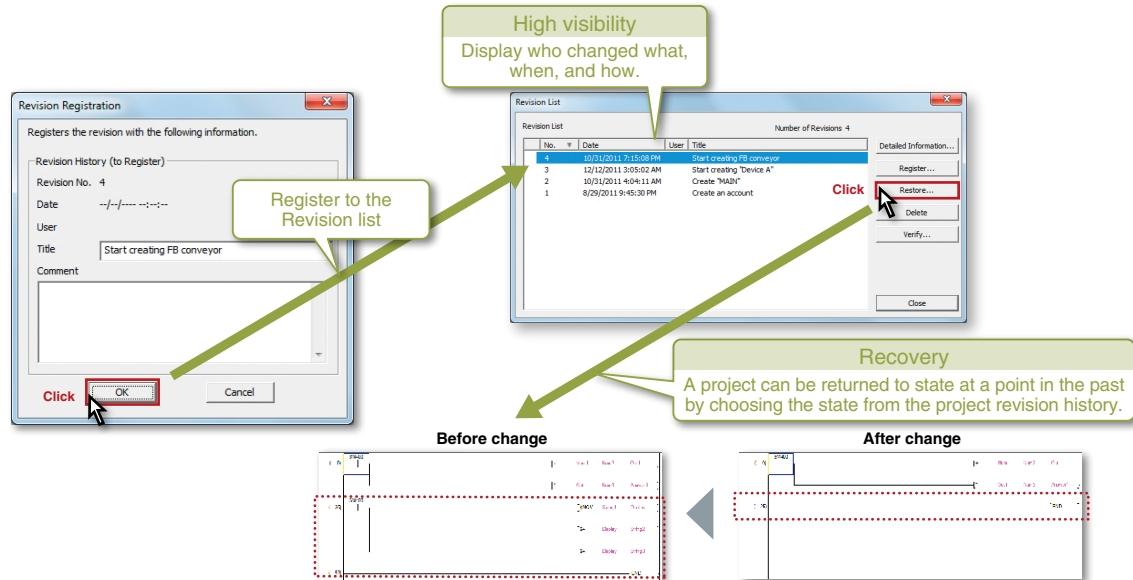Necessary information in detail can be easily printed just by selecting print conditions.
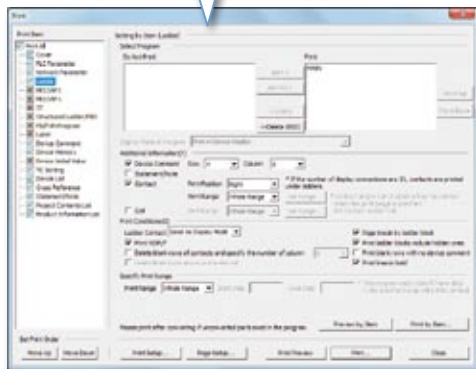
POINT **The print range, contact coil usage, Device list, and Cross reference information also can be printed.**

▶ Project

1 Back up and restore a project easily

By registering project revision history, the project can be recovered easily.
Comparisons between projects registered in the history can be made.
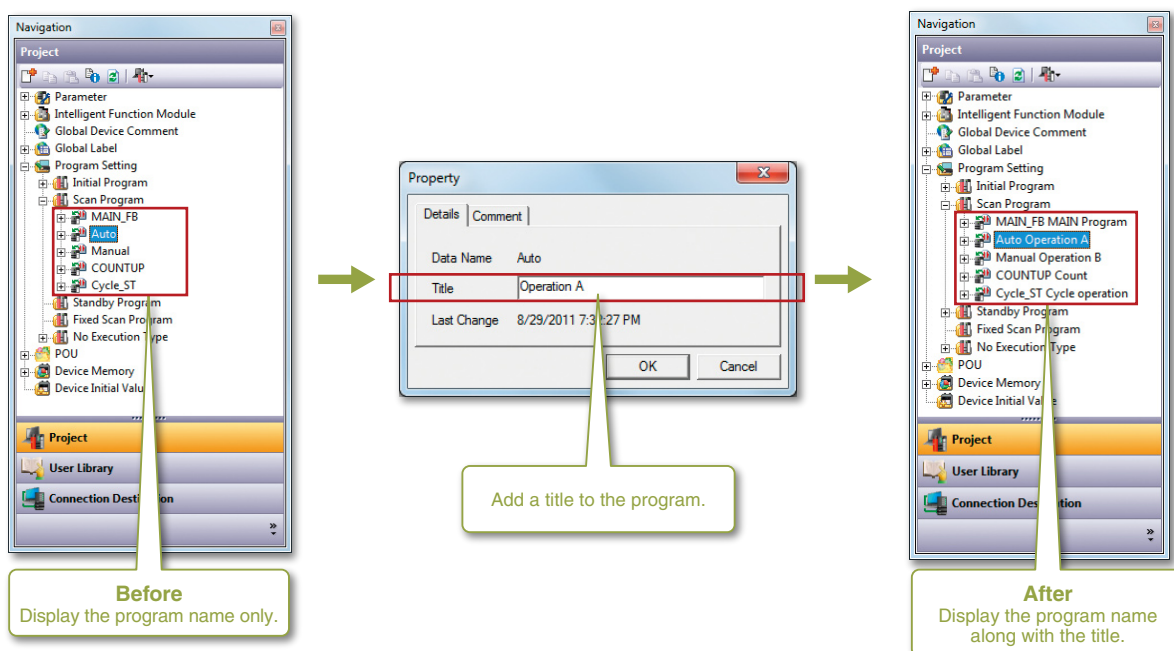
High visibility
Display who changed what, when, and how.

Revision Registration
Registers the revision with the following information.

Revision History (to Register)
Revision No.   4
Date   --/--/---- --:--:--
User
Title   Start creating FB conveyor
Comment

Register to the Revision list

Click   OK   Cancel

Revision List
Revision List   Number of Revisions 4

No.	Date	User	Title
4	10/31/2011 7:15:08 PM		Start creating FB conveyor
3	12/12/2011 3:05:02 AM		Start creating "Device A"
2	10/31/2011 4:04:11 AM		Create "MAIN"
1	8/29/2011 9:45:30 PM		Create an account

Detailed Information...
Register...
Click Restore...
Delete
Verify...
Close

Recovery
A project can be returned to state at a point in the past by choosing the state from the project revision history.

Before change   **After change**

POINT   It is unnecessary to save projects under different names for back up.

2 Program title display guides you

In addition to the program name, the program title is displayed, allowing the program contents to be understood at a glance.
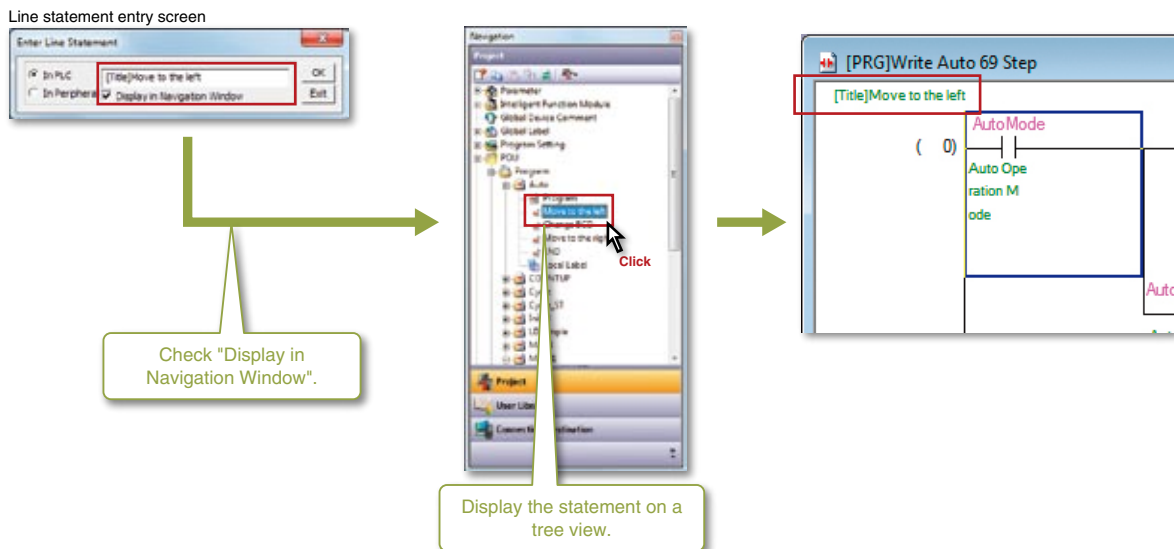
Navigation — Project
Parameter
Intelligent Function Module
Global Device Comment
Global Label
Program Setting
  Initial Program
  Scan Program
    MAIN_FB
    Auto
    Manual
    COUNTUP
    Cycle_ST
  Standby Program
  Fixed Scan Program
  No Execution Type
POU
Device Memory
Device Initial Value

Project
User Library
Connection Destination

Property
Details | Comment

Data Name   Auto
Title   Operation A
Last Change 8/29/2011 7:3 :27 PM

OK   Cancel

Add a title to the program.

Navigation — Project
Parameter
Intelligent Function Module
Global Device Comment
Global Label
Program Setting
  Initial Program
  Scan Program
    MAIN_FB MAIN Program
    Auto Operation A
    Manual Operation B
    COUNTUP Count
    Cycle_ST Cycle operation
  Standby Program
  Fixed Scan Program
  No Execution Type
POU
Device Memory
Device Initial Value

Project
User Library
Connection Destination

Before
Display the program name only.

After
Display the program name along with the title.

POINT   While the program name is limited to eight characters, up to 32 characters can be entered for the title as supplementary information.

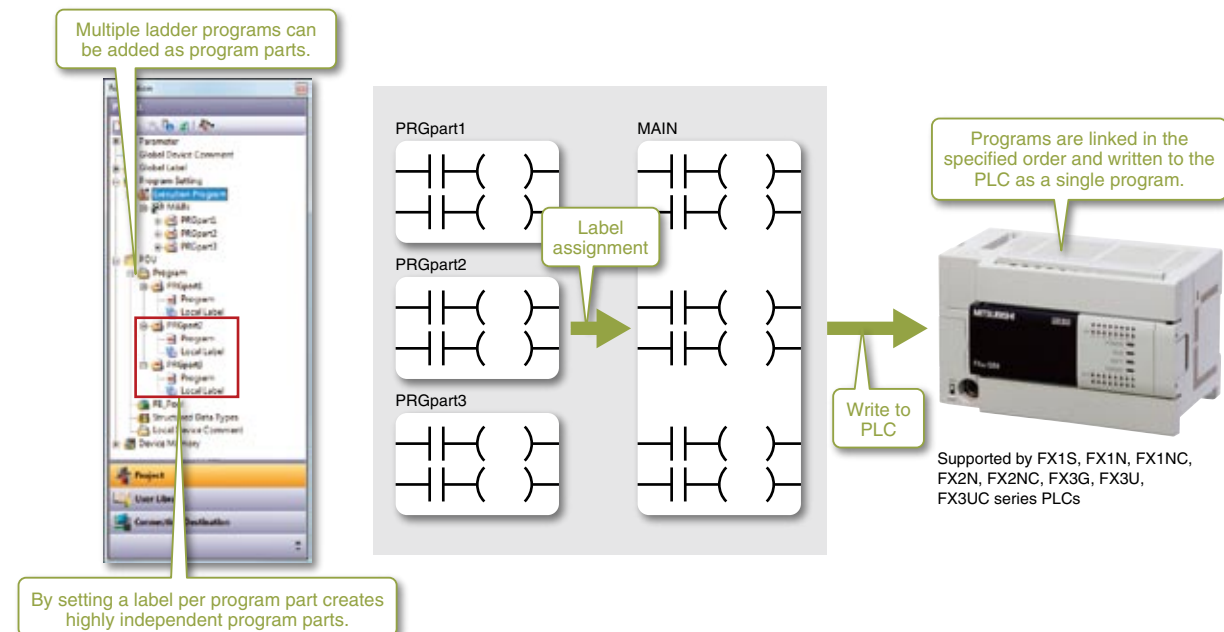# 3 Tree view offers easy-to-understand processing flow

The statements appended to program processes can be displayed on a tree view for easy access to them. The processing flow and structure of the program can be easily understood and jump to each process quickly.

Line statement entry screen

Check "Display in Navigation Window".

Display the statement on a tree view.

Click

4 Handling multiple program parts with FX series CPU

Multiple ladder programs can be added as program parts.
By setting a label per program part creates highly independent program parts.

Multiple ladder programs can be added as program parts.

PRGpart1

PRGpart2

PRGpart3

MAIN

Label assignment

Programs are linked in the specified order and written to the PLC as a single program.

Write to PLC

Supported by FX1S, FX1N, FX1NC, FX2N, FX2NC, FX3G, FX3U, FX3UC series PLCs

By setting a label per program part creates highly independent program parts.

▶ Project

5 **Docking windows allow for making efficient use of the screen**

The docking windows can be hidden to use the screen efficiently.

Click ⊞ to fold detailed display.

Clicking a tab opens the folded window.
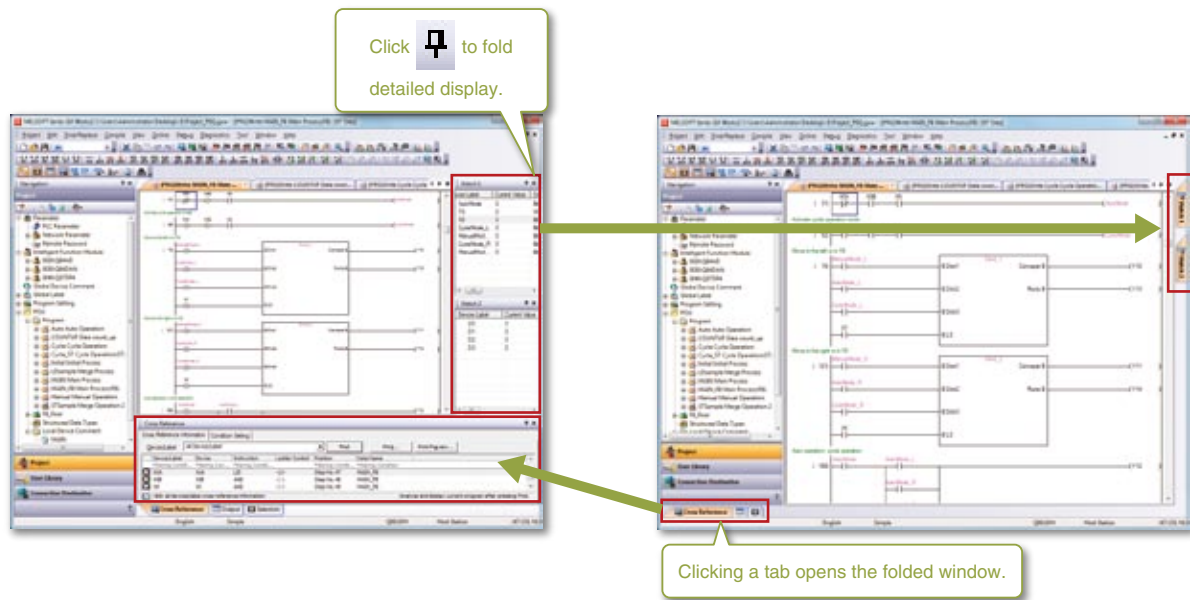
6 **Setting connection destinations between multiple settings**

Frequently used multiple connection destinations can be set and switched between them according to the use scenario.
It is unnecessary to save projects for different connection targets.

Multiple connection destinations can be set according to the usage of the project.

Direct link to USB

Laptop PC   PLC

Connection via GOT

Laptop PC   GOT   PLC

Connection via Ethernet hub

PC   HUB   PLC
                         PLC
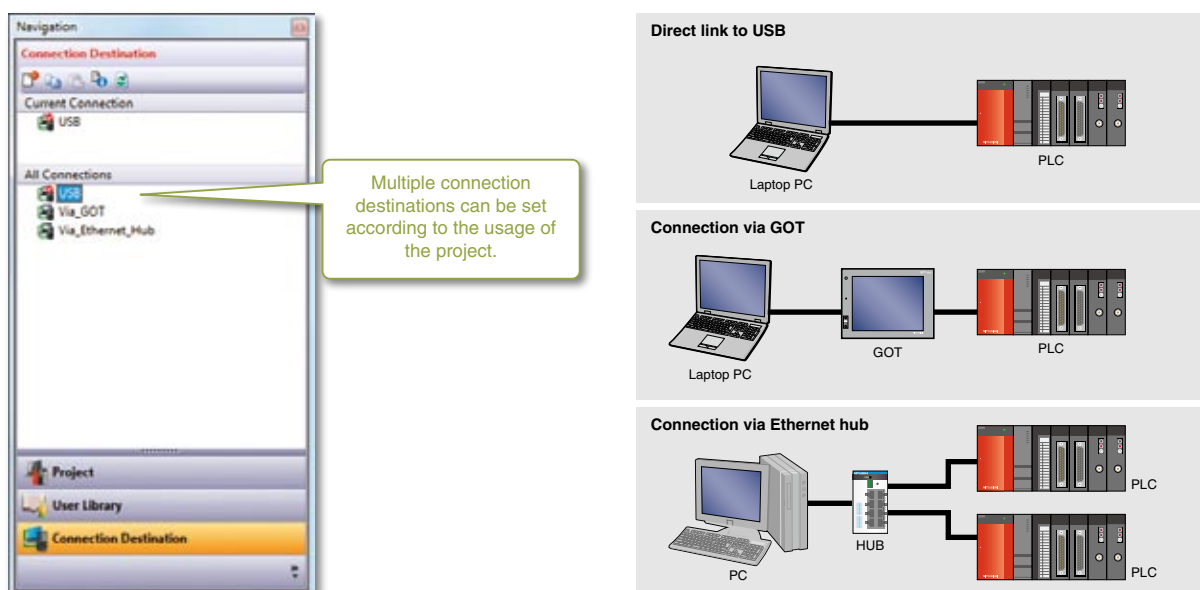
POINT   **The connection destinations can be set from the Navigation window.**

7 Customize keyboard key arrangement

Key customization allows you to arrange keys as you like.
Key customization can be saved in a file and reused.

Any functions can be assigned to the shortcut keys.

F5 and F6 keys are far and difficult to use.

Change from [F5] to [A] and from [F6] to [B].

⊣⊢ ➡	[A]	Open Contact
⊣/⊢ ➡	[B]	Close Contact
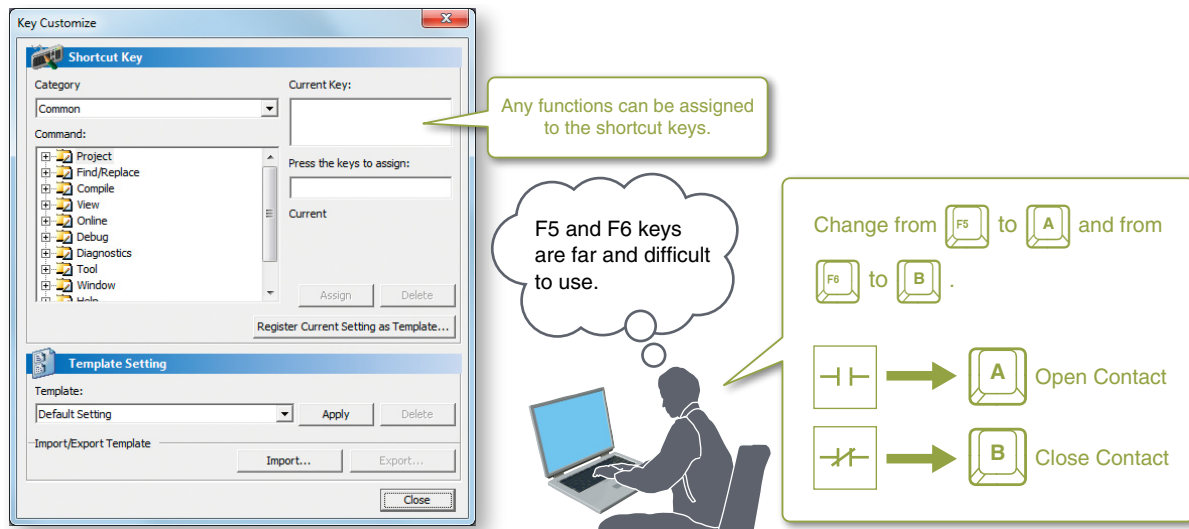
POINT

**Keys can be assigned to menu items
with no shortcut keys assigned but used frequently.**

8 Help information guides you operation method with a single keystroke

Displaying Help information makes it easier to confirm the operation.

Display the help screen by pressing [F1] key.
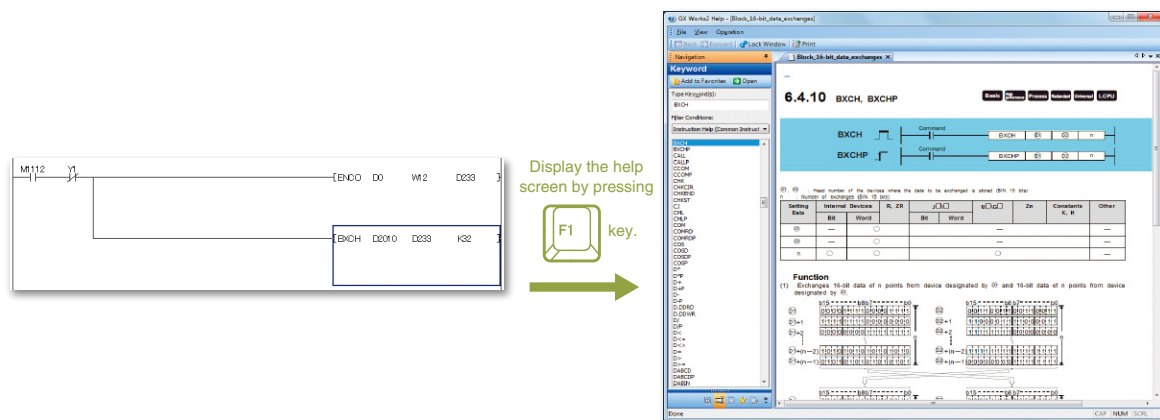
Various help information can be displayed in the Help window.

? CPU Error Help	? Special Relay/Register Help	? Changes from GX Developer	Instruction Help	PDF Operating manual

POINT

Frequently used help screens can be bookmarked.

▶ Label Programming/Structured Programming

1 Structured programming

[From a roll of ladder program to structured programming]
By using a Structured project in GX Works2, a large and complicated program can be structured and segmented according to the processing details, control details, and functionalities.

A "roll" of ladder program tends to be difficult to view the entire processing. On the contrary, by designing a compact program module for each process in structured programming, coding and debugging will be more efficient and the program quality will be also improved.

It also supports complicated structured programming by allowing for a nesting structure which puts a FB in another FB.

Segmentation and structuring of program
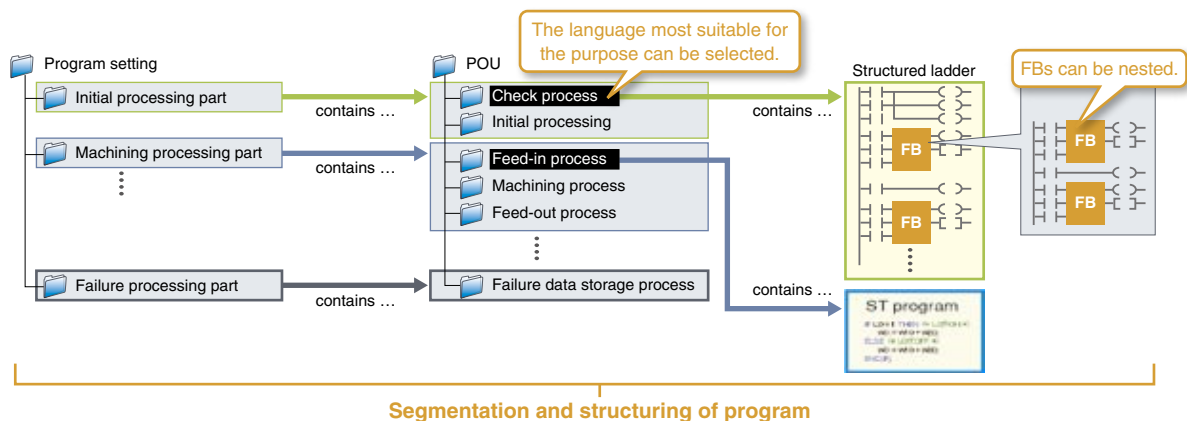
2 Supports IEC61131-3 standard languages

GX Works2 supports languages specified by the IEC61131-3 standard.

Graphical language

[Ladder language]
This graphical language represents a program as a ladder which consists of contact points and coils, and is used in the same manner as conventional GX Developer.

[Structured ladder/FBD language]
The structured ladder language is a graphical language used according to the design technique of the relay circuit. The structured ladder allows for nesting FBs. The FBD language graphically represents a ladder by connecting functions and/or FBs.
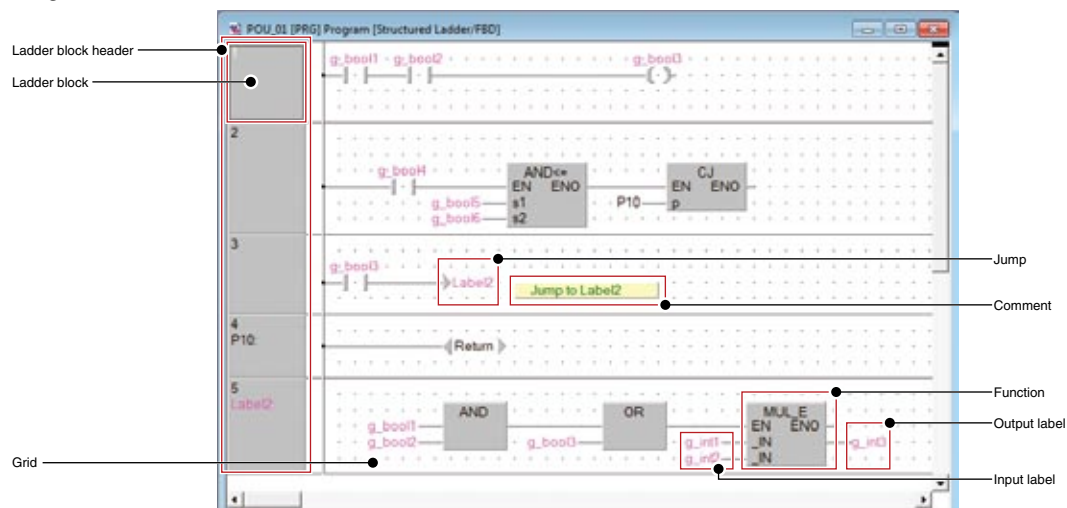
[SFC language]

A graphical language for comprehensively describing sequence control.

This language pairs a step which describes a process with a transition condition to move to the next step.
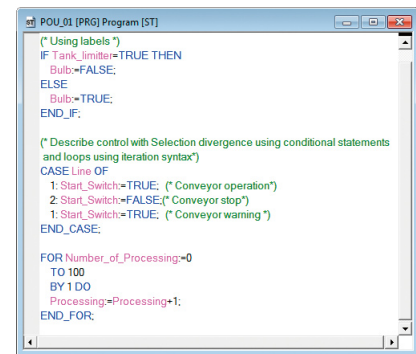
The step and transition condition can be described in the ladder language.

Initial step
Transition condition
Step
Simultaneous divergence
Simultaneous convergence
Jump
Transition condition/step program
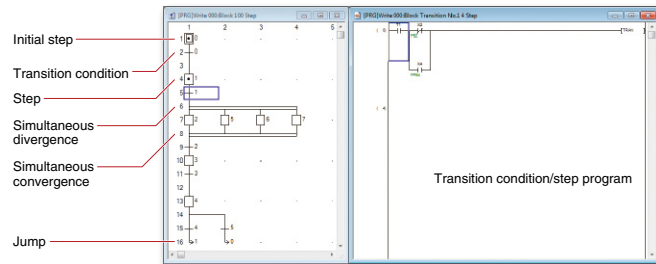
Text language

[ST (structured text) language]

The ST language allows for describing control with selection divergence using conditional statements and loops using iteration syntax, similar to high-level languages such as C. This helps creating comprehensive and concise programs.


```
POU_01 [PRG] Program [ST]
(* Using labels *)
IF Tank_limiter=TRUE THEN
  Bulb:=FALSE;
ELSE
  Bulb:=TRUE;
END_IF;

(* Describe control with Selection divergence using conditional statements
  and loops using iteration syntax*)
CASE Line OF
  1: Start_Switch:=TRUE;  (* Conveyor operation*)
  2: Start_Switch:=FALSE;(* Conveyor stop*)
  1: Start_Switch:=TRUE;  (* Conveyor warning *)
END_CASE;

FOR Number_of_Processing:=0
  TO 100
  BY 1 DO
  Processing:=Processing+1;
END_FOR;
```

3 Improve development efficiency using user libraries

For structured projects of GX Works2, frequently-used programs and FBs can be saved in user library files separately from the project. By utilizing the user library files into a new project, it is unnecessary to create the same program from scratch, and therefore improve program development efficiency.

Utilize user library file into project

Use FB from user library in program

User library file
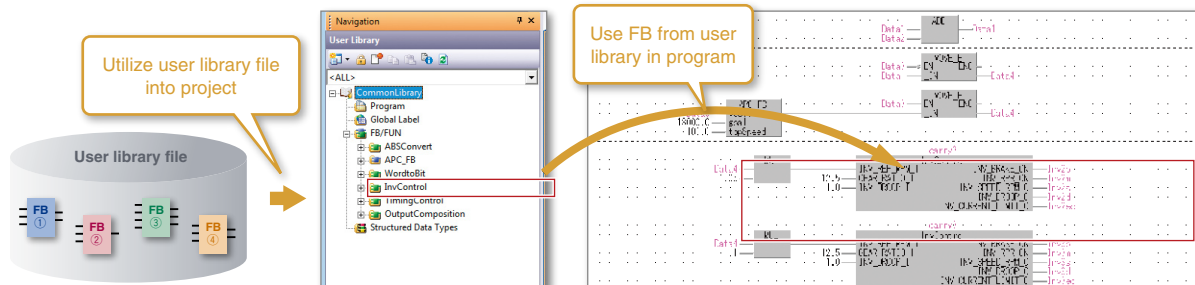
4 Device-unconscious programming

It is not easy to guess device usage from a device name such as "Y10" or "M0".

As the program grows, the number of device types and devices are increased and it will be necessary to program by checking the device assignment with the system specifications, resulting in lower efficiency. Using labels, a self-explaining name such as "Production line start signal" or "Start parts supply" can be given to each device to improve programming efficiency as well as prevent input errors.


POINT   **Using labels eliminates device assignment upon system changes.**

▶ Segmentation of Program (FB: Function Block)

1 Make it easy using FB

FB stands for "Function Block" and is a ladder block frequently used in a sequence program and segmented as a part for reuse within the program.
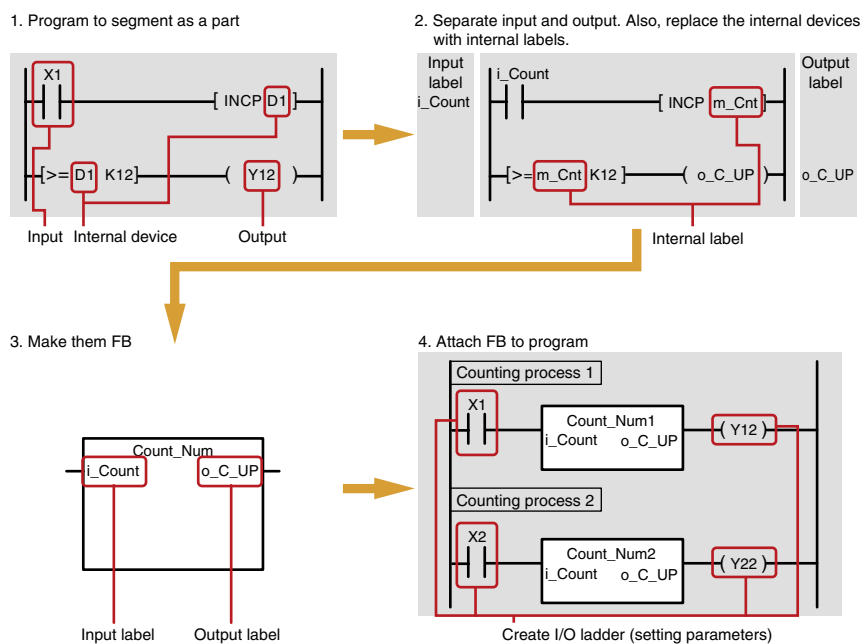
FB improves program development efficiency and reduces programming errors to ensure higher program quality.

Segment repeatedly used ladder blocks as a part
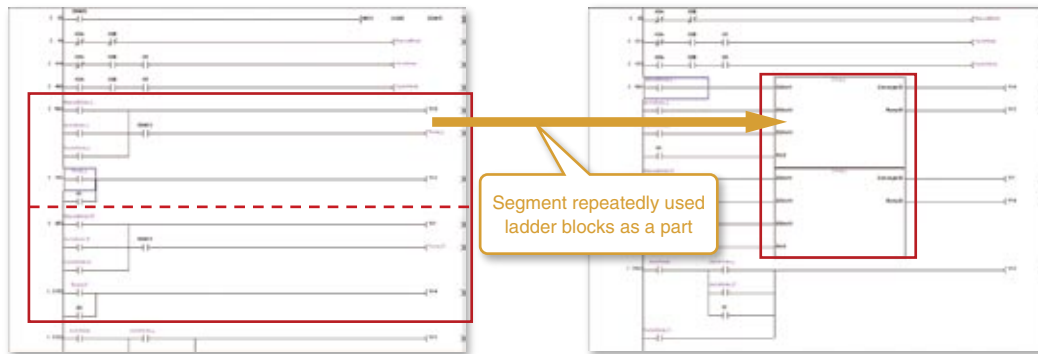
[What is program segmentation?]

The following describes the segmentation flow:

Example) This program turns on the output signal (Y12) after the input signal (X1) turns on for 12 times.

1. Program to segment as a part

2. Separate input and output. Also, replace the internal devices with internal labels.

Input Internal device Output

Internal label

3. Make them FB

4. Attach FB to program

Input label Output label

Create I/O ladder (setting parameters)

[Advantage 1 of using FB: Easier programming]

A sequence program can be created just by dragging and dropping FBs.

This significantly reduces program development processes.

Just by choosing FB from part selection window and dragging & dropping it
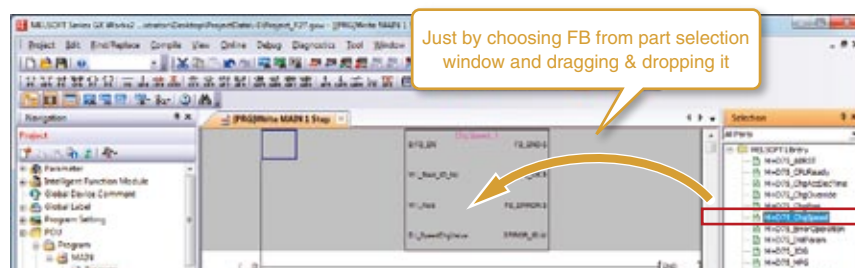
[Advantage 2 of using FB: Improved readability]

Using FBs in a sequence program improves its readability because the program only consists of "boxes" (FBs), inputs, and outputs.
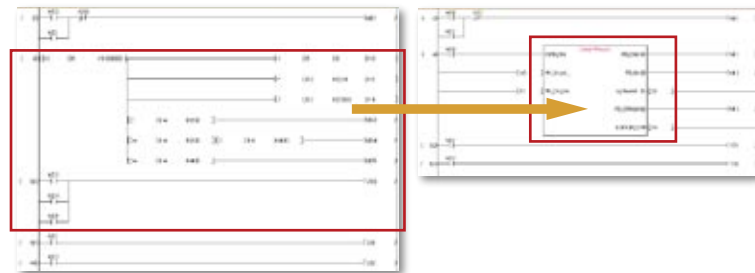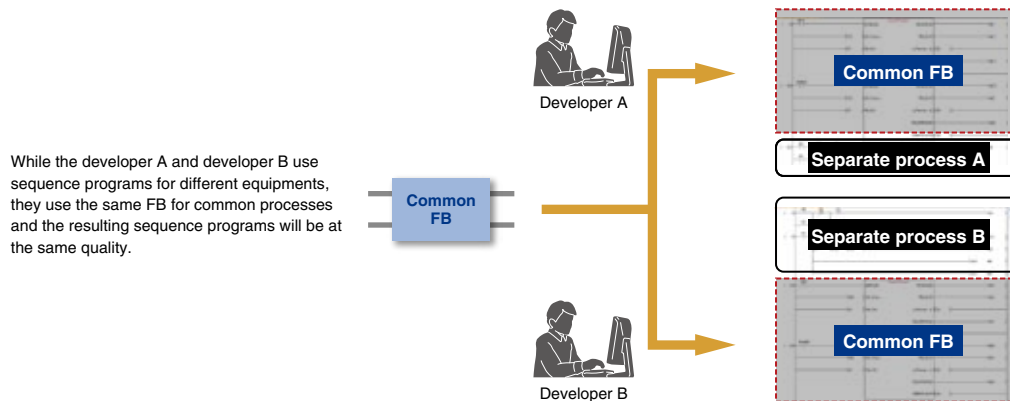

[Advantage 3 of using FB: Reusability]

By segmenting standard programs as parts, they can be reused as many times as required.
You are no longer required to copy an existing program and then modify devices.

Segmentation

FB for startup control

FB for startup control

FB for startup control

FB for startup control
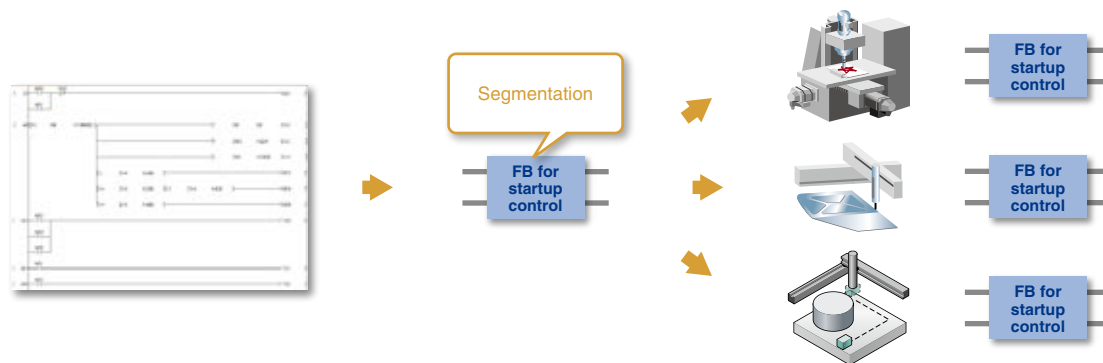
[Advantage 4 of using FB: Higher quality]

By segmenting standard programs as parts (FBs) and reusing them, program quality will be uniform and independent from the skill levels of the developers.

While the developer A and developer B use sequence programs for different equipments, they use the same FB for common processes and the resulting sequence programs will be at the same quality.

Developer A

Common FB

Common FB

Separate process A

Separate process B

Common FB

Developer B

[Advantage 5 of using FB: Asset preservation]

By segmenting an important sequence program involving technology expertise as a part (FB) and protecting it with a password, it will be protected from leakage.

Protected by password

FB

▶ Segmentation of Program (FB: Function Block)

2 Useful FB libraries supplied by vendors

In addition to the custom FBs, useful FB libraries supplied by our partners are available. For the acquisition of FB libraries, please contact your local Mitsubishi representative.

[What is FB library?]
An FB library is a collection of FB parts which can be used in simple projects of GX Works2.
By using these FBs, settings and operation of the MELSEC-Q/L modules as well as partner products can be configured.

■ **Example of MELSEC-Q/L module**

Analog Input Module

[FB for module]

AD signal read

Offset setting

Gain setting

FB   **FB**   **FB**   ····

Analog signal

Level meter
Flow meter ····
Manometer

■ **Example of partner product**

[FB for partner product]

Vision sensor   RFID   Laser displacement sensor   Temperature controller

FB   **FB**   **FB**   **FB**   ····

CC-Link

Ethernet

Vision sensor   RFID   Laser displacement sensor   CC-Link communication converter   Temperature controller

Partner product family

When how to use an FB is not certain, right-click it on the FB Selection Window to display the help information.

When you are not sure about how to use FB, just right-click it for help!
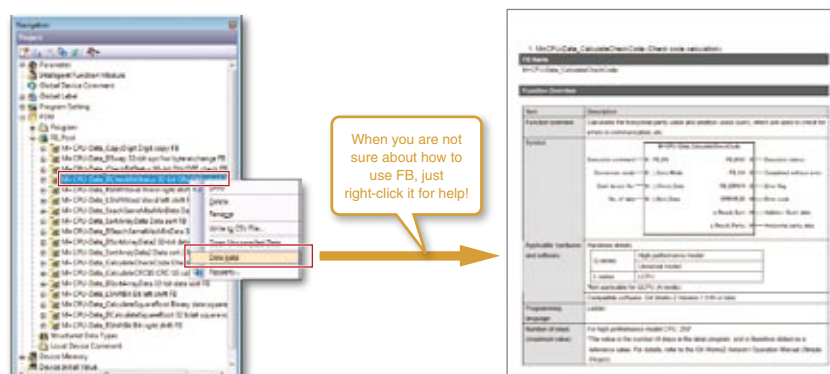
MEMO

▶ Interaction with iQ Works

1 Implements a seamless engineering environment

MELSOFT iQ Works is an integrated engineering software product, composing of GX Works2, MT Works2, GT Works3, and RT ToolBox2. By sharing information such as system designs and programming as the entire control system, the system design and programming efficiency are improved and total cost reduction is achieved.
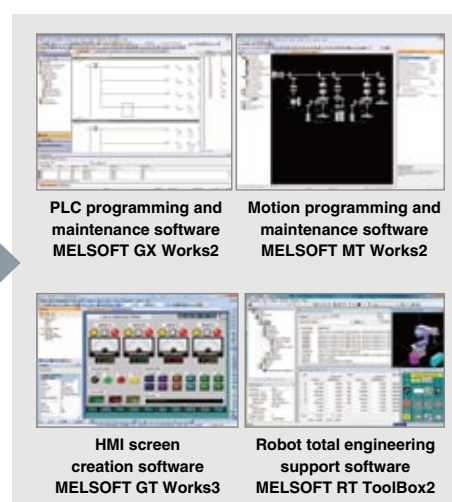
[MELSOFT Navigator]
In combination with GX Works2, MT Works2, GT Works3, and RT ToolBox2, this software performs upstream system design and inter-software operation.
It provides such convenient functions as system configuration design, batch setting of parameters, system labeling, and batch reading.

PLC programming and
maintenance software
MELSOFT GX Works2

Motion programming and
maintenance software
MELSOFT MT Works2

HMI screen
creation software
MELSOFT GT Works3

Robot total engineering
support software
MELSOFT RT ToolBox2
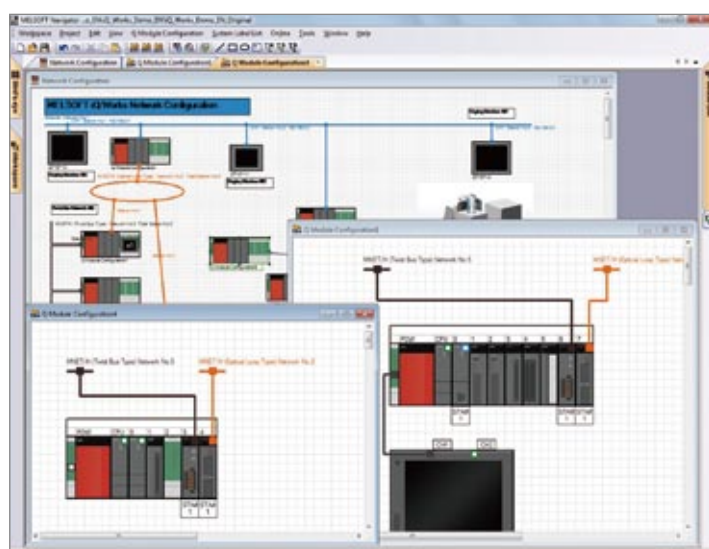
MELSOFT Navigator

■ Workspace management
Multiple project data (programmable controller projects, motion controller projects, GOT projects, and robot controller projects) can be managed totally using a workspace.

• System configuration diagram
Graphically represents the entire system as "network configuration" + "multi module configuration" + "CC-Link configuration".
The diagram can be easily created by dragging and dropping the modules, and various checks such as power supply capacity check are also performed.

• System label
To reduce processes and prevent setting errors, the system labels are centrally defined and shared among all the projects.
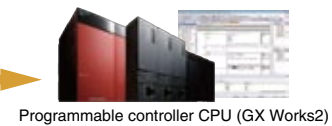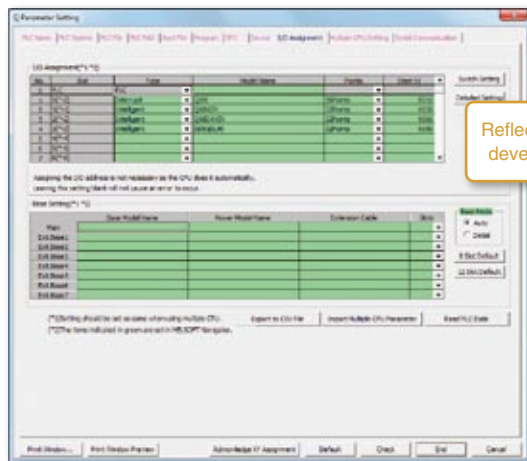
2   Parameter settings for individual tools are no longer required

After finishing parameter setting for one system, another parameter setting for another system is waiting for you ...

Parameter settings for multiple systems are particularly troublesome when implementing a program. MELSOFT Navigator reflects information defined in the system configuration diagram on all the projects in GX Works2, MT Works2 and GT Works3. You no longer need to launch each software and check for integrity. *1

*1 You are still required to set detailed parameters in each tool.

Parameter setting information in system configuration diagram

Reflected on data of various development tools at once

Programmable controller CPU (GX Works2)

Motion controller (MT Works2)

GOT (GT Works3)

3   Shares labels and automatically changes all related projects

Previously, when device assignment was changed, it was necessary to repeat the same modification work for the number of projects for all equipments. MELSOFT Navigator eliminates such repetition by allowing the PLC, motion controller, and GOT to share the labels. For example, when device assignment is changed in a PLC project, the change is automatically reflected on the motion controller and GOT projects. This greatly reduces the time required for setting as well as setting errors.

Define labels centrally

Automatically reflects changed information on each project

Programmable controller CPU (GX Works2)

Motion controller (MT Works2)

GOT (GT Works3)
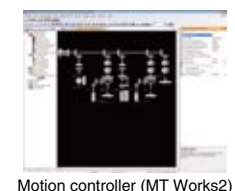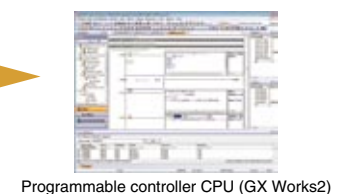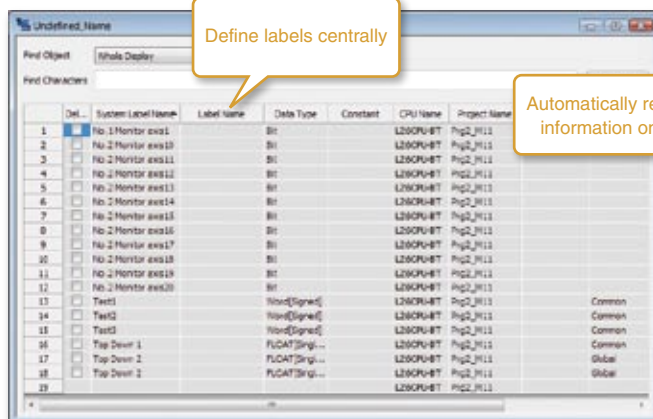
▶ Security

1 Detailed project security management

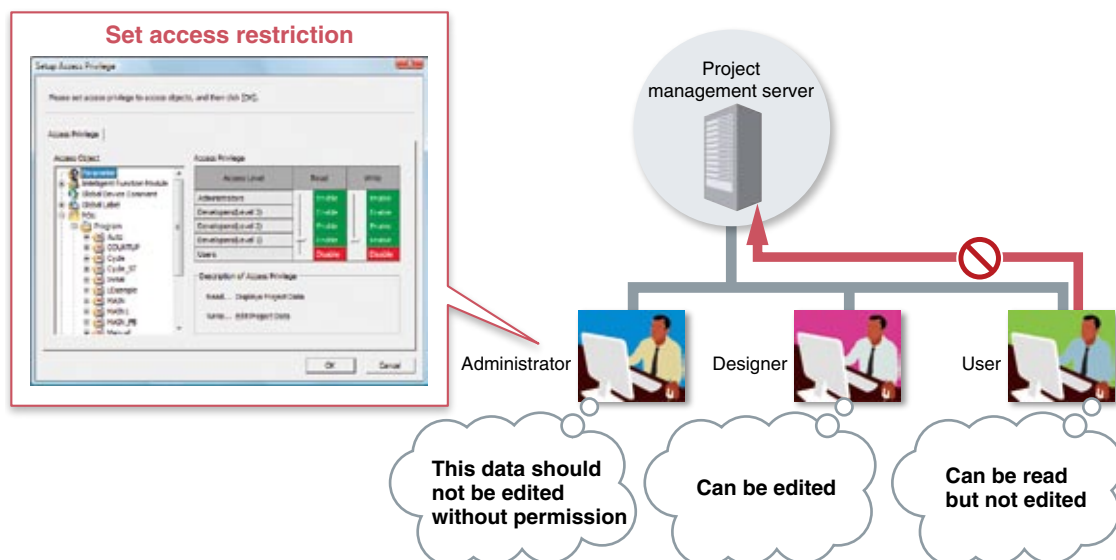Project safety can be maintained by limiting user access for each program and parameter.

[User registration (addition, change, and deletion)]
The access level can be managed for each user.

Register users allowed for access
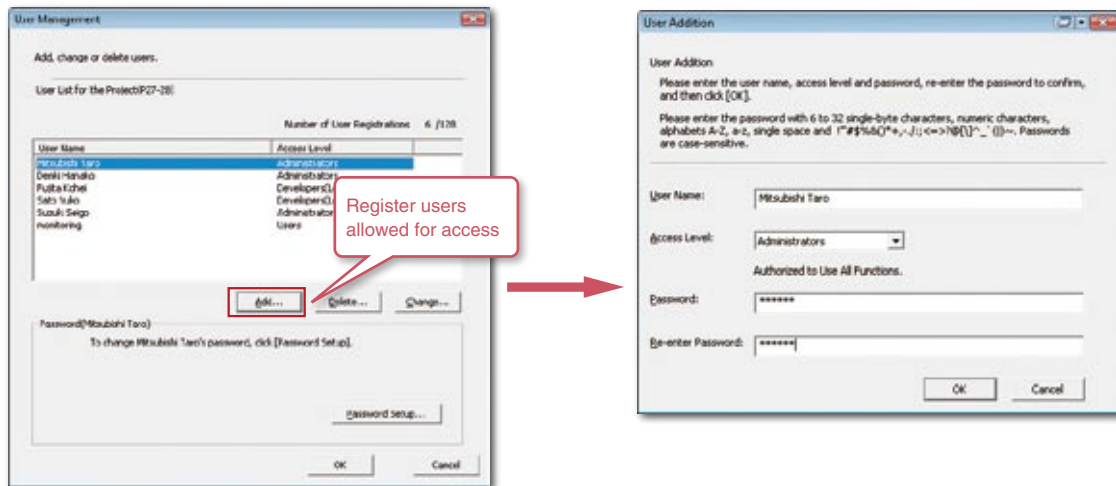
[Access restriction]
Setting security not only restricts an access to projects but also prevents the data created by the user from erroneous modification and/or disclosure to unauthorized users.


Set access restriction

Project management server

Administrator   Designer   User

This data should not be edited without permission

Can be edited

Can be read but not edited

POINT	When multiple persons take charge in the same project, unauthorized changes to the project data can be prevented.

2 Protects the program

[Password registration]
By setting a password for a program in the programmable controller CPU, the program can be protected from unauthorized change and leakage.
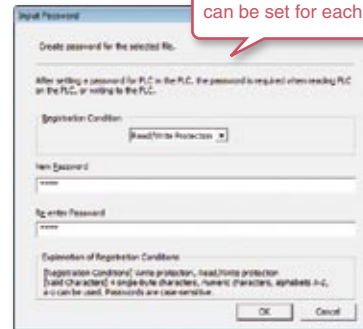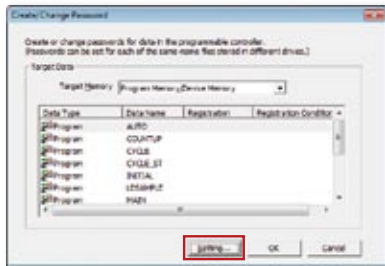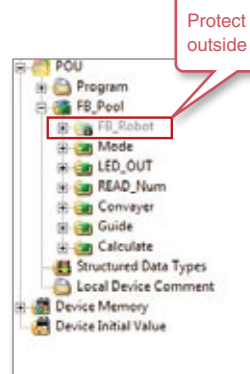

Read/Write or Write Protection can be set for each program.

[Block password setting]
By setting a block password, the FBs within a project which contains in-house software expertise can be protected from theft and leakage.
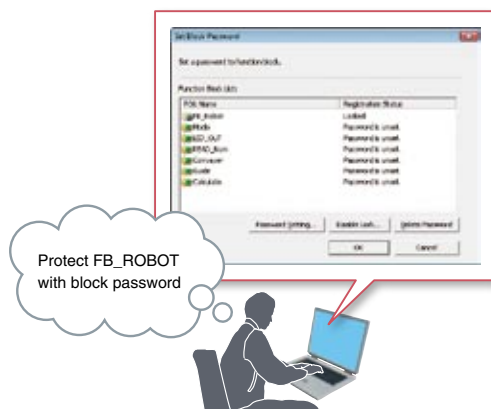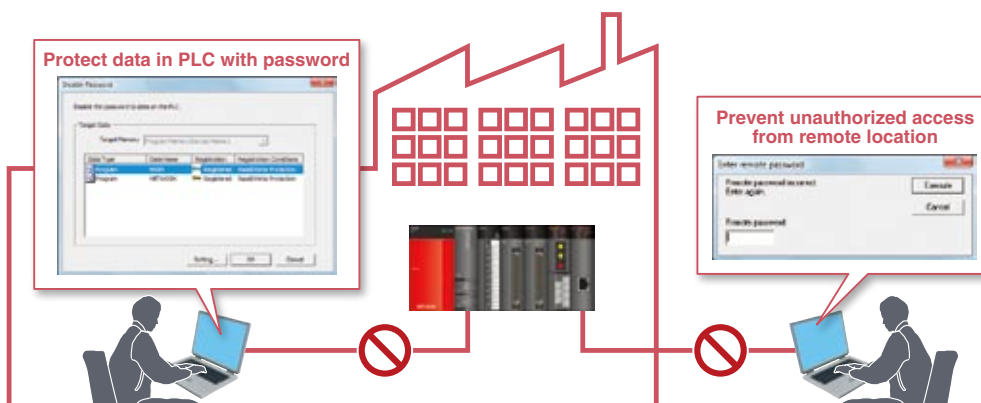

Protect FB_ROBOT with block password

Protect data from being leaked outside using block password

3 Prevents unauthorized access

By setting a remote password, an unauthorized access from a remote site via Ethernet or a public line can be prevented.

Protect data in PLC with password

Prevent unauthorized access from remote location

■ Operating Environment

Item		Contents
Personal computer	OS	Microsoft® Windows® 7 Starter Operating System*1 / Microsoft® Windows® 7 Home Premium Operating System*1 / Microsoft® Windows® 7 Professional Operating System*1 / Microsoft® Windows® 7 Ultimate Operating System*1 / Microsoft® Windows® 7 Enterprise Operating System*1 / Microsoft® Windows Vista® Home Basic Operating System / Microsoft® Windows Vista® Home Premium Operating System / Microsoft® Windows Vista® Business Operating System / Microsoft® Windows Vista® Ultimate Operating System / Microsoft® Windows Vista® Enterprise Operating System / Microsoft® Windows® XP Professional, Service Pack 2 or later / Microsoft® Windows® XP Home Edition, Service Pack 2 or later / Microsoft® Windows® 2000 Professional, Service Pack 4 or later
	CPU	Intel®Core™2 Duo Processor 2GHz or more
	Required memory	Recommended 1GB or more
Available hard disk capacity		When installing GX Works2: HDD available capacity is 2.5GB or more. When operating GX Works2: Virtual memory available capacity is 512MB or more.
Disk drive		CD-ROM supported disk drive
Monitor		Resolution 1024 x 768 pixels or higher

*1 64-bit edition supported

■ Supported Programmable Controller CPU

Series name	Model
MELSEC-Q series	Basic model QCPU (Q00J, Q00, Q01)
	High Performance model QCPU (Q02, Q02H, Q06H, Q12H, Q25H)
	Universal model QCPU (Q00UJ, Q00U, Q01U, Q02U, Q03UD, Q03UDE, Q04UDH, Q04UDEH, Q06UDH, Q06UDEH, Q10UDH, Q10UDEH, Q13UDH, Q13UDEH, Q20UDH, Q20UDEH, Q26UDH, Q26UDEH, Q50UDEH, Q100UDEH)
	Remote I/O module (QJ72LP25, QJ72BR15)
MELSEC-L series	L02, L02-P, L26-BT, L26-PBT, LJ72GF15-T2
MELSEC-F series	FX0, FX0S, FX0N, FX1, FX2, FX2C, FX1S, FX1N, FX1NC, FX2N, FX2NC, FX3G, FX3U, FX3UC

These CPU modules below are supported with using GX Developer which is included on the CD-ROM.

Series name	Model
QCPU(Q mode)	Process CPU (Q02PH, Q06PH, Q12PH, Q25PH)
	Redundant CPU (Q12PRH, Q25PRH)
QCPU(A mode)	All types
QSCPU	All types
QnACPU	All types
ACPU	All types
Motion controller (SCPU)	All types
CNC (M6, M7)	All types

■ Product Information
[Single license product]

Product name	Model	Model code
GX Works2 Version1 (CD-ROM) Single license product	SW1DNC-GXW2-E	13PG71

[Volume license product]

Product name	Model
GX Works2 Version1 (CD-ROM) Volume license product	SW1DNC-GXW2-EA

[Additional license product]

Product name	Model	Remarks
GX Works2 Version1 Additional license product	SW1DNC-GXW2-EAZ	This product does not include CD-ROM. Only license certificate with the product ID number will be issued.

■ Manuals
[Operating manual*1]

Manual name	Supply status	IB/SH No.	Model code
GX Works2 Version1 Operating Manual (Common) Explains the system configuration of GX Works2 and the functions common to a Simple project and Structured project such as parameter setting, operation method for the online function.	Sold separately	SH-080779ENG	13JU63
GX Works2 Version1 Operating Manual (Simple Project) Explains methods for such as creating and monitoring programs in Simple project of GX Works2.	Sold separately	SH-080780ENG	13JU64
GX Works2 Version1 Operating Manual (Simple Project, Function Block) Explains methods for such as creating function blocks, pasting function blocks to sequence programs, and operating FB library in Simple project of GX Works2.	Sold separately	SH-080984ENG	13JU72
GX Works2 Version1 Operating Manual (Structured Project) Explains methods for such as creating and monitoring programs in Structured project of GX Works2.	Sold separately	SH-080781ENG	13JU65
GX Works2 Beginner's Manual (Simple Project) Explains fundamental methods for such as creating, editing, and monitoring programs in Simple project for users inexperienced with GX Works2.	Sold separately	SH-080787ENG	13JZ22
GX Works2 Beginner's Manual (Structured Project) Explains fundamental methods for such as creating, editing, and monitoring programs in Structured project for users inexperienced with GX Works2.	Sold separately	SH-080788ENG	13JZ23

*1 The operating manuals are included on the CD-ROM with the software package.
     Manuals in printed form are sold separately for single purchase.
     Order a manual by quoting the manual number (model code) listed in the upper table.

MEMO

MEMO

iQ Platform Compatible
Programmable Controller Engineering Software
MELSOFT GX Works2

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions and other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; and to other duties.

⚠ For safe use

- To use the products given in this publication properly, always read the relevant manuals before use.
- The products have been manufactured as general-purpose parts for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway Vernon Hills, IL 60061, USA	Tel : +1-847-478-2100 Fax : +1-847-478-2253
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Av Paulista, 1439-Cj. 72 Cerqueira Cesar CEP 01311-200, Sao Paulo, SP, CEP:01311-200, Brazil	Tel : +55-11-3146-2200 Fax : +55-11-3146-2217
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8 D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire., AL10 8XB, UK	Tel : +44-1707-276100 Fax : +44-1707-278695
Italy	Mitsubishi Electric Europe B.V. Italian Branch Viale Colleoni 7-20041 Agrate Brianza (Milano), Italy	Tel : +39-039-60531 Fax : +39-039-6053312
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80 E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-93-565-3131 Fax : +34-93-589-2948
France	Mitsubishi Electric Europe B.V. French Branch 25,Boulevard des Bouvets, F-92741 Nanterre Cedex, France	Tel : +33-1-5568-5568 Fax : +33-1-5568-5757
Czech Republic	Mitsubishi Electric Europe B.V.-o.s.-Czech office Avenir Business Park, Radlická 714/113a CZ-158 00 Praha 5	Tel : +420-251-551-470 Fax : +420-251-551-471
Poland	Mitsubishi Electric Europe B.V. Polish Branch ul. Krakowska 50 32-083 Balice, Poland	Tel : +48-12-630-47-00 Fax : +48-12-630-47-01
Russia	Mitsubishi Electric Europe B.V. Russian Branch St.Petersburg office Sverdlovskaya emb., bld "Sch", BC "Benua", office 720; 195027, St.Petersburg, Russia	Tel : +7-812-633-3497 Fax : +7-812-633-3499
South Africa	Circuit Breaker Industries Ltd. 9 Derrick Road, Spartan, Gauteng PO Box 100, Kempton Park 1620, South Africa	Tel : +27-11-977-0770 Fax : +27-11-977-0761
China	Mitsubishi Electric Automaiton (China) Ltd. No.1386 Hongqiao Road,Mitsubishi Electric Automation Center Shanghai China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	Setsuyo Enterprise Co., Ltd. 6F., No.105, Wugong 3rd, Wugu Dist, New Taipei City 24889, Taiwan, R.O.C.	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 1480-6, Gayang-dong, Gangseo-ku Seoul 157-200, Korea	Tel : +82-2-3660-9530 Fax : +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Bulding Singapore 159943	Tel : +65-6470-2480 Fax : +65-6476-7439
Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111 Soi Serithai 54, T.Kannayao, A.Kannayao, Bangkok 10230 Thailand	Tel : +66-2-906-3238 Fax : +66-2-906-3239
Indonesia	P.T. Autoteknindo Sumber Makmur Muara Karang Selatan Block A/Utara No.1 Kav. No.11 Kawasan Industri/Pergudangan Jakarta-Utara 14440, P.O Box5045 Jakarta 11050, Indonesia	Tel : +62-21-663-0833 Fax : +62-21-663-0832
India	Mitsubishi Electric India Pvt. Ltd. 2nd Floor, DLF Building No.9B, DLF Cyber City Phase III, Gurgaon 122002, Haryana, India	Tel : +91-124-4630300 Fax : +91-124-4630399
Australia	Mitsubishi Electric Australia Pty.Ltd. 348 Victoria Road, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN